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VALUE ADDED IN INDUSTRIAL STATISTICS AND NATIONAL ACCOUNTS

EQUAL IN THEORY, DIFFERENT IN PRACTICE

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Value added in industrial statistics and national accounts

Equal in theory, different in practice

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Abstract

UNIDO compiles and provides value added estimates on total manufacturing in its databases and publications, which are generally derived from two different sources. On the one hand, detailed structural business statistics data in industrial statistics (commonly based on surveys and censuses) provide figures on the *value added of manufacturing industries*. On the other hand, *manufacturing value added* measures an exclusive and exhaustive contribution of manufacturing to the gross domestic product of an economy and therefore refers explicitly to national accounts concepts.

While it is correctly assumed that these two figures need to be equal in theory, they differ in practice, even if structural business statistics data are among the most important data sources in many countries and play a central role in national accounts. There are many stumbling blocks associated with the complexity of measuring whole economies that hamper easy comparability. This in the end leaves the data user sometimes confused about what data to use for analytic purposes. There is no simple and straightforward unique strategy, as the choice of data source depends on the given context. Understanding the reasons for possible deviations in the data values of the two different sources, however, is crucial for in-depth analyses.

This article does not intend to provide a full description of all relevant details in the transition from business accounting to national accounting, but it should provide the interested reader a comprehensive overview of the major influencing factors for deviations. Besides a description of basic concepts, analyses and visualizations based on case studies as well as on data from UNIDO's statistical databases, offer profound insights.

Keywords: *industrial statistics; national accounts; manufacturing; value added.*

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1 Introduction

In most countries some form of *structural business statistics* are an integral part of *national accounts* to derive *gross domestic product* (GDP) in accordance with the *production approach*.[1]

Although structural business statistics are often essential for national accounts, there are many stumbling blocks associated with definitions or the simple complexity of measuring whole economies that hamper easy comparability of data. This in the end may leave the data user confused sometimes on what data to use for analytic purposes. There is no simple and straightforward unique strategy, as the choice of data source depends on the given context. Understanding the reasons for possible deviations in the data values of the two different sources (structural business statistics and national accounts), however, helps significantly in deciding which data to use for specific purposes. Therefore, it is helpful to understand the path from granular data of businesses to the estimation of macro-aggregates of whole economies.

United Nations (2000) describes the link between business accounts and national accounts in much more detail. In particular, it focuses on some country practices, since accounting standards, both in format and content, may differ. They may vary not only from one country to another, but also from one business to another. This makes it nearly impossible to develop a single standardized global format for converting business accounts into national accounts. As a consequence, business statisticians, as well as national accountants, have to use their judgement and understanding of the accounting practices in their countries to translate and adjust business accounts data to fit internationally agreed standards for comparable business statistics/national accounts.

It is moreover important to note that *National statistical institutes/offices* (NSIs or NSOs) of many countries use business accounts directly or indirectly through censuses and surveys as well as administrative data (e.g. value added tax data) to generate macro-economic-aggregates on micro-data of businesses. Such aggregates are often published in special business statistics publications. At that stage, business entities are already categorized according to their activities and represent statistical units. In any case, high quality statistical business registers are a precondition for sound publications as outlined in UNIDO (2010, p. 1). In structural business statistics, business accounting information is used to calculate macro-economic-aggregates, allowing to display values for output, value added and other important variables. Usually, such business statistics publications further allow deep insights into the structure of economies, as plenty of detailed variables are observed (cost of materials, energy expenditure, ...).

Nonetheless, even if structural business statistics provide significant inputs for national accounts calculations, it does not necessarily make these data perfect estimates for national accounts, although mostly gained through a well defined survey concept. One

[1] The GDP estimate according to the production approach usually needs to be reconciled with estimates based on the income as well as the expenditure approach. This is commonly done by using the rigorous framework of supply and use tables. Since the income and the expenditure approach are not of specific interest in this analysis, they are mentioned here for the sake of completeness.

major reason can be found in the necessity of national accounts aggregates to provide as consistent and comparable time series as possible in order to generate a reliable and stable estimate for GDP. This can often only be achieved by decreasing the complexity of structural business statistics data in terms of restricting input variables to those that are of main economic interest (such as value added). A reduction of the complexity to major economic aggregates is another common approach. For that reason, value added in national accounts is often only published for sections in terms of the *International Standard Industrial Classification of All Economic Activities* (ISIC). Analyses focusing on the basic economic structure at a high aggregation level (e.g. ISIC section) and intending to compare longer time series are therefore based on national accounts data rather than structural business statistics data. More granular analyses, however, are commonly based on structural business statistics data, as basic data cover much more details on the economic structure. Such granular data might of course contain more inconsistencies, especially over time, because the elimination of inconsistencies comes at the cost of detail.[2]

This article does not intend to provide a full description of all relevant details in the transition from business accounting to national accounting, but should give the interested reader a comprehensive overview of the major influencing factors for deviations. The focus is furthermore restricted to the manufacturing sector, as it is the main interest of the United Nations Industrial Development Organization (UNIDO).

The central question of this paper could be phrased as:

> Why does the sum of *value added of manufacturing industries* (in industrial statistics commonly based on surveys and censuses in some form of national structural business statistics) not simply correspond to the so-called *manufacturing value added* (data derived from national accounts)?

The complex answer lies in investigating the applied basic concepts, followed by a second part comprising a few case studies to explore the effects in more detail. Instead of providing only definitions, formulas and tables, visualizations are used as well to highlight the influence of different aspects for more clarity. A third part more broadly shows the currently present deviations for a variety of countries covered in UNIDO's databases (UNIDO, 2020a,b,c).

To sum up, structural business statistics can be viewed as an intermediary between company accounts and national accounts. In this unique position, it offers a variety of options for structural analysis to data users; data users with awareness of the bigger picture.

[2]Not to mention the limited resources in NSIs; or to put it in other words, NSIs invest resources to eliminate inconsistencies in structural business statistics, it is just often done in own departments, namely national accounts.

2 Basic concepts

Despite the main focus of this article, namely analysing the manufacturing sector (ISIC Rev. 4 section "C"), it is nonetheless important to start with the concept of calculating gross domestic product (GDP) to understand the inter-connectivity of structural business statistics and national accounts.

2.1 Gross domestic product and value added

The *System of National Accounts* 2008, referred to as SNA or SNA2008, defines GDP in United Nations (2010, p. 34) as:

> Basically, GDP derives from the concept of value added. Gross value added is the difference between output and intermediate consumption. GDP is the sum of gross value added of all resident producer units plus that part (possibly the total) of taxes on products, less subsidies on products, that is not included in the valuation of output.

The above definition can be rewritten in a basic equation:

$$GDP = \sum Gross\ Value\ Added\ \ [+taxes\ on\ products - subsidies\ on\ products]$$

Ignoring the part *taxes and subsidies* for now, most importantly, the above definition introduces another basic equation defining the already mentioned *production approach* that this article focuses on:

$$(Gross)\ Value\ Added = Output - Intermediate\ Consumption$$

The attentive reader may have noticed that "gross" was put in parentheses. Clarification on gross vs. net measures is provided in United Nations (2010, p. 34):

> In principle, the concept of value added should exclude the allowance for consumption of fixed capital. The latter, in effect, is not newly created value, but a reduction in the value of previously created fixed assets when they are used up in the production process. Thus, theoretically, value added is a net concept. This conclusion applies to domestic product as well. [...] However, gross measures of product and income are commonly used for various reasons. The depreciation of fixed assets as calculated in business accounting does not generally meet the requirements of the SNA. The calculation of consumption of fixed capital requires that statisticians estimate the present value of the stock of fixed assets, the lifetime of various types of assets, patterns of depreciation, etc. Not all countries make such calculations, and when they do there may be differences in methodology (with some of them using business data even when inadequate). *Consequently, gross figures are more often available, or available earlier, and they are generally considered more comparable between countries.*

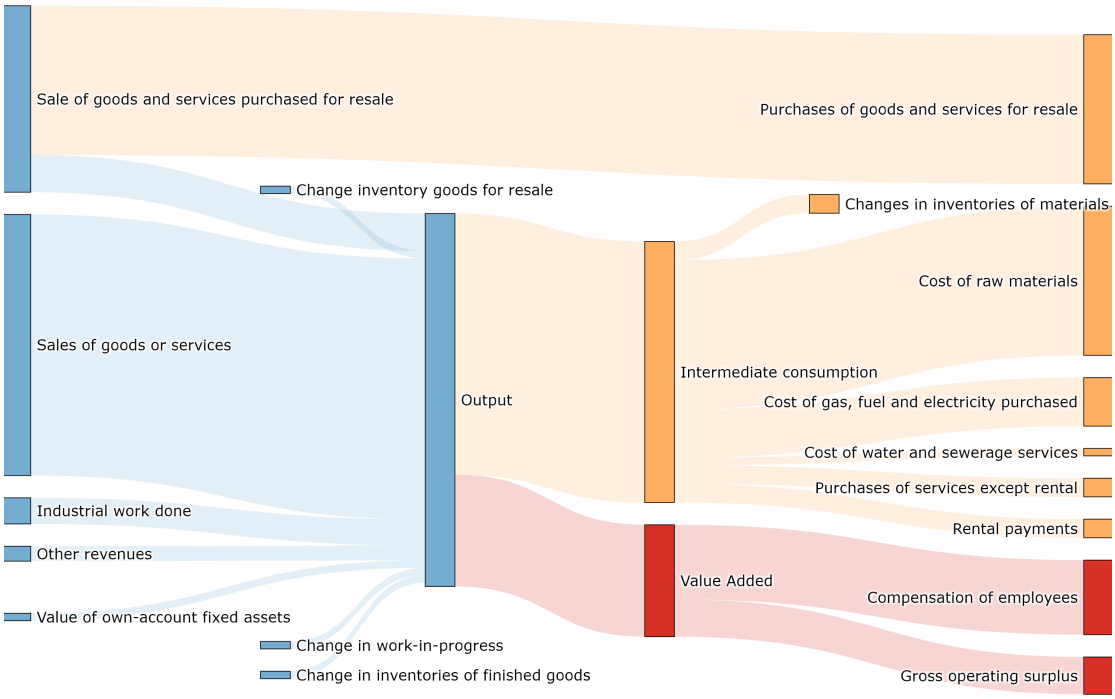
As gross measures are commonly used and this article does not intend to focus in more detail on "consumption of fixed capital", all references to value added in this article actually refer to gross value added and are abbreviated as (G)VA or just VA in the remainder of this paper.

However, value added is not commonly understood at the basic level of information providers for economic data, as it is not a term that is used in the language of business accounting.

2.2 Business accounting and the calculation of value added

Output (OUT), value added (VA) and intermediate consumption (IC) represent SNA concepts that business accountants are not necessarily familiar with. The *International Recommendations for Industrial Statistics* (United Nations, 2011) help to further decompose the variables of the initial equation of interest $VA = OUT - IC$ by using terms that are more precisely related to terms used in business accounting. Thus, the aforementioned relationship can be extended to provide a broader picture in Figure 1.

Figure 1: Components of output, intermediate consumption and value added and their relationships to more common terms used in business accounting



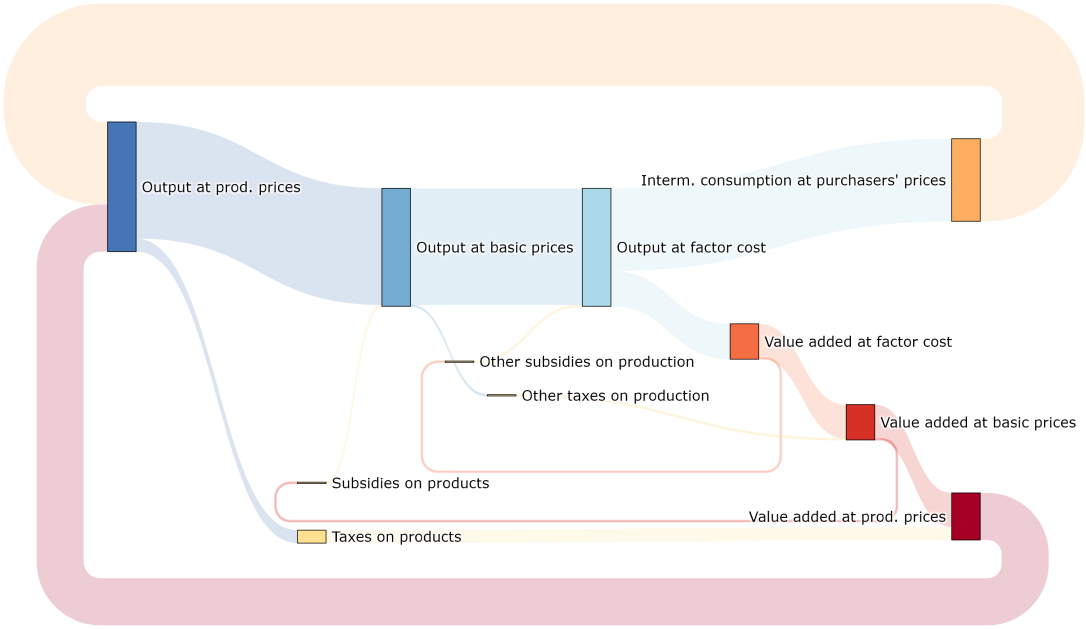
Source: Own illustration.
Note: The proportions of the variables were generated individually and do not reflect any generally valid pattern. The categories needed to be abbreviated. The interested reader can find the full description and definition of the variables in United Nations (2011). Additionally, the terms primarily reflect the situation of a producer in manufacturing, as this is the main focus in this article.

Although the variables seem to be clear, businesses/producers are usually interested in the value they actually receive for the goods or services they produce. To avoid confusion about what values are being compared, definitions need to be more precise on

taxes that the producer remits to the respective government bodies and subsidies the producer might receive from government bodies.

Different valuations (expressed in prices) used in economic statistics can be quite confusing, thus Figure 2 provides a valuable overview. The illustration is generally displayed using the *net system of recording value added tax (VAT)*, implying that VAT is excluded in output as well as in intermediate consumption (for further details, see United Nations (2010, p. 101)).

Figure 2: Valuation concept in economic statistics based on the net system of recording value added tax



Source: Own illustration.
Note: The proportions were chosen individually and do not have generally valid implications.

In short, the most important relationships in valuation can be expressed as:

$$\begin{aligned} \text{producers' prices} &= \text{basic prices} + \text{taxes on products (excl. VAT)} - \text{subsidies on products} \\ \text{basic prices} &= \text{factor cost} + \text{other taxes on production} - \text{other subsidies on production} \end{aligned}$$

where following variables are further defined:

Taxes on products: payable per unit of some good or service.

Subsidies on products: payable per unit of a good or service produced.

Other taxes on production: taxes that the producing units are liable to pay as a result of engaging in production. Examples are duties and registration fees, business licences and payroll taxes.

Other subsidies on production: subsidies with the exception of subsidies on products that resident enterprises may receive as a result of engaging in production (for example, subsidies on payroll or workforce, and subsidies to reduce pollution).

This distinction now allows us to provide a more precise definition of GDP:

$$GDP = \sum (Gross)\ Value\ Added\ at\ basic\ prices + taxes\ on\ products - subsidies\ on\ products$$

The initial GDP description referred to "resident producer units" as basic units for value added. The subsequent chapter gives more insights into the observation unit.

2.3 Market producers as a subgroup of all resident producer units

The previous section introduced more precise definitions on the variables value added and intermediate consumption as well as output, highlighting the importance of exact definitions in economic statistics. The need to separately categorize taxes as well as subsidies introduces another obstacle in the comparability of data and leads to the question which unit to actually observe.

Taking the principal GDP definition as a starting point, United Nations (2010) mentions "resident producer units". This allows us to describe GDP as follows (for this illustrative purpose it is not essential to separately mention taxes/subsidies):

$$GDP = \sum_{i=1}^{n} (Gross)\ Value\ Added_i = \sum_{i=1}^{n} Output_i - \sum_{i=1}^{n} Intermediate\ Consumption_i$$

- with $i = 1, ..., n$ ... resident producer units

Lequiller and Blades (2014, p. 15) stress that GDP combines all output (or production) of all firms, non-profit institutions, government bodies and households in a given country in a single figure, with no double counting, during a given period, regardless of the type of goods and services being produced, provided that production takes place within the country's economic territory.

Within the United Nations (2010) national accounting concept, institutional units that are resident in the economy are grouped together into five mutually exclusive sectors composed of the types of units summarized in Table 1.

Table 1: Institutional sectors (without subsectors) according to SNA 2008, grouping institutional units with similar economic behaviour together

Sector.Codes	Sector.Text
S1	Total economy
S11	Non-financial corporations
S12	Financial corporations
S13	General government
S14	Households
S15	Non-profit institutions serving households
S2	Rest of the world

Source: United Nations (2010, p. 546ff.)

While the calculation of GDP in national accounts should per definition cover all resident producer units, we must consider that units belonging to the different sectors are not necessarily homogeneous. Not even homogeneous in their administrative duties with

regard to bookkeeping, the essential source of information for further data processing in structural business statistics. While registered businesses are mostly required by law to apply detailed business accounting, there is normally no such obligation for households (considering household producers often belong to the informal sector of an economy). Furthermore, units of the general government often have to follow diverging accounting requirements as well.

Grouping the most similar units with available and relevant accounting information ultimately results in the attainment of own structural business statistics in plenty of countries. Structural business statistics tend to focus exclusively on the observation of businesses under market conditions following price settings as a result of demand and supply. *For the manufacturing sector, relevant units are usually classified in S11 and in S14 (e.g. household units (persons) in their capacity as owners of unincorporated enterprises).* While non-financial corporations need to fulfill legal requirements to be incorporated, the observation of the relevant units in S14 is of course more difficult, thinking of private producers for own final use. Entities being considered under the control of the general government might be classified as *market producers* in S11, or as government controlled *non-market producers* in S13. The latter are often not included in business statistics, although such entities might be producing relevant output in the manufacturing sector. Nonetheless, market producers in manufacturing usually cover the most significant part of value added in manufacturing.

Therefore, compared to the equation from the perspective of national accounts, *structural business statistics often refer to market-producers in S11 and S14 only (instead of all resident producers).*

$$\sum_{i=1}^{n} (Gross)\ Value\ Added_i = \sum_{i=1}^{n} Output_i - \sum_{i=1}^{n} Intermediate\ Consumption_i$$

- with $i = 1, ..., n$ ... ***market-producers of institutional sectors S11 and S14***

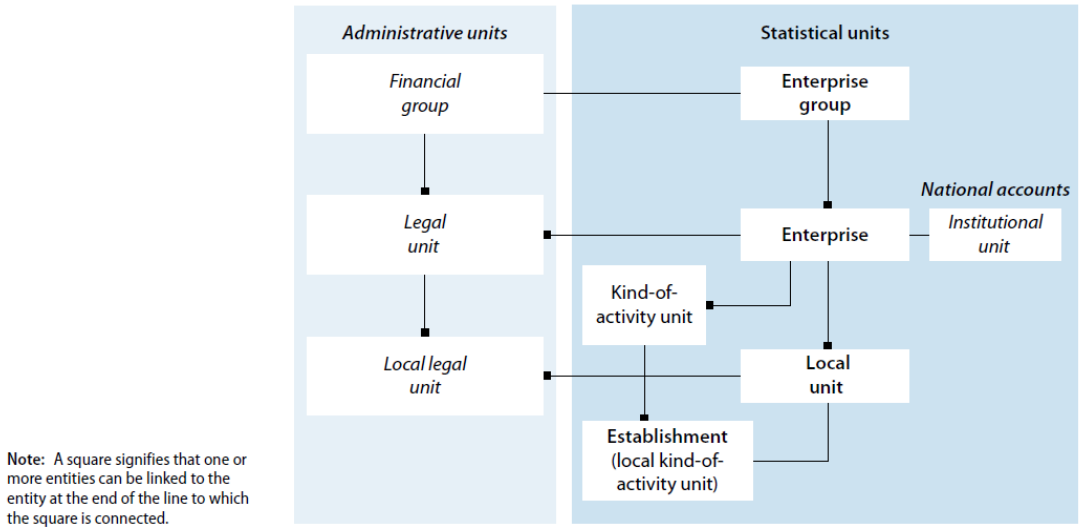
2.4 Relevance of the observed statistical unit

Ideally, economic statisticians want to measure the most homogeneous units, such as a factory producing one single product. An ideal case further implies such a factory to represent an economic entity that is capable, in its own right, of owning assets, incurring liabilities and engaging in economic activities and in transactions with other entities. Additionally, it sells all its output on the market, and business accounting is available to report all relevant variables concerned (including taxes and subsidies).

Being aware of the economic reality's complexity and the different approaches across countries to the definitions of business accounting rules (not speaking of the often unregulated informal sector), such "ideal cases" will not be exclusively available. As soon as more than one activity in terms of ISIC is carried out in the factory, or the factory is owned by a natural person also possessing other factories, it can get very difficult to extract the necessary data flows, as legal units are usually the relevant underlying unit in company accounts. This leads to the necessity in economic statistics to introduce

further units, as outlined in United Nations (2011, p. 28) and shown in Figure 3.

Figure 3: Relationship between different types of statistical units



Source: United Nations (2011, p. 28)

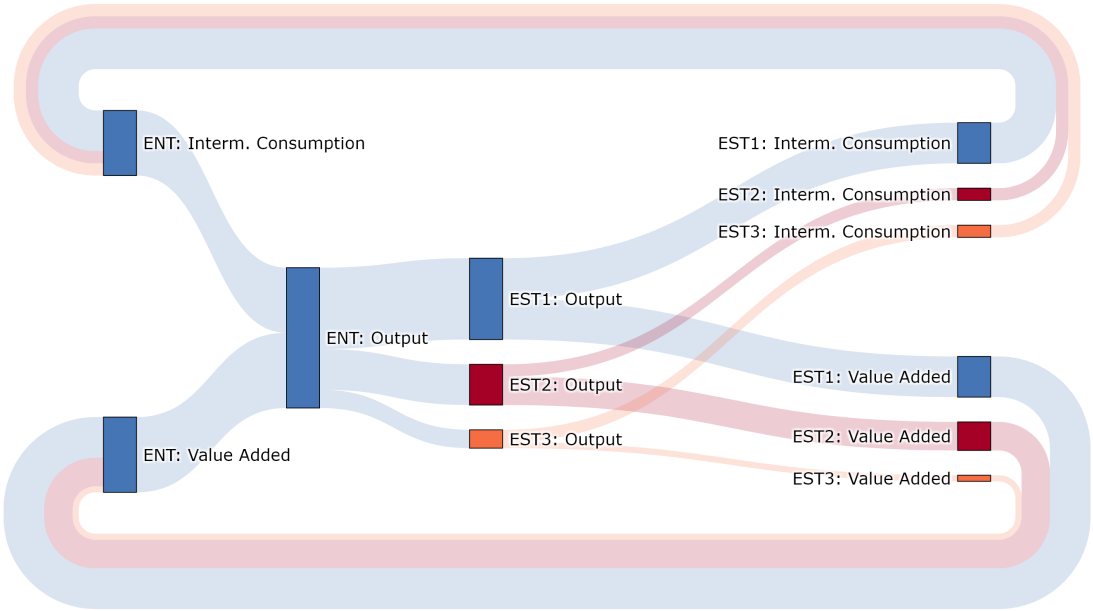
The aforementioned ideal case of a "one activity factory" would be e.g. subsumed to be an *establishment (local kind-of-activity unit)*. However, the information necessary to compile business statistics is often only available at the level of legal units. One or more legal units can build an enterprise. An enterprise in the sense used here is a unit created for statistical purposes. With the information illustrated in Figure 3, it is easy to imagine that smaller distortions in economic data are not only possible, but a logical implication of economic complexity.

Returning once more to the example of *one factory = one establishment = one enterprise*, all of the value added created by the establishment/enterprise would be subsumed under a main activity. Being aware that the real world economy consists of larger enterprises that cover more than one activity, a delineation is necessary. Figure 4 illustrates the hypothetical case of one enterprise (ENT) consisting of three establishments (EST1, EST2 and EST3) with different main economic activities according to ISIC.

Measured at enterprise level, output, value added and intermediate consumption only refer to one main activity (blue represents e.g. the manufacture of wearing apparel - ISIC Rev. 4 division 14). However, the establishment level reveals that values actually refer to three different activities (besides the manufacture of wearing apparel, one establishment reflects the manufacture of textiles (ISIC Rev. 4 division 13 - red) and the other establishment reflects wholesale trade of leather articles (ISIC Rev. 4 division 46 - orange)). This constellation has an impact on the value added figures delineated by economic activity in case establishments are defined to be the basic observation unit. More complex cases might also involve the existence of an ancillary activity, as described in United Nations (2011, p. 30).

At this stage, it is important to keep in mind that economic realities are complex and that observation units can by far not always be considered to be simply structured and

Figure 4: Influence of the statistical unit on output, intermediate consumption and value added



Source: Own illustration showing the example of an enterprise (ENT) with 3 establishments (EST).
Note: colours indicate different activities, with the main activity of the enterprise displayed in blue.

homogeneous. Thus, the observation unit has an impact on the results. We must further take into consideration that the availability of detailed delineated enterprises often goes hand in hand with an increase in the complexity and cost of producing statistics.

2.5 Building the manufacturing aggregate

Industries are defined in SNA in the same way as in ISIC: an industry consists of a group of establishments engaged in the same, or similar, kinds of activity. At the most detailed level of classification, an industry consists of all of the the establishments falling within a single class of ISIC. Higher levels of aggregation correspond to the groups, divisions and, ultimately, sections of ISIC.

An overview of all sections according to ISIC Rev. 4 classification is presented in Table 2.

Table 2: Activities according to ISIC Rev. 4 sections

Section	Divisions	Description
A	01–03	Agriculture, forestry and fishing
B	05–09	Mining and quarrying
C	10–33	Manufacturing
D	35	Electricity, gas, steam and air conditioning supply
E	36–39	Water supply; sewerage, waste management and remediation
F	41–43	Construction
G	45–47	Wholesale and retail trade; repair of motor vehicles and motorcycles
H	49–53	Transportation and storage
I	55–56	Accommodation and food service activities
J	58–63	Information and communication
K	64–66	Financial and insurance activities
L	68	Real estate activities
M	69–75	Professional, scientific and technical activities
N	77–82	Administrative and support service activities
O	84	Public administration and defence; compulsory social security
P	85	Education
Q	86–88	Human health and social work activities
R	90–93	Arts, entertainment and recreation
S	94–96	Other service activities
T	97–98	Activities of households as employers; undifferentiated goods- and services- producing activities of households for own use
U	99	Activities of extraterritorial organizations and bodies

Source: United Nations (2008, p. 43)
Note: The ISIC classification hierarchy can be further expanded to groups and classes.

Regarding manufacturing, all establishments (resp. available basic statistical units as shown in Figure 3) whose main activity is in one of the classes of ISIC C are summed up to represent the manufacturing sector. In terms of theoretical national accounts definitions, this implies:

$$(Gross)\ Value\ Added_{ISIC\ C} = MVA = \sum_{i=1}^{n} Output_i - \sum_{i=1}^{n} Intermediate\ Consumption_i$$

- with $i = 1, \ldots, n$ ... resident producer units of ISIC Rev. 4 section C
- MVA ... manufacturing value added

As already mentioned, measuring economic reality is very complex and often, approximations have to satisfy the needs. Choosing enterprises as basic units, e.g., implies assigning all value added of the enterprise to one single main activity, even if more activities are being carried out at the establishment level of the same enterprise. At the same time, value added in accordance with its precise definition needs to rely on data from legal units, because only business accounting at this unit level offers enough detail on essential variables that need to be collected. All deviations from an ideal case *one enterprise = one legal unit = one establishment = one factory with one single activity* requires the introduction of estimates.

Furthermore, the distinction between market producers vs. non-market producers needs to be taken into account. In structural business statistics, the aforementioned

aggregation might be attained by carrying out a census, using survey methods and/or administrative data. Often, as stated in the beginning, the basic collection of relevant data and its aggregation is carried out by business statisticians. Thus, the following equation holds

$$(Gross)\ Value\ Added_{ISIC\ C} = \sum_{i=1}^{n} Output_i - \sum_{i=1}^{n} Intermediate\ Consumption_i$$

- with $i = 1,\ldots,n$ ... ***(surveyed) market-producers*** with a main activity in ISIC C

There might be quite a significant difference between observing ***all resident producer units*** as theoretically foreseen in national accounts, on the one hand, and ***(surveyed) market-producers*** being the most suitable approach in structural business statistics, on the other hand. Moreover, survey schemes, or more generally, the chosen approach to measure national economies, is historically rooted in each country and therefore subject to many country-specific factors. National statistical offices in some countries use sample surveys and estimation procedures to obtain estimates for non-observed entities in structural business statistics, whereas other countries only publish data for survey entities above a certain threshold value (e.g. 20 employees) without further estimates on the missing information. Other countries might only survey registered enterprises in structural business statistics, whereas the dimensions of the informal sector are rather roughly estimated by national accounts for major aggregates. That is why it is essential to always carefully take metadata into consideration when using structural business statistics data for analytic purposes. Metadata provide information on coverage and many other aspects of published survey results. UNIDO's INDSTAT databases (UNIDO, 2020a,b) contain meta-information for every country and reporting period, informing the data user about possible restrictions regarding comparability and coherence.

To sum up, the focus of structural business statistics often lies in the consistent publication of plenty of details within a given time frame and for a defined subset of the relevant observation units. National accountants ideally use this information as input into the production account. Further information is added (households/informal sector, non-market producers, ...) and more stable results are often the outcome. However, time series consistency comes at the cost of the details of publication regarding variables and economic structure (e.g. ISIC level).

2.6 Manufacturing value added vs. value added of manufacturing industries: equal in theory, different in practice

Recapitulating this chapter, the production approach describes the economic output of a national economy from the producer's perspective. (Gross) value added is the key factor in the production approach, calculated for each industry and acting as the indicator of the economic performance of each industry. As value added is not a term that is commonly used in business accounting, several steps are necessary to process

the granular data from business accounting to macroeconomic aggregates in national accounts. In between, we observe the very important output of structural business statistics, providing detailed insights into the value added of manufacturing industries, however, depending on the scope and type of the statistical units observed.

Thus, the *value added of manufacturing industries* is used to measure growth and structure, but not the level. In more detail it is ...

> *[...] a survey concept that refers to the given industries' net output derived from the difference of gross output and intermediate consumption.* Value added is calculated without deducing consumption of fixed assets represented by depreciation in economic accounting concepts. [...] Depending on the survey method selected, [...] value added may often refer to census value added which disregards the margin between the receipt from and payment for non-industrial services. Survey data on [...] value added may also disregard the contribution of small and household-based manufacturing units which are often excluded from the regular industrial survey program. Estimates for such units are made separately for the compilation of national accounts (Andreoni and Upadhyaya, 2014, p. 4).
>
> The value added of the entire manufacturing sector is, theoretically, the sum of the value added of all manufacturing activities. However, in practice, MVA cannot simply be derived by adding up all [...] value added figures because of the complexity associated with survey methods. [...] value added may not cover all activity units engaged in manufacturing due to the incomplete frame used in the survey. On the other hand, activity units are often classified as manufacturing based on their primary activity. This implies that secondary activity can often be of a non-manufacturing nature. Such discrepancies are resolved in the process of compiling national accounts using supply use or input-output tables. Thus, *MVA measures an exclusive and exhaustive contribution of manufacturing to GDP* (Andreoni and Upadhyaya, 2014, p. 4f.).

With awareness of the data flow and the necessity for estimations, some categories of corrections can be listed that national accountants can carry out using survey/census data from structural business statistics to bring it in line with national accounts, which needs to publish as exhaustive data as possible on the country's economy (based on categories referred to in the case studies section as well as outlined in Statistical Office of the European Communities (2015)):

- **conceptual adjustments**: are (regular) adjustments designed to bring basic data in line with SNA definitions. Conceptual adjustments are or may be needed to ensure correct treatment of the following items:
  - To include research and development, software, entertainment, literary and artistic originals and other intellectual property products misreported as intermediate consumption in gross fixed capital formation (GFCF));

  - To exclude durable goods of small value from GFCF;
  - To allocate Financial Intermediation Services Indirectly Measured (FISIM) and insurance output to users;
  - To exclude holding gains accounted for in changes of inventories;
  - To include net taxes on production to ensure that output and (G)VA are at basic prices;

- **adjustments for exhaustiveness**: Lack of exhaustiveness ('non-exhaustiveness') in national accounts or their underlying basic statistics can have various causes and can thus be assigned to specific types or categories of non-exhaustiveness

  - The producer is not registered, e.g. to avoid paying taxes or social security contributions (shadow economy activities).
  - The producer is carrying out illegal activities, e.g. drugs trafficking or the smuggling of alcohol and cigarettes.
  - The producer is not subject to registration on the grounds of being a household producer not engaged in market production or whose market production is so small that registration as an entrepreneur is not required.
  - A legal person or company is registered but excluded from the survey frame, for example because they fall below the threshold for a particular statistic.
  - Although the producer is registered, it is not recorded statistically, for example because a register is out of date or contains errors.
  - The producer is deliberately providing false details, for example output may be under-reported, intermediate consumption may be over-reported to evade or reduce income tax, VAT or social security contributions.
  - The data are defective from a statistical point of view, either because particular data have not been recorded or because recorded data have been incorrectly processed.

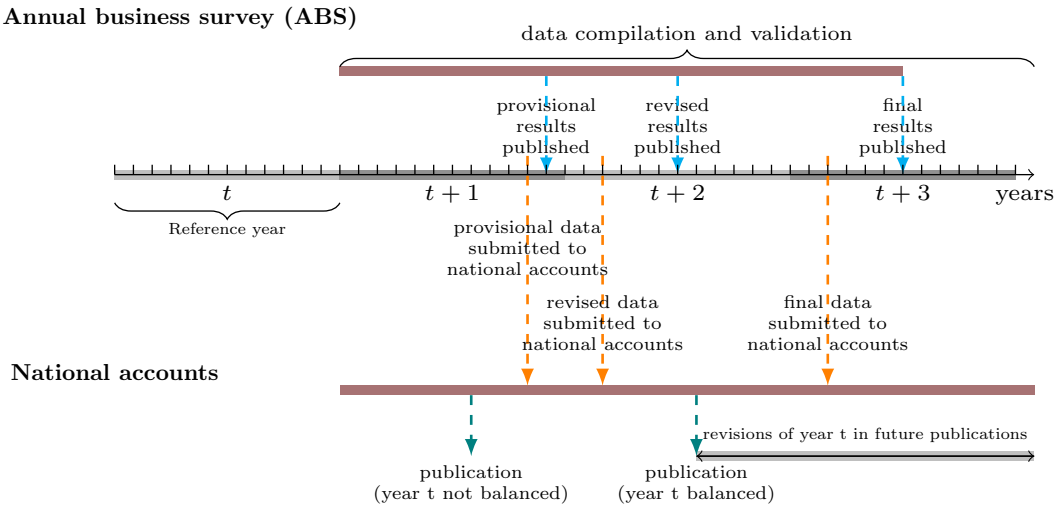
- **other corrections**: might be necessary to adjust data from business statistics to, e.g. correct for inconsistencies due to the observation unit. Structural business statistics might rely on publishing data for enterprises, whereas national accounts need to delineate establishments.
- **balancing adjustments**: might be necessary, e.g. to reconcile the estimates based on the production approach with estimates based on the income and the expenditure approach.

This theoretical part aimed to provide an overview of the relevant influencing factors for the differences between value added of manufacturing industries resulting from industrial statistics (resp. more broadly, from structural business statistics) and MVA from national accounts. Structural business statistics are usually a main input for national accounts. Deviations reflect additional estimations carried out by national accountants on input data to construct consistent time series on major economic aggregates. As this implies additional time, effort, cost and knowledge, national accounts data are the preferred data source for general analyses of the big picture of economies. However, as

soon as there is a need to carry out more detailed analyses on the structure and interdependencies of economies, structural business statistics data become essential. What is more, they are available earlier.

Based on data on the United Kingdom, Ayoubkhani (2014) gives an exemplary overview on the possible timeline of processing annual business survey and national accounts data, summarized in Figure 5 .

Figure 5: Timeline of annual business survey deliveries to national accounts and respective releases, example United Kingdom



Source: Own illustration based on Ayoubkhani (2014, p. 13 and p. 28).

Of course, more details and earlier availability as well as constraints in the number of data revisions come at the cost of more inconsistencies in the (survey) data over time. Furthermore, structural business statistics often only cover surveyed data.

The next section refers to exemplary country case studies, giving insights into the dimensions of possible deviations. One major conclusion to be drawn is the importance of always taking published meta-information into consideration, since, although worldwide standards for economic statistics have been agreed on, all country data are to some extent biased with individual specifics. Specifics that reflect the complexity of trying to measure economic reality.

3 Case studies

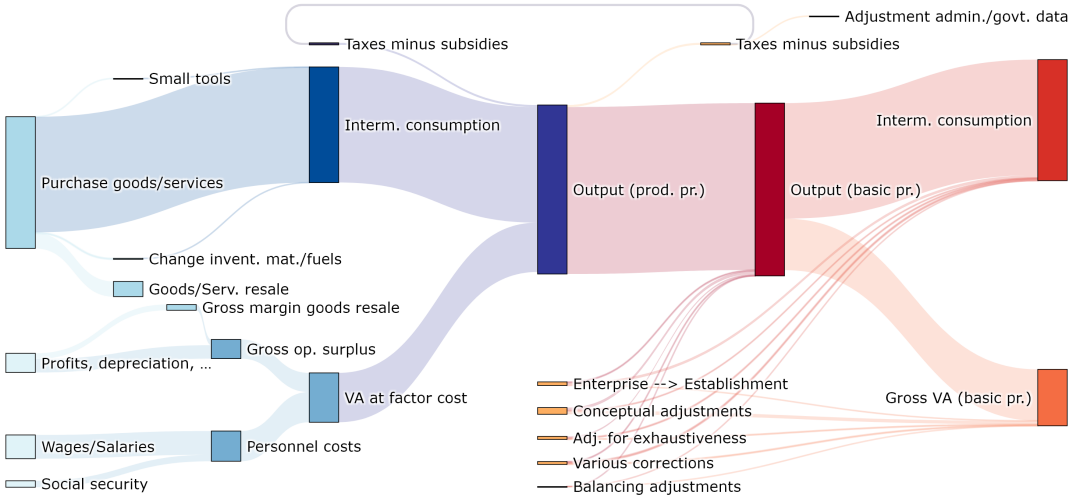
The previous chapter has already outlined the theoretical background for possible deviations between structural business statistics and national accounts. A clearer picture of the influence of different categories of adjustments is presented with case studies for selected countries. Countries for which relevant information based on detailed enough data decomposition is published. UNIDO's host country, Austria, and its neighbouring country, Slovakia, for example, published such information.

3.1 Case study: Austria

According to Statistics Austria (2016, p. 39), the EU harmonized Structural Business Statistics is one of the main data sources in the *System of National Accounts* in Austria and plays a central role in the *production approach* of calculating GDP[3].

A visualization of available data provides interesting insights into the deviations resulting from the transition process of data from structural business statistics to national accounts. The data illustrated in Figure 6 refer to the level of total manufacturing (ISIC Rev. 4 section C) for reference year 2011.

Figure 6: From structural business statistics to national accounts, showing manufacturing total data for reference year 2011 in Austria



Source: Own illustration based on data from Statistics Austria (2016, p. 87, Table 3.29), Statistics Austria (2020) and Statistical Office of the European Communities (2020).
Note: Blue colours indicate the sphere of structural business statistics, red colours the sphere of national accounts.

Taking the data flow from left to right (or: from the sphere of structural business statistics - blue colour - to the sphere of national accounts - red colour) into consideration, some adjustments have obviously been carried out by national accountants. Apart from additional government information on the amount of taxes and subsidies[4], other major adjustments focus primarily on the values of output at basic prices and intermediate consumption at purchasers' prices, and therefore also influence the final figure for gross value added at basic prices in ISIC C. The adjustments themselves can be considered to be altogether of relevant but limited influence on the total outcome for ISIC C (a few per cent - be aware that the Sankey diagram in Figure 6 displays the proportions published in Statistics Austria (2016)). Among the adjustments, conceptual adjustments make up the major part of the changes.

Statistics Austria (2016, p. 87, Table 3.29) provides some further information on the

[3]SBS data at the same time also represent the basic data source for Austrian data in the UNIDO INDSTAT databases (UNIDO, 2020a,b).

[4]Businesses can normally only to some extent extract the necessary information from business accounts.

categories of deviation that are applied throughout the transition of structural business statistics to national accounts.

Table 3: Austria: production account - manufacturing, in mil. EUR, 2011

ISIC	Year	OP	Component	OUT	IC	VA
C	2011		Initial data (including S.13)	166502	115958	50544
C	2011	minus	Taxes on products, except VAT and import taxes	-2033	0	-2033
C	2011	plus	Other subsidies on products	12	0	12
C	2011	+/-	Various corrections to the initial data	587	1431	-844
C	2011	+/-	Conceptual adjustments (FISIM, insurance service charge, small tools, holdinggains/losses, own-account software, addition for self-produced additions to fixedassets etc.)	2872	-419	3291
C	2011	plus	Adjustments for exhaustiveness (revenues off the books, underrecording, other)	1499	855	644
C	2011	plus	Balancing adjustments	6	40	-35
C	2011		Total	169446	117865	51581

Source: Statistics Austria (2016, p. 87, Table 3.29)
Note: OUT refers to Output, IC to Intermediate Consumption and VA to Value Added

Aside from the categories[5] mentioned in both Figure 6 and Table 3, Figure 6 names an additional category *Enterprise –> Establishment*. This category was introduced to represent the sum of effects that in Statistics Austria (2016, p. 88) is described as: "For the initial data, the company structure is first projected down to establishment level".

In other words, it comprises *the projection of enterprise data down to establishment data*, as outlined in the section Relevance of the observed statistical unit from a theoretical perspective.[6] A further look at Figure 6 reveals this effect to be of minor influence altogether. This might be true for the level of total manufacturing (ISIC C) that we are currently looking at. Although Statistics Austria does not publish detailed calculation patterns for ISIC divisions (2-digit codes) regarding this specific issue, a closer look at a more detailed ISIC level would likely lead to a more diverse picture, as some activities are probably more affected by dominant multi-establishment enterprises than others. One might, however, assume such an effect by looking at differences in deviations from structural business statistics to national accounts for the variable output displayed later in Figure 8.

The attentive reader may have noticed another reason for deviation, since the table

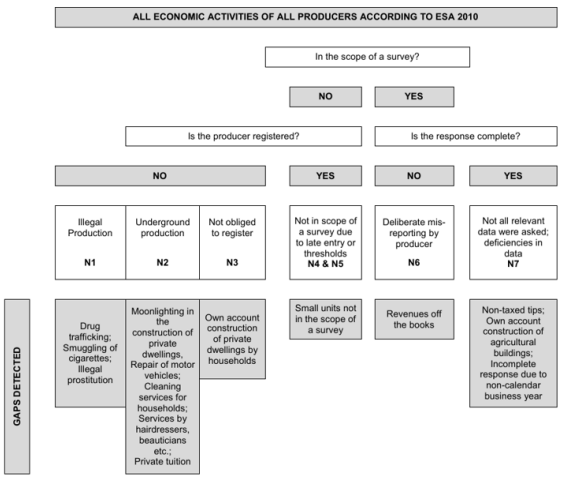
[5] *various corrections*, *conceptual adjustments*, *adjustments for exhaustiveness* and *balancing adjustment*

[6] Statistics Austria (2016, p. 7) explains the reason for the production approach in Austrian national accounts as relying on the establishment: *"In ESA 2010 a distinction is made between institutional units, which are grouped together to form the five institutional sectors, and local activity units, which are intended to represent technical and economic circumstances. The economic unit best suited to depict the production process is, according to ESA 2010, the "local kind of activity unit". The kind of activity unit, which is generally called a "Betrieb" (establishment) in Austria, covers all the parts within an institutional unit which contribute to exercising a productive activity at class level (four digits) of the ÖNACE Rev.2. The local kind of activity unit is a part of an activity unit which is found at the local level (local unit)."*

actually specifies **Initial data *(including S. 13)***. Thus, there is a need to explore the influence of institutional sector S13 (general government). Long story short, Statistics Austria (2016, p. 87) actually states that it is negligible in manufacturing in Austria (only ISIC 10 *Manufacture of food products* and 18 *Printing and reproduction of recorded media* are affected to a minor degree).

However, having already mentioned institutional sectors, what is the influence of the *household sector (S.14)* in manufacturing production? Structural business statistics according to the European concept covers, aside from S11 (non-financial corporations), relevant parts of S14 as well (e.g. units (persons) in their capacity as owners of unincorporated enterprises). Table 3 does not quantify the influence of other households directly (e.g. non-market producers producing for own final use). Nonetheless, it seems to be subsumed in the category **Adjustments for exhaustiveness (revenues off the books, under-recording, other)** which represent deviations of 0.9 per cent on output, 0.7 per cent on intermediate consumption and 1.3 on value added. Figure 7 gives an overview of adjustments for exhaustiveness by different categories and provides further insights into the amount of adjustments for exhaustiveness. *Misreporting by the producer (e.g. revenues off the books) is depicted as a main factor in adjustments for exhaustiveness for Austria in ISIC C.*

Figure 7: Detection of data gaps by type of non-exhaustiveness (a) and adjustments for exhaustiveness by different categories in mil. EUR (b), Austria.



NACE section	N1: underground producer	N2: illegal producer	N3: producer not obliged to register	N4&N5: Registered producer not included in statistics	N6: Mis-reporting by the producer	N7: statistical deficiencies	Sum
A	0	0	0	0	0	69	69
B	0	0	0	0	0	0	0
C	0	0	0	132	406	106	644
D	0	0	0	5	4	0	9
E	0	0	0	0	23	1	24
F	1,333	0	1,833	249	226	15	3,656
G	383	233	0	164	1,044	44	1,869
H	0	0	0	145	130	90	364
I	0	0	0	285	1,514	1,198	2,997
J	0	0	0	38	48	10	95
K	0	0	0	0	0	8	8
L	0	0	0	0	0	8	8
M	0	0	0	211	192	66	469
N	673	0	0	65	56	25	819
O	0	0	0	0	0	0	0
P	147	0	0	0	26	0	173
Q	0	0	0	0	325	0	325
R	0	0	0	0	550	0	550
S	192	231	0	0	79	88	590
T	0	0	0	0	0	0	0
Total	**2,728**	**464**	**1,833**	**1,293**	**4,625**	**1,730**	**12,672**

Source: Statistics Austria (2016, p. 305 and p. 68)

Table 4, as an extended version of Table 3, provides a percentage overview of the impact of the transition from enterprise to establishment level as well as the other categories. The deviations are calculated using the line "Total" as the basis.

Table 4: Austria: production account - manufacturing, in mil. EUR, 2011, extended

ISIC	OP	Component	OUT	IC	VA	OUT%	IC%	VA%
C		**ESTAT-SBS|UNIDO (VA refers to VA at Factor Cost, not producers prices as in Initial data)**	**163718.7**		**48392.1**	**96.62**		**93.82**
C		**Initial data (including S.13)**	**166502.0**	**115958**	**50544.0**	**98.26**	**98.38**	**97.99**
C	minus	Taxes on products, except VAT and import taxes	-2033.0	0	-2033.0	**-1.20**	**0.00**	**-3.94**
C	plus	Other subsidies on products	12.0	0	12.0	**0.01**	**0.00**	**0.02**
C	+/-	Various corrections to the initial data	587.0	1431	-844.0	**0.35**	**1.21**	**-1.64**
C	+/-	Conceptual adjustments (FISIM, insurance service charge, small tools, holdi ...)	2872.0	-419	3291.0	**1.69**	**-0.36**	**6.38**
C	plus	Adjustments for exhaustiveness (revenues off the books, underrecording, oth ...)	1499.0	855	644.0	**0.88**	**0.73**	**1.25**
C	plus	Balancing adjustments	6.0	40	-35.0	**0.00**	**0.03**	**-0.07**
C		**Total**	**169446.0**	**117865**	**51581.0**	**100.00**	**100.00**	**100.00**

Initial data (including S.13) [a] OUT at producers' prices, IC at purchaser prices, VA at producers' prices;
Total [*] OUT at basic prices, IC at purchaser prices, VA at basic prices;

Source: Statistics Austria (2016, p. 87, Table 3.29)
Note: OUT refers to Output, IC to Intermediate Consumption and VA to Value Added

As to deviations with regard to taxes, Figure 2, illustrated in the basic concepts section, can be taken into consideration for a general explanation. The deduction of **taxes on products, except VAT and import taxes** resp., the addition of **other subsidies on products** is related to deriving the basic price estimates (in Austria, the overwhelming part of taxes on products refers to only one ISIC, namely ISIC 19 (mineral oil taxes)).

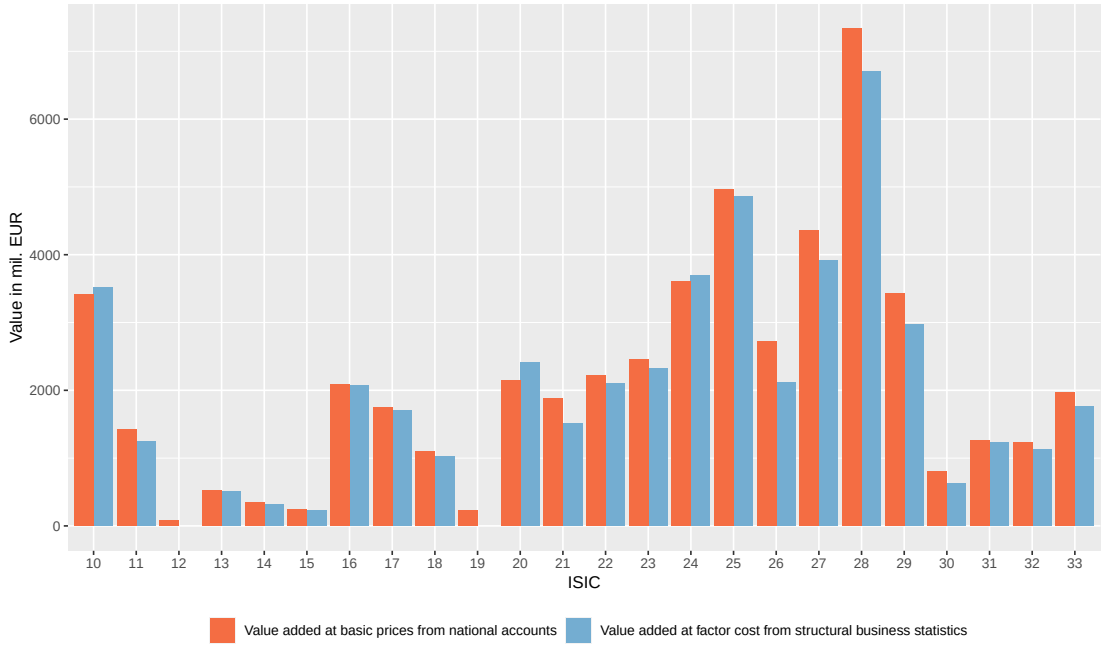
Various corrections to the initial data lead to reductions in VA by 1.6 per cent. It is explained by Statistics Austria as *methodological innovations concerning foreign units in ITGS (International Trade in Goods and Services), corrections of misreporting units and adaptation of units which do not report calender years.* As to ITGS, Statistics Austria (2016, p. 7) specifies: "Since ITGS targets at goods crossing the border and not at the change of ownership, the new treatment in national accounts and balance of payment statistics excludes transactions without the change of ownership on a resident unit. Simultaneously with the exclusion of these transactions, all trade margins and value added, respectively, that had been imputed for VAT traders on the output approach of GDP for balancing purposes have been eliminated."

Conceptual adjustments refer to *FISIM (Financial Intermediation Services Indirectly Measured)*, *insurance service charge*, *small tools*, *holding gains/losses*, *own-account software*, *addition for self-produced additions to fixed assets*, etc. Unfortunately, the impact of the different categories is not further divided by Statistics Austria, but for FISIM (Financial Intermediation Services Indirectly Measured) and R&D (Research & Development), general aspects can be taken into consideration. *FISIM* generally heightens intermediate consumption in manufacturing, whereas *purchased R&D* is deducted from intermediate consumption to be in line with ESA 2010 (Statistical Office of the European Communities, 2013) (this changed in comparison to ESA 1995 (Statistical Office of the European Communities, 1999), as R&D is subsumed in ESA 2010 to be part of gross fixed capital formation (GFCF)) . *Own-account software and own-account research and development (R&D)* are part of production and increase output and value added, respectively, in further consequence.

Although the *deviation for manufacturing total in Austria is about 6 per cent in*

total (value added at basic prices from national accounts compared to value added at factor cost from SBS), the deviations at 2-digit level (ISIC divisions) are quite numerous. Furthermore, Figure 8 reveals that national accounts estimates do not necessarily always need to be higher than value at factor cost from structural business statistics. This is the case in Austria to some extent due to the differences of enterprise vs. establishment level, as explained above.

Figure 8: Value added for ISIC Rev. 4 divisions for reference year 2011, Austria



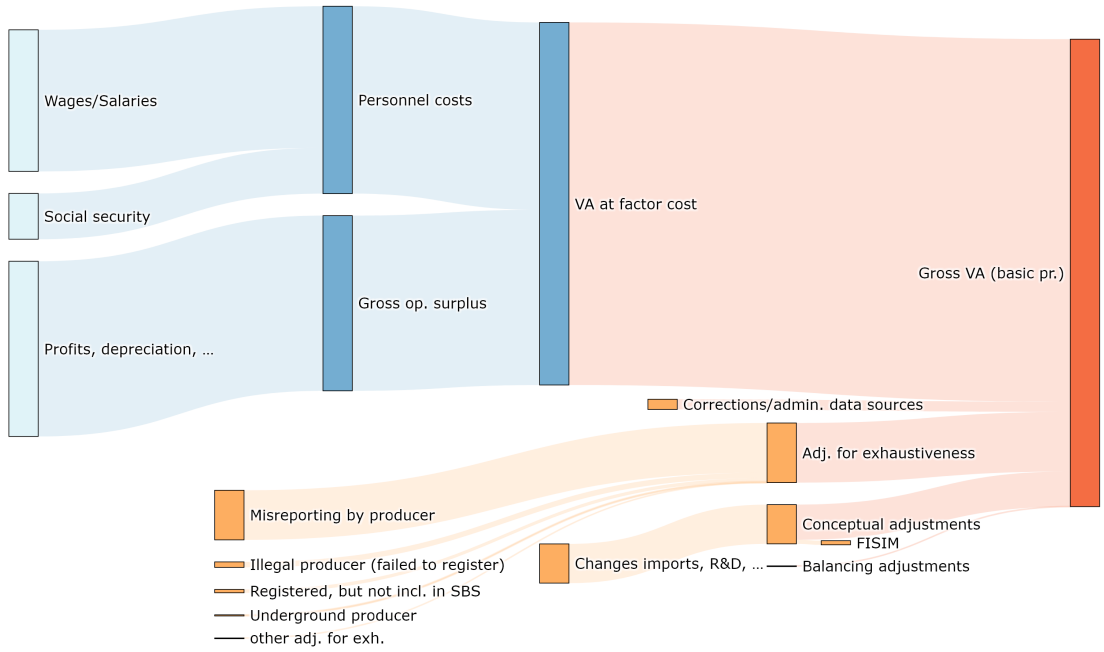
Source: Own illustration based on data from Statistics Austria (2016) and UNIDO (2020a).

3.2 Case study: Slovakia

The NSO of the Slovak Republic expresses the production approach in the Statistical Office of the SR (2016, p. 12) to be the basic method for the compilation of annual national accounts and for the quantification of GDP in Slovakia. In terms of statistical practice, the establishment unit is, similar to the Austrian approach, defined to be the relevant observation unit. Although the statistical information on this unit of the manufacturing sector is mainly obtained from the annual structural survey for production branches, essential information is nonetheless missing to display the entire data flow from structural business statistics to national accounts, as was the case for Austria. Nonetheless, other useful information is available, allowing us to take a closer look into the major data adaptations national accountants in Slovakia have carried out for reference year 2010.

Figure 9 shows the decomposition of the main parts of value added for total manufacturing (ISIC Rev. 4 section C). While the blueish coloured variables on the left categorize information from structural business statistics, the sphere at the bottom of the illustration depicts applied corrections and adjustments to achieve the final estimate of value added in 2010 on the basis of national accounts.

Figure 9: From structural business statistics to national accounts, showing manufacturing total data for reference year 2010, Slovakia



Source: Own illustration based on data from Statistical Office of the SR (2016, Annex D) and Statistical Office of the European Communities (2020).
Note: Blue colours indicate the sphere of structural business statistics, red and orange colours the sphere of national accounts.

The biggest part of the adaptations can be subsumed in the category **adjustments for exhaustiveness**. Above all, *misreporting by producer*[7] makes up the major part of deviations in this respect. The Statistical Office of the SR (2016, p. 280f) generally explains in more detail:

> "In the sector of non-financial corporations the estimate ... is formed by the undervalued production ... and the overvalued intermediate consumption ... . The reporting units when filling in the statistical questionnaires deliberately undervalue their sales and overvalue their expenditures (due to lower taxes etc.). Obviously, no exact data are available on the amount of the undervalued production and overvalued intermediate consumption. The verification of reported data and the subsequent adjustment for under/overvaluation is done by comparing the information from annual and quarterly statistical survey for small enterprises up to 20 employees and for big firms with more than 20 employees, together with the information from accounting statements checked-out by audits. ... In the sector of households it is assumed that the undervaluation of output and overvaluation of intermediate consumption can occur in all branches but with different intensity. Within the compilation of output and intermediate consumption for the sec-

[7]The producer is deliberately providing false details, for example output under-reported, intermediate consumption over-reported to evade or reduce income tax, VAT or social security contributions.

tor of households, in the group of entrepreneurs not registered in the business register the deliberate undervaluation of output and overvaluation of intermediate consumption is assumed. The main reason is the achievement of a reduced tax base and the payments of levies to social security system and health insurance. The estimate is done based on the data inquired from the sample statistical survey for entrepreneurs not registered in the business register and information from the accounting annexes to the tax declarations, on the basis of the time series and the share of intermediate consumption in production."

The Statistical Office of the SR (2016, p. 95, Table 81) specifies the overwhelming part of the category *misreporting by producer* to represent underestimated output in the household sector S14. The biggest values are seen in ISIC divisions 16 ("Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials") and 25 ("Manufacture of fabricated metal products, except machinery and equipment"), however, all relevant ISIC divisions in manufacturing seem to be affected.

Illegal producers in manufacturing in Slovakia are mainly present in activities such as the illegal production of drugs, alcohol and cigarettes.

The category *Registered, but not included in business statistics* contains "estimates of production, intermediate consumption and value added for physical persons, who are not registered in the business register and for whom no data on their economic activity have been surveyed" (Statistical Office of the SR, 2016, p. 278). The term "physical persons" indicates that household entities (S14) are subsumed under this category (e.g. such entities might be registered at the tax authorities, but are not covered in the statistical business register as they might fall below threshold values, ...).

Underground producers refers to producers that should have registered, but did not, e.g. to avoid paying taxes or social security contributions (shadow economy activities).

While the above mentioned ***adjustments for exhaustiveness*** make up an additional 12.7 per cent of value added for reference year 2010, **conceptual adjustments** have an impact of 7.5 per cent. Regarding Slovakia, one major influencing factor in particular can be named in this respect:

- *changes to the value on imports*: the value of "imported goods" is significantly reduced in intermediate consumption; this means that value added is also increased, as the value of "exported goods" in terms of output is at the same time diminished by a lower value. Generally, the adaptations to imports and exports are explained in Statistical Office of the SR (2016, Chapters 5.13-5.16).

The interested reader will find more detailed tables about these deviations of manufacturing industries in Statistical Office of the SR (2016, p. 91ff).

4 Value added data in UNIDO's databases

This final section will give the reader a very general overview of available figures on the *value added of manufacturing industries* in UNIDO's INDSTAT databases (UNIDO, 2020a,b) compared to *manufacturing value added* in the MVA database (UNIDO, 2020c). Reasons for deviations were already explained from a conceptual point of view as well as through case studies in the previous sections. The calculation of all percentage deviations in this section is based on current prices and is based on the formula:

$$Deviation_{\%} = \frac{Manufacturing\ value\ added_t - Value\ added\ of\ manufacturing\ industries_t}{Manufacturing\ value\ added_t} * 100$$

4.1 UNIDO's INDSTAT and MVA databases

The INDSTAT databases (UNIDO, 2020a,b) comprise values on *industrial statistics* and are therefore commonly related to survey and census data resulting from some sort of structural business statistics reported by NSOs. The MVA database (UNIDO, 2020c), however, is derived mainly from the *National Accounts Main Aggregates Database* (United Nations Statistics Division, 2020b,a) and refers to *national accounts* data of the respective countries.

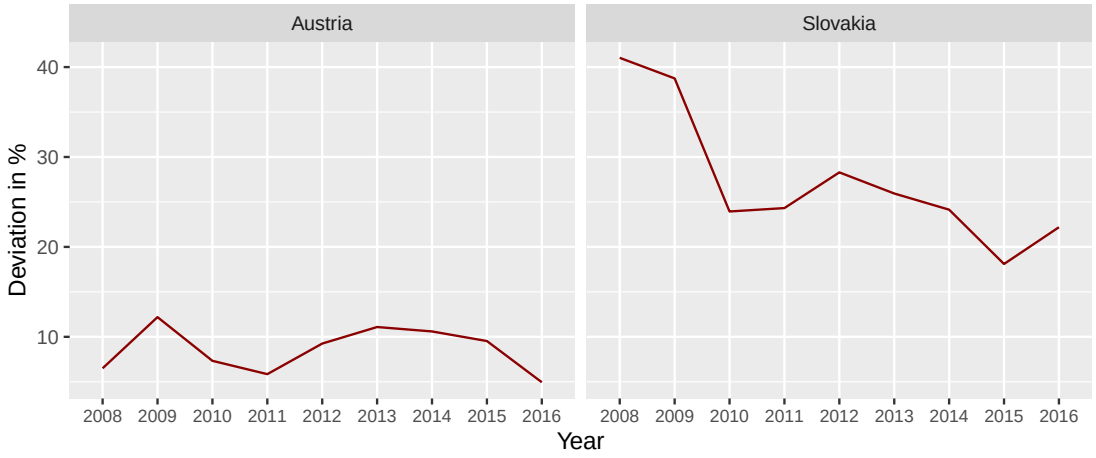
The INDSTAT databases contain meta-information per country and reporting period, so that the data user can obtain an overview of potential restrictions regarding comparability and coherence. The importance of considering the metadata of different data sources in structural business statistics has already been outlined in previous chapters. Metadata provide information on coverage and many other aspects of published survey results, possibly differing significantly across countries due to historically rooted approaches to measuring countries' economies. Metadata, however, can only give an indication of possible deviations, as a detailed analysis requires extensive input description from separate NSO publications, such as those mentioned in the case study section. Unfortunately, such detailed documents are rarely published. Rather they are often only available for internal NSO project documentations.

4.2 General comparison of percentage deviations

The deviations of selected countries in the case study section referred to specific reference years, namely 2011 for Austria and 2010 for Slovakia. Figure 10 reveals that the deviations between *value added of manufacturing industries* and *manufacturing value added* are not constant over time, but reflect continuous work of the different departments of NSOs. While the percentage deviation for Austria between 2008 and 2016 fluctuated between 5 per cent and 10 per cent, the deviation for Slovakia declined from more than 30 per cent in 2008 and 2009 to around 20 per cent in subsequent years. One explanation can be found in the expansion of structural business statistics to cover the

household sector[8] as well from the reference year 2010 onwards[9].

Figure 10: Deviations of manufacturing value added and value added for manufacturing industries over time for Austria and Slovakia



Source: Own illustration based on data from UNIDO (2020c) and UNIDO (2020a).

The example of Slovakia shows that there is a continous need to integrate new information in structural business statistics survey schemes. One might of course ask why newly gained knowledge does not immediately lead to a revision of the whole time series in structural business statistics. As already mentioned earlier, several restrictions, above all the complexity of more granular and detailed data in structural business statistics in addition to limited resources, need to be considered in this respect. Furthermore, requirements in structural business statistics are often specified in legal acts (legal obligation to report survey questionnaires only for well defined entities such as legal units) causing delays in the integration of information.

The case studies and especially the metadata of surveys for different countries show that there are different approaches on how the structure of the economy is estimated. While some countries apply random sampling, a combined estimation covering cut-off survey results and administrative data has become increasingly prevalent. Surveying only the biggest manufacturing entities eases the burden for respondents, a highly requested issue in many countries.

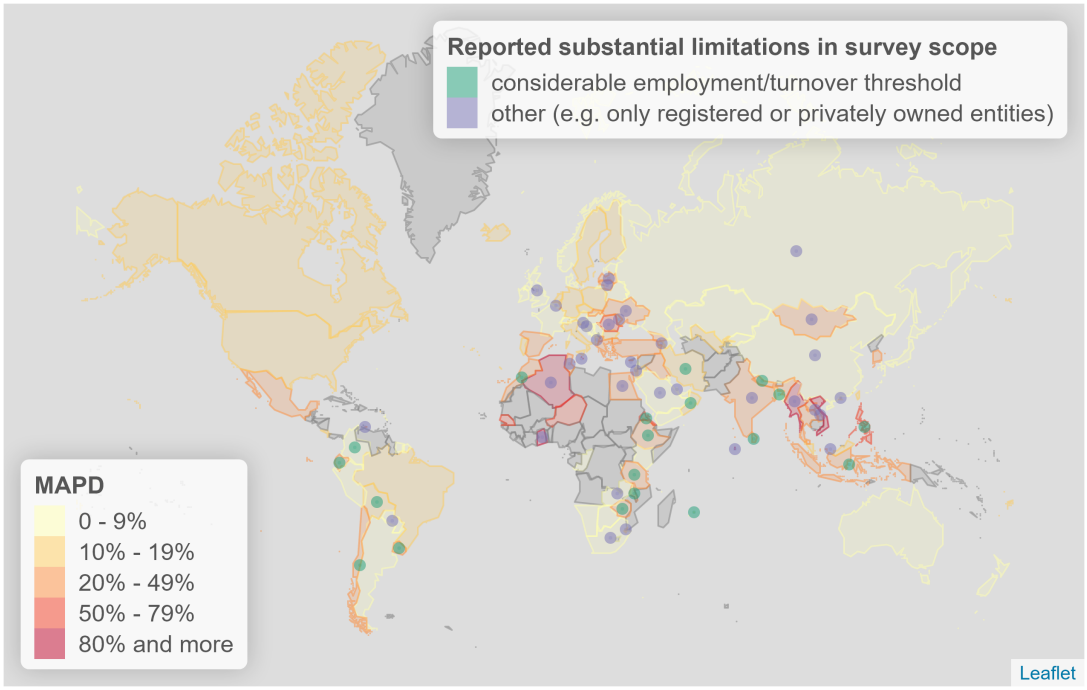
Bearing in mind the details of the basic concepts and the case study section, this final section intends to provide a general overview of countries in INDSTAT and MVA databases for *Total manufacturing* (section C in ISIC Rev. 4 and section D according to ISIC Rev. 3.1) and its deviations. The world map in Figure 11 shows the mean absolute percentage deviation between 2008 and 2016 for countries with available values in the INDSTAT as well as the MVA database.

The boxplot in Figure 12 more specifically illustrates the deviations per year and

[8] At least those entities of the household sector that are covered by the statistical business register.

[9] See metadata at https://ec.europa.eu/eurostat/cache/metadata/EN/sbs_esms_sk.htm: "Data on small entrepreneurs (physical persons) are included in SBS data files starting with the data transmission of preliminary 2010 SBS data files."

Figure 11: Country-specific mean absolute percentage deviation of manufacturing value added and value added of manufacturing industries between 2008 and 2016



Source: Own illustration based on data from UNIDO (2020a) and UNIDO (2020c).
Note:

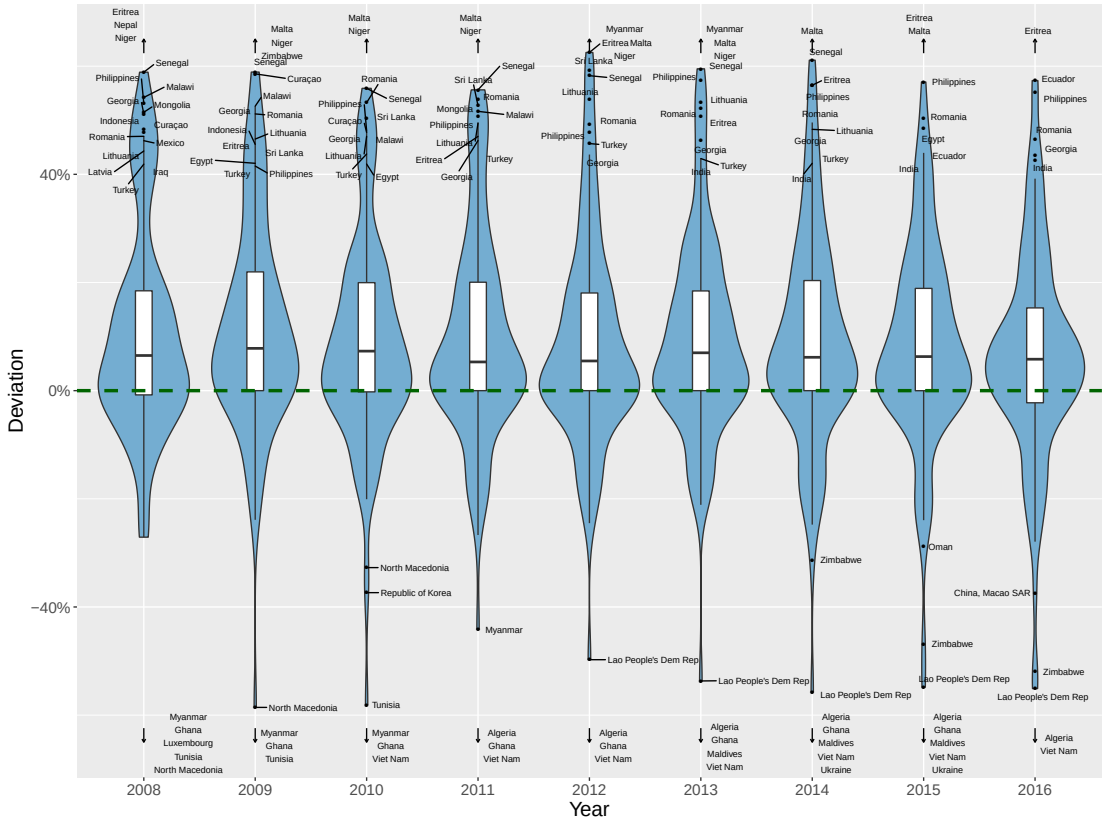
$$MAPD = \frac{1}{n}\sum_{t=1}^{n}\left|\frac{Manufacturing\ value\ added_t - Value\ added\ of\ manufacturing\ industries_t}{Manufacturing\ value\ added_t}\right| * 100$$

shows the median deviation to be slightly below 10 per cent. The interquartile range for the majority of years lies between 0 and about 20 per cent, implying that *manufacturing value added* in countries is frequently higher than *value added of manufacturing industries* from industrial statistics. To fully understand each single difference, we would again have to closely follow the path from business accounts data to final national accounts estimates for the individual countries. Unfortunately, such detailed information is often only internally available for the respective NSO divisions, and an exhaustive analysis would go far beyond the scope of this paper. Explanations can sometimes be found in the survey metadata at first glance. Higher deviations for Chile, the Philippines and Viet Nam can, for instance, partly be explained by a restriction of industrial statistics survey results to entities with 10 and more, respectively 20 and more employees or the restriction to cover registered entities only.[10]

Generally, higher figures for *manufacturing value added* compared to *value added of manufacturing industries* are in line with the explanations in the basic concepts section. National accounts are more complete as, e.g. estimates on the informal sector resp. non-observed (non-registered) units are included as well. Nonetheless, we already demonstrated in the case study section that adjustments can affect output as well as

[10]For further details on these and other countries, please consider Table 5 in the appendix.

Figure 12: Boxplot of deviations between manufacturing value added and value added of manufacturing industries over time

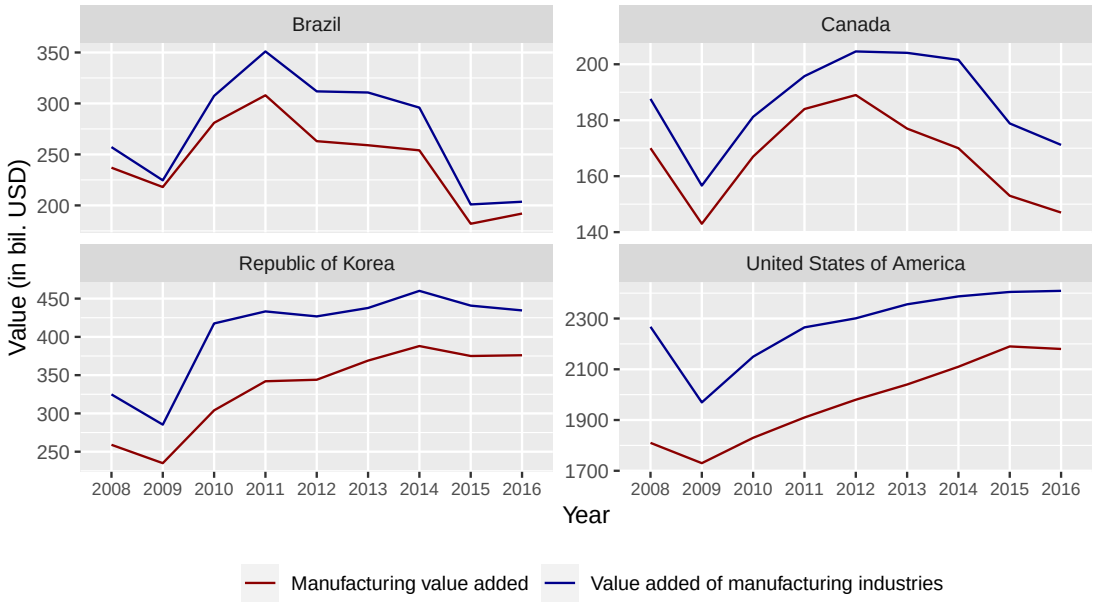


Source: Own illustration based on data from UNIDO (2020a) and UNIDO (2020c).

intermediate consumption, not to speak of the influence of the statistical unit and possible secondary activities (e.g. wholesale trade might be assigned to manufacturing when enterprises are observed; at establishment level, this part of value added would be assigned to trade and services, however). Thus, in some countries, MVA might also be lower than value added of manufacturing industries derived from industrial statistics. Brazil and the Republic of Korea are among this group, as are Canada and the United States (see Figure 13).

As to the latter and as a concluding note to this paper, the interested reader is referred to Horowitz and Planting (2006), a methodological document of the Bureau of Economic Analysis (U.S. Department of Commerce) explaining the general "Concepts and Methods of the U.S. Input-Output Accounts". It outlines that industrial statistics, in the form of the multi-annual economic census and annual industry surveys, are also one of the main input sources for national accounts. That specific document does not explain the deviations in detail, for example it does not indicate deviations in per cent, but it again describes the complexity of the measurement of whole economies for which it is essential to have intermediary products in the form of structural business statistics surveys, although survey results are imperfect estimates and need to be adjusted for national accounts' needs.

Figure 13: Differences in value added over time for Brazil, Canada, the Republic of Korea and the United States of America



Source: Own illustration based on data from UNIDO (2020a) and UNIDO (2020c).

5 Summary, conclusions and outlook

One of the main intentions of this article was to give the interested data user, may it be a high frequency or random user of manufacturing data from official statistics, an explanation of why *value added* data from structural business statistics, or more specifically *industrial statistics*, and *national accounts* may differ. Although a full description of all the relevant details in the transition from business accounting to national accounting would require plenty more pages to fill, the reader has hopefully developed a deeper understanding of the major influencing factors for deviations. Such insights require familiarity with fundamental conceptual frameworks, as introduced in the section *basic concepts*. Several steps are necessary to process the granular data from business accounting to macroeconomic aggregates in national accounts. The very important output of industrial statistics is found in between, providing detailed insights into the value added of manufacturing industries, depending on the scope and type of statistical units observed. With knowledge of the central concepts, it becomes clearer why *value added of manufacturing industries* and *manufacturing value added* are equal in theory, but different in practice.

- The *value added of manufacturing industries* is a survey concept that refers to the given industries' net output derived from the difference of gross output and intermediate consumption.
- *Manufacturing value added* measures an exclusive and exhaustive contribution of manufacturing to GDP.

Deviations can above all be attributed to necessary estimations and adjustments carried out by national accountants on survey/census data of structural business statistics to bring them in line with national accounts needs to publish as exhaustive data on a country's economy as possible. Nonetheless, it needs to be emphasized that national accountants heavily rely on industrial statistics as the basic source of information on value added in the industrial sector, as already outlined in UNIDO (1987), even if coverage of data, concepts and definitions sometimes hamper comparability.

The *case studies* section showed in more detail that the often historically rooted context of how countries survey their businesses and estimate major economic aggregates can explain major adjustments and estimations (at least at a high level of macroeconomic-aggregates in terms of ISIC activities). However, these country-specific processes are very detailed and the description of the chosen approaches are only sometimes publicly available in extended documentations.

Thus, to comprehensively explain all of the differences between *value added of manufacturing industries* and *manufacturing value added* in *UNIDO's INDSTAT and MVA database*, far more information would need to be processed. Information that is often unfortunately only available in department-internal documentations of national statistical offices and is not released. Therefore, it is even more important to consider metadata information in analyses of UNIDO's INDSTAT products, as the scope of surveys in industrial statistics can give a hint about which part of the manufacturing industries (perhaps only registered establishments with 20 and more employees) is covered.

References

Andreoni A, Upadhyaya S (2014) Growth and distribution pattern of the world manufacturing output: A statistical profile. Working Paper 02/2014, UNIDO, Vienna

Ayoubkhani D (2014) Annual Business Survey, A Comparison between ABS and National Accounts Measures of Value Added. Tech. rep., Office for National Statistics, Newport, accessed Sept. 2020 at https://www.ons.gov.uk

Giovannini E (2008) Understanding economic statistics: an OECD perspective. OECD Publishing

Horowitz K, Planting M (2006) Concepts and Methods of the U.S. Input-Output Accounts. BEA Papers, Bureau of Economic Analysis, accessed May 2020 at https://bea.gov/

Lequiller F, Blades D (2014) Understanding National Accounts. OECD Publishing, Paris, DOI 10.1787/9789264214637-en

Statistical Office of the European Communities (1999) European System of Accounts: ESA 1995. Collection: Manuals and guidelines, Publications Office of the European Union, Luxembourg

Statistical Office of the European Communities (2013) European System of Accounts: ESA 2010. Collection: Manuals and guidelines, Publications Office of the European Union, Luxembourg, DOI 10.2785/16644

Statistical Office of the European Communities (2015) ESA 2010 GNI process tables compilation guide. Tech. Rep. Eurostat/C3/GNIC/281 Rev. 1 EN, European Commission - Eurostat, Luxembourg, accessed May 2020 at https://circabc.europa.eu

Statistical Office of the European Communities (2020) Structural Business Statistics data. Available at: Eurostat - statistical database

Statistical Office of the SR (2016) GNI Inventory SK - ESA 2010. Tech. rep., Statistical Office of the Slovak Republic, Bratislava, accessed March 2020 at https://slovak.statistics.sk

Statistics Austria (2016) Inventory of methods for National Accounts in Austria according to ESA 2010. Tech. rep., Statistics Austria, Vienna, accessed May 2020 at https://statistik.gv.at

Statistics Austria (2020) Structural Business Statistics from 2008 onwards - enterprise data. Available at: STATcube - statistical database

UNIDO (1987) Comparisons between Industrial Statistics and National Accounts. Tech. Rep. V.87-91402, UNIDO, Vienna

UNIDO (2010) Industrial Statistics: Guidelines and Methodology

UNIDO (2020a) INDSTAT 2 Industrial Statistics Database at 2-digit level of ISIC Revision 3. Available at: https://stat.unido.org/

UNIDO (2020b) INDSTAT 4 Industrial Statistics Database at 3- and 4-digit level of ISIC Revision 3 and 4. Available at: https://stat.unido.org/

UNIDO (2020c) MVA Manufacturing Value Added Database. Available at: https://stat.unido.org/

United Nations (2000) Links Between Business Accounting and National Accounting. Economic & social affairs, United Nations

United Nations (2008) International Standard Industrial Classification of All Economic Activities (ISIC), Rev.4. United Nations, DOI 10.18356/8722852c-en

United Nations (2010) System of National Accounts 2008. United Nations, New York, DOI 10.18356/4fa11624-en

United Nations (2011) International recommendations for industrial statistics 2008. United Nations, New York, DOI 10.18356/677c08dd-en

United Nations Statistics Division (2020a) Methodology for the National Accounts Main Aggregates Database. Accessed Oct. 2020, https://unstats.un.org/

United Nations Statistics Division (2020b) National Accounts - Analysis of main aggregates. Available at: https://unstats.un.org/unsd/snaama

United Nations Statistics Division (2020c) National Accounts Main Aggregates Glossary . Accessed Oct. 2020, https://unstats.un.org/unsd/snaama/Metadata/Glossary

A Countries reporting substantial limitations in survey scope

Table 5: Countries reporting substantial limitations in survey scope

Country	Scope
Albania	All registered enterprises.
Algeria	Not reported.[2008:2010] All registered establishments.[2011:2015]
Bangladesh	Establishments with 10 or more employees.[2008:2012]
Armenia	All registered establishments.[2008]
Belgium	All registered enterprises.[2008:2016]
Bolivia (Plurinational State of)	Enterprises with 20 or more persons engaged or with a revenue of more than 3 million bolivianos.[2010:2016]
Myanmar	All government-owned enterprises.
Sri Lanka	Establishments with 25 or more persons engaged.[2008:2013] Establishments with 25 or more persons engaged; from reference year 2014 onwards, the frame is the register of industrial establishments, which is a product of Economic Census 2013/2014.[2014:2016]
Chile	Single-unit establishments with 10 or more employees; all establishments belonging to multi-unit companies.[2008:2016]
China	All industrial enterprises with annual revenue from principal business above 5 million Chinese Yuan.[2008:2010] For survey on financial status of industrial enterprises: industrial enterprises above designated size (annual revenue above 20 million Chinese Yuan); for survey on employees and wages: all non-private enterprises and sample private enterprises in urban areas.[2011:2016]
Colombia	Establishments with 10 or more persons engaged.[2008:2016]
Croatia	All establishments.[2008:2013] All proxy enterprise equal legal units registered in the statistical business register and were active during at least a part of the reference period.[2014:2016]
Cyprus	All privately owned enterprises.[2008:2016]
Ecuador	Establishments with 10 or more persons engaged.[2008] All enterprises.[2010:2015] Enterprises with 50 or more persons engaged or with an annual turnover of more than one million USD.[2016]
Ethiopia	Establishments with 10 or more persons engaged.
Eritrea	Establishments with 10 or more employees.
State of Palestine	All privately owned enterprises.
Ghana	All privately owned establishments.[2013]
China, Hong Kong SAR	All privately owned establishments.

Table 5: Countries reporting substantial limitations in survey scope *(continued)*

Country	Scope
India	All manufacturing units registered under sections 2m(i) & 2m(ii) of Factories Act,1948; Bidi & Cigar units employing 10 or more workers with aid of power or 20 or more workers without aid of power and registered under Bidi & Cigar (Conditions of Employment) Act, 1966 and electricity undertakings engaged in generation, transmission and distribution of electricity and not registered with Central Electricity Authority.
Indonesia	Large establishments (with 100 or more persons engaged) and medium scale establishments (with 20 to 99 persons engaged).[2008:2009] Establishments with 20 or more employees.[2010:2015]
Iran (Islamic Republic of)	Establishments with 10 or more employees.[2008:2015] All establishments.[2016]
Lao People's Dem Rep	All registered establishments.[2015:2016]
Latvia	All registered enterprises.
Lithuania	All registered enterprises.[2008:2016]
Malawi	Large establishments.
Malaysia	All registered establishments engaged in manufacturing as their main activities.[2008] Census covers all establishments in years ending with 0 or 5. For other years, only selected establishments are covered subject to sampling.[2009:2016]
Maldives	All registered establishments.[2013:2016]
Malta	All enterprises.[2008:2010] All privately owned enterprises.[2011:2016]
Mauritius	Establishments with 10 or more persons engaged.[2008:2016]
Mongolia	All registered establishments.[2008:2016]
Republic of Moldova	All self-sustained establishments. Data exclude the area of the left bank of the Dniester and the town of Bender.[2008] All registered enterprises.[2009:2016]
Morocco	Enterprises with 10 or more employees or an annual turnover of more than 100,000 Moroccan Dirhams.[2008:2012] Not reported.[2013:2016]
Oman	Establishments with 10 or more employees.[2008:2016]
Nepal	Census: establishments with 10 or more persons engaged; Survey: establishments with less than 10 persons engaged;
Curaçao	All registered enterprises.
Paraguay	All establishments.[2010] All registered enterprises.[2014]
Philippines	Data refer to establishments with average total employment of 20 or more persons engaged.[2008:2016]
Qatar	Not reported.[2008:2013] All registered establishments.[2014:2016]
Romania	All registered enterprises.[2008:2016]
Russian Federation	All registered enterprises.[2008:2016]

Table 5: Countries reporting substantial limitations in survey scope *(continued)*

Country	Scope
Saudi Arabia	Survey covers only factories licensed under the National industries protection and encouragement law and the capital investment law.[2008:2009] All privately owned establishments.[2010:2015] All establishments.[2016]
Viet Nam	All registered enterprises.[2008:2016]
Slovenia	All registered enterprises.[2008:2016]
South Africa	Data for employment: all establishments; data for other variables: privately owned units only.[2008:2009] Not reported.[2010:2016]
Zimbabwe	Establishments with 10 or more employees.[2009:2016]
Eswatini	All registered establishments.[2011:2016]
Tunisia	Number of establishments and employees relate to enterprises with at least one employee registered under the social security scheme. Other variables relate to all enterprises.[2008] All privately owned enterprises.[2009:2016]
Ukraine	All registered enterprises.[2008:2016]
Egypt	All public establishments; private establishments with 10 or more employees.[2010:2016]
United Kingdom	All businesses that meet the requirements for compulsory VAT registration and are registered for VAT and/or Pay as You Earn (PAYE).[2008] All businesses registered for VAT and/or Pay as You Earn (PAYE).[2009:2016]
United Republic of Tanzania	Establishments with 10 or more persons engaged.[2008:2016]
Uruguay	Not reported.[2008:2009] Enterprises with 10 or more persons engaged.[2010:2016]
Zambia	All registered establishments.[2010:2016]

Source: UNIDO (2020a)

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Glossary

(Gross) Value Added	Gross value added is the difference between output and intermediate consumption. [...] In principle, the concept of value added should exclude the allowance for consumption of fixed capital. The latter, in effect, is not newly created value, but a reduction in the value of previously created fixed assets when they are used up in the production process. Thus, theoretically, value added is a net concept. However, gross measures of product and income are commonly used, because they are more often available, or available earlier, and they are generally considered more comparable between countries (United Nations, 2010, p. 34). *It is a national accounts concept and cannot be directly observed from the accounting records of enterprises/establishments. It is approximated from available information as shown in Figure 1.* All references to value added (VA) in this article actually refer to gross value added and are therefore also abbreviated as (G)VA., 1
Gross Domestic Product (GDP)	Basically, GDP derives from the concept of value added. Gross value added is the difference between output and intermediate consumption. GDP is the sum of gross value added of all resident producer units plus that part (possibly the total) of taxes on products, less subsidies on products, that is not included in the valuation of output.(United Nations, 2010, p. 34), 1

Industrial Statistics	In general, industrial statistics are statistics reflecting the characteristics and economic activities of units engaged in a class of industrial activities that are defined in terms of the International Standard Industrial Classification of All Economic Activities (ISIC). Industrial statistics pertain to two distinct but interrelated sets of annual and short-term industrial statistics. Moreover, these industrial statistics form part of a broader domain of structural and short-term business statistics (United Nations, 2011, pp. 2 and 12)., 2
Informal Sector	A production unit in the informal sector may [. . .] be defined as a household enterprise with at least some production for sale or barter that meets one or more of the following criteria: limited size in terms of employment, non-registration of the enterprise and non-registration of its employees (United Nations, 2011, p. 34)., 6
Intermediate Consumption	Intermediate consumption, abbreviated as IC, consists of the value of the goods and services consumed as inputs by a process of production, excluding fixed assets whose consumption is recorded as consumption of fixed capital (United Nations, 2010, p. 120). *It is a national accounts concept and cannot be directly observed from the accounting records of enterprises/establishments. It is approximated from available information as shown in Figure 1*, 3

ISIC	The International Standard Industrial Classification of All Economic Activities, abbreviated as ISIC, is a standard United Nations Statistics Division (UNSD) classification of economic activities arranged so that entities can be classified according to the activity they carry out. Currently the fourth revision of ISIC (United Nations, 2008) is commonly used and also mainly referred to in this article. The hierarchically structured ISIC Rev. 4 classification contains sections, divisions, groups and classes., 1
Manufacturing Value Added	Manufacturing value added, abbreviated as MVA, measures an exclusive and exhaustive contribution of manufacturing to GDP., 2
Market Producers	Market establishments produce goods and services mostly for sale at prices that are economically significant (United Nations, 2010, p. 20)., 7
National Accounts	National accounts, abbreviated as NA, are based on the internationally recommended System of National Accounts (SNA) and are a coherent, consistent and integrated set of macroeconomic accounts, balance sheets and tables based on a set of internationally agreed concepts, definitions, classifications and accounting rules. National accounts provide a comprehensive accounting framework within which economic data can be compiled and presented in a format that is designed for purposes of economic analysis, decision-taking and policy-making (United Nations Statistics Division, 2020c)., 1
Non-Market Producers	Non-market producers supply goods or services free, or at prices that are not economically significant, to households or the community as a whole (United Nations, 2010, p. 111)., 7
NSI	National statistical institute, 1
NSO	National statistical office, 1

Output	Output, abbreviated as OUT, is defined as the goods and services produced by an establishment, excluding the value of any goods and services used in an activity for which the establishment does not assume the risk of using the products in production, and excluding the value of goods and services consumed by the same establishment except for goods and services used for capital formation (fixed capital or changes in inventories) or own final consumption (United Nations, 2010, p. 106). *It is a national accounts concept and cannot be directly observed from the accounting records of enterprises/establishments. It is approximated from available information as shown in Figure 1*, 3
Production Account	The production account is the starting point for the sequence of accounts for institutional units and sectors displaying how income is generated, distributed and used throughout the economy (United Nations, 2010, p. 95)., 11
Production Approach	The production approach, which is also called the output approach, measures GDP as the difference between value of output less the value of goods and services used in producing these outputs during an accounting period., 1
Structural Business Statistics	Structural business statistics, abbreviated as SBS, are production-related statistics that are collected and compiled to establish the structure, activity, competitiveness and performance of enterprises at national, regional and international levels and generally provide annual information referring to a whole reference year (United Nations, 2011, p. 3). Other common abbreviations used by national statistical offices are also ABS (annual business statistics/survey) or AIS (annual industrial survey)., 1

System of National Accounts	The system of national accounts, abbreviated as SNA, consists of a coherent, consistent and integrated set of macroeconomic accounts, balance sheets and tables based on a set of internationally agreed concepts, definitions, classifications and accounting rules (United Nations Statistics Division, 2020c)., 3
Value Added of Manufacturing Industries	Value added of manufacturing industries, abbreviated as VAMI, is a survey concept that refers to the given industries' net output derived from the difference of gross output and intermediate consumption., 2
VAT	Value added tax, 1

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