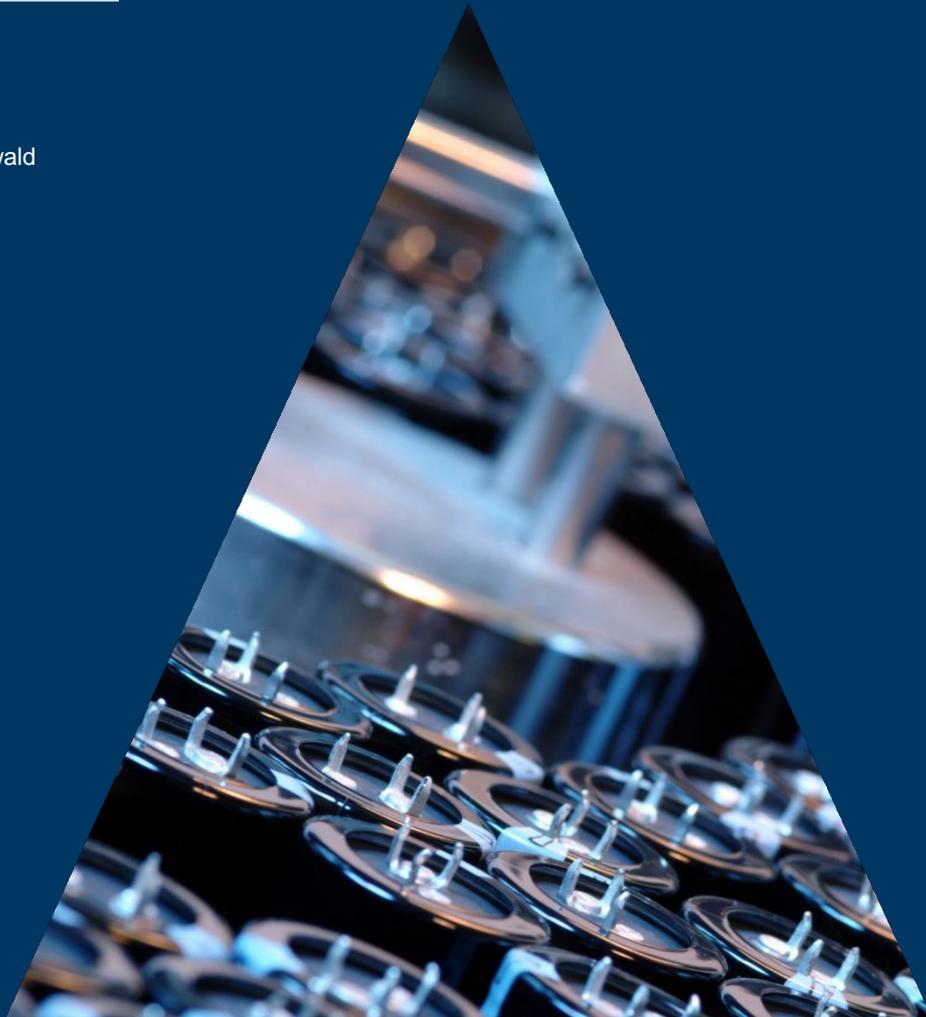


# Direct Gross Value Added Calculation Method

## Case Study

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## List of Abbreviations

GDD	Global Drug Development
GDP	Gross domestic product
GVA	Gross value added
GVC	Global value chains
NIBR	Novartis Institutes for BioMedical Research
R&D	Research and development
SNA	System of National Accounts
VGM	Virtual gross mark-up

# 1

## Introduction

GDP is a well-established measure of the market value of goods and services produced by a country to satisfy the needs of final consumers. GDP has long been used to measure the economic performance, societal progress of nations and ultimately, of wealth. <sup>1</sup> Its aggregate nature implies that it is possible to express how much an individual company contributes to the national GDP. This singular value component is defined as the direct GDP contribution of a company, also referred to as the direct Gross Value Added (GVA).<sup>2</sup>

The system of national accounts (SNA) provides a binding framework for calculating a country's GDP. With the launch of the Frascati Manual by the OECD starting from September 2014, research and development (R&D) services are no longer recorded purely as production inputs.<sup>3</sup> Instead, R&D is treated as contributor to economic performance, and it is seen as a creator of a capital asset and hence a contribution to national wealth. The revision fundamentally changed the valuation of R&D. Based on this development, the costs invested in R&D are considered to build intellectual property, which creates value for the economy regardless of its immediate financial return. This paradigm shift alone led to an upward correction of the GDP of several countries that show a high intensity of R&D activities.

The treatment of R&D as capital investment can equally be applied to the corporate level.<sup>4</sup> So far, the new method has been applied by Sanofi-Aventis Germany GmbH.<sup>5</sup> Novartis has developed a method of calculating direct GDP contribution for all its affiliates that also applies the revised approach of R&D expenditure. The importance of this undertaking is not merely the implementation of the macroeconomic framework in the context of a global corporation. It is about assessing the contribution of a company's R&D activities to national economic gains i.e., to national wealth. Prior to the adoption of the Frascati Manual, R&D was treated as a cost factor and hence diminishing national wealth. Novartis implemented this methodological revision into its Financial, Environmental and Social impact valuation framework to calculate its direct economic impact i.e., its direct contribution to national and global GDP. This paradigm assumes that R&D activities contribute as value components to GVA. Novartis is following the

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<sup>1</sup> IMF Web Publication: Tim Callen "Gross Domestic Product: An Economy's ALL", Feb 2020, [Web link](#)

<sup>2</sup> The sum of all the gross value added of all resident institutional units engaged in **production**, adding taxes, and subtracting subsidies on products that are not already included in the value of their outputs, yields the gross domestic product (GDP) of a country.

<sup>3</sup> In the cost centric paradigm, R&D is treated as intermediate consumption and is assumed to be completely consumed in the value chains of the users in the current business cycle. For reference, see: System of National Accounts 2008; European System of Accounts ESA 2010; Frascati Manual 2015, OECD; Forschung und Entwicklung in den Volkswirtschaftlichen Gesamtrechnungen, VGR, Destatis; Erhebung für Forschung und Entwicklung, Stifterverband; Identifikation der Unternehmen mit F&E Aufwendungen, Schweizerische Eidgenossenschaft.

<sup>4</sup> Zubrzycki, K. "Quantification of the macroeconomic contribution of internal R&D of an enterprise within the European System of National Accounts", February 2020, Technical University of Berlin.

<sup>5</sup> Volkswirtschaftlicher Wert und Beitrag zum Wirtschaftswachstum: Bemessung des ökonomischen Beitrags im Jahr 2017 resultierend aus Forschungs- und Entwicklungsaktivitäten von Sanofi in Deutschland – ein Gastbeitrag des WifOR-Instituts, Standort Gesundheit, Januar 2019.

guidelines of OECD, which have introduced innovation as a driver of wealth into the SNA.

The valuation of a company's **total direct GDP contribution** is the sum of the direct GDP contribution of its **own operation** <sup>6</sup> and the direct GDP contribution of **R&D** activities.

A company is part of an ecosystem embedded in a network of supplier and customer relationships. The goods and services that it procures in support of its business activities trigger a GDP contribution by its suppliers, immediately (tier 1), of suppliers of suppliers (tier 2) and so forth, up the entire value chain to the first step of mining, agriculture, and services. The GDP contribution along the supply chain (tier 1 – tier  $\infty$ ) is called the **indirect GDP contribution**. Through salaries and wages paid in own operation and along the supply chain, consumption is enabled. Consumption is an important driver of GDP, and the consumption enabled through salaries and wages paid directly and indirectly is the **induced GDP contribution**.

**Total GDP contribution = Direct GDP contribution + Indirect GDP contribution + Induced GDP contribution.**

The total direct GDP together with supply chain related indirect and induced GDP contribution measures the full aggregate of economic impact a company brings to society.

The measurement of GVA for a company has become an established practice to express the direct economic contribution of a company to society. <sup>7</sup> The value components of direct GVA will soon become a commonly shared standard in stakeholder-centric corporate reporting, as proposed by the Value Balancing Alliance. <sup>8</sup>

The aim of this study is to give insight on how the concept of SNA transfers to the company level. It enables us to measure the wealth (expressed in USD) a company brings to society. The following chapter (2) outlines the method Novartis has built to calculate its direct GDP contribution. The case study outlines the steps to identify the specific value components of direct GVA and intends to offer practical guidance on the key consideration for direct GDP calculation. Chapter 3 provides a theoretical calculation example for one country. Chapter 4 concludes the case study with a discussion of the findings and an outlook.

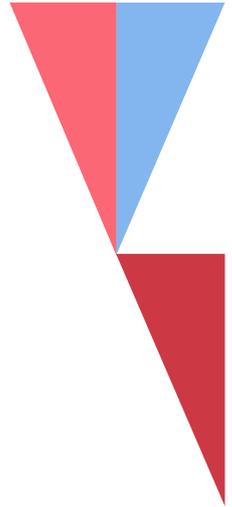
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<sup>6</sup> Own operation encompasses the internal value chain consisting of production, sales and distribution, and supportive business services

<sup>7</sup> WEF White Paper: "Measuring Stakeholder Capitalism: Towards Common Metrics and Consistent Reporting of Sustainable Value Creation", SEP 2020, [Web link](#), page 38 ff.

<sup>8</sup> Novartis joins BASF, Deutsche Bank, LafargeHolcim, Philip Morris International, Bosch, SAP and SK to establish the Value Balancing Alliance, a non-profit organization addressing the need to rethink the value contribution of business as it pertains to capital. The alliance aims to create a standard for measuring and disclosing the environmental, human, social, and financial value companies provide to society and to provide guidance on how these impacts can be integrated into business steering.

# 2 Method



## 2.1 Explanation of Fundamental Calculation Methods

In order to compute Novartis' direct GDP contribution in accordance with the system of national accounts (SNA), income statement lines from Novartis' financial accounting are selected which fit the macroeconomic rationale. This process requires a good understanding of both, the substance of corporate financial reporting and the underlying methods to measure the gross domestic product.

According to the SNA, the GDP – viewed as an aggregate measure of production – can be calculated in three ways:

- I. the production approach (also called output approach),
- II. the income approach, and
- III. the expenditure approach.

Behind these three approaches lies the idea of product balances: The same amount of final value produced for use within an economy must balance with intermediate consumption, final consumption and capital formation (including changes in inventories). The national product balance is defined as:

$$\text{output} = \text{intermediate consumption} + \text{final consumption} + \text{capital formation}^9$$

Furthermore, the product balance equation can be maintained while bringing intermediate consumption to the left hand-side of the equation. The equation then yields two measures of direct GDP contribution:

$$1. \text{output} - \text{intermediate consumption} = \text{final consumption} + \text{capital formation}$$

The left hand-side shows the GDP contribution as calculated via **the production approach**, and the right hand-side shows the GDP contribution as obtained via the expenditure approach.

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<sup>9</sup> According to the SNA, 2008 statistical framework of the European Communities, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations and World Bank, the output is defined as the goods and services produced by institutional units in which labor and assets are used to transform inputs of goods and services. Moreover, all output must be such that it can be sold on markets or at least be capable of being provided by one unit to another, with or without change. Intermediate consumption consists of goods and services used up in the course of the production within the accounting period. Final consumption consists of goods and services used by individual households or the community to satisfy their individual or collective needs and wants. The activity of gross fixed capital formation is restricted to institutional units in their capacity as producers, being defined as the value of their acquisitions less disposals of fixed assets.

Usually, the **production approach** applies to calculate the direct GDP contribution of a company, for the own operation activities. There is an evident output available that can be accounted for which is put in relation to goods and services needed for the generation of output (referred to as intermediate consumption).

Novartis has measured direct GDP contribution of a company in pilot countries. The pilot project team raised the concern that the value-generating aspect of one R&D-intensive country organization was not recognized in the concept of the production approach. In consequence, Novartis examined applying the income approach for measuring the direct GVA of R&D activities. This is in line with the update of the SNA since September 2014 following the issue of the OECD Frascati Manual.<sup>10</sup>

The income approach builds the direct GVA “bottom-up” through the compensation of employees, consumption of fixed capital (expressed by periodic depreciation of machinery and equipment), other taxes minus other subsidies on production, and a net operating surplus (profit component).

$$\text{IV. } GVA = \text{compensation of employees} + \text{consumption of fixed capital} + \text{other taxes minus other subsidies on production} + \text{net operating surplus}$$

Overview of Direct GDP contribution calculation methods:

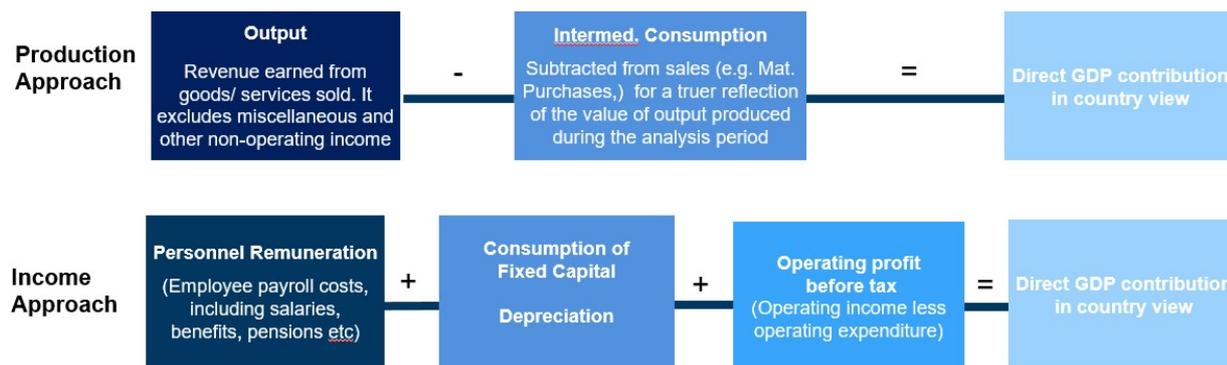


Chart I: Overview of Direct GDP contribution calculation methods.

The choice of the calculation method depends on the availability of data in a specific business context. If the direct GDP contribution is determinable as the difference between output and intermediate consumption, then the production approach is applied. If singular GVA components such as income of employees, other taxes minus other subsidies on products and estimates of consumption of fixed capital are available, the income approach can be applied to estimate the Direct GVA. Due to the missing output component (no immediate revenue figures are available for R&D) the income approach is applied for measuring the GVA of research and development activities in the Novartis Impact Valuation method.

<sup>10</sup> In the cost centric paradigm, R&D is treated as intermediate consumption and is assumed to be completely consumed in the value chains of the users in the current business cycle. For reference see: System of National Accounts 2008; European System of Accounts ESA 2010; Frascati Manual 2015, OECD; Forschung und Entwicklung in den Volkswirtschaftlichen Gesamtrechnungen, VGR, Destatis; Erhebung für Forschung und Entwicklung, Stifterverband; Identifikation der Unternehmen mit F&E Aufwendungen, Schweizerische Eidgenossenschaft.

## 2.2 Application of Production Approach

To map Novartis' financial data into the macroeconomic rationale, the reporting content has been thoroughly analyzed. The income statement expressing the company's revenue and costs by their nature (material, personnel, capital etc.)<sup>11</sup> has proven to enable a consistent mapping to the formula<sup>12</sup> of the production approach.

Novartis chose to show the direct GDP contribution by country of operation in addition to the Novartis global total. Consequently, the valid data source comprises the income statements of the closed financial year of all legal entities of a country. Mapping this data to the rationale of the system of national accounts means that every income statement line has to be assessed as either GVA relevant, or irrelevant. Lines that are irrelevant for GVA are taken out of the scope of the calculation. The definition of GVA relevant accounts and their attribution to either the output or the intermediate consumption results in a gross value added figure for a Novartis country. The generic formula of direct GDP contribution of operation that follows the production approach can be displayed as follows:

Direct GVA relevant accounts	IC Statement by nature mapping	
	<u>Total net sales</u>	AI05_010
+	Revenues from 3rd party royalties & milestone p.	AI05_014
+	<u>Revenues from 3rd parties excl. revenues from royalties</u>	AI05_015
+	Other income (part of core operation)	AI05_080
+	<u>Changes in inventory</u>	AI05_113
+	Capitalized self-produced PPE	AI05_114
=	<b>Output</b>	<b>sum of above</b>
-	COGS Component (Material purchases + services)	AI05_110
-	Expenses from 3rd parties royalties and milestone	AI05_558
-	Other expenses (part of core operation)	AI05_560
-	Customs duty incurred	AI05_120
-	Membership fees to trade associations	AI05_593
=	<b>Expenses contributing to Intermediate consumption</b>	<b>sum of above</b>

Table 1: **Generic formula for Novartis direct GDP contribution of own operation based on income statement by nature.** Output - intermediate consumption = direct GDP contribution of operation.

### 2.2.1 Key take aways from the application of Production approach

The calculation of direct GDP contribution of own operation resulted in a detailed understanding on how to best apply the financial corporate data to the production approach. As

<sup>11</sup> Income statement by nature is a financial reporting concept following IFRS guidelines that expresses income and expenses for the entire production value of a financial period ( i.e. not only the value of goods sold is considered, also the value of the increase of inventory as well as self-produced equipment is included).

<sup>12</sup> Output – Intermediate consumption = Direct GVA

an example, salaries & wages are a substantial part of the residual calculation of the production approach. In consequence, those elements should not be considered as part of the intermediate consumption in the material/service cost component. The very same principle applies for the depreciation of machinery and equipment.

Working through the data within the GVA relevant accounts of Other Income and Other Expense, the project team learnt that some non-GVA-relevant content is contained. The following accounts have to be deducted by default from the production approach calculation: Income from financial equity, Other Interest, Exchange rate differences. Those accounts are defined to always be eliminated from the direct GVA of own operation as they are neither GVA relevant nor part of own operation.

Assuming a country perspective, a potential GVA transfer can happen through Intercompany transactions. This is the reason why Intercompany income and expense accounts that transfer GVA relevant values are included in the method. From the global company view, those Intercompany accounts are irrelevant, as they balance out to zero.<sup>13</sup>

## 2.3 Application of Income Approach

The income approach formula for research and development<sup>14</sup> activities is defined as follows:

$$\begin{aligned} & \text{II. direct GDP contribution (R\&D)} \\ & = \text{personnel costs (R\&D)} + \text{depreciation (R\&D)} \\ & + \text{other taxes less subsidies (R\&D)} + \text{net operating surplus (R\&D)} \end{aligned}$$

Novartis follows an extended version of this approach and combines personnel cost of R&D from internal financial reporting data with external values coming from national statistics. Except of personnel cost, not all components on the right side of above formula are easily attributable to R&D in corporate financial accounting. In line with established macro-economic approaches<sup>15</sup> Novartis decided to estimate the missing components via the virtual gross mark-up (VGM). The VGM is an industry markup ratio published by OECD for the pharmaceutical industry per country. With this approach, the direct GVA for R&D is comparable to the pharmaceutical industry benchmark of each country. The VGM's comparability was considered to be a benefit for both understanding and explaining the results.

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<sup>13</sup> The learnings lead to the extension of the calculation schema. Additional lines are added to include the elimination of OIE as well as the IC revenue and expense lines. The details are outlined in [Table II in chapter 3](#) in the calculation example of Direct GDP contribution of country China.

<sup>14</sup> In the formula research and development is defined for simplicity combined as R&D. In practice, those values are individually calculated per function cost of research and development.

<sup>15</sup> Frascati Manual 2015, OECD; Forschung und Entwicklung in den Volkswirtschaftlichen Gesamtrechnungen, VGR, Destatis; Erhebung für Forschung und Entwicklung, Stifterverband; Identifikation der Unternehmen mit F&E Aufwendungen, Schweizerische Eidgenossenschaft.

Novartis uses the pharmaceutical industry values from national statistics of OECD, WIOD and Klems. Where statistic data is not available, Novartis takes a weighted average rate derived from all countries of operation as a benchmark for the respective country's pharmaceutical industry. This approach follows international guidelines by the OECD and the recommendations of the European system of national accounts, thus is in line and directly comparable to international macroeconomic figures.<sup>16</sup> The following formula for the VGM ratio (by industry and country) applies:

$$I. \quad VGM_{industry \text{ ratio}} = \frac{GVA_{(country, industry)} - compensation \text{ of employees}_{(country, industry)}}{compensation \text{ of employees}_{(country, industry)}}$$

Subsequently, the statistical industry VGM ratio per country is multiplied with Novartis' personnel cost for research & development / country to receive the Virtual gross margin (VGM) on country level. The direct GDP contribution of R&D is the sum of the company's actual personnel costs in R&D plus the relevant Novartis' VGM. Thus, the formula for Novartis' direct GDP contribution for R&D becomes:

$$II. \quad \text{direct GDP contribution (R\&D)} = \text{personnel costs (R\&D)} + \text{personnel costs (R\&D)} \times \left( \frac{GVA_{(country, industry)} - compensation \text{ of employees}_{(country, industry)}}{compensation \text{ of employees}_{(country, industry)}} \right)$$

Overall, this calculation approach shows the direct GDP contribution of research and development to come from a combination of Novartis functional R&D expenses (Sum of personnel cost / country) and data of national statistics (VGM/ country). This approach allows comparability to the national industry benchmark.

The virtual gross mark-up (VGM) method is applied to estimate the direct GDP contribution of research and development activities. The VGM ratio is both country and industry specific and reflects the national differences in personnel cost, capital intensity and profitability of the pharmaceutical industry with regards to total industry personnel cost per country.

## 2.4 Summary of Calculation Process

In summary, the calculation of direct GDP contribution follows a 3-step approach. In a first step, the **direct GDP contribution** of Novartis **own operation** is calculated. For this, the necessary accounting information that relates to the Output combined with the required intermediate consumption of the company's own production is collected from the audited financial data. The data extraction identifies the relevant accounts from the income statement by nature that are relevant for the direct GDP contribution calculation. Those GVA relevant accounts implicitly include functional cost such as R&D. As the GDP contribution of R&D is treated separately (see 2.3), R&D related cost are isolated and removed from the direct GDP contribution own operation.

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<sup>16</sup> Compare with the European system of national accounts, ESA 2010, Eurostat, European Commission, European Union, 2013 and the Manual on measuring research and development in ESA 2010, Eurostat, European Commission, European Union, 2014.

In Novartis’s financial reporting, research related activities are captured in separate reporting units. The removal of research activity from operation can simply be done by filtering out the entire reporting unit.

The removal of the development part requires more effort. The development function costs included in the residuum calculation of the production approach are identified and subtracted from Direct GDP contribution of own operation. To identify the values, income statement by function was used.<sup>17</sup>

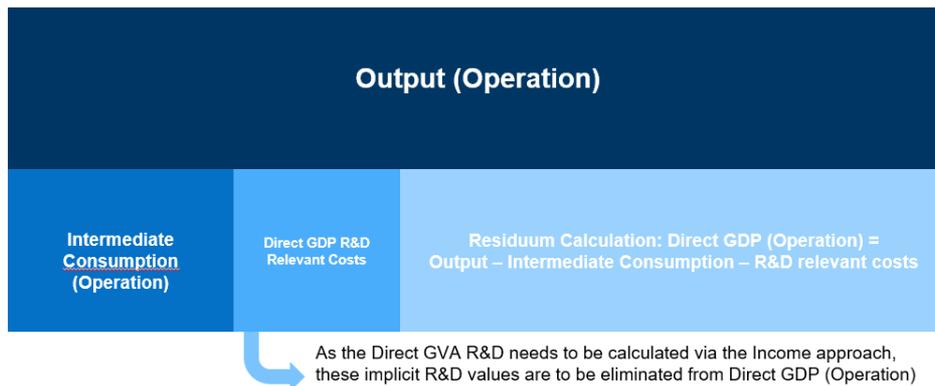


Chart II: Identification of GVA own operation relevant cost with elimination of R&D functional cost.

**Step 2** intends to explicitly capture the value of direct GVA of research and development. A specific form of the income approach is used which is referred to as **the gross mark-up method**. See Chart III for a visualization of the second step.



Chart III: Estimation of Direct GDP contribution of Research (R) and direct GDP contribution of Development (D) summarized as direct GDP (R&D).

In **Step 3** the **total direct GVA contribution** is calculated as the summation of the direct GDP contributions of own operation plus the result of Direct GVA of R&D activities. See Chart IV: for a visualization of the total direct GDP contribution:

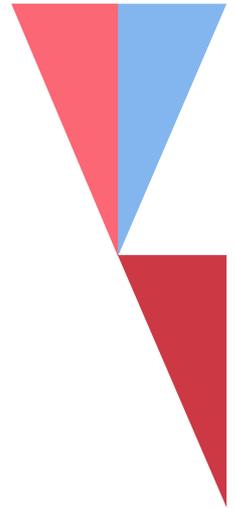
<sup>17</sup> The GVA relevant functional cost include the classic cost components except amortization of intangible assets. See Annex 5.1 for detailed definition of which development costs are implicitly captured in the residual calculation of the production approach.



Chart IV: **Calculation of the total direct GDP contribution.** Calculation of total direct GDP as a sum of direct GDP own operation and direct GDP R&D.

# 3

## Example: Novartis in China based on fictitious data



### 3.1 Direct GDP Contribution of own operation – Step 1

The first step of the method to estimate a GDP contribution of a company is to evaluate the available financial statements in order to receive a proxy for the Output and also to identify data that refer to all materials and services needed to produce this output (also referred to as Intermediate consumption). For Novartis, the most adequate structure is the country structure of the income statement by nature. As outlined in [chapter 2](#), Novartis seeks to recognize R&D activities as a part of Direct GDP contribution, in line with macro-economic methods. Consequently, the research and development cost items included in the financial data of the formula pertaining to (output - intermediate consumption) need to be identified and removed.

The **identification of the research activities** is based on specific reporting units of the Novartis Institutes for BioMedical Research (NIBR). The removal of research cost from the direct GDP contribution of operation is achieved by exclusion of NIBR reporting units from the calculation.

The **identification of the development activities** is based on the cost items from the financial statements by function for the Novartis Global Drug development (GDD) organization. The approach for identifying development activities differs from the approach for identifying research activities since the development activities are neither split out in reporting units nor available as accounts in the income statement accounts by nature. The sum of all relevant development cost items must be thus eliminated from the direct GDP contribution value at the country level via an approach that takes the development cost as a reference from functional Income-Statement.<sup>18</sup>

Following the production approach, the direct GDP contribution for own operation is calculated by subtracting all expenses contributing to intermediate consumption – excluding all items corresponding to research or development activities as described above – from the output. In the numerical example for China, the **output** is equal to the sum of total sales, revenues from royalties, intercompany and other income, changes in inventory and capitalized self-produced equipment.

The expenses contributing to **intermediate consumption** consist of material and non-material expenses to produce the periodic manufacturing output as well as other expenses that are indirectly linked to the production process. See table II for a detailed compilation of the GVA income and expenses for Novartis in China.

However, not all items in the residual calculation might contribute to the complete production output. Therefore, specific “generic accounts” in the Novartis context - mainly the Other income and Other expenses items - need to be properly evaluated for direct GDP contribution relevance. Financial experts defined specific elements as part of other income and other expenses that should be excluded from the direct GDP calculation operation. Those elements are neither GDP relevant nor related to operation. Examples of accounts falling into this category are:

- Income from financial assets valued at equity;
- other interests (credits);
- exchange rate differences;

The sum of the irrelevant items is subtracted from the expense contributing to intermediate consumption in the correction line named “Correction Other Income Expense” (see table II and second last line showing the total sum of those OIE items).

<b>Example Values for China in 2019 in thousand USD</b>	<b>Operation w/o R&amp;D</b>	<b>Research</b>	<b>Development</b>
Total net sales	1'700		
+ Revenues from 3rd party royalties & milestone payments	170		
+ Revenues from 3rd parties excl. revenues from royalties	250		
+ Other income (only partly)	350		
+ Changes in inventory	225		
+ Capitalized self-produced PPE	750		
+ Intercompany income (non-material)	25		
<b>= Output</b>	<b>3'470</b>		
Intercompany expenses (non-material)	-250		
+ COGS (Material purchases)	-750		
+ Expenses from 3rd parties' royalties and milestone	-275		
+ Other expenses (only partly)	-375		
+ Customs duty incurred	-70		
+ Membership fees to trade associations	-80		
<b>= Expenses contributing to intermediate consumption</b>	<b>-1'800</b>		
- Correction Other Income Expense	-70		
+ Correction Embedded Development values	300		
<b>= Direct GDP Contribution</b>	<b>1'900</b>		

Table II: **Novartis direct GDP contribution of own operation.** Output, intermediate consumption, direct GDP contribution for China in 2019 in thousand US Dollars.

The residual value between output and intermediate consumption yields the direct GDP contribution of own operation. Thus, the direct GDP contribution value of own operation without R&D activities for Novartis in China (based on mock-up accounting figures from FY 2019) equals appr. 1900 million USD.

<sup>18</sup> GVA Relevant development cost are outlined in Annex 5.1. The elimination of the total development cost is included in Table II in last line “Correction of embedded development values”

## 3.2 Direct GDP contribution of research and development – Step 2

The VGM ratio of the pharmaceutical industry in China is based on a 5 year average of country and industry level gross value added and industry compensation of employees factors from satellite accounts of the World Input-Output Database.<sup>19</sup> Other databases provided by OECD can be used to compute the VGM ratio. For countries where the VGM ratio is not available, a Novartis specific weighted average factor is being used. With this setup it is possible to calculate an R&D VGM even in countries showing minor research & development activities (e.g. conducting few local clinical trials).

In our example, the VGM ratio of the pharmaceutical industry in China equals 1.42 and can be applied to both, to personnel costs of research and development activities, respectively.

Using the Virtual Gross Margin ratio of China, we can calculate the VGM of China with the following formula:

$$\text{Virtual Gross mark-up R\&D} = (\text{Novartis R\&D Personnel cost}) \times \frac{\text{Gross mark-up Ratio of a country}}{\text{Industry Gross Mark-up Ratio}} \times \frac{\text{Personnel cost Industry}}{\text{Personnel cost Industry}}$$

Thus, an estimate of the direct GDP contributions of research and development activities accounts for 426 k (research) and 560 thousand U.S. Dollars for development in 2019. See Table III for the detailed calculation:

Example Values for China in 2019 in thousand USD	Operation w/o R&D	Research	Development
Total net sales	1'700		
+ Revenues from 3rd party royalties & milestone payments	170		
+ Revenues from 3rd parties excl. revenues from royal	250		
+ Other income (only partly)	350		
+ Changes in inventory	225		
+ Capitalized self-produced PPE	750		
+ Intercompany income (non-material)	25		
<b>= Output*</b>	<b>3'470</b>		
- Intercompany expenses (non-material)	-250		
+ COGS (Material purchases)	-750		
+ Expenses from 3rd parties' royalties and milestone	-275		
+ Other expenses (only partly)	-375		
+ Customs duty incurred	-70		
+ Membership fees to trade associations	-80		
<b>= Expenses contributing to intermediate consumption</b>	<b>-1'800</b>		
- Correction Other Income Expense	-70		
+ Correction Embedded Development values	300		
<b>= Direct GDP Contribution</b>	<b>1'900</b>	<b>426</b>	<b>560</b>
Personnel Cost		176	232
Virtual Gross Mark-up (industry & country specific)		x 1.42 250	x 1.42 329

Table III: **Novartis direct GDP contributions research and development.** Direct GDP contributions for research and development calculated via the country and industry specific virtual gross mark-up ratio for China.

<sup>19</sup> Timmer, M. P., Dietzenbacher, E., Los, B., Stehrer, R. and de Vries, G. J. (2015), "An Illustrated User Guide to the World Input-Output Database: the Case of Global Automotive Production", Review of International Economics., 23: 575-605.

### 3.3 Total Direct GDP Contribution – Step 3

Finally, the **Total direct GDP contribution** is calculated. By including the significant contribution of R&D activities to GVA, a comprehensive estimate of the Total direct GDP contribution of Novartis China is provided.

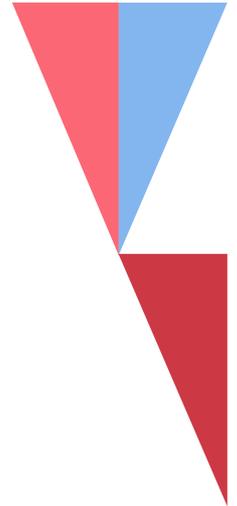
See **Table IV** for a detailed breakdown between own operation, research and development activities as well as Novartis Total direct GDP contribution estimation for China accounting for 2,887 Mio USD.

Example Values for China in 2019 in thousand USD	Operation w/o R&D	Research	Development	Total
Total net sales	1'700			
+ Revenues from 3rd party royalties & milestone payments	170			
+ Revenues from 3rd parties excl. revenues from royal	250			
+ Other income (only partly)	350			
+ Changes in inventory	225			
+ Capitalized self-produced PPE	750			
+ Intercompany income (non-material)	25			
<b>= Output</b>	<b>3'470</b>			
- Intercompany expenses (non-material)	-250			
+ COGS (Material purchases)	-750			
+ Expenses from 3rd parties' royalties and milestone	-275			
+ Other expenses (only partly)	-375			
+ Customs duty incurred	-70			
+ Membership fees to trade associations	-80			
<b>= Expenses contributing to Intermediate consumption</b>	<b>-1'800</b>			
- Correction Other Income Expense	-70			
+ Correction Embedded Development values	300			
<b>= Direct GDP Contribution</b>	<b>1'900</b>	<b>426</b>	<b>560</b>	<b>2887</b>

Table IV: **Novartis total direct GDP contributions.** Direct GDP contributions for operation, research and development for China in 2019 in thousand US Dollars.

# 4

## Discussion and Outlook



The in-depth review of the Direct GDP contribution calculation method enabled Novartis to understand how to use the financial income statements most accurately in line with SNA calculations. The practice of translating existing available financial data into the calculation of direct GDP contribution has become a well-established corporate competence. This competence was put to practice when the GVA portion of export business needed to be correctly attributed to the destination countries served through a centralized export organization. To prevent double counting, the GVA attribution to the countries of destination was resolved by identifying the income components that form the GVA in the destination countries.<sup>20</sup> Utilizing the cost components of the income approach allowed direct GDP contribution to be attributed to countries that do not issue detailed financial statements.

Evaluating the contribution of research and development activities to national wealth through the direct GDP contribution is still a fairly new method. So far, the method is not yet commonly applied by companies. The explicit calculation of R&D impact is an interesting example of how the method of GDP contribution can be extended. It is paving the way for a forward looking and resilient approach to economic wealth, while allowing to track how a company stays on the path of innovation.

For an extended form of R&D intensity, we look at the R&D GDP contribution ratio which is the GDP contribution of research and development divided by the Total Direct GDP.<sup>21</sup> This indicator expresses the value-generating power of the R&D activity of an enterprise.<sup>22</sup> A higher R&D GDP contribution ratio implies a greater contribution to economic stability on the company's part.

Using GDP as a purely **economic** measure of wealth is much debated against the background of major societal challenges. GDP alone is often seen as falling short of measuring real social progress and the well-being of society.<sup>23</sup> That is also the reason why the concept of direct contribution to GDP will need to progress. It needs to be put in context of **other impact dimensions** to include the perspective of external costs that influence the well-being of the entire planet in terms of **environmental** burden. Also, this measure does not capture the distribution of wealth, requiring an additional **social** impact value dimension.<sup>24</sup> Only in combination with social and environmental impact measurements, the direct GDP contribution unfolds its true impact.

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<sup>20</sup> See the detailed formula for an application of the income approach for export business in Appendix 5.3.

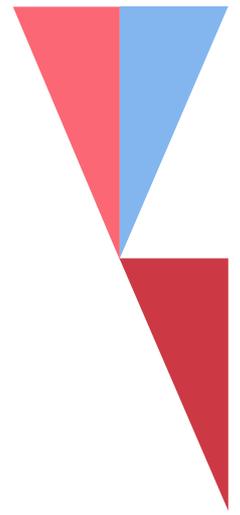
<sup>21</sup> R&D intensity is the ratio of expenditures by a firm on research and development as a proportion to the firm's sales.

<sup>22</sup> Zubrzycki, K. "Quantification of the macroeconomic contribution of internal R&D of an enterprise within the European System of National Accounts", February 2020, Technical University of Berlin.

<sup>23</sup> IMF Web Publication: Tim Callen "Gross Domestic Product: An Economy's ALL", Feb 2020, [Web link](#).

<sup>24</sup> HBR: Amit Kapoor & Bibek Debroy "GDP is not a measure of Human Well-Being", Oct 2019, [Web link](#).

# 5 Annex



## 5.1 GVA relevant functional cost:

The table shows the relevant functional cost types in blue that should be eliminated from Direct GDP operation calculation.

S22_010 Personnel Costs own	
S22_020 Personnel Costs 3rd parties	
S22_030 Travel & Meetings	
S22_040 Depreciation (excl. buildings/leasehold land)	
S22_050 Other Infrastructure costs	
S22_060 Material & Services	
S22_070 IT costs	
S22_080 Various costs	
S22_090 Fair value remeasurement of contingent consideration	
S22_150 Direct Project & Program costs	
S22_158 Amortization of Software	
S22_159 Amortization of intangible assets excl. Software	
S22_160 Total amortization of intangible assets	
S22_169 Impairment of intangible assets excl. Software	
S22_170 Total impairment of intangible assets	
S22_190 Allocations	
S22_200 TOTAL DEVELOPMENT	
Development cost relevant for GVA	

Table V: GVA relevant functional cost (development)

## 5.2 Calculation of Virtual Output

A *virtual output* resulting from research or development activities can be estimated after estimating the direct GDP contribution from R&D. For that purpose, the system of national accounts refers to the sum of costs approach in order to derive the R&D capitalization value.<sup>25</sup>

<sup>25</sup> Compare with the European system of national accounts, ESA 2010, Eurostat, European Commission, European Union, 2013 and the Manual on measuring research and development in ESA 2010, Eurostat, European Commission, European Union, 2014.

To calculate the officially compliant R&D output value, the intermediate consumption related to research (or development) activities must be added to the direct GDP of research (or development).<sup>26</sup> The formula for Novartis' virtual output of research (R) (and equally applicable for development) activities is as follows:

$$\text{III. } \text{virtual output (R)} = \text{direct GDP contribution (R)} + \text{intermediate consumption (R)}$$



Chart V: Estimation of virtual output of Research (R) and virtual output of Development (D) summarized as virtual output (R&D).

The sum of the Direct GDP contribution of research and development and the relevant intermediate consumption of research and development result in the virtual output (R&D).

## 5.3 GVA Calculation of Export business

Applying the income approach, the Direct GDP contribution own operation is calculated for countries with representational sales offices with a bottom-up approach of cost components being available in global financial reporting data structures.

Income approach- accounts/ export Country	Internal Account ID	Nomination	Source Export Hubs in Headquarter
<b>Income Approach – Direct GVA Division IM</b>			
ABS (Personnel Costs IM)		KUSD	Personnel costs
+ Depreciation IM		KUSD	Depreciation on property, plant and equipment
= Direct GVA operation IM		KUSD	<b>(Personnel cost + Depreciation)</b>
<b>Income Approach – Direct GVA Division Sandoz</b>			
ABS (Personnel Costs Sandoz)		KUSD	Personnel cost
+ ABS (Depreciation Sandoz)		KUSD	Depreciation on property, plant and equipment
= Direct GVA operation Sandoz		KUSD	<b>(Personnel cost + Depreciation)</b>
<b>Total GVA (Sum of Divisional GVA / Export Country)</b>			

Chart VI: Estimation of direct GVA for countries serviced through export hubs. <sup>27</sup>

<sup>26</sup> The terms "R&D relevant costs" and "intermediate consumption related to research (or development) activities" are used interchangeably throughout this case study.

<sup>27</sup> Profit component is not getting included in calculation of income approach as per business process set-up for export scenarios.

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