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Working paper

BEPIDS[1]

Operationalizing the BE-DTIB definition: mapping and aggregate analysis.

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Last Release Date

31 December 2024

[1] *The **B**elgian **E**conomic **P**otential in the **I**ndustry of **D**efence and **S**ecurity project is being researched jointly by the Department of Applied Economics of the 'Vrije Universiteit Brussel' (VUB) and the Department of Economics Management and Leadership of the Belgian 'Royal Military Academy' (RMA). The project receives financial support from the 'Belgian Federal Public Planning Service Science Policy' (BELSPO) and the Belgian 'Royal Higher Institute for Defence' (RHID). The project timeframe spans from Oct 2022 – December 2024.*

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The following counts as a draft/working paper to be submitted to academic journals or think-tanks and may be subject to adjustments based on stakeholder feedback and throughout the review process. Any comments can be sent to - gregory.kegels@vub.be

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Operationalizing the BE-DTIB definition: mapping and aggregate analysis.

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Introduction

In this paper we outline a methodology to operationalize the outlined definitions for the concept Belgian Defence Technological and Industrial Base (BE-DTIB) by mapping included entities and estimating the current direct economic impact for 2023.[7]

For Belgium, the few recent studies mapping defence related legal entities remain limited in scope and detail. One of the reasons being that there is currently no readily available data sources from which information can be derived, also not for aggregate figures. Hence, entities are identified based on top-down lists received from the country's Defence authorities or Defence industry association(s), are sourced through bottom-up desk research, or through a combination of both.[8]

Given the lack of a comprehensive overview or impact estimations of the BE-DTIB, we outline a definition for the concept and mapping approach to operationalize it for analysis. First, we define the BE-DTIB based on prior research. Next, we describe the methodology, the general process and general data cleaning operations to develop the dataset required for analysis.[9] Following this, we provide a descriptive analysis of the

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[7] This paper does not cover indirect economic impact. Indirect impact analysis using Input-Output analytical Tables (IOATs) and Supply-Use Tables (SUTs) is intended as the topic of a future paper of the researchers (not covered within the BEPIDS project).
[8] In the top-down approach, the inclusion of entities is derived from the procurement list of the armed forces and/or industry organizations. Conversely, the bottom-up approach involves utilizing data such as national statistics, surveys, or qualitative inclusion criteria derived with bottom-up sourcing, which includes desk research involving the analysis of websites and newspaper articles to determine the inclusion of an entity within the delimitations. A methodology is deemed overall bottom-up when it incorporates certain top-down sources, such as a procurement list received from the armed forces, along with multiple qualitative inclusion criteria that necessitate bottom-up sourcing.
[9] We do not provide the full outline of all steps as this would be extensive and defeat the purpose of this paper. We outline the approach to such an extent that details are not overburdening the reader, yet that any research may be able to replicate the employed approach.

mapped BE-DTIB through several key questions. Finally, we conclude with key insights and next steps. The scope of this paper concerns an aggregate descriptive analysis and high-level analysis; it does not delve into details per legal entity.

Employed definition for mapping the BE-DTIB

In prior research, we employed a multiple case study approach to derive generalizations on the definition and inclusion criteria for the concepts of the DTIB and the defence industry. This analysis resulted in the following general understanding of the *DTIB concept*, which we employ for the mapping due to its wider scope than the concept of the *Defence Industry*.[10]

"The DTIB consists of domestic sources that provide goods, services and technologies required by armed forces to fulfil their responsibilities, either directly or by being part of the value chain."[11]

Any good, service or technology required by armed forces, either directly procured/purchased or indirectly required as an input within the value-chain, can hence be included. Contrary to the general understanding of the *defence (equipment) market* concept, a product does not necessarily need to be intended or designed/adapted for military use to be considered part of the DTIB. While in most cases this overlaps with products offered in the *defence market*, also products designed and intended for security-use or critical materials and common goods for security of supply are essential to fulfill the requirements of the armed forces. Important to note is that "domestic" can be replaced by other geographical delimitations (e.g. EDTIB, NATO-DTIB) depending on the scope of what is the object of analysis for defence planning purposes.

To be considered in the mapping, an entity must be established under Belgian law and be recognized as a distinct legal entity, with only those entities possessing a 'Belgian legal entity number' in the Crossroad Bank for Enterprises (CBE) being considered.[12] Consequently, entities with 'establishment unit' or 'branch office' numbers are

[10] See: (Kegels et al. 2024)
[11] Ibid.
[12] The Belgian legal entity number, also referred to as a 'company, enterprise or undertaking registration number', is a unique identification number existing out of 10 digits of which the first number is either a 0 or 1. See: FPS Economy (2024) [LINK]

disregarded for this mapping exercise.[13] This also implies that entities registered in the CBE, having only a "hollow" representative office, establishment unit, or branch office in Belgium, and those established under foreign laws ('foreign entities') are excluded, as they are not considered separate legal entities. However, subsidiaries located in Belgium, operating as distinct legal entities under Belgian law, are encompassed in the BE-DTIB delineations. Belgian-based entities under 'foreign control' are not excluded from the BE-DTIB mapping.[14] However, while an entity may be included in the BE-DTIB mapping, it might not meet the criteria for funding support due to foreign control. This discussion, however, is outside of the scope of this paper.

For the mapping we consider the actual BE-DTIB, i.e. those that *currently provide goods, services and technologies* to armed forces or within the value chain. The "potential BE-DTIB" is included to the extent that the legal entities currently do provide goods, services and technologies but have the potential to further increase their impact; the legal entities were known to have provided products in the recent past based on the available sources but currently no longer do so; and recently founded legal entities that do not have any products yet but will target the outlined customers. Hence, the current mapping does not include legal entities that currently do no provide any products, nor have indicated intent, but have the technological innovation capabilities or industrial capacity to do so given the right context.[15]

Below, we outlines the specific inclusion criteria employed for the mapping.

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[13] The 'establishment unit' or 'branch office' numbers consist out of 10 digits of which the first number ranges between 2 to 8. See: Ibid.

[14] Foreign-control' here to refers to undertakings where, either alone or jointly with other foreign undertaking(s)/person(s), the (group of) foreign undertaking(s)/person(s) can exert - directly or indirectly, *de facto* or *de jure* - "decisive influence" on the (activity of the) Belgian-based legal entity, i.e. to determine the strategic commercial behavior and decisions of the legal entity such as its budget, business planning, (dis)investment decisions and its management appointment. See: *(EU Merger Regulation 139/2004, art 3(2))* ; (Vaquero 2019). The notion of control is also outlined in Belgian law in *article 1:14 of the Belgian Code for Companies and Associations*. However, we employ the EU notion of 'control' as understood under the EU Merger Regulation. The recent Foreign Direct Investment Screening mechanism for Belgium similarly refers to the *EU Merger Regulation* to define the term 'control'. See: art 2, 1° in the *Cooperation Agreement 30 November 2022 to Establish a Mechanism for the Screening of Foreign Direct Investments*".

[15] This is for instance the case in a wartime scenario where some car and truck factories may choose (or in extreme cases may be mandated by government) to transform (a part of) it's assembly process to produce vehicles for the armed forces instead of civilian vehicles.

Any entity

i. registered in Belgium in the Crossroad Bank of Enterprises (CBE);
   a. that was established under Belgian law and;
   b. that is considered a separate legal entity (regardless of its specific legal status and the way in which it is financed);

ii. with economic activities[16] occurring on Belgian soil and;

iii. which supplies 'defence-use products[17]' or 'security-use products' , including 'dual-use items and technologies' to any (i.e. foreign or domestic) 'Defence actors' or as inputs or components to 'other legal entities active in the DTIB value chain' OR;

iv. which *significantly or continuously* supplies 'any other products' directly to any 'Defence actors' or as significant inputs (e.g. critical materials), components or services to 'other entities active in the (global) DTIB value chain'.

is considered part of the BE-DTIB.

Concerning the supply-side delimitations of the BE-DTIB:

Defence-use products consist out of three buckets:

- 'Defence-related products' as outlined in the Common Military List of the EU.[18]
- 'Dual-use products (items and technologies)' as outlined in the EU Dual-Use Regulation, when used for military purposes.[19]

[16] 'Economic activities' refers to any relevant activity such as design, development, production, maintenance, targeted research, any other services, including supplying or maintenance of necessary (sub)components. We also consider as an economic activity any research of Higher Education Institutions that are not yet commodified, but hold such intent.
[17] Note: 'Product' here refers to goods, services, technologies through any type of economic activity (research, design, production, etc.).
[18] EU Common Military List [LINK]
[19] EU Dual-use list [LINK]

- As there are gaps remaining in these product categories, we opt to assign a catch-all category for products that are not included in these frameworks, but can be considered defence-specific (e.g. external armed security services during operations and other services directly related to military operations). This category is based on products included by others in their mapping analyses (e.g. SIPRI, ASD).[20]

Security-use products refers to:

- Goods and services in the EU civil security taxonomy (e.g. includes defensive cyber).[21]
- 'Dual-use products (items and technologies)' as outlined in the EU Dual-Use Regulation, when used for security purposes.

For the demand-side delimitations we consider the offering of goods and services to

- Foreign and Belgian 'Defence actors' (Ministry of Defence, National Armaments Directorate, Military intelligence, any of the other components or parts of the armed forces that can procure goods or services) and;
- Any other entities active in the DTIB value chain.

Methodology for mapping and sourcing key data for analysis

Step 1: Obtaining legal entity names from relevant sources

Sources for mapping of entities

The mapping of the BE-DTIB cannot be deduced from existing national statistics or the NACE-BEL classification system of activities. NACE-BEL serves as the Belgian version of the statistical nomenclature (NACE Rev. 2) employed in the European Union for categorizing economic activities and is the standard reference framework for generating and disseminating economic activity-related statistics in Belgium. However, NACE-BEL incorporates only a limited number of codes (e.g., 20510 for 'Explosive products

[20] For more info, see: (Kegels et al. 2024)
[21] EU Security taxonomy [LINK] [LINK]

manufacturing' and 25400 for 'weapons and ammunition manufacturing') that allow for the identification of military goods production. Moreover, the NACE-BEL classification system lacks the capability to differentiate between military and civilian market economic activities in the production of dual-use and dual-product goods. The same issues apply to the other existing classification systems of activities. Hence, we employ the following sources to set-up the mapping of the entities of the BE-DTIB.[22]

(1) Defence and Security Procurement contracts

(2) EU, NATO, and Belgian Defence (R&D) programs[23]

(3) Already listed in the Group for Research and Information on Peace and Security (GRIP) database of the Belgian 'armaments industry'.

(4) D&S-focused or relevant business associations[24]

(5) 'Defence-related' or 'dual-use' products exports[25]

(6) Existing reports, e.g. reports from the Flemish Peace Institute.

(7) DG HOME list of EU security market

(8) EU Register of Certified Defence-related Enterprises - CERTIDER

(9) Defence-relevant NACE codes (limited)

(10) LinkedIn (legal entity self-identified as defence-related')

(11) Mentioned in newspaper articles or other open sources as having DTIB-relevant activities.

(12) Business days & events[26]

(13) Obtained via stakeholders (Federal Public Service Economy, The Belgian National Armaments Director office).

[22] Note: The mapping builds on a preliminary exercise done by ACOS STRAT-NAD and FPS Economy, which the BEPIDS project has continued in cooperation with both.

[23] e.g., the European Defence Fund (EDF) and its precursors programs – the European Defence Industrial Development programme (EDIDP), Preparatory Action for Defence Research (PADR) and Defence Pilot Projects (PP); European Defence Industry Reinforcement through common procurement act (EDIRPA); Act in Support of Ammunition Production (ASAP); Defence Research Action (DEFRA); Royal Military Academy, Royal Higher Institute for Defence and other direct projects at Belgian Defence; Defence Innovation accelerator for the North Atlantic (DIANA).

[24] e.g.: BSDI; Skywin; FLAG; EWA; Pole Mecatech D&S; Belgospace; BAG. See more on this *infra*.

[25] Via open source, as the regional export control services do not share this info publicly.

[26] e.g. Belgian Defence and Security association days; EUROSATORY; EURONAVAL.

(14) Any legal entity participating in the impact survey shared on LinkedIn and the website of the Royal Higher Institute for Defence, which were not yet included via the above sources and indicated they have DTIB-relevant activities.

From these sources, we derive a list of legal entities which forms the basis for the main file that can be used to link to other datasets for further analysis. We link these via the legal entity number of the Crossroad Bank of Enterprises of the Federal Public Service Economy (FPS Economy) in order to further connect to the required datasets for the analysis.

Step 2: Data sourcing and filling gaps and patches

Data sourcing

The data for this overview are partially drawn from the Belfirst database of Bureau van Dijk (owned by Moody's).[27] The Belfirst database assembles information of Belgian (and Luxembourgian) legal entities, from the annual accounts reported to the National Bank of Belgium (NBB), from information reported to FPS Economy (Crossroads Bank of Enterprises) and from the Belgian Official Journal into a common database. Turnover, gross value added, employment and other key data were primarily extracted from the Belfirst.[28] Where unavailable or restricted due to access rights, gaps were filled in through open data extract, scripts or manually from the direct sources above, as well as from open data of the Federal Public Service Social Security. For instance, addresses for the establishment unit location and NACE-BEL information were collected from the Crossroads Bank of Enterprises and the National Bank of Belgium's "open data extracts". Missing employment figures were filled with information from the open access version of the portal of the Federal Public Service Social Security. The remainder of the current data in the dataset (e.g. categorizations such as CapTechs) were filled in manually based on desk research or though scaping scripts and queries.

[27] (Bureau Van Dijk, n.d.) [LINK]
[28] Note: We employ the unconsolidated accounts of the legal entities.

Data gaps and patches

Turnover, employment, gross value added

While companies are required by law to report certain information publicly in their annual accounts, there are exemptions. For instance, small companies only have to report publicly when it exceeds either of the following three categories: it has a turnover of 700k EUR, total assets of 350k EUR, or employment of 10FTEs in the reporting year. Even when these limits are reached the reporting for these small companies occurs via the 'micro-model', which gives less information than the other reporting models. Hence, this information is not always reported to the NBB. As a result, the Belfirst database also does not contain such information for these companies.

To retrieve more exact estimations, data for the micro companies can be inferred and filled in based on the averages of the available data for the size type (Micro). Alternatively, a "MAX" designation can be employed according to the threshold exemptions. Hence, each micro company with no data available in the Belfirst is accorded 700k EUR for turnover in accordance with the threshold before reporting values becomes required. The differences between each method is negligible. While this data inference method can be argued to misrepresent due to the skewing of the data for Micro companies, it provides a more accurate picture of the BE-DTIB as a whole than if these were left as blanks.

The average number of employees for 2023 is derived from the Full-Time Equivalents (FTE) data. When data for 2023 is not available, it takes the value for the latest available year. Other data gaps (some entities with size 'Micro') are filled in based on taking the Max employment threshold (9 FTE) for the size type. Similar to the above, the impact of doing so is negligible on the total figures.

DTIB-specific information

There is a lack of publicly available information on the proportion of defence-related activities within the turnover or employment of the entities. Hence, the current estimations for the size of DTIB-related impact are based on stratified weighted averages of data inferences from the available DTIB-related proportions in the dataset (see: *infra*). The proportion of DTIB-related turnover, employment and gross value added within their

total were obtained from a survey[29] sent to the list of the mapped legal entities as well as published online on the website of the Royal Higher Institute for Defence and LinkedIn, and from the last available known ratio that are publicly available. The latter comes with a caveat, while including these values enables a better estimation due to increasing the amount of datapoint in the dataset, it hampers comparisons across years as the latest available DTIB-proportion may not be applicable in the year of analysis. Nevertheless, these inclusions are preferable for the aim of our research. Future updates should continue data gathering for previous years in order to retroactively re-asses previous estimations, thereby enabling a correct longitudinal analysis over time.

Head-office as location versus the primary location of activity

Due to data limitations, we initially assigned the impact of the mapped legal entities according to its head-office location in Belgium. However, a more correct assessment is to make corrections according to the establishment units' location where the registered entity creates the impact.

Analyzing the impact based on the location of its main activities rather than the head-office location is crucial for several reasons. First, economic impact of a legal entity is better reflected by where its activities and employment are concentrated. This provides a more precise picture of regional economic contributions and needs. Second, accurate data on where economic activities occur can inform better policy-making and resource allocation. Regions with significant operational activities may require more infrastructure, support, and investment. If these are incorrectly allocated (by using head-quarter locations), the wrong conclusions may be drawn on how specific regions may be able to better support the DTIB.

To illustrate, many legal entities in Belgium in general choose to have their head-offices in Brussels due to its position as the administrative hub of Belgium and due to it being close to the decision-making institutions, but often have more important facilities activity-wise in the other regions. The result is a possible overestimation of the impact in Brussels. This hypothesis is also supported by the mapping for the BE-DTIB (see: *infra*) with a portion of the entities initially mapped in Brussels being mainly reallocated to the

[29] See: separate annex to this paper.

region of Flanders when considering the indicated primary location of the legal entity' activities, as available in the open data access version of the Federal Public Service Social Security's employment registry. Furthermore, while it is not a focus in our current research, the different export control mechanisms of military and strategic goods employed by the regions may affect the choice of where to allocate the headquarters of the legal entity, with export controls generally considered less strict in Wallonia and Brussels as opposed to Flanders.

While the Federal Public Service Social Security does gather data per establishment unit of legal entities, the detailed data is not open to the public. However, open access is available in a limited version of the 'employment registry' (WIDE), which indicates the municipal code[30] of the establishment unit location where the legal entity has the most activities in terms of employment. This code can in turn be linked to a postal code and cross-referenced with the gathered establishment unit info per legal entity we obtained from the Federal Public Service Economy's open data access. After matching the datasets we obtain the location of the primary unit of activity per legal entity. Hence, corrections can be made to the mapping location based on the primary location of activity, which improves the correctness of the impact assessment per region.

Step 3: Categorization and adding descriptive characteristics per legal entity

Categorizing the DTIB

Vital for the operationalization of the mapping of the domestic DTIB is its categorization into distinct categories based on common characteristics. As noted above, the NACE-BEL only contains a limited number of codes useful for defence or security-related activities. There are a myriad of different categorization methods that can be used to outlined subparts of the DTIB (as well as for the defence industry).[31] Given the impetus

[30] The municipal code is not the same as a postal code. Municipal codes are employed by governments for wider municipalities, as well as for statistical purposes. Postal codes covers smaller municipalities (a subset within the municipal code number) and are employed for postal addresses. FPS Social Service indicates only the municipal code, meaning the codes need to be matches via a translation table before linking to the establishment unit data from FPS Economy.

[31] See: (Kegels et al. 2023)

for this research paper is the BE-DIRS, which as one of its key objectives includes understanding how the BE-DTIB can enter European value chains, we find the most relevance in categorizing the entities according to categorizations employed by the EU.[32] Below, we outline a correspondence table matching the domains of the BE-DIRS with the EDA CapTechs and the EDF categories of actions, which generally align (See: Table 1).

Preference goes to the CapTechs as opposed to the EDF categories, as the CapTech can directly be linked to Technology Building Blocks (TBB) and more granular roadmaps.[33] Specialties are further narrowed down within the CapTech categories according to the Areas of Responsibilities (AoR) for the CapTech based on the more detailed EDA technology Taxonomy (TT) and according to the Technology Building Blocks (TBBs)[34] needed for further development of the technologies listed in the Technology Taxonomy to achieve the sought-out capability needs. The AoR defines the characteristics of the CapTech in two manners.[35]

First, via the Strategic Research Agendas (SRAs) that defines the CapTech and indicates the technologies of the Technology Taxonomy (TT) a certain CapTech is responsible for in terms of monitoring their progress and promoting research. The EDA Technology Taxonomy currently list 350 topics classified according to defence-relevant technologies and research activities.[36] The latest publicly available Technology Taxonomy is categorized into 5 segments with 3 horizontal levels and 2 overarching vertical segments. The hierarchical horizontal levels are similar to the OEM to Tier 3 model, but excludes tier 3: 'Systems and product-level technologies' (OEM), 'System related technologies' (Tier 1), 'Underpinning technologies' (Tier2). The vertical segments consist of 'supplementary technology areas' and 'Specialized technology taxonomies' that do not match the hierarchical levels as they can be applicable to all of these.

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[32] Doing so also enables distinguishing the broadness of the conceptual understanding from how it is used in practice; any legal entities that cannot be allocated to one of the segments can be seen as only being part of the DTIB in the periphery or for (security of) supply of common goods and services.

[33] While access for detailed roadmaps are only accessible to those with a "need to know", it provides a comprehensive tool for defence planning.

[34] The Overarching Strategic Research Agenda (OSRA) summarizes the separate Strategic Research Agenda's (SRAs) of each CapTech area by outlining the specific Technology Building Blocks (TBBs) for the R&T areas in a comprehensive roadmap. See: (EDA 2023) [LINK]; (EDA 2021) [LINK]

[35] (EDA 2021) [LINK]

[36] (EDA 2023b) [LINK]; (EDA 2021b) [LINK]

Second, the AoR defines the characteristics of the CapTech via the AoR Matrix that matches the items of the Technology Taxonomy (bottom-up perspective) with the listed capability needs (top-down perspective) of the Generic Military Task List (GMTL) for a certain CapTech, which enables the identification of detailed Technological Building Blocks (TBBs) needed for the development of capabilities listed in the GMTL. Each TBB is connected to a specific CapTech and for each TBB there is a roadmap with project ideas as well as an in-depth assessment.

EDA CAPTECH areas		***CAPTECH Abbr.***	***DIRS domain*** ***(matched to the EDA CAPTECH)***	***EDF***
1.	*Technologies, components and modules (Semiconductors, photonics, electronics)*	***TCM***	*Underpinning technologies (HA)*	*(Materials) and components*
2.	*Radio Frequency Sensors Technologies*	***RADAR***	*Underpinning technologies (HA)*	*Advanced passive and active Sensors*
3.	*Electro Optical Sensors Technologies*	***OPTRONICS***	*Underpinning technologies (HA)*	*Advanced active and passive Sensors*
4.	*Communication Information Systems and Networks*	***INFORMATION***	*Information processing & data management, communications & embedded intelligent systems (HA)*	*Information superiority* *Digital tranformation*
5.	*Materials and Structures*	***MATERIALS***	*Advanced soldier system (VA)* *Smart and advanced structures and materials (HA)*	*Materials (and components)*
6.	*Missiles and Munitions (and weapons)*	***AMMO***	*Ammunition systems/effectors and integration (VA)*	*Air and missile defence*
7.	*Aerial Systems*	***AIR*** ***(incl. logistics)***	*Next generation combat aircraft technologies (VA)* *Unmanned intelligent systems (VA)*	*Air combat*
8.	*Ground Systems*	***LAND*** ***(incl. logistics)***	*Unmanned intelligent systems (VA)* *(Advanced Soldier system (VA))*	*Ground combat*
9.	*Guidance, Navigation and Control*	***GNC***	*Unmanned intelligent systems (VA)*	*Information superiority*

			Information processing & data management, communications & embedded intelligent systems (HA)	
10.	*Naval Systems*	***MARITIME (incl. logistics)***	*Maritime mine countermeasures technologies (VA - priority)*	*Naval* *Underwater warfare*
11.	*Experimentation, System of Systems, Battlelab, and Modelling & Simulation*	***SIMULATION***		*Simulation and training*
12.	*Medical response, CBRN and Human Factors*	***CBRN & HF***	*Advanced military health and human performance (VA)*	*Medical support, CBRN, biotech and human factors*
13.	*Cyber Research & Technology*	***CYBER***	*Defence-related cyber (HA – priority)*	*Cyber*
14.	*Energy and Environment*	***ENERGY***	*Energy and environment (HA)*	*Energy, reilience and environmental transition*
15.	*Space-related technologies*	***SPACE***	*Space-related applications (VA)*	*Space*
			DIRS domains applicable to multiple CAPTECHS	***EDF (extra)***
			Emerging and disruptive technologies (HA) *In-service support and life cycle services (HA)* *Skills and competences (HA)*	*Disruptive technologies* *Force protection and mobility*

Table 1*: Alignment of EDA CapTechs to BE-DIRS domains and EDF categories. Source: Own composition.*

Step 4: Data inference method

To infer DTIB-specific proportions per legal entity, such as the DTIB-related proportion within total turnover, gross value added, employment, obtained via the survey and open sources, we employed stratified weighted averaging to calculate a combined weighted mean per legal entity.

While regression-based imputation is commonly employed, we found it did not suffice in this context. While regression models can include interaction terms to capture the combined effect of two or more variables, if there are insufficient observations for each interaction term, the model does not accurately estimate effects. In case of insufficient data, the model produces biased estimates, either overestimating or underestimating the true relationships. Hence, since regression models rely only on the available data as given to infer interactions, sparse or skewed data leads to unreliable estimates. The

stratified weighted averaging method avoids this pitfall by actively engaging with the data, correcting it where observations are low with scaling factors based on the information from related strata.

Stratified weighted averaging explicitly accounts for the heterogeneity within the dataset by dividing it into distinct strata based on relevant characteristics. Each stratum is analysed separately for its weighted average, ensuring that the unique attributes of each subgroup are preserved and more accurately represented. Another advantage is that stratified weighted averaging does not rely heavily on specific model assumptions. It is primarily a descriptive technique that uses observed data to calculate averages and adjustments, making it more robust to violations of assumptions such as linearity or normality. In this manner it can capture non-linear patterns that regressions (depending on the type employed) may overlook.

First, we outline strata based on key characteristics influencing DTIB-related activities. For instance, a strata may consist of whether a legal entity is part of a defence-relevant association or not, what the geographic region is where it is located and what the size category is of its total turnover. For this strata, several stratum exist based on the mix of these characteristics. Next, we calculate the weighted mean and weight for each stratum within the above strata. For instance, the stratum mean for a legal entity that is part of an Defence relevant association, located in Brussels and has turnover lower than two million EUR will have a different average ratio for its DTIB-derived turnover within the total turnover than a legal entity that is not part of a relevant association, is located in Brussels and has a turnover lower than two million EUR. Where observations per stratum are low, a scaling factor is employed based on the most comparable stratum with sufficient observations. Once the mean and the weight are calculated per stratum, the applicable mean and weight per stratum is allocated to each legal entity within the dataset matching the specific stratum characteristics.[37] For each legal entity a combined weighted mean is then calculated to combine the weighted means from the stratum of the separate strata analysis to obtain a more precise estimation. For our analysis we employed two

[37] Another advantage to this method is that once formulas are set up in excel, the calculations can be set up to automatically update the new analysis with new data inputs (e.g. if more data is obtained on the % of DTIB-related turnover per company, it can automatically update the weights and ratios across the dataset).

strata resulting in the following calculation to impute the combined weighted mean (Xcw) per legal entity for which the information was not obtained from the survey or open sources.

$$\bar{X}_{cw} = \frac{W_1\bar{X}_{w1} + W_2\bar{X}_{w2}}{W_1 + W_2}$$

Xw1: Weighted mean for the particular stratum within the first strata analysis.

Xw2: Weighted mean for the particular stratum within the second strata analysis.

W1: Weight for the particular stratum within the first strata analysis

W2: Weight for the particular stratum within the second strata analysis.

The estimated ratio per legal entity can then be employed to calculate the estimated values for each, such as its DTIB-related turnover on the basis of the available total turnover data sources from the Belfirst and the National Bank of Belgian's open data extract. Subsequently the estimated values per legal entity can then be employed for the aggregated analysis, providing more details than if a simple extrapolation based on available values were employed.

RESULTS of the mapping

This section gives a descriptive analysis of the BE-DTIB. To better understand the mapping we illustrate the results via several key questions.

1. How many entities are included in the BE-DTIB mapping and what is their estimated impact?
2. In what CapTechs do we find the most entities and in what sectors is the impact the highest?
3. What is the regional spread of the BE-DTIB? (HQ vs main location of activities)
4. What is the coverage of the mapping by Belgian defence-relevant associations?
5. What countries are most represented in the foreign ownership of the BE-DTIB mapping?
6. What is the CapTech breakdown per Region?

1. How many entities are included in the BE-DTIB mapping and what is their impact?

Key figures

Based on the delimitations of the BE-DTIB and the mapping sources described above, we derived 892 separate legal entities to include in the impact analysis. While the full mapping is more extensive, reaching active 949 legal entities, 57 legal entities were excluded from analysis due to their skewing impact and as their impact could not correctly be estimated with sufficient confidence based on the available data. For this reason, we excluded universities (except for the Royal Military Academy) and several large legal entities for which there was not a clear indication of their DTIB-derived proportion in their activities, nor could it correctly be derived with confidence via inferences of the available data from the impact assessment. Nevertheless, these entries are maintained in the dataset as future research may continue data gathering to assign correct values for analysis. Furthermore, while not core to their activities, they remain stakeholders active in the BE-DTIB. Legal entities that have been disbanded or went bankrupt are also maintained in the dataset, as this enables tracking pitfalls for the BE-DTIB over time. Considering these, the dataset counts 1020 legal entities. In total the 892 legal entities maintained for the impact analysis have a turnover of 37 Billion EUR, employ about 103k employees and represent 12.7 Billion EUR of Gross Value Added (GVA) for all their economic activities in 2023.

We then made estimations via data inferences based on the available info in the database on proportions of turnover, GVA and employment from DTIB-related activities (see *supra* for a description of the employed inference method. This data was available for 186 legal entities. Based on the available data and employed inference method, we estimate the BE-DTIB included for the impact assessment has an estimated DTIB-derived turnover of 5.01 Billion EUR, direct employment of 16.3k and 2.02 Billion EUR in gross value added. The direct impact constitutes 0.33% of total Belgian employment[38] and its direct gross value added for Belgium (before adjustments for taxes and subsidies) is

[38] Calculated based on: Statbel -Employment 2023 data. [LINK]

around 0.34% of Belgian's GDP for 2023.[39] When viewed according to the specific regions of Belgium, the direct full time equivalents (FTEs) of the BE-DTIB constitute around 0.28% of total employment in the Brussels capital region, 0.29% in the region of Flanders and 0.42% in the region of Wallonia when allocated according to the region where the legal entity has the most employment activity.[40]

Based on an extrapolation of the available survey data[41], we estimate the BE-DTIB has a total export ratio of 47% in 2023 for its DTIB-derived turnover, representing around 2.4 billion EUR.[42] Using the same method, we estimate the expenditure of DTIB R&D represents about 18% as compared to turnover, with an estimated 917 million EUR being spent on R&D. Concerning employment, about 24% of the DTIB FTEs is focused on R&D, constituting an estimated 4124 FTEs. Important to note is that universities, while mapped in the dataset, are not included in the impact assessment. Hence, these values are not skewed by universities their focus on R&D.

Comparison of the BE-DTIB mapping with the NL-DTIB mapping

Although there are differences in the industrial fabric of the countries, the Netherlands is the most comparative neighboring country concerning the DTIB, with both the Netherlands and Belgium their DTIB focusing on more specialized niche goods and services, as opposed to France, Germany and the UK that have the industrial infrastructure and financial capacity to drive large weapons system development and production programs. Furthermore, due to the Benelux, the Netherlands and Belgium have more integrated industrial ties and interconnected economies. It also participates more closely in joint military ventures, most notably through the integration of its Navies

[39] Calculated based on: NBB – Regional and National accounts for 2023. [LINK] We do not consider taxes or subsidies in this estimation comparing gross value added to GDP as this data on taxes and subsidies is per legal entity is unavailable to us.
[40] As indicated *supra*, this method is employed as opposed to allocation according to the headquarters location in order to better estimate the impact of the legal entities per region.
[41] This extrapolation was done using a weighted means calculation based per stratum of turnover size type.
[42] This estimation ranges between 39 to 56% with a confidence interval of 90%.

and its related joint procurement. [43] For all these reasons, it is interesting to use the Netherlands as the key country of comparison. When we compare the current mapping with the most recent available mapping of the NL-DTIB, we see that the BE-DTIB mapping has fewer entities, and the impact thereof is estimated to be lower (see: **Figure 2**). However, while the mapping study on the NL-DTIB overall is similar to our approach, they also include security actors, such as the police or civil intelligence, and the security value chain in their mapping criteria.

	BE (23 data)	NL (23 data)*
Turnover	37 B	51 B
GVA	11 B	(not provided)
FTE	103 k	180 k
#Entities	892	1050
DTIB Turnover	5.01 B	7.7 B
DTIB GVA	2.02 B	3.6 B
DTIB FTEs	16386	22453
%DTIB Turnover	13%	15%
%DTIB GVA	17%	(not provided, 10.9% in 2021 study)
%DTIB FTEs	16%	12%

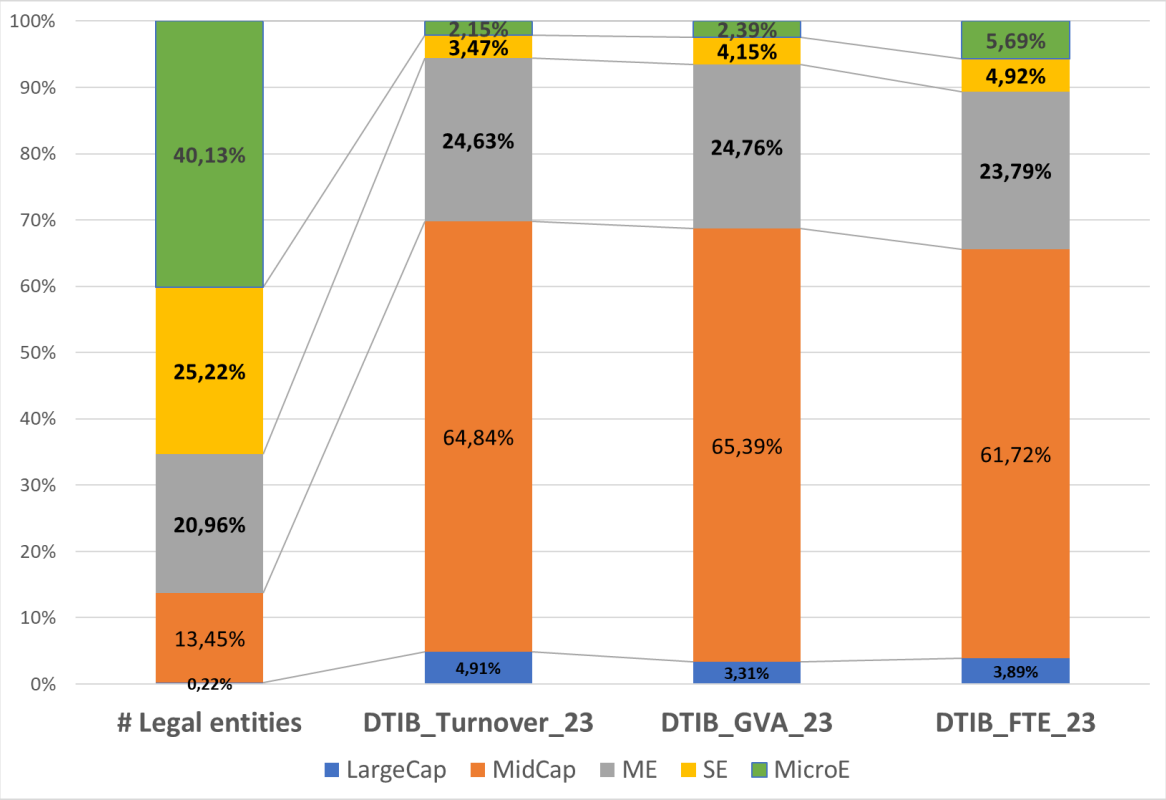
** NL study includes security actors and security value chain under it's definition of DTIB. The BE study does not include security-focussed entities in its impact assessment unless they fall under the BE-DTIB definition.*

***Table 2**. Comparison of the BE-DTIB and the NL-DTIB. Source: Own composition based on the BE-DTIB database and the NL-DTIB study done by Berenschot* for the Dutch government.*

[43] BeNeSam (Belgisch Nederlandse Samenwerking) cooperation since 1948 and the recent joint-procurement of M-frigates and Mine CounterMeasures Vessels (MCMVs). For more information, see: (Peeters and Pilon, 2020) [LINK]

Impact BE-DTIB by size type for DTIB activities

The majority of the mapped legal entities are Micro-sized entities (40.13%). However, they constitute only a small amount of the estimated impact within the entire mapped BE-DTIB: 2.15% of DTIB-derived turnover, 2.39% of gross value added and about 5.69% of FTEs. Similarly, Small-sized entities represent a large amount of the mapped entities (25.22%), but encompass little of the impact. Medium-sized entities their mapping (20.96%) closely maps their impact, with about 24% for each impact indicator. On the other hand, MidCaps, which only consists of 13.45% of the mapped entities, accounts for the bulk of the impact, with it representing about 65% of DTIB-related turnover and 61.72% of employment. Also notable is that although there are only 2 legal entities considered LargeCaps included in the impact assessment, they have a substantial impact per legal entity (see: **Figure 3**).

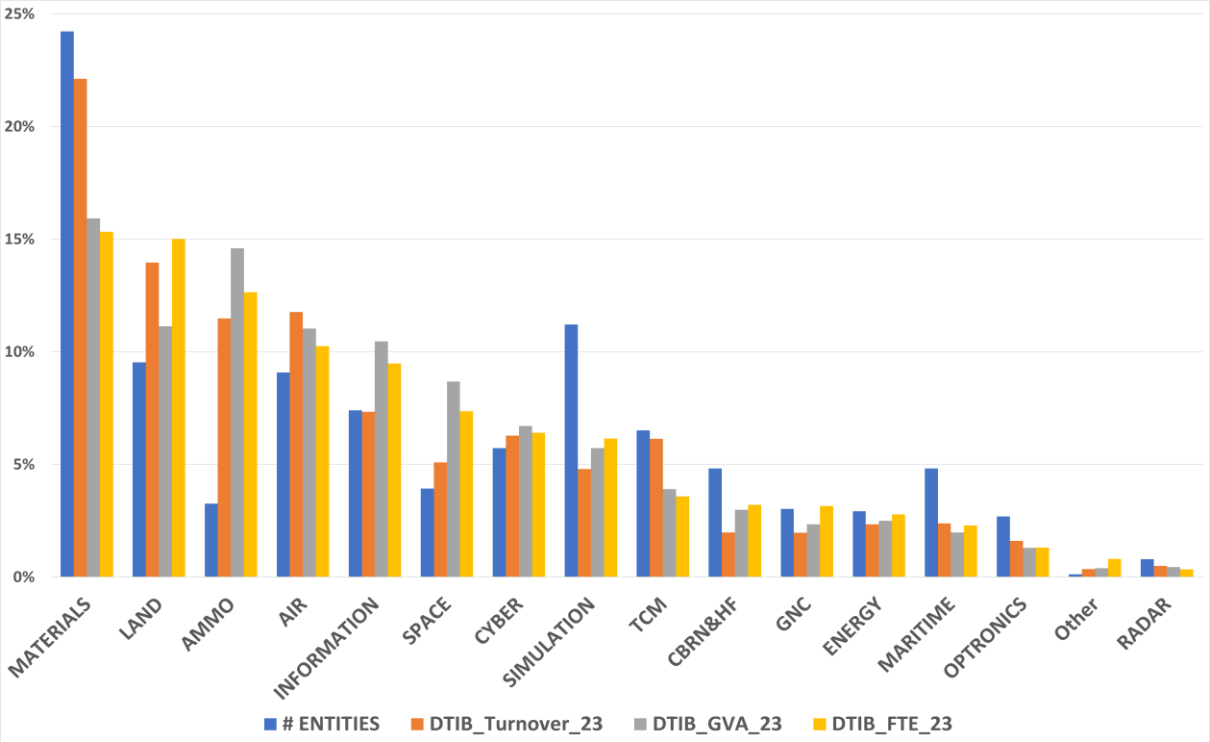


	# Legal entities	DTIB_Turnover_23	DTIB_GVA_23	DTIB_FTE_23
LargeCap	0,22%	4,91%	3,31%	3,89%
MidCap	13,45%	64,84%	65,39%	61,72%
ME	20,96%	24,63%	24,76%	23,79%
SE	25,22%	3,47%	4,15%	4,92%
MicroE	40,13%	2,15%	2,39%	5,69%

Figure 3. *Impact of the BE-DTIB by size type.*[44] *Source: Own composition based on the BE-DTIB database.*

2. *In what CapTechs do we find the most entities and in what CapTech is the impact the highest?*

The chart below provides an aggregated overview of the BE-DTIB according to various Capability Technology groups (CapTechs), breaking down the metrics for the number of entities, turnover, gross value added (GVA), and employment across the different CapTechs.



[44] The size types employ EU definitions (except for balance sheet size). Micro Enterprises employ fewer than 10 persons and have a turnover not exceeding EUR 2 million; Small Enterprises employ fewer than 50 persons and have a turnover not exceeding EUR 10 million; Medium Enterprises employ fewer than 250 persons and have a turnover not exceeding EUR 50 million; MidCaps exceed turnover of 50 million or 250 persons, employing a maximum of 3000 persons; LargeCap are legal entities not classified as an SME employing more than 3000 persons. *See: European Investment Bank [LINK]; DG GROW [LINK]*

Figure 4. *Estimated DTIB impact allocated per CapTech, ordered per estimated DTIB FTEs. Source: Own composition based on the BE-DTIB database.*

CAPTECH	# ENTITIES	DTIB_Turnover_23	DTIB_GVA_23	DTIB_FTE_23
MATERIALS	24,22%	22,11%	15,92%	15,32%
LAND	9,53%	13,96%	11,13%	15,01%
AMMO	3,25%	11,48%	14,58%	12,64%
AIR	9,08%	11,76%	11,02%	10,25%
INFORMATION	7,40%	7,33%	10,45%	9,47%
SPACE	3,92%	5,09%	8,67%	7,36%
CYBER	5,72%	6,27%	6,70%	6,40%
SIMULATION	11,21%	4,79%	5,72%	6,14%
TCM	6,50%	6,13%	3,90%	3,58%
CBRN&HF	4,82%	1,98%	2,98%	3,20%
GNC	3,03%	1,96%	2,34%	3,14%
ENERGY	2,91%	2,34%	2,49%	2,77%
MARITIME	4,82%	2,38%	1,98%	2,29%
OPTRONICS	2,69%	1,60%	1,29%	1,30%
Other	0,11%	0,35%	0,39%	0,80%
RADAR	0,78%	0,49%	0,43%	0,33%

Table 5. *Estimated DTIB impact allocated per CapTech, ordered per estimated DTIB FTEs. Source: Own composition based on the BE-DTIB database.*

Legal entities allocated in the mapping to the Materials, Land, Ammo and Air CapTechs provide the highest estimated amount of employment for DTIB-related activities. The estimated DTIB-related turnover closely follows this pattern, with the legal entities allocated to the Air Captech resulting in slightly higher turnover per FTE than the Ammo Captech. On the other hand, the legal entities allocated to the Ammo CapTech represent almost 15% of the entire DTIB-related gross value added within the mapping, as opposed to about 11% for the legal entities allocated to the CapTech Air, giving the former a slightly higher economic contribution than the latter.

The Materials sector stands out with the highest number of entities and estimated impact across the employed metrics, indicating a robust cluster of legal entities focused on materials essential for defence applications. This high concentration underscores the role of the BE-DTIB within the European Defence Technological and Industrial Base to provide inputs and specialized materials at the lower end of the value chain. The Materials CapTech represents essential supplies of base materials or refined products necessary for the production of defense technology. This includes metals, composites, polymers, high-grade textiles and other specialized materials that are prerequisites for manufacturing advanced equipment such as aircraft, vehicles, and electronic systems further down the value chain. The high turnover in the Materials CapTech indicates the specialization and technological edge of Belgium in regards to material science. This specialization often involves the development of new materials with enhanced properties such as greater durability, lighter weight, or improved thermal resistance, which are critical for modern defense applications. As an input provider, Belgium's materials sector plays a role in the broader defense value chains, providing essential components to other areas, such as Aerospace, Land Systems, and Naval Defense. These sectors rely heavily on high-quality materials to construct the end products that are central to defense operations. For instance, in aerospace, materials such as titanium, aluminum, and carbon fiber composites are vital for creating aircraft that are both lightweight and resilient. However, as many activities mapped to the materials CapTech occur on the lower end of the value chain, this is an area where legal entities are prone to being overlooked as they are not traditionally considered defence-related. Considering the sources we employed for the mapping, we posit that the mapping can further be expanded for this area in future iterations.

Of note as well is that the CapTech information and CapTech Cyber combined carry a higher weight of the estimated DTIB-related employment respective to their combined turnover, suggesting the reliance on human capital and skilled workforce required for software development and implementing cyber security solutions. Despite the relative lower turnover figures within estimated total DTIB-driven turnover, the relatively high employment within the totals indicates the legal entities are well positioned for future demand increases. Given the rise of hybrid threats and increasing need to protect

company systems and critical infrastructure, it is essential that enough skilled potential is maintained and developed for these activities.

The Maritime CapTech exhibits notably low figures across all employed impact metrics. This observation raises several important considerations about the status and strategic position of Maritime capabilities. First, despite Belgium's geolocation and the economic impact of its non-defence maritime sector, ports and other maritime infrastructure suggesting the importance of naval force projection, its defence-ready shipbuilding capabilities are, essentially, non-existent. However, Belgium is significantly involved in developing next-generation mine countermeasure capabilities through the rMCM (Mine Counter measure) program, in collaboration with the Netherlands and through being part of consortia successfully winning calls in the European Defence fund and its precursor programs. Furthermore, Belgium has an extensive non-defence related maritime sector that can enter the EDTIB given the right incentives. Hence, despite the current overall low estimated impact of the Maritime CapTech, it is well positioned to enter these new value chains. The increased focus of Belgium on expanding its naval capabilities in line with the demand caused by recent threats further supports the potential growth for this area of the BE-DTIB if properly incentivized.

While we see the CapTech Optronics and the CapTech Radar on the lower end of the distribution for the BE-DTIB impact, there is an important caveat that should be considered. While legal entities can be allocated to multiple CapTechs in the dataset, the analysis above only considers the CapTech indicated as the best match fitting its overall activities relevant for the defence technological and industrial base. However, a legal entity with it's main focus on providing inputs for defence satellites, and thus allocated to the CapTech Space, may equally have activities in Optronics. It is thus important to consider that the chart indicates primary characteristics allocated to each legal entity.

3. What is the regional spread of the BE-DTIB?

What is the regional distribution of the entities and their impact on DTIB activities?

The following map (see: **Figure 5**) shows the regional spread of the main location of activity of the legal entity, colored by size type and with the bubbles representing turnover

for DTIB-related activities. In terms of entities, there is a noticeable cluster concentration in, Liège, Kortrijk, Antwerp and surrounding, tough primarily not in, Brussels. However, while Antwerp encompasses a large amount of the mapped legal entities, in terms of estimated DTIB-related impact Antwerp is less significant. As can be expected from its historical role in the Belgian Defence industrial production, Liege accounts a higher concentrations of DTIB-related activities per legal entity. Little activity is present in the far-South of the country, as can be observed from the clear Southern line following the N90 highway under which there are only a few entities.

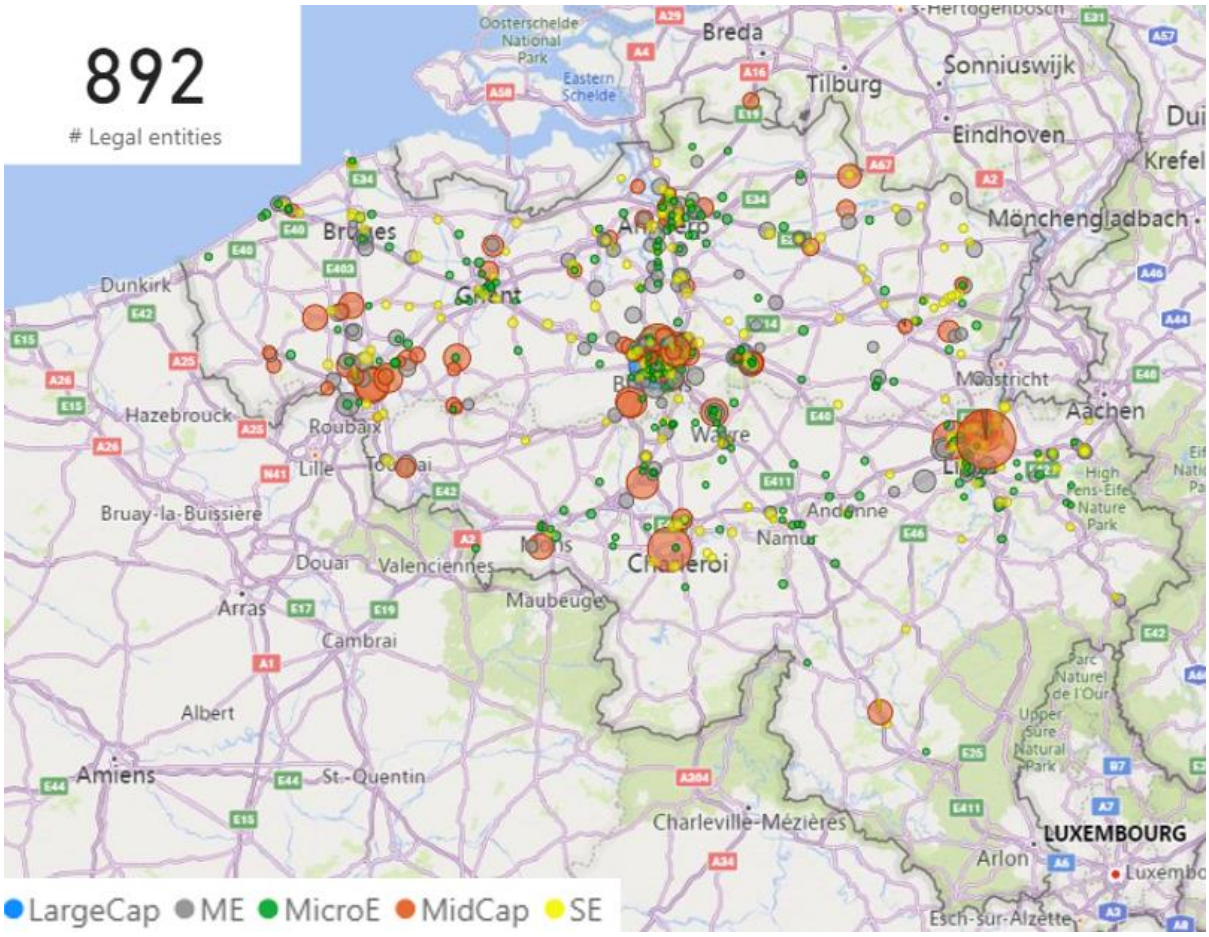


Figure 6. *Primary location of activities of the mapped legal entity colored by size type. Source: Own composition based on the BE-DTIB database.*

The Brussels Capital Region has the lowest proportion across all categories: 13.23% for legal entities, 10.08% for turnover, 7.87% for GVA, and 8.94% for FTE within the total BE-DTIB mapping when the mapping is assigned to the location where the legal entity has the most economic activity in terms of employment. However, when the legal entities are

assigned to the regions according to their headquarter location, we see that 14,46% of the mapped legal entities have a headquarters in the Brussels capital region, corresponding to 17% of turnover, 14.58% of GVA and 16.46% of FTEs within the DTIB totals. This confirm the use of the Brussels capital region as a administrative hub, while its primary economic activities are in establishment units in one of the other two regions. Comparing the distributions between allocation according to the primary location of activities as opposed to the headquarters location, we see that 1.23% of the legal entities are reallocated to Flanders.

Flanders has the highest share of legal entities with 53.59% and impact with 53.91% of turnover, 52.61% of GVA and 54.43% of FTE. However, given the large amount of entities its proportional impact per legal entity is lower than in the other regions.

Wallonia accounts for 33.18% of the mapped legal entities, representing 36.01% DTIB-related turnover, 39.52% of GVA and 36.63% of FTE. Of note is the proportionally higher GVA within the distribution as compared to its turnover than the other two regions, which have a lower GVA-to-turnover ratio for its combined DTIB-related activities. The higher GVA-to-turnover ratio in Wallonia, compared to Flanders and Brussels, indicates the legal entities in Wallonia, viewed as a whole, are better able to generate value-added economic output per unit of DTIB-related turnover than those in the region of Flanders and the Brussels Capital region.

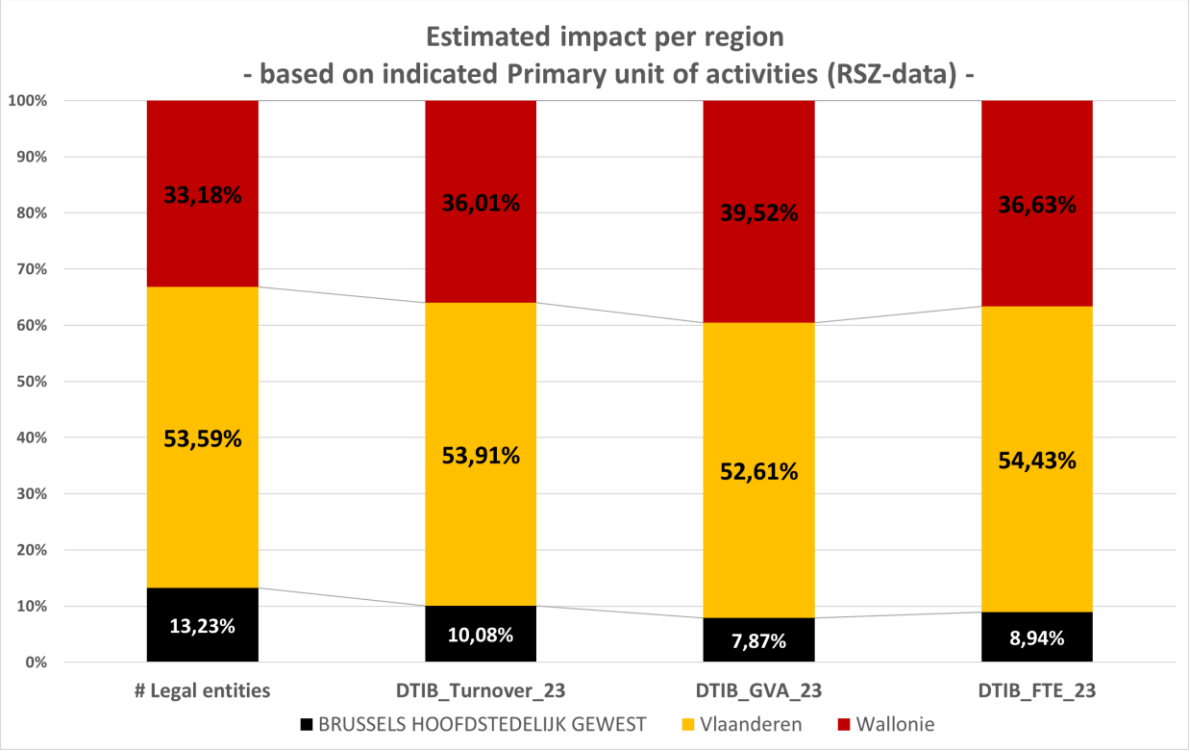


Figure 7. *Estimated DTIB-related impact by Region, based on indicated primary location of activities according to FPS Social Security data. Source: Own composition based on the BE-DTIB database.*

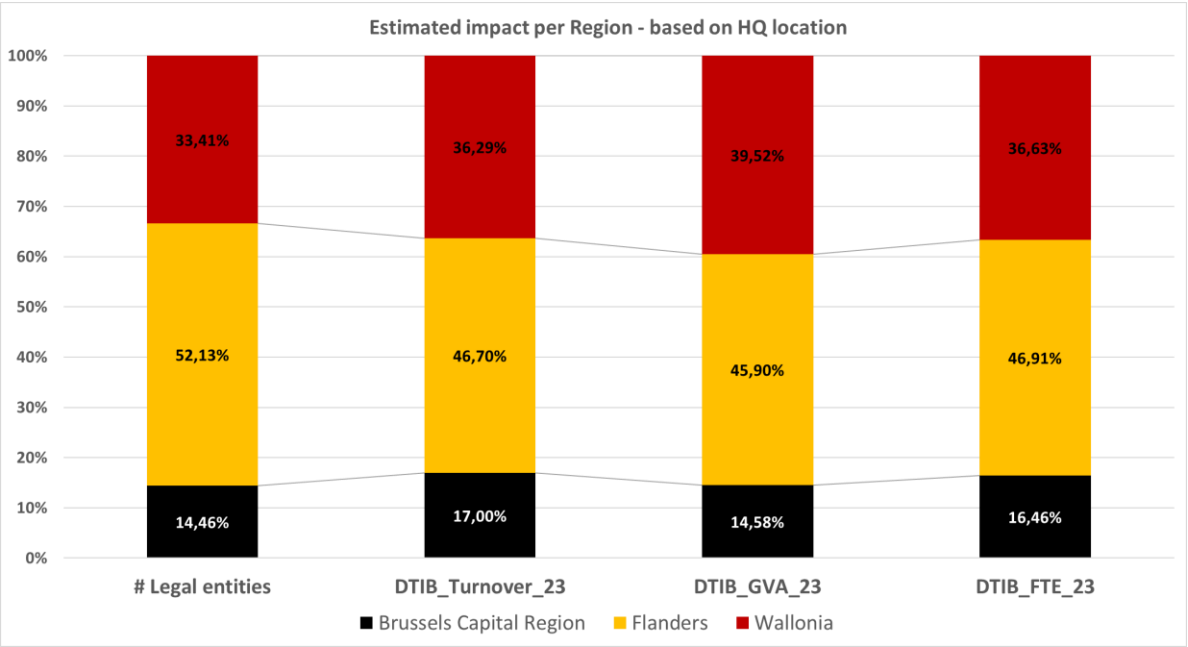


Figure 8. *Estimated DTIB-related impact by Region, based on the headquarters location (official main address of the legal entity). Source: Own composition based on the BE-DTIB database.*

What is the distribution of "self-identified" defence-focused legal entities?

Figure 9 below, focuses on the legal entities that "self-identify" and market themselves as being defence-focused and part of the defence industry. We consider membership in defence-focused associations (BSDI, Pole Mecatech Defence and Security, Skywin Defence and Security), as well as participation in defence fairs such as Euronaval and Eurosatory as self-identifying as being defence-focused and part of the defence industry.[45] We observe that the majority of these legal entities with a focus on defence are located in Wallonia (51%), 38% in Flanders and 11% in the Brussels Capital Region. While the broader BE-DTIB mapping in the previous section indicated the importance of Flanders, the concentration of core defence-focused companies thus remains primarily in Wallonia.

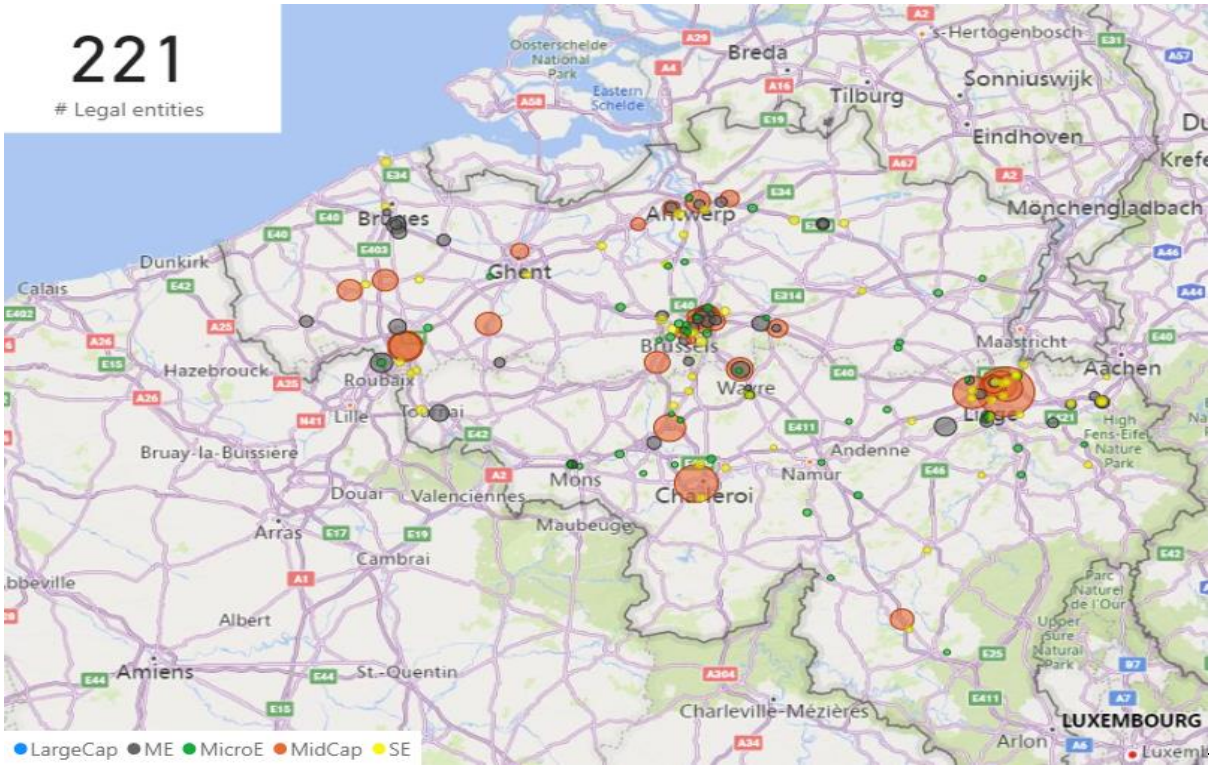


Figure 9. *Map of the location of "self-identified" defence-focused entities. Source: Own composition based on the BE-DTIB database.*

[45] Note: Of course, as Pole Mecatech and Skywin are regional competitive clusters in Wallonia, the majority of openly *'self-identified defence-focused legal entities'* (as described) is primarily allocated to Wallonia. Comparing this to the overall BE-DTIB mapping in the previous section, there is room in the other regions to have mapped legal entities promote themselves as being relevant to the DTIB.

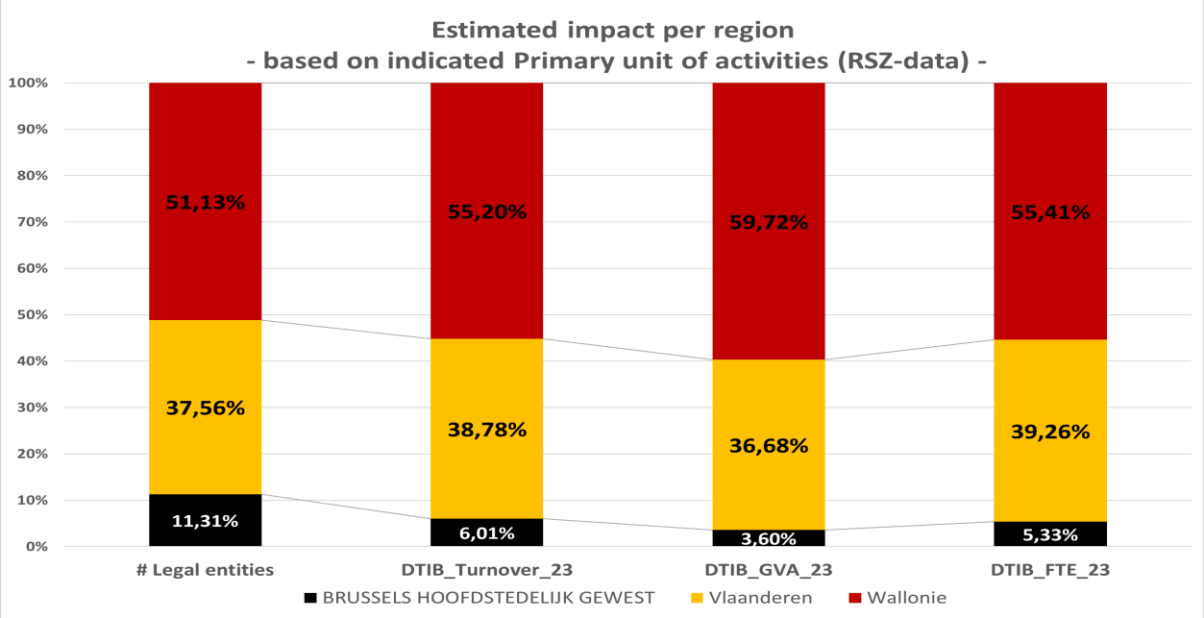


Figure 10. *Distribution and impact of "self-identified" defence-focused entities. Source: Own composition based on the BE-DTIB database.*

4. What is the coverage of the mapping by Belgian defence-relevant associations?

Belgium has several associations that are directly focussed on defence and security: the 'Belgian Security and Defence Industry' (BSDI) business group of Agoria[46]; the Defence pole of Skywin, the aerospace cluster of Wallonia[47]; and the Defence and Security ecosystem of Pole Mecatech[48].

Furthermore, there are other associations that, while not directly focusing on defence or security, focus on activities that are relevant for the DTIB within the value chain. For instance, members of aeronautics associations engage in the development of propulsion systems, avionics, and required new materials, which are directly or indirectly applicable

[46] BSDI [LINK]; The Cyber warfare-related activities are managed with the defence focus group of Agoria's 'Cyber Made in Belgium (CMiB) business group. As the member list for CMiB is not publicly accessible, we cannot derive to what extent all of the DTIB-relevant members are included as members of BSDI.
[47] Skywin [LINK]
[48] Pole Mecatech [LINK]

to military aircraft or UAVs. Similarly, space-focussed companies provides key technologies and infrastructure that support military communications, surveillance, and reconnaissance capabilities. Hence, the members of these associations also provide inputs in the DTIB value chain. As such, these associations indirectly play a vital role in enhancing the technological foundation and capabilities of the BE-DTIB. Notable associations in Belgium include Agoria's 'Flemish Aerospace Group' (FLAG)[49], the 'Entreprises Wallonnes de l'Aéronautique' business organization (EWA)[50] , 'Flanders Space'[51], the 'Wallonie Espace' association[52], and Agoria's Belgospace.[53]

Figure 11 presents a breakdown of the coverage of Defence and Security (D&S)-relevant associations[54] by their percentage of total coverage of the mapped legal entities included in the database. BSDI has the largest coverage, accounting for 13% of the mapped legal entities. The other defence-focussed associations, Skywin's Defence Pole and Pole Mecatech's defence and security ecosystem, respectively account for 8% and 4% of the mapping. At first glance, this seemingly indicates a lack of coverage of the BE-DTIB by these associations. For the defence-relevant, yet not directly focussed associations, the highest coverage is realized by FLAG (7%), EWA (5%) and Flanders Space (5%). In total 47% of the mapped legal entities are covered by one of the listed associations, leaving 53% unrepresented, a significant portion of the mapping.

However, the figures in table 12 provide more nuance to the above. The table presents the membership coverage across national and regional BE-DTIB, as well as the estimated DTIB-related FTE, Turnover, and GVA. While the total coverage of the mapped legal entities is 47%, the associations cover the majority of the estimated DTIB impact; namely 77% of the FTEs, 82% of turnover and 82% of GVA of all the mapped legal entities. Similarly, while BSDI only covers 13% of the mapped legal entities, it covers an estimated

[49] FLAG [LINK]
[50] EWA [LINK]; EWA is a partner of the Skywin competitive cluster (see: *infra*).
[51] Flanders Space [LINK]
[52] Wallonie Espace [LINK]; Wallonie espace is a partner of the Skywin competitive cluster (see: *infra*).
[53] Belgospace [LINK]
[54] The 'Blauwe cluster' (Flanders) also includes a project supporting the maritime defence sector (See: LEVIATAD), but was not included as a key relevant association in the 'association section' in this paper due to the inclusion of defence in the cluster currently remaining limited.

impact in terms of GVA of 41%. While BSDI does not come close to representing the majority of the BE-DTIB, it comes close to covering the majority of the impact.

For the regional coverage by regional-focussed associations, Skywin's Defence pole obtains the highest coverage of 23% for the region of Wallonia, while FLAG covers 14% of the mapped legal entities with their primary activity in the region of Flanders. BAG is the only regional-association primarily focussing on Brussels and only covers about 7% of the mapped legal entities allocated to the Brussels Capital Region.

Of interest as well is the GVA-to-Turnover between the different associations. While not applicable in all cases[55], on the aggregate a higher GVA-to-turnover ratio is generally an indicator of higher economic efficiency, innovation, and competitiveness. A higher GVA relative to turnover typically indicates that a group of legal entities is more efficient in creating value from its activities than other analysed groups. It suggests that the grouping produces a high amount of value with relatively fewer costs for intermediate goods and services. Taking this into account, BSDI has the largest positive gap between its GVA (41%) and turnover (33%) for the BE-DTIB. This indicates that, on average, the members of BSDI are more efficient in generating value for DTIB-related activities relative to their DTIB-related revenue compared to the other associations.

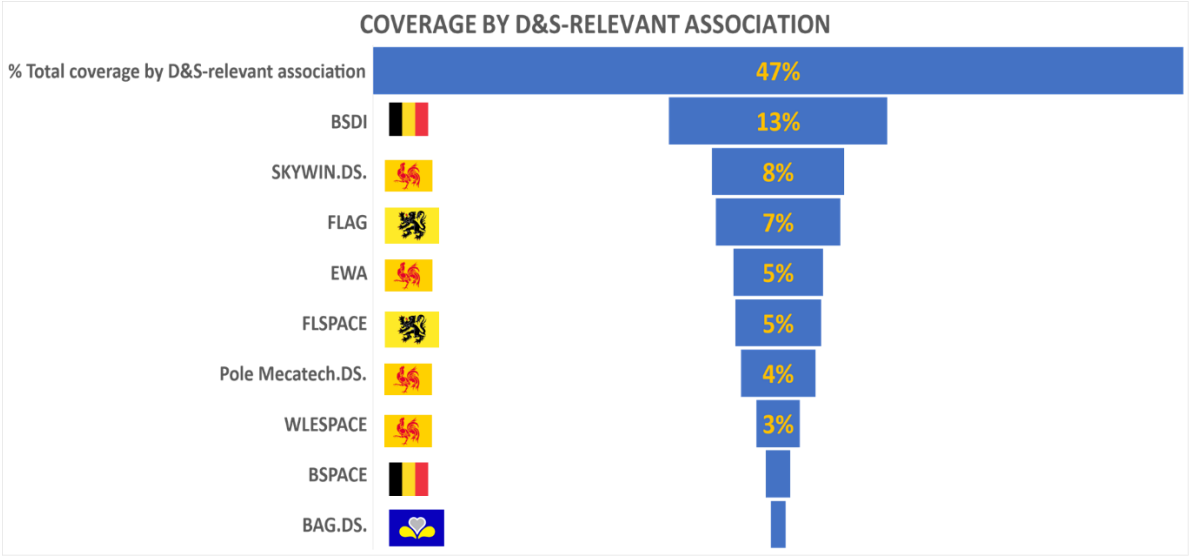


***Figure 11**. Coverage of mapped legal entities by key Defence and security relevant associations. Source: Own composition based on the BE-DTIB database.*

[55] A lower GVA does not always indicate a lack of competitiveness, as the GVA is dependent on the activity make-up of the sector the legal entity is primarily active in and the business model.

	# Members	Coverage % national DTIB	Coverage % regional	%DTIB FTE	%DTIB Turnover	%DTIB GVA
Coverage by D&S-relevant association	423	47%		77%	82%	82%
BSDI.24&23	114	13%		37%	33%	41%
SKYWIN.DS.24	69	8%	23%	17%	16%	19%
EWA.24	47	5%	16%	16%	16%	19%
PM.DS.24	39	4%	13%	15%	14%	18%
FLAG.LA	65	7%	14%	12%	18%	15%
FLSPACE.24	45	5%	9%	11%	10%	12%
WLESPACE.24	23	3%	8%	6%	4%	6%
BSPACE.24	13	1%		7%	5%	6%
BAG.DS.24	8	<1%	7%	2%	2%	2%
None	469	53%		23%	18%	18%

Table 12. *DTIB-impact per key Defence and security relevant association. Source: Own composition based on the BE-DTIB database.*

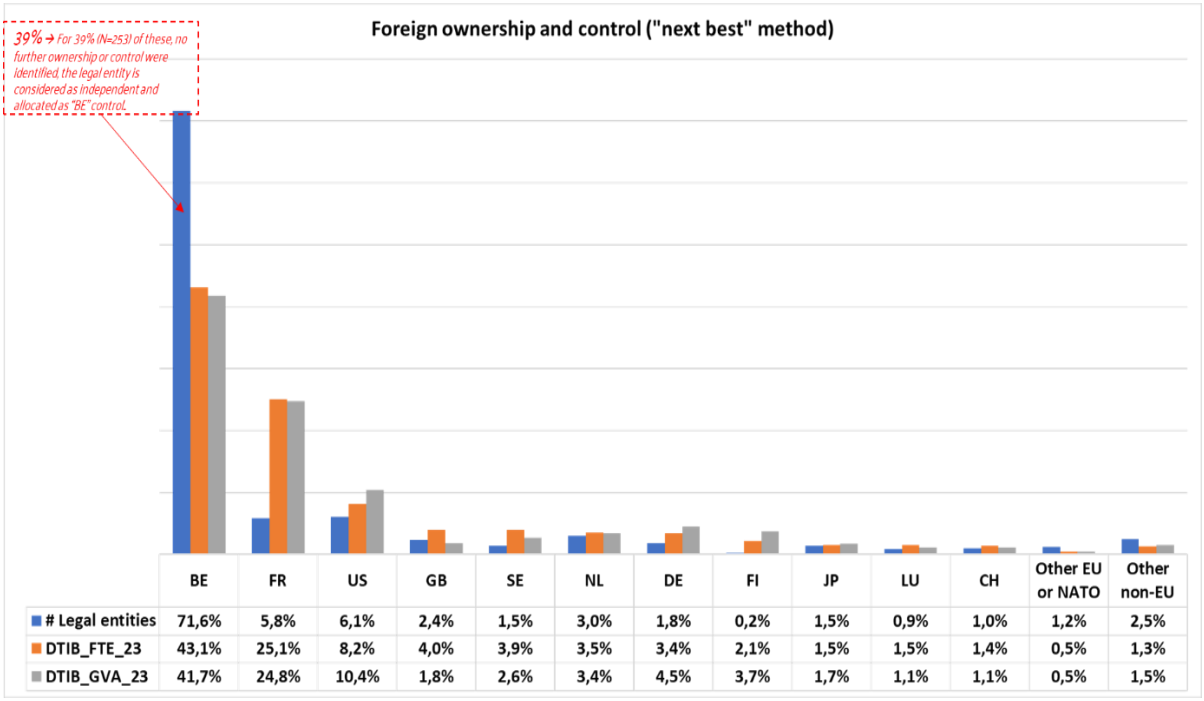
5. *What countries are most represented in the foreign ownership of the BE-DTIB mapping?*

Figure 13 provides a high-level analysis of the foreign ownership of the BE-DTIB mapping. We employed a mixed method to derive ownership information for each legal entity based on the controlling shareholders as well as the global ultimate owner information that are available to a limited extent in the ORBIS and BelFirst database. We first examined whether information regarding the controlling shareholders of each legal entity was

provided. If such data was unavailable, we then applied the 25.01% threshold to identify the Global Ultimate Owner (GUO), as it allows for more granular detection compared to employing the 50.01% threshold. Under this approach, a legal entity qualifies as having a GUO if a single shareholder directly or indirectly holds at least 25.01% of the shares. If neither of the above methods provided information, the legal entity is considered to be independent and self-owned.

For entities designated as self-owned, we conducted further desk research to verify whether this designation was correct. However, approximately 39% of the legal entities did not have identifiable ownership or control information, and were therefore classified as being owned by the legal entity itself and thus 'Belgium-owned'. This designation, however, does not necessarily imply that these entities are controlled by Belgian persons, as the legal structure and ownership might still involve foreign interests. Furthermore, it is important to note that the 25.01% method is specifically designed to capture the ownership of one single shareholder, thereby excluding entities with multiple shareholders, even if their combined holdings exceed 25.01%. For instance, a legal entity with six foreign shareholders, each holding 10% of the shares, forming a majority, would not qualify under this method. This limitation means that a foreign actor intending to mask their ownership in this manner could potentially avoid detection. The concept of control also extends beyond ownership and shareholder control to include factors such as management, individuals on the board of directors, or even family control, who may wield significant influence over the direction and operations of a legal entity. However, the present analysis does not delve into such considerations, focusing solely on ownership as the determinant for identifying the ultimate owner. While ownership and control may align, they are not always synonymous, and in some cases, control may reside with individuals or entities that do not hold the highest shareholder stake. A deeper analysis is required in follow-up research to further discover the extent of foreign ownership.[56]

[56] The most straight forward approach is employing the UBO-register that encompasses the 'Ultimate Beneficial Owner(s) (UBO)' of the legal entity. However, while the UBO-register can be accessed by researchers if legitimate interest is proven, its scope is limited and payment for searches are involved. This fell outside of the scope of the current research. Follow-up research seeks to get broader access to the UBO-register and the required financial resources for a deeper analysis.



	BE	FR	US	GB	SE	NL	DE	FI	JP	LU	CH	Other EU or NATO	Other non-EU
# Legal entities	71,6%	5,8%	6,1%	2,4%	1,5%	3,0%	1,8%	0,2%	1,5%	0,9%	1,0%	1,2%	2,5%
DTIB_FTE_23	43,1%	25,1%	8,2%	4,0%	3,9%	3,5%	3,4%	2,1%	1,5%	1,5%	1,4%	0,5%	1,3%
DTIB_GVA_23	41,7%	24,8%	10,4%	1,8%	2,6%	3,4%	4,5%	3,7%	1,7%	1,1%	1,1%	0,5%	1,5%

Figure 13. *Foreign ownership of the BE-DTIB (mixed method approach). Source: Own composition based on the BE-DTIB database.*

Given the method and its limitations employed above, the majority of ownership (71,8%) is in hands of BE legal entities. However, these represent only about 43% of the impact in terms of FTE and 41% of the GVA for DTIB-related activities, indicating a relative lower economic footprint as a whole compared those that are foreign owned. The next largest foreign ownership countries in terms of FTEs are France (FR) and the United States (US). France accounts for 5.8% of the legal entities, but its FTE and GVA shares are significantly higher than its legal entity share, with 25.1% of FTEs and 24.8% of GVA, indicating that French-owned legal entities tend to be more impactful in terms of employment and economic value within the BE-DTIB. Similarly, US-based legal entities or shareholders own 6.1% of the mapped legal entities, accounting for an impact of 8.2% of FTEs and 10.4% of GVA for the BE-DTIB. Hence, while the impact here is lower than for France, the US-owned legal entities contribute significantly to the BE-DTIB output (10.4% GVA) and employment (8.2% FTE).

Aside from the top 10 countries for foreign ownership, the remaining distribution and impact is limited, with 1.2% of the mapped legal entities for other EU and NATO member

countries and 2.5% of the mapped legal entities being owned by a legal entity located in a non-EU or non-NATO country. Hence, there is a relatively high concentration of foreign ownership by a select number of countries.

6. *What is the CapTech breakdown per region?*

Looking at the breakdown per CapTech for Flanders (see: **Appendix A**), we see that the CapTech Materials has the highest estimated DTIB-derived turnover, followed by CapTech Land, Cyber, TCM, and Information. While the CapTech Air and Space are not in the top 5 concerning estimated DTIB-derived turnover, when viewed combined they have a DTIB-derived turnover slightly lower than the CapTech Cyber. Similarly, the CapTech Cyber and Information can be viewed combined considering their similarities, moving them to the second position for estimated DTIB-derived turnover. Notable is that the overall proportion of DTIB-derived turnover for Flanders is low, at about 10% of the turnover within all economic activities of the mapped legal entities. The reason for this is the overall characteristics of the goods and services these entities offer within the DTIB value chain. While we do not provide a detailed breakdown of the position within the value chain in this paper, a high-level analysis of the data indicates a lack of positioning of the mapped Flemish legal entities as Original Equipment Manufacturers (OEM) or even within the higher end of the DTIB value chain providing subsystems. Hence, defence overall remains peripheral to the activities of the mapped Flemish legal entities, with the majority rather providing inputs and components within the lower end of the value chain, or by providing supporting services and niche specialties. Often these legal entities are overlooked as being defence-relevant due their DTIB activities being peripheral. Nevertheless, as indicated from the estimated impact compared to the other Regions, its contribution to the DTIB should not be underestimated (see: *supra*). Furthermore, the total industrial and technological base of the mapped legal entities, represented by their total economic activities, indicates room for further contribution within DTIB value chains. The legal entities allocated to the CapTech TCM, for instance, have an estimated DTIB-related turnover of only 6% within the turnover from all economic activities for the legal entities allocated to the Captech.

Similarly, in the Brussels Capital Region (see: **Appendix B**), the overall proportion of DTIB-derived turnover within all activities of the mapped legal entities is around 10%. Here as well, defence overall remains peripheral for the mapped legal entities. The CapTech with the highest estimated DTIB-derived turnover is Materials, followed by Simulations, Information, Energy, and Space. When combined, Air and Space constitute the second

largest category for DTIB-derived turnover. Looking more closely at the type of product provided by the legal entities, we note that supporting services (consulting[57], digital services & equipment, maintenance & repair, logistics, engineering services) are the core activity within the value chain. Further, it must be noted that while Materials is indicated as the first CapTech impact-wise, the legal entities allocated to Materials include large legal entities with production facilities in Flanders and Wallonia as well. While the mapping allocates the legal entity to Brussels due to it being the primary location of activity (See: 'Methodology' section), the impact is thus partially skewed as it includes the impact that is generated in the other Regions as well.[58]

As opposed to Flanders and the Brussels Capital Region, Wallonia's DTIB-derived turnover represent 38% within the total turnover from all economic activities of the mapped legal entities. Contrary to Brussels and Flanders, there are more legal entities at the end of the value chain specifically focused on end-products or subsystems. Hence, 'defence actors' and the DTIB value chain are more important to its activities. The key CapTechs in term of estimated DTIB-derived turnover are Ammo, followed by Air, Land, Materials, and Space (see: **Appendix C**).

While the above provides some limited insights based on the mapped legal entities per region according to the outlined sources in the methodology, it is important to consider the wider industrial base and strategic focus of each region. While the underlying industrial size per CapTech, represented by the total turnover from all economic activities, can provide general insights on DTIB strengths and where it may have untapped potential (See: **Appendix A to C**); also those not included in the mapping due to not currently having DTIB-related activities or due to not being included in any of the outlined sources may have activities that can be relevant for the DTIB. For instance, while the DTIB positioning of the CapTech Maritime and CapTech CBRN&HF (including biotech) are underrepresented for Flanders compared to the other categories, they correspond to domains deemed strategic within regional policy given their importance to regional value added and employment, as well as to future competitiveness and growth. However, the

[57] The CapTech 'Simulation' in the mapping also includes legal entities providing more general consultancy services.
[58] To break this down further a more detailed analysis would be required according to each Establishment Unit location. The current research does not include this in its scope.

legal entities active in these domains are not substantially (pro)active within DTIB value chains, despite a large non-defence industrial and technological base underpinning it.

As indicated in **Tables 14 to 16** below, there is an overlap between the CapTech groups and existing cluster or innovation ecosystems of the Regions. Hence, clusters and ecosystems, representing the strategic or focus domains, are in place to drive relevant innovation. While these clusters and ecosystems are not focused on the DTIB, their existence can contribute to the BE-DTIB by incorporating or promoting this focus directly within[59], if doing so is permissible by the currently outlined stipulations in the cluster and ecosystem agreements. Aside from these key clusters and innovation ecosystems, there are also other notable clusters driven through business networks, relevant accelerators/incubators and industry partnership support programs with Research and Technology Organizations. A detailed discussion on these, however, falls outside the scope of this paper. Below, we outline key clusters, innovation ecosystems and business networks for each Region relevant for the DTIB.

CapTech*	**'Spearhead Clusters' (SC), 'innovation ecosystem'[60] (IE) and 'innovative business networks' (BN)[61] in Flanders relevant for the DTIB.****
MATERIALS	MateriNex (IE); Bluechem (IE); Catalisti (SC)
SIMULATION	Ed-Tech (IE)
LAND (also Land-logistics)	Log!VILLE (IE) ; VIL – Epowering logistics (SC)
CBRN&HF(&Biotech)	MEDVIA (SC)
MARITIME	Blauwe cluster (SC)
SPACE	Flanders Space/Vlaamse Ruimtevaartindustie - VRI (IE)

[59] While a separate defence-related clusters could be set-up per Region, it may be more beneficial to maintain and leverage the benefits of existing clustering, ecosystems and other mechanisms that align with the strategic domains outlined in regional policy. Especially in Flanders, given the large relevant industrial and technological base, yet low overall proportion of estimated DTIB-related activities for the mapped legal entities within all economic activities, this may be a more targeted approach for its specific characteristics. Promoting the inclusion of DTIB-focused activities within existing mechanisms facilitates spill-over between defence-related and civil innovation. This is already done explicitly, for instance, by Pole Mecatech and Skywin in Wallonia, which have specific defence poles within the cluster.

[60] Note: While we do not include it in the table due to the limited defence-relevance, even the innovation ecosystem 'CAPTURE', which focusses on re-use of water, CO2 and plastics, can be relevant for technology building blocks (TBBs) under the CapTechs ENERGY and MATERIALS (e.g. plastics).

[61] 'Innovative business networks' that are supported in Flanders are Agoria-FLAG, 'AirCargo Belgium', 'Cluster Digital Construction', 'EUKA (drones)', 'Groen licht Vlaanderen', 'Maas', 'Hydrogen industry cluster', 'Smart Buildings in Use', 'Smart digital Farming'. Of these mainly Agoria's FLAG and the EUKA drone network are applicable for the DTIB. [LINK]

ENERGY	Flux 50 (SC)[62]
AIR	Agoria-FLAG (BC)
AIR	EUKA (BC)

**Only the most corresponding CapTech is linked to the clusters and ecosystems, yet others can be linked as well (e.g. MARITIME contains naval logistics as well and could therefore partially fall under the logistics-related ecosystems or clusters. Legal entities mapped to CapTech simulation also include some general consultancy companies, hence it is not exactly aligned to the ED-Tech Ecosystem).*

*** While these have a sectoral focus area, the membership in these clusters and innovation ecosystems are cross-sectoral. They also include IT, suppliers, R&D services and customers. The clusters correspond to 'strategic domains'.*[63]

Table 14. *Alignment table between CapTechs and Clusters and Innovation Ecosystems. Source: Own composition based on information from VLAIO.*

CapTech	**Relevant Clusters and Business networks for Brussels**
INFORMATION / CYBER / SIMULATION	Software cluster
CBRN&HF (including Biotech)	LifeTech cluster
AIR	Brussels Aerospace and Defence Group – BAG (business network)

Table 15. *Alignment table between CapTechs and relevant Clusters and Innovation ecosystems. Source: Own composition based on information from hub.Brussels*[64] *and Innoviris website.*[65]

CapTech	**Relevant 'Competitiveness clusters' (CC) and 'business clusters' (BC) for Wallonia**[66]
AIR / SPACE	SKYWIN (CC)[67]
MATERIALS	MecaTech (CC)
CBRN&HF (including Biotech)	BioWin (CC)

[62] While the cluster is not directly defence-relevant, security of supply of energy and affordable energy prices is a critical component to ensure a completive industrial footprint and as an input within the entirety of the value chain.

[63] See: (Angelino et al. 2023)

[64] Hub.Brussels [LINK]

[65] Innoviris [LINK]

[66] Clustering Wallonia [LINK] ; *"The Walloon Region's clustering policy is supported by two structures: clusters and competitive clusters. Where the business clusters are financed to develop economic activities and promote innovative partnerships, whether of an industrial, commercial or technological nature, the competitive clusters are mainly supported for the realization of investment, R&D or development projects, training in line with the competitive positioning strategy that they themselves have defined."* [LINK]

[67] The 'Wallonie Espace' an 'EWA' association are part of the Skywin competitive cluster since 2006. [LINK]

INFORMATION / CYBER	InfoPole (BC)
Cross-domain (LAND, AIR, MARITIME)	Logistics In Wallonia (CC)
MATERIALS	PlastiWin (BC)
SPACE	Wallonie Espace (partner of Skywin cluster) (BC)
ENERGY	TWEED (BC)
AIR	Entreprises Wallonnes de l'aeronautique – EWA (partner of Skywin cluster) (BC)

Table 16. *Alignment table between CapTechs and relevant Competitive Clusters and Business Clusters. Source: Own composition based on information from 'Cluster Wallonia'.*[68]

Discussion and next steps

Summary of key findings

Based on the currently available data, we derive the following key insights. First, the BE-DTIB mapping includes 892 legal entities with an estimated DTIB-derived turnover of 5.01 billion EUR, directly employing around 16,300 people and contributing approximately 2.02 billion EUR in GVA in 2023. The total direct impact of the BE-DTIB constitutes around 0.33% of Belgian employment and 0.34% of Belgium's GDP. Exports from BE-DTIB legal entities account for 47% of their turnover, amounting to about 2.4 billion EUR. Around 18% of turnover (approximately 917 million EUR) is allocated to R&D with R&D employment representing 24% of BE-DTIB's FTEs, totaling an estimated 4,124 FTEs. In terms of entity size, Micro-sized entities (40.13%) represent the majority but contribute minimally, while MidCaps (13.45%) account for the bulk of the impact, contributing 65% of turnover and 61.72% of employment.

The BE-DTIB is concentrated in several Capability Technology (CapTech) groups, notably Materials, Land, Ammo, and Air, with Materials showing the largest number of entities and impact. Cyber and Information CapTechs, although smaller in turnover, are highly reliant on human capital. Maritime capabilities, though currently low in impact, are

[68] Clustering Wallonia [LINK]

strategically positioned for future growth, particularly through the participation of Belgian legal entities in naval defence R&D projects and procurement.

The BE-DTIB shows a strong concentration in Liège, Kortrijk, and surrounding Brussels, with Wallonia as a whole exhibiting a higher GVA-to-turnover ratio for DTIB-related activities, suggesting that its entities are more effective at generating value. Self-identified defence-focused entities are predominantly located in Wallonia. The BSDI business group represents a significant share of the DTIB's economic impact despite covering only 13% of legal entities, with associations like Skywin's Defence pole and Pole Mecatech's Defence ecosystem covering a comparatively smaller amount of the DTIB-related impact.

Foreign ownership is concentrated in Belgium to only a few countries, with foreign-controlled entities from France and the United States accounting for a larger portion of the economic impact, contributing 25.1% of FTEs and 24.8% of GVA for French-owned entities and 8.2% of FTEs and 10.4% of GVA for US-owned entities. While 71.8% of the legal entities are Belgium-owned, they represent only 43% of the FTE impact and 41% of the GVA, indicating that foreign ownership has a greater influence on the economic footprint of the DTIB.

Implications for policy

While the analysis in this paper is too limited on its own to sculpt detailed policy advice, some key implications for policy can be outlined.

Given Wallonia's higher GVA-to-turnover ratio, indicating greater economic efficiency per unit of turnover, policies can lean into this advantage to further support legal entities indicating the defence market as core to their activities. The higher focus on DTIB-related activities for the legal entities mapped to Wallonia suggests they are on the aggregate better positioned to increase output when demand from defence actors increases.

With a larger number of legal entities, Flanders plays a significant role in the DTIB. However, many entities do not consider defense as their primary activity. Policies aimed at increasing the positioning of the DTIB should encourage these legal entities to integrate more deeply into the defense value chain, through incentives for spill-overs of dual-use

technologies and by more proactively seeking their participation in the DTIB. The latter applies to the Brussels Capital Region as well. As indicated above (see: Section 'CapTechs per Region'), existing mechanisms, aligning with the focus domains of the regions, can be leveraged to do so.

Lastly, given the significant foreign ownership in the BE-DTIB, particularly from France and the United States, policies can focus on strengthening international industrial collaborations with countries with pre-existing links between legal entities.[69]

Limitations and further research

From an academic standpoint, this paper contributes to the operationalization of the BE-DTIB by operationalizing a conceptual definition into an empirical mapping. This process serves to expand our understanding of Belgian legal entities within the broader EDTIB. However, the working definition employed in this study, while comprehensive, may be critiqued for not fully capturing certain entities with potential relevance to the DTIB. For example, only a limited number of entities involved in biotechnology are currently represented in the dataset, largely due to the scarcity of such entities identified in the sources. Nonetheless, Belgium is well-positioned to leverage its expertise in biotechnology (e.g. human enhancements) to provide goods and services for military applications in the future. This suggests that the full potential of the BE-DTIB may not be entirely reflected in the current mapping, and further research could expand on these underrepresented parts holding potential.

The comparison between the BE-DTIB and NL-DTIB highlights the ongoing need for a standardized definition of the DTIB and for consistent data sourcing using a common methodology. Such standardization would enable more accurately tracking the contributions of each country's industrial and technological base to the EDTIB, and for facilitate meaningful cross-country comparisons. In this regard, we suggest that the EDA, with its core mission of supporting the EDTIB, consider initiating a research project to conduct such a wider mapping analysis. This initiative could improve the tracking of the

[69] However, given the limitations of the method employed, further deep-dives on ownership and control are required.

impact of support mechanisms within the EDTIB. Furthermore, such mappings would provide valuable insights by allowing comparisons between a country's wider DTIB and the legal entities that explicitly identify as defence-focused, such as those affiliated with defence-related business associations or participating in defence trade fairs. [70]

The analysis for the DTIB-related impact in this paper is limited to a cross-sectional methodology, i.e. the DTIB-derived turnover, employment and GVA data is collected from the legal entities at a single, or rather a narrow, point in time for statistical analysis to compare the differences between the legal entities according to their assigned characteristics (e.g. CapTechs). Looking forward, it is advised to continue obtaining the required data in the following years in order to set-up a time-series analysis that tracks the development of the mapped legal entities across the years and to retroactively update previous estimation based on increased capturing of data for the current year analyzed. In this manner the data is available to analyze the impact of government support or policy changes through several methodologies, e.g. an adjusted Variance decomposition analysis,[71] Difference-in-difference analysis (DID)[72], the persistence of profit (POP) approach[73].

This paper provided some limited insights on the characteristics per region, including by examining the estimated regional DTIB impact per CapTech compared to the proportion thereof in the legal entities their total economic activities, as well as to the wider regional industrial focus. To generate a better understanding of Belgian (and regional) strengths and potential relative to the wider EDTIB and NATO-DTIB, other approaches for deriving

[70] Note: Notwithstanding differences in products types and positioning in the value chain (with entities lower in the tier structure and more dual-use type products less likely to consider the defence-market as key to their activities), we hypothesize that gaps will be larger in countries with less friendly investment climates for entities considered defence market-related. Of course, as stated, such a comparative analysis can only be made once DTIB mappings are done for several EU member states employing a common methodology.

[71] Note: Through analysis of year effects, changes caused by government policy can be inferred. The data required for setting up the variance decomposition analysis approach is more extensive and needs to be assessed for viability first. See: (Lipczynski et al. 2017, p. 369).

[72] Note: For the difference-in-difference approach, simply put, consists of comparing different impact measures (e.g. growth) of legal entities that benefited from government support ('the treatment group'), as opposed to those that did not ('the control group').

[73] Note: Used to derive the persistence of profitability of a legal entity compared to comparable legal entities. See: (Lipczynski et al. 2017, pp. 379-383).

strength and potential can be cross-examined: Military List Exports, Dual-use exports, Defence and Dual-use publications and patents, and the positioning of Belgian legal entities within supranational defence-initiatives and the alignment thereof with domestic industrial and technological characteristics. Furthermore, the economic impact of potential investments and support in the BE-DTIB can be estimated using input-output tables and supply-and-demand tables. These, however, fall outside of the scope of this paper.

Lastly, another limitation to our approach is that we could not employ AI in the setting up of the database due to inherent security concerns of linking AI to any information that could be deemed strategic or sensitive. Only traditional scraping was employed where required. With the recent advancement in scraping tools employing AI and relative ease with which AI can be trained to complete datasets directly in excel, the mapping can be replicated (and expanded) substantially faster and at reasonable cost if AI can be employed. This is particularly useful for filling in lower level details of a categorical nature (specific products, technologies, skills, products in the value chain) that the current dataset only covers on a higher-level due to the FTEs required to manually fill in such info when scraping is not possible. We suggest any research replicating our approach include AI scrapping and categorizations to cut down the time required to develop a core dataset.[74]

[74] Note: After training such a scraping model, the mapping analysis can also be extended by scraping the websites (and Linkedin pages obtained via the scraping) of all Belgian legal entities (for which websites are obtainable) to identify any remaining legal entities currently active in the DTIB value chain or which have potential due to their product typology.

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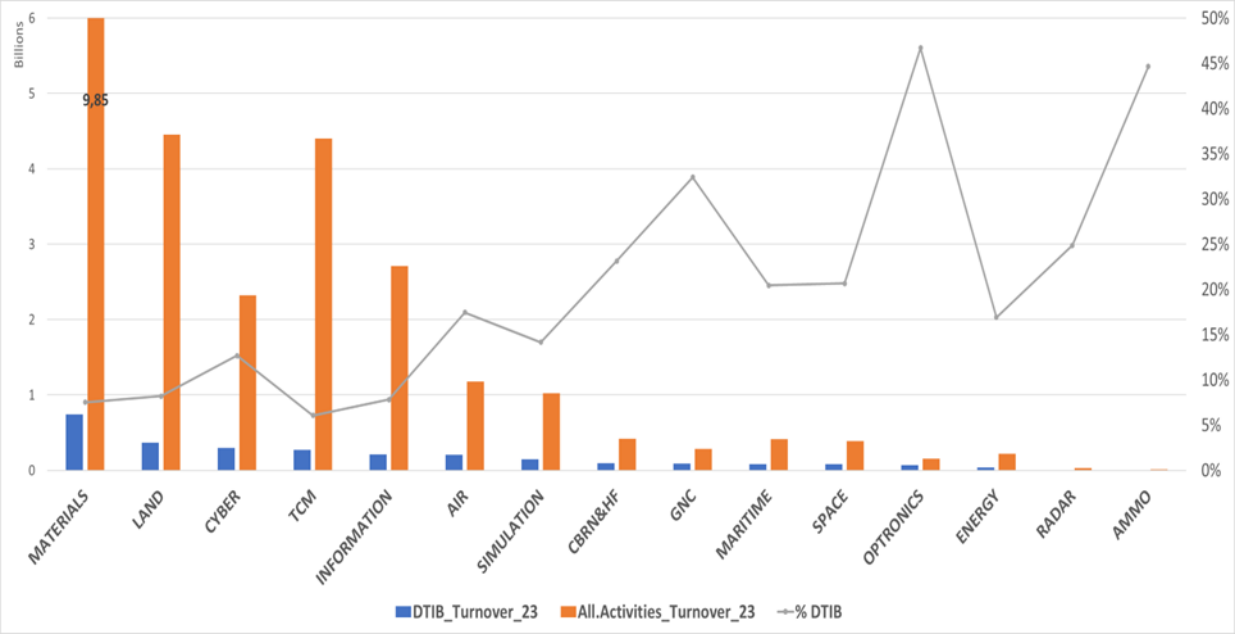
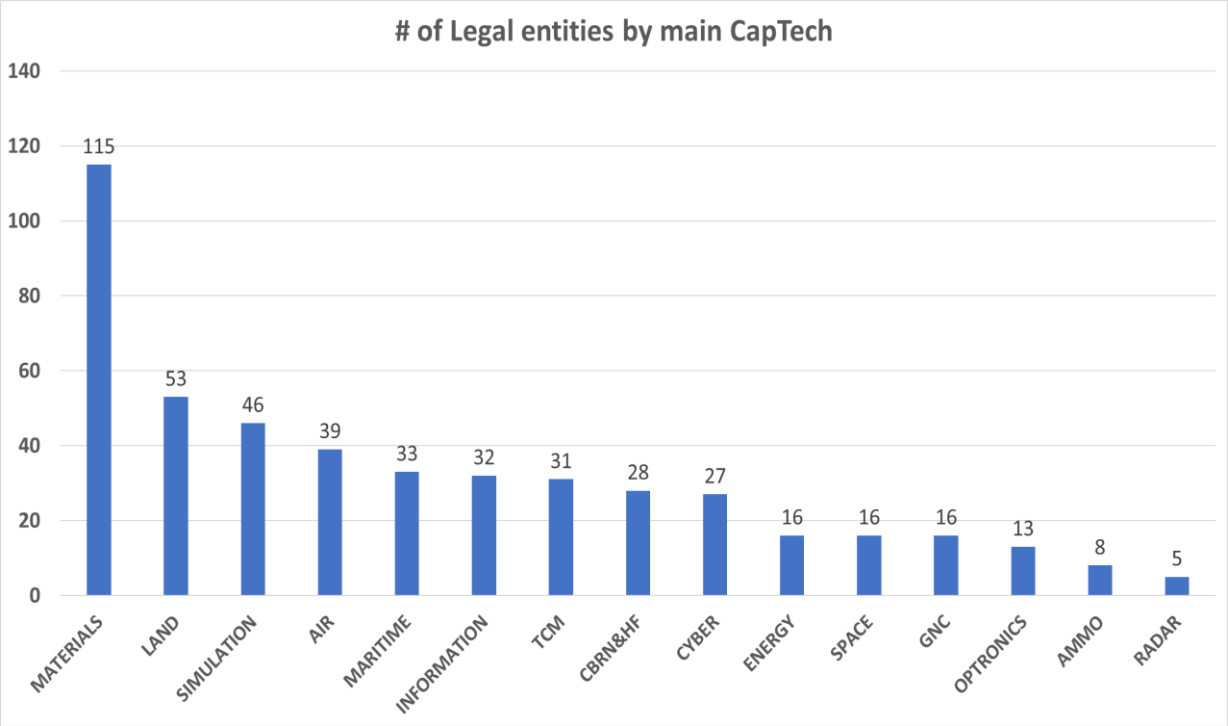
APPENDIX

Appendix A *– Flanders per CapTech. Source: BE-DTIB dataset.*

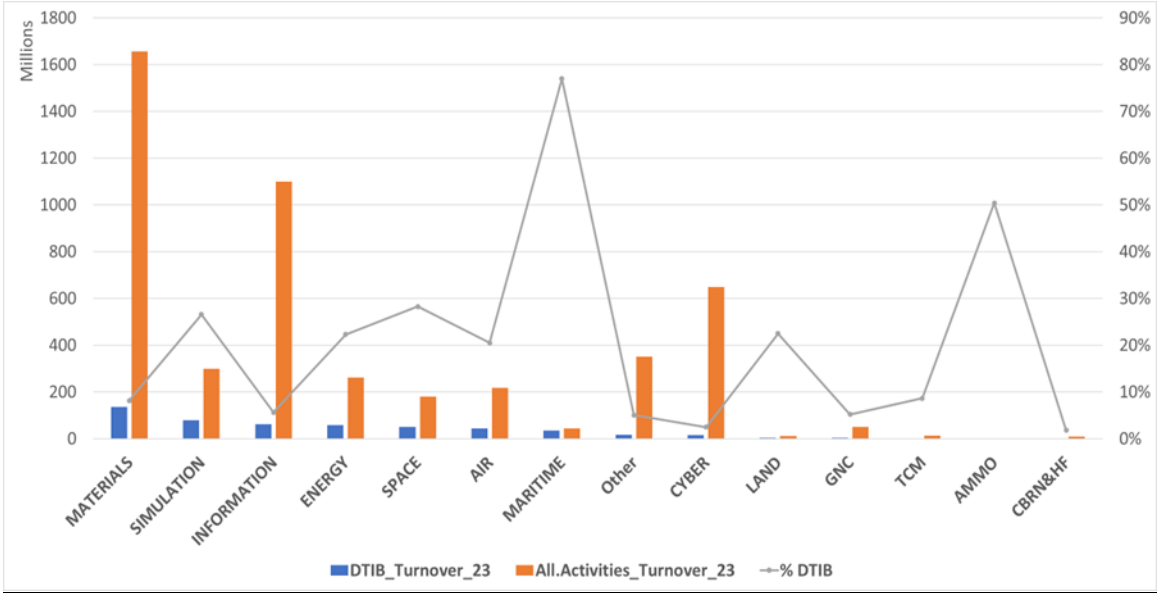


	DTIB_Turnover_23 (mln)	All.Activities_Turnover_23 (mln)	% DTIB
MATERIALS	741,35	9.849,83	8%
LAND	364,61	4.450,37	8%
CYBER	294,93	2.323,58	13%
TCM	267,73	4.402,92	6%
INFORMATION	212,20	2.709,38	8%
AIR	204,83	1.173,78	17%
SIMULATION	145,14	1.023,93	14%
CBRN&HF	96,50	416,70	23%
GNC	91,33	282,00	32%
MARITIME	84,19	411,88	20%
SPACE	80,68	390,18	21%
OPTRONICS	70,86	151,75	47%
ENERGY	37,26	220,38	17%

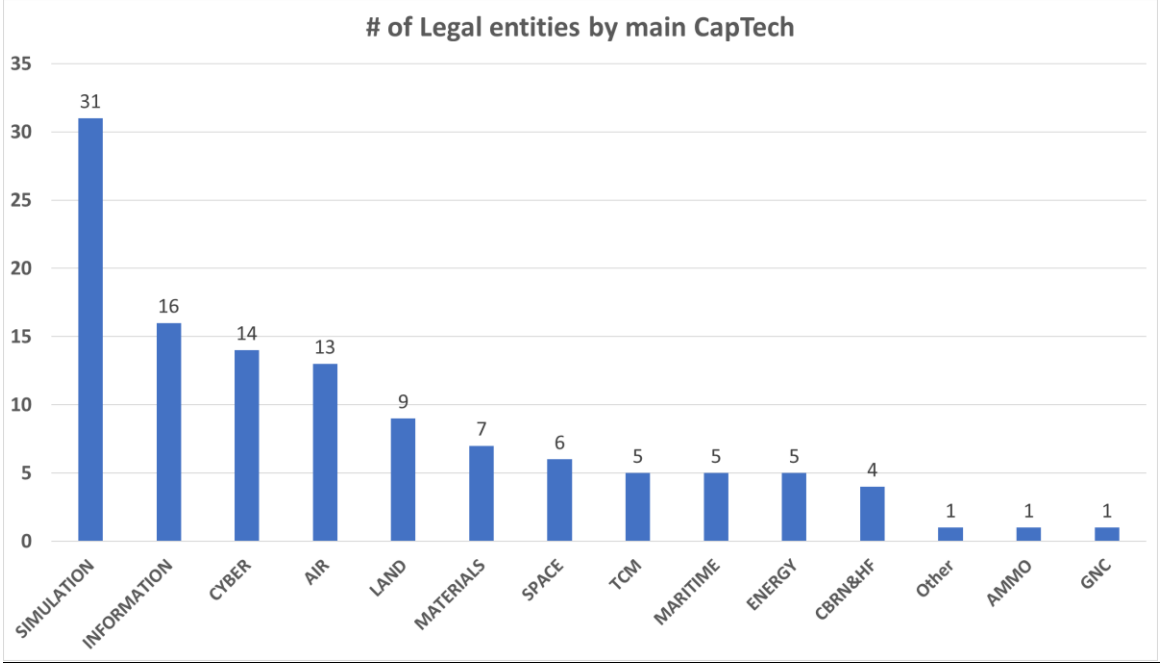
RADAR	7,88	31,69	25%
AMMO	5,51	12,34	45%



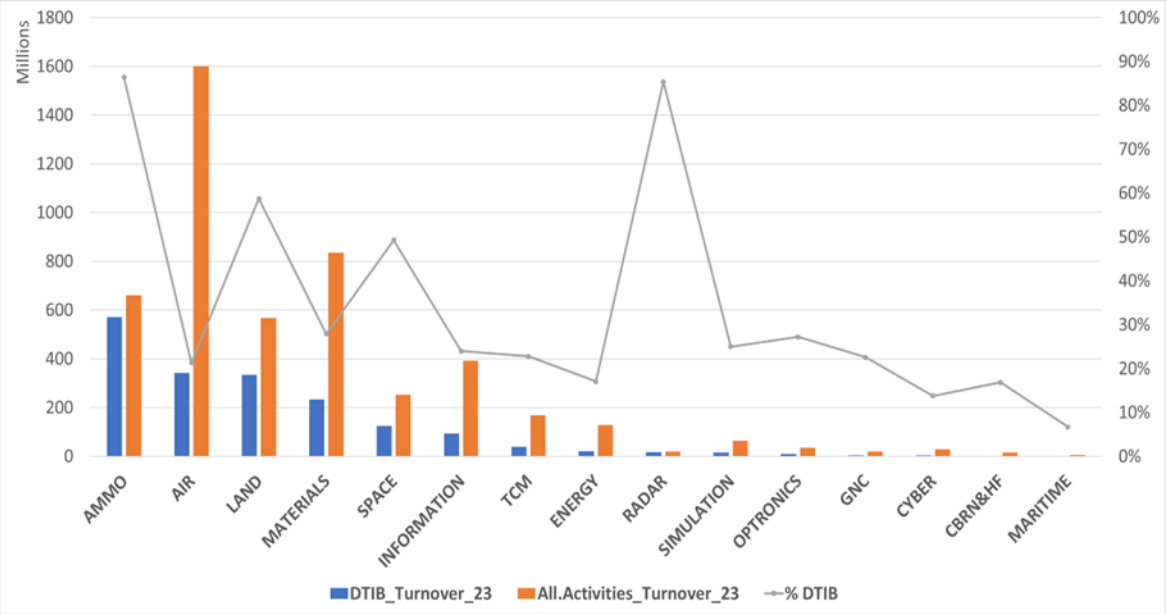
Appendix B *– Brussels Capital Region per CapTech. Source: BE-DTIB dataset.*



	DTIB_Turnover_23 (mln)	All.Activities_Turnover_23 (mln)	% DTIB
MATERIALS	135,43	1.656,18	8%
SIMULATION	79,18	298,36	27%
INFORMATION	61,99	1.098,36	6%
ENERGY	58,25	261,41	22%
SPACE	50,99	180,27	28%
AIR	44,61	217,71	20%
MARITIME	34,73	45,13	77%
Other	17,76	350,65	5%
CYBER	15,99	649,18	2%
LAND	2,71	12,06	23%
GNC	2,60	50,00	5%
TCM	1,11	12,83	9%
AMMO	0,18	0,36	50%
CBRN&HF	0,16	9,05	2%

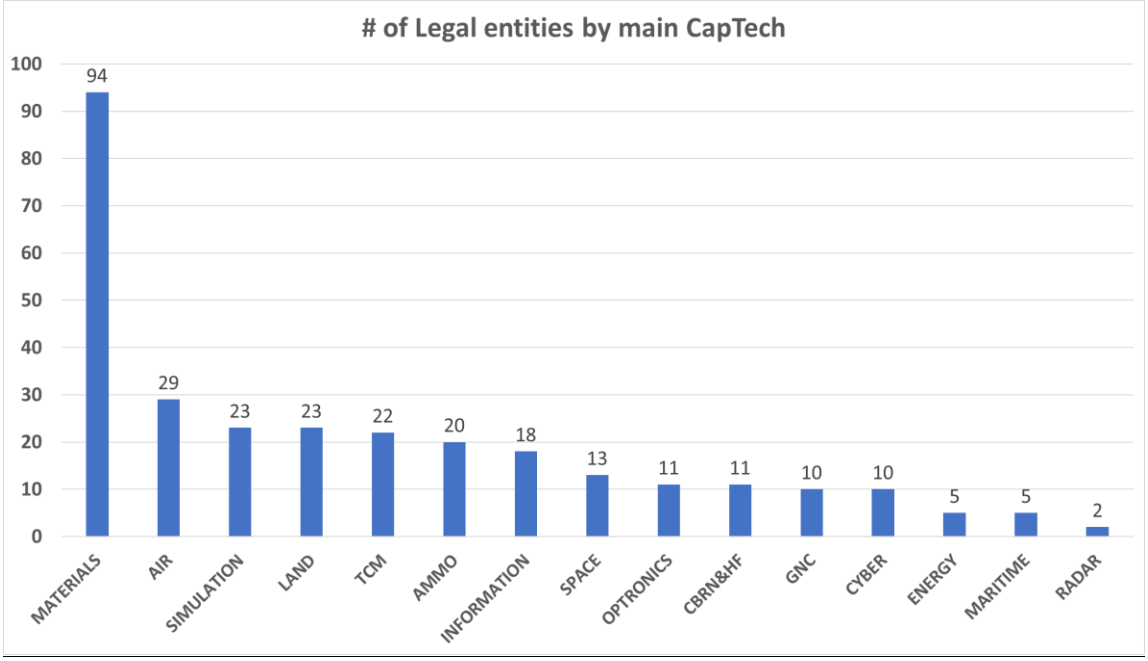


Appendix C *– Wallonia per CapTech. Source: BE-DTIB dataset.*



	DTIB_Turnover_23 (mln)	All.Activities_Turnover_23 (mln)	% DTIB
AMMO	570,23	660,35	86%
AIR	340,56	1.599,34	21%
LAND	332,89	567,24	59%
MATERIALS	232,48	833,88	28%
SPACE	123,71	251,21	49%
INFORMATION	93,77	391,75	24%
TCM	38,54	169,31	23%
ENERGY	21,71	127,18	17%
RADAR	16,60	19,45	85%
SIMULATION	15,92	63,69	25%
OPTRONICS	9,36	34,43	27%
GNC	4,41	19,54	23%
CYBER	3,85	27,93	14%

CBRN&HF	2,44	14,46	17%
MARITIME	0,35	5,26	7%



Acknowledgements

The mapping builds in part on a preliminary exercise done by ACOS STRAT-NAD and FPS Economy, which the BEPIDS project has continued in cooperation with both. In the dataset we maintain the legal entities obtainable via public sources versus those only obtainable via Defence and FPS Economy to indicate the extent that the mapping uses public sources as opposed to requiring cooperation with other parties.