

Mestrado em Gestão de Informação

Master Program in Information Management

MINDING THE GAPS

Digital Transformation in Portuguese SMEs

João Paulo Coelho Pinto, PhD

Project Work, presented as partial requirement for obtaining the Master's degree in Information Management, with specialization in Knowledge Management and Business Intelligence

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação

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Advisor: Prof. Nuno António, PhD

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To Miguel and Carolina,
that are growing faster than I tell them to,
but who will always be my little babies

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ABSTRACT

The widespread use of digital technologies is at the heart of a massive global transformation. Business models and processes are becoming increasingly more dependent on data, to the point that it is a critical success factor for many companies. However, not all enterprises are fully engaged with this relatively new reality, while some others procrastinate due to the absence of knowledge or easily/financially accessible tools.

Based on data collected via a survey, we offer a characterization on the perception of people working in Portugal in respect to the value of technological innovation and its adoption on the enterprises where they work. Our data corroborates the existence of a bias, unfavourable to SMEs, both in terms of implementation and perception of relevance of Digital Transformation and Data-Driven Management in their operational and strategical routines.

Based on the assumption that SMEs will face an increasing competitive pressure in the future, since technology progressively benefits economies of scale, we set on to identify business sectors where those enterprises were already lagging compared to larger ones in respect to several structural business metrics. A comparison with information from other European Countries underlines a generic dire picture of businesses in Portugal, where the value added per unit of capital and labour investment are much lower than those found in most European countries. Additionally, we observed that in Portugal, SMEs were particularly lagging behind bigger companies in the Information/Communication and Mining/Quarrying sectors.

This works emphasizes the need to facilitate the adoption and use of technology in Portuguese SMEs, as well as building up management literacy that encourages continuous improvement and innovation.

KEYWORDS

Micro, Small and medium-sized enterprises; Digital Transformation; Digital Literacy; Data-driven Management; Data-driven Decision Making; Artificial Intelligence; Data Mining; Big Data; Machine Learning; Operational efficiency.

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LIST OF ABBREVIATIONS AND ACRONYMS

AI	Artificial Intelligence
BI	Business Intelligence
CAE	Classificação Portuguesa de Actividades Económicas
CRISP-DM	Cross-industry standard process for data mining
DT	Digital Transformation
GDP	Gross Domestic Product
INE	Instituto Nacional de Estatística
IAPMEI	Instituto de Apoio às Pequenas e Médias Empresas e à Inovação
NACE	Nomenclature statistique des activités économiques dans la Communauté européenne
SCIE	Sistema de Contas Integradas das Empresas
SEN	Sistema Estatístico Nacional
SBS	Structural Business Statistics
SME	Small and medium-sized Enterprise
SEO	Search Engine Optimization

1. INTRODUCTION

1.1. BACKGROUND

Everything is a process. And, in today's World, even the tiniest process is becoming supported and/or enabled by some flow of data. Every aspect of everyone's lives, and those of companies, is being recorded. Then, somewhere, those pieces of information are pieced together to (putatively) assist us: optimal waking-up time, optimal car path to work, reading suggestions, next travel destination, sex partners, etc. The list of applications is becoming endless and increasingly seamless with our lifestyle. In fact, the biggest companies in the World are becoming online platforms of some kind, brokers between providers and users. These platforms struggle among themselves to get the best of both in their platform (often "the best" is "the most") and support their business models on the idea of "better", differentiated targeted services. Interestingly, it so happens that, more and more, that "better" service is built on a more extensive and clever use of whatever information those brokers can obtain and make out of everyone's data. And, as the already popular saying goes, when people and companies are not sure what the product of a given platform is, well, it is probably because they are the product.

Google, Facebook, Amazon, Twitter, Uber, etc, are giant companies. Their number of global users and the processes they enable every single second are mind-blowing (see for example ('Data Never Sleeps 7.0', 2020)). As a consequence, clans of promoters (see for example (Pedro Domingos, 2015)) and detractors/sceptics (see for example (Cathy O'Neil, 2016; Nick Bostrom, 2014)) of this new reality are being formed. Like in most other questions in society, perhaps we will need to strike a balance between a pure short-term utilitarian view of things (potentiated by the fantasy of bringing new Worlds into the World) and an exaggerated risk-averse/regulatory-driven/progress-impending "old man from Restelo" view on things. Regardless of how one stands, the fact to the matter is that the future is arriving every moment, and it is information & knowledge intensive. And all the sudden, artificial intelligence is no longer Science Fiction. News feeds from mainstream news providers constantly report development in these areas (see for example (Ian Sample, 2020; Karla Pequeno, 2018, 2020)). Also, curiously, mainstream artists, such as some of the most acclaimed and popular writers, are starting to include their imaginings of this "brave new World" in their *oeuvre* (see for example (Dan Brown, 2018; Ian McEwan, 2019))

However, this evolution that is shaping the World is liable to produce great(er) gaps between enterprises. In this "arms race", those that can, and will, adopt new practices will become more efficient and valuable. A McKinsey Analytics report designates the value capturing asymmetry between adopters vs. non-adopters of full-scale data-driven management and operation as "Breaking Away" (Peter Bisson, Bryce Hall, Brian McCarthy, & Khaled Rifai, 2018). Also, IDC reports a profit growth CAGR (2014-2018) gap between digital and non-digital manufacturers of over 10% (Gabriel Coimbra, 2020). Similarly, technical solution providers are also naturally quite effusive about the benefits that their products can bring about. SAP communicates, for example, that out of all the SP500 companies, the loyalty and customer experience oriented ones grow and create value twice as much as the others, and that Digital Transformation is a strong enabler of that performance (Rui Soares, 2020). Databricks, in association with Forrester, have estimated for example that their solutions lead on average to a 5% increase revenue (*The Total Economic Impact™ Of The Databricks Unified Data Analytics Platform*,

2020). Evidence, and logic, suggests that data-driven management and business models are going to be main determinants of the success of all companies.

1.2. OPPORTUNITY

For Portuguese companies, and for the national economy as a whole, the global dynamic described above can either be viewed as an opportunity or as a threat. Typically, the difference arises from whether each frames itself as a leader or a follower in the current global competitive market. So far, things do not look bright for Portugal. For example, attention/interest trends estimated via search engine queries suggest a “Business Intelligence” has hardly evolved since 2004 in Portugal, whereas it duplicated globally (*Figure 1*). Furthermore, attention to “Data Science” and “Digital Transformation” have increased globally much more than in Portugal (one can conclude that by e.g. using “Business Intelligence” and a measurement standard).

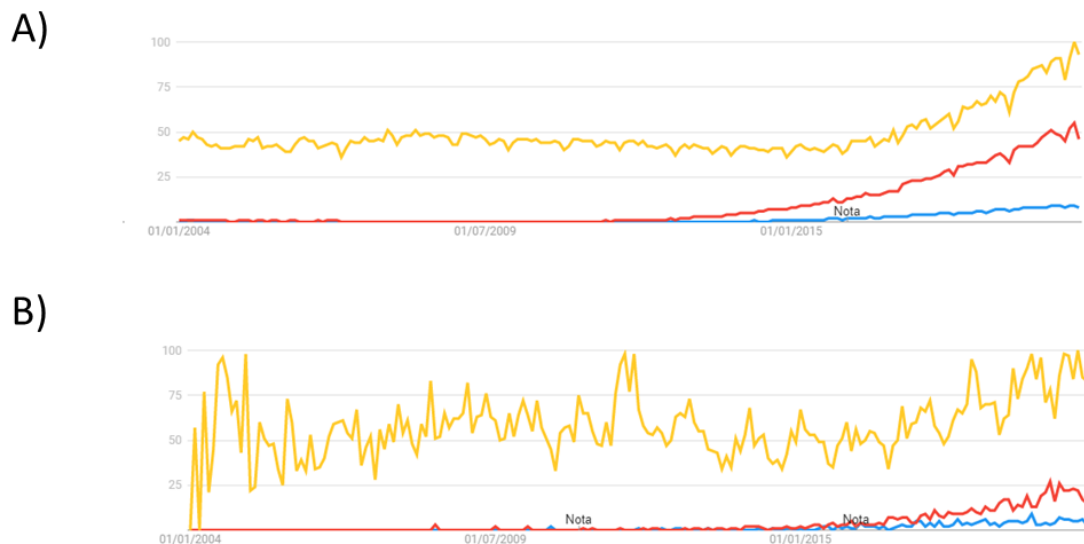


Figure 1 - Search queries performed on Google since 1st January 2004 ('Google Trends', 2020). A) Worldwide Data. B) Queries performed from Portugal. Yellow lines: Business Intelligence (Topic); Red lines: Data Science (Field of Study); Blue lines: Digital Transformation (Topic).

Personal experience, and preliminary discussions, suggest that Portuguese companies typically map on the first level of IDC's “MaturityScape: Data Excellence Stage” framework, characterized by an *ad hoc* approach to data problems, where “Information is siloed. Data quality and integration issues constrain usage to limited domains. Risks are unknown.”. Also, Portugal does not have a perceived strategy either in place or under consideration in respect to AI (AI Index Steering Committee - Stanford University, 2019) and lacks some of the fundamentals of a strong economy. For example, GDP (either absolute or per capita) is much smaller than those of other developed countries and PSI20 companies are dwarfed by other European players/competitors. This may prove a crucial point, as rich

companies/countries have naturally more available income that may be reinvested as data-oriented Capex/Opex investments.

However, vision is arguably even more important than financial statements. For example, in a survey conducted by McKinsey&Company, data indicates that a successful digital transformation is three times more likely to occur when key actions occur, such as those matching highly committed senior management (Hortense de la Boutetière, Alberto Montagner, & Angelika Reich, 2018). In fact, departmental schisms within an organization (such as the “business vs. IT” gap) is often an impediment for the implementation of globally optimal processes, when a coherent and transparent strategy is not fully endorsed by top managers. Paradoxically, however, it has also been observed that star performer managers/employees are the ones most resistant to embrace data, due to their historically confirmed absence of need for it (Jeff Bladt & Bob Filbin, 2014). Thus, for most companies when business vision is myopic, things will get worse before a sense of urgency triggers a strategic realignment matching the reality described above.

More and more, companies operate on a global market and, thus, they are judged against a wider array of productivity and business model standards. Either by their own accord, or driven by these industry standard shifts, evidence points to an unprecedented growth in demand in companies’ needs, which may however be constrained by lack of qualified staff and good historical training data (Dan Vesset et al., 2018).

On the positive note, the amount of literature, case-studies and application of Digital Transformation and Industry 4.0 in Portugal seems to be exponentially lifting off (as a reference, Scopus offers 29 papers from 2021 on Digital Transformation in Portugal, compared to only one in 2016 and previous years). A recent research paper documented a study on the implementation of the Portugal I4.0 program in the Portuguese economy (Rita, Silva, & Junior, 2022), and while suggesting the positive impact of the program, acknowledges the need to extend these analyses over a greater period of time. Additionally, on the topic of Digital Transformation on SMEs, a lot of relevant application information is continuously being documented (see for example (Chang, Chang, & Lu, 2021; Ghobakhloo & Iranmanesh, 2021; Masood & Sonntag, 2020) for recent relevant articles on the topic).

1.3. GENERAL GOAL & RELEVANCE

In these times of both urgency and scarcity, it seemed sensible to attempt to examine fits and gaps between Portuguese companies and international leading benchmarks, to plan ahead and make best use of our resources. As mentioned above, “poor” and small companies tend to be more vulnerable to upcoming changes, by lack of resources and adequate scale. Thus, emphasis was given to SME’s, as they play an important role in Portuguese economy and are most vulnerable to the increasingly fast maturing economy: 99.9% of all Portuguese companies are SME’s (PORDATA, 2018), and around 70% are not expected to survive 1 year after their setup (INE, 2018). We thus set on to characterize common perception of people working in Portugal towards innovation aspects such as digital transformation and data-driven management. Also, we aimed at analysing business metrics of Portugal, and comparing them to European benchmarks, to assess and identify efficiency opportunities among Portuguese businesses, in particular those of micro/small/medium sized companies.

2. MATERIALS AND METHODS

2.1. SURVEY

A survey was set-up using the Qualtrics platform ('Qualtrics', 2021) following the script and content depicted in Appendix A. The development of the survey followed a design thinking approach where both a "paper prototype" and an initial version of the survey were discussed with 5 independent individuals before production. The final version implemented 4 sections in order to characterize: 1) The individual, 2) The organization where he/she works, 3) His/Her perception on digitalization and 4) His/Her perception on how digitalization is being implemented at the organization where he/she works. Portuguese was set as the sole language of the survey, given the scope of this work. 104 answers were obtained from residents in Portugal during November and December 2020. All analysis that required sub-selecting classes of survey respondents were considered significant only for $n \geq 5$.

2.2. CONSOLIDATED SME'S ECONOMIC DATA AND ANALYSIS

Consolidated indicators of Portuguese and European SME's were obtained from Instituto Nacional de Estatística (INE, 2022b) (*Table 1*) and Eurostat (Eurostat, 2022) (*Table 2*).

Table 1 – Selected metadata relative to the information obtained from Instituto Nacional de Estatística.

Dimensions	Metrics
Time Dimension: 2008-2020	Enterprises – number Persons Employed – number Turnover – million euro
Enterprise Size Dimension: Micro Enterprises Small Enterprises Medium Enterprises Big Enterprises	Value Added at Factor Cost – million euro Apparent labour productivity – thousand euro Rate of Investment [Defined as the ratio between "Gross fixed capital formation" and "Gross Value Added") – %
Region: Portugal	
Economic Activities: NACE Rev2. – Level 1 Granularity	

Table 2 – Selected metadata relative to the information obtained from Eurostat.

Dimensions	Metrics
Time: 2010-2019	Enterprises – number Persons employed - number Turnover or gross premiums written - million euro
Enterprise Size: 0-9 Employees 10-19 Employees 20-49 Employees 50-249 Employees 250+ Employees	Apparent labour productivity - thousand euro Value Added at Factor Cost – million euro Apparent labour productivity – thousand euro
Region: European Union - 27 countries (as of 2020), partner countries and EU candidate countries; Country-specific granularity	
Economic Activities: NACE Rev2. – Level 1 Granularity	

Data from INE's "Sistema de Contas Integradas das Empresas" (SCIE) database was used to analyse and discuss the evolution of different dimensions of businesses since 2008 up to 2020, whereas Eurostat data was used to benchmark Portuguese business metrics with those of other European countries. For this benchmark, data from 2019 was used, which is the latest that Eurostat makes available at the moment (*i.e.*, as of May 2022). Although more comprehensive in terms of geographical scope (as it contain information from most European countries), Eurostat only makes available a narrower set of dimensions, does not yet include data from 2020 and only considers business from "B" to "N" classes of economic activities in the Structural Business Statistics (SBS) database (see Table 11 for a key between code and designation of economic activities according to the NACE Rev2 classification). Additionally, due to confidentiality considerations, some information was not made available for some metrics-dimensions (*e.g.*, Eurostat does not make available Labour Productivity for big (more than 250 persons employed) Real Estate Businesses in Portugal). Overall, roughly 10% of information of 2019 for the selected metrics-dimensions was missing (1 263 values out of 13 260) and was imputed following a sequential process:

- If a value existed for 2019 for a given metric-dimensions, consider it. Else:
- If a value existed for 2018 for a given metric-dimensions, consider the one for 2019 equal to it. Else:
- If at least 3 values existed between 2010 and 2017, infer the one for 2019 via linear regression. Else:
- If a value existed for 2017 for a given metric-dimensions, consider the one for 2019 equal to it. Else:
- If a value existed for 2016 for a given metric-dimensions, consider the one for 2019 equal to it. Else:

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- Impute information as to satisfy the “Total is equal to the sum of the parts” principle (*e.g.*, the average Labour Productivity for Portuguese big companies could be estimated after knowing the Labour Productivity of big companies from all economic activities). Else:

- Assume a metric-dimension value equal to that of the EU. This was always applied “Bottom-Up” (*e.g.* Country-Sector Total to Country Total) and reverted to the previous “Else” condition whenever possible (typically just one of the sector values was missing; the country total could then be easily obtained after that estimation), to minimize the extrapolation error.

All the information used in these analyses, either that that was directly obtained from the above-mentioned sources and that that was imputed, is made available as supplementary material on https://osf.io/r4fs6/?view_only=bb802e969c1b43eb8077e43b16d6587e.

Visualizations were created using the Seaborn (‘Seaborn: Statistical Data Visualization’, 2022) and Matplotlib (‘Matplotlib: Visualization with Python’, 2022) python packages and the Jupyter Notebook’s software (‘The Jupyter Notebook’, 2022).

3. RESULTS AND DISCUSSION

3.1. PERCEPTION OF INDIVIDUALS REGARDING DIGITAL TRANSFORMATION IN PORTUGAL

A survey was elaborated in order to assess the current understanding, perceived value and actual development of Digital Transformation initiatives within Portuguese organizations. Implied in its design, several workforce and organizational parameters were equally obtained in order to verify putative correlations with them, and breakdown these analyses, along those dimensions.

Due to the Covid19 pandemic-related social restrictions, the survey was exclusively distributed via social media platforms, through personal contacts. Please see sections “2.1 Survey” and “7 Appendix A – “Transformação Digital em Portugal” Survey” for expanded detail regarding the execution and design of this study.

Overall, 104 individuals, mostly with a workplace located in the Lisbon district area, participated in this survey (Figure 2).

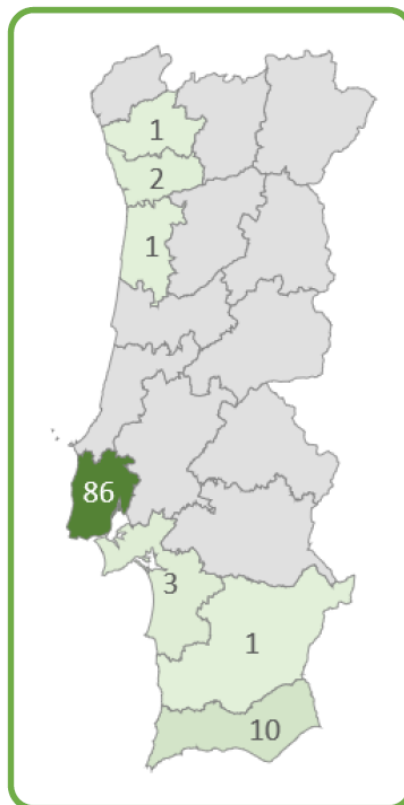


Figure 2 – Geographical distribution of the workplace location of people that took part in the survey.

Participants of this survey were predominantly male (66%) and had a global average age of ~39 years. Interestingly, we also noted that the age distribution differed between genders (Figure 3), as men were on average ~6 years older than women (~41years old versus ~35 years old, respectively).

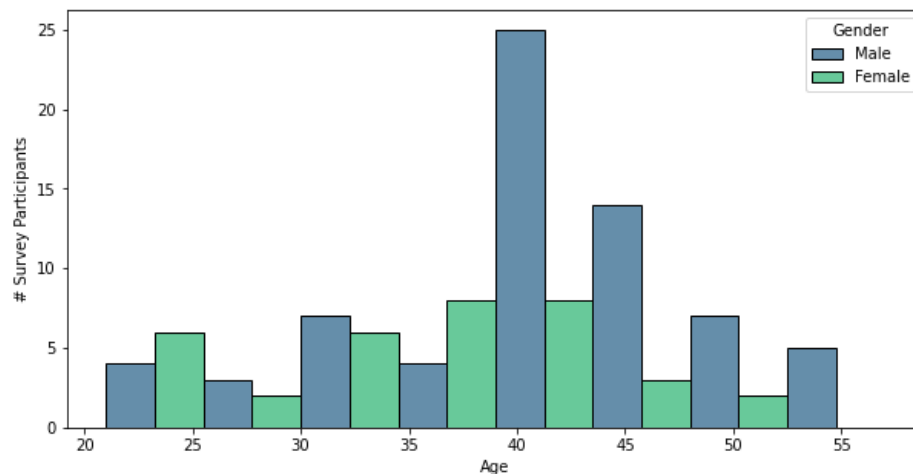


Figure 3 – Age distribution of the participants in the survey, split by gender.

Out of all participants, only 7% did not attain at least any University Degree (at least Bachelor). In respect to the position in the organization hierarchy, there is a slight prevalence of Middle Managers (40%), versus Top Managers (27%) or collaborators at a more operational level of the organization (26%). At a first glance, one observes that women, compared to men, predominantly occupy middle management position, and are much more infrequently found to occupy top management positions (Figure 4). This asymmetry in gender equally is quite well documented and not the scope of this report. One should, however, note that in this survey, women tended to be much younger than man. This can, at least partially, explain the Top Management bias between men and women as, looking solely at the data from this survey, there is understandably an age gap between Middle Management and Top Management of ~7 years (~38 versus ~45 years old on average), which compares well to the average age gap between men and women in this survey. In fact, critically analysing data from this survey, it appears that the average age of women, in any hierarchy tier, is lower than that of man (Figure 5). Again, exclusively referring to this data, it would appear that women occupy operational positions during a shorter period of time, are quicker to move into middle management and then top management position. Again, gender equality is a quite relevant matter in society and, to better discuss it, one would require a greater set of data and strict criteria to define and characterize many dimensions, other than this short and self-applied survey.

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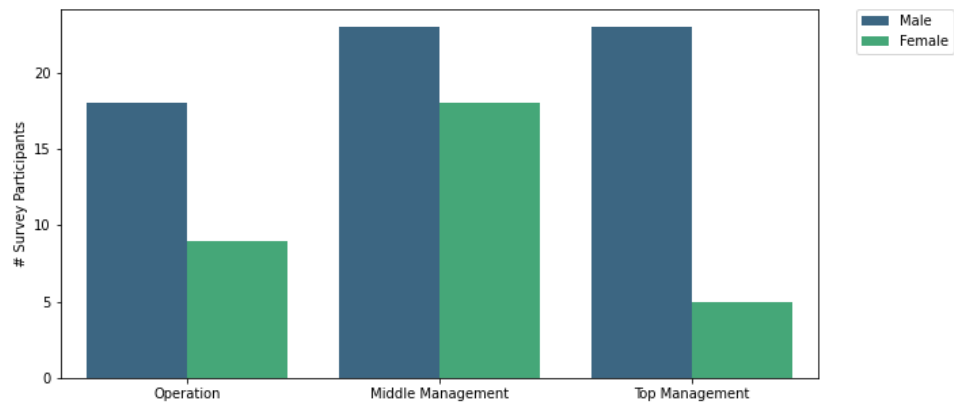


Figure 4 – Distribution of the participants in the survey in respect to the hierarchy level they occupy within the organization, detailed by gender.

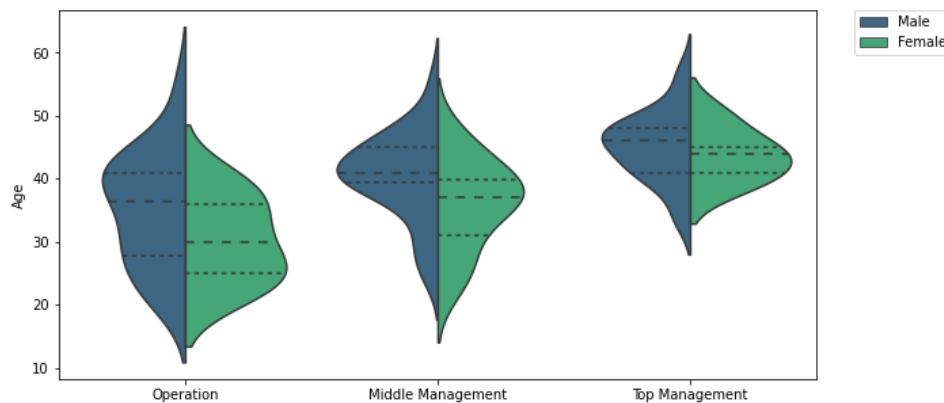


Figure 5 – Age distribution of the participants in the survey in respect to the hierarchy level that they occupy within the organization, split by gender. The horizontal bracketed lines on each violin plot represent the value of the quartiles for each sub-population.

As to the industry in which each participant works, results were, as expected, scattered among the many sectors of the Portuguese workplace scenario (Table 3), however with an overrepresentation of Wholesale and Retail.

Table 3 – Distribution of the participants in this survey in respect to the industries/sectors in which each person works. Please note that some organizations cross different sectors, thus the sum of participants under each sector exceeds to total number of participants in the survey.

Sector	# Survey Participants
Agriculture, farming of animals, hunting and forestry	4
Mining and quarrying	1
Manufacturing	8
Electricity, gas, steam, cold and hot water and cold air	4
Construction	7
Wholesale and retail trade	26
Transportation and storage	4
Accommodation and food service activities	11
Finance and Insurance	14
Real estate activities	1
Education	4
Human health and social work activities	9
Government	5
NGO's	1
Other activities	36

In respect to the department/area within each organization where each survey participant is integrated, results were equally distributed among many different possibilities (Table 4).

Table 4 – Distribution of the participants in this survey in respect to the departments/areas within each organization in which each person works. Please note that some job descriptions cross different areas, thus the sum of participants under each sector exceeds to total number of participants in the survey.

Department / Business Area	# Survey Participants
Administration / Executive Committee	20
Finance / Financial Control	15
Commercial	28
Production	8
Marketing	19
Information Technology	22
Online / App / Social Media	6
Human Resources	4
Operations	31
Supply Chain / Logistics	11
Procurement	5
Legal	4
Business Development	18
Business Intelligence	17
Workplace Safety and Hygiene	2

In terms of the localization of the main headquarters of the organizations where the survey participants work, the vast majority (69%) indicate that they are based in Portugal, 18% elsewhere in the European Union and 13% elsewhere in the World. The global reported sizes and age of those organizations are documented in *Table 5*. Naturally, one observes that there is a strong correlation between size of an organization and its age. One does also observe that reported organizations with a size greater than 10 000 employees are not Portuguese (*Table 6*).

Table 5 – Count of survey participants as a function of the reported age and size of the organization (measured by the number of its employees) where they work.

Age \ Size	< 10	10 - 100	100 - 1 000	1 000 - 10 000	> 10 000	Total
< 1 Year	2					2
1 - 2 Years	5			1		6
2 - 5 Years	1		1			2
5 - 10 Years	3	4	1	1		9
10 - 20 Years	2	5	2	4	3	16
> 20 Years	2	8	11	22	26	69
Total	15	17	15	28	29	104

Table 6 - Count of survey participants as a function of the reported size of the organization where they work and the localization of its headquarters.

Size \ Headquarters Localization	Portugal	Elsewhere in the EU	Other	Total
< 10	15			15
10 - 100	17			17
100 - 1 000	12	2	1	15
1 000 - 10 000	24	2	2	28
> 10 000	4	15	10	29
Total	72	19	13	104

The great majority of participants in the survey (74%) had past direct experience in the development and implementation of, at least, one Digital Transformation initiative. One should note that there is slightly higher chance of a Top Manager having somehow participated in one of these projects (82%) than Middle Managers (71%) or someone at an operational level (70%). Naturally, not only do Top Managers have a privileged position in the company that allows them to be involved and globally lead such initiatives but also, they tend to be more senior employees with longer professional experiences.

When asked on the nature of these Digital Transformation past experiences, participants categorised them under four major typologies: Exploration of novel business models; Business process engineering and organizational efficiency improvement; Improvement of information management in support of decision making; Improvement of information management in support of operational processes within the organization. Overall, participants in the survey shared that, on average, most past experiences are related to the improvement of information in support of operational processes, while the least common on average was the exploration of novel business models (*Table 7*).

Table 7 – Participation in the different categories of Digital Transformation initiatives, split by hierarchical level. Please note that survey participants may have participated in more than one category of initiative, thus each row may sum differently than 100%. Please refer to the main text for a complete description of each initiative category.

	New Business Models	Organizational Efficiency	Decision Support Info	Operational Support Data	None
Top Mgt	46%	39%	18%	36%	18%
Middle Mgt	17%	41%	46%	44%	29%
Operational	7%	30%	30%	48%	30%
Average	23%	38%	33%	43%	26%

One can observe that the participation of top management in Digital Transformation is skewed towards the exploration of new business models, a category naturally less prone to enable the participation of personnel at lower levels of the organization. It is however surprising that so little attention was, on average, given by them to the information that they consume. In fact, it is relatively much more likely that a person in other levels of the organization has helped to develop the nature of information to support decision making than the main decision makers. This could either mean that a particular logic applies to top management decisions, where historical know-how has greater value, or that little may be required to align the information that they consume with what is transversally available to the company. Although the coherence of information within an organization is quite critical, each position is likely to benefit from a specific view of the whole data. In this particular case, the consumption of highly detailed information by people occupying higher positions in a given organization, may inadvertently compel them towards a logic of micromanagement and supervision. Based on this survey, one assesses that operational efficiency and support information has been considered more critical along the professional paths of top managers.

Middle managers seem to have distributed their attention along the various categories of Digital Transformation initiatives, except for the less likely “Exploration of novel business models”. They seem to have invested their efforts in initiatives that promote the development of information to support top management decision making, naturally as they constitute the level of organization that directly reports to top managers. People working at an operational level of the organization seem to acknowledge more their efforts on the initiatives set to improve information that support their activity.

Since each person may have participated in more than one kind of Digital Transformation initiative, each row in Table 7 sums differently than 100%. Figure 6 breaks-down the overlap and correlation of participation in the different categories among themselves.

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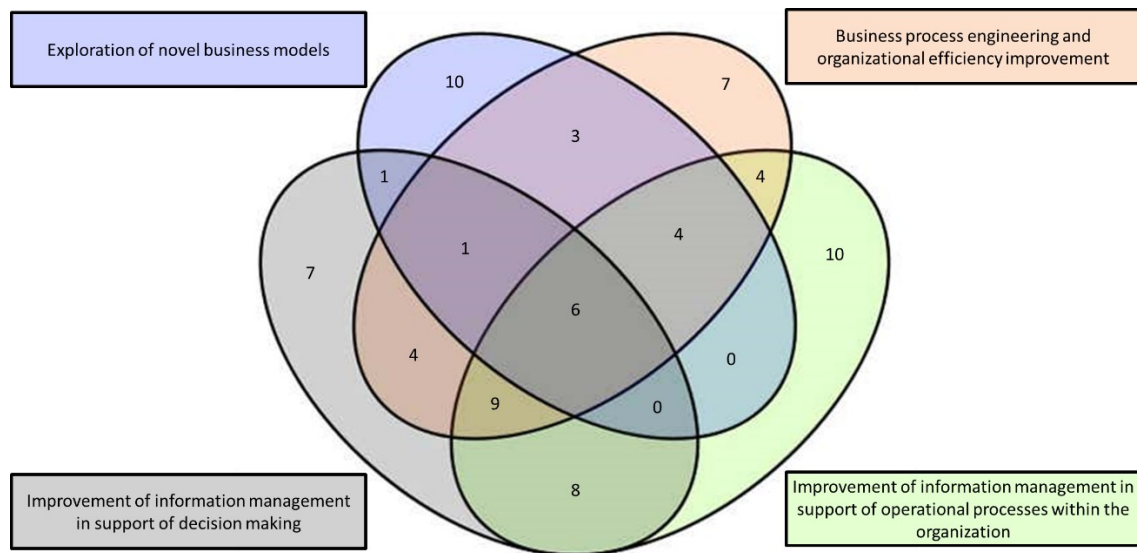


Figure 6 – An exhaustive Venn Diagram characterizing the overlap of participation in the different types of Digital Transformation initiatives, indicated by the number of participants in the survey.

It is also interesting to observe that, with the exception of companies smaller than 10 people (where most of these questions have putatively yet to be posed and present-day concerns are elsewhere), Digital Transformation seems to involve all the organization, but falls with the size of the company (Figure 7). One cannot but hypothesize that this global trend is probably due to specialization of the workforce.

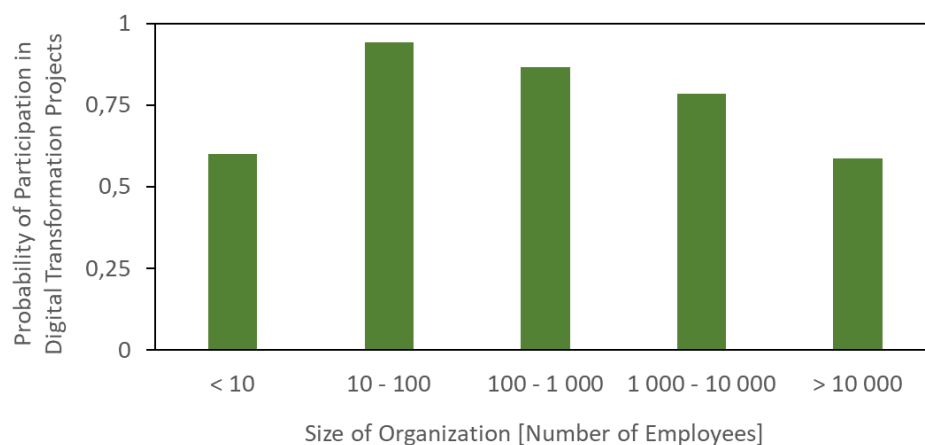


Figure 7 – Probability of a survey participant registering a past contribution in a Digital Transformation project and the size of the organization where they currently work.

It also appears that people working on foreign organizations have a relatively lower probability of having participated in Digital Transformation projects (68%), compared to employees of Portuguese organizations (77%). However, that bias may simply be explained by the relatively greater size (on

average) of foreign organizations, and the greater specialization of its employees (in other words, project oriented and business development teams may be located elsewhere), as described above. No additional correlation between the size of an organization and specific patterns of differential exposure to specific categories of Digital Transformation initiatives was observed (data not shown).

When asked to rank the level of risk and opportunity that globalization and digital transformation is likely to have on Portuguese organizations, participants generally perceive these global trends as net positive. However, it is interesting to observe that risk/benefit ratio varies with the hierarchical level of the person (Figure 8). It seems that people working at an operational level of an organization perceive on average those global trends as a great opportunity (~9/10), but also attached to some risk (~5/10). Top managers are much more likely to see them as great opportunity (~10/10) and very little risk (~2/10). Interestingly, middle managers seem to form a bimodal-like population where some individuals seem to stand half-way between operational personal and top managers, while other are much more concerned with the risk that globalization and digital transformation is bringing to Portuguese companies.

It is prohibitive to further break-down this analysis, due to the limited number of participants and the high cardinality of some dimensions (such as the industry/sector where the organization operates). Still one can speculate that the size and sector of the organization lends great differences to the risk perception of their employees. Also, it can simply be that middle managers are offered on average greater visibility to the whole organization and are more sensible to the constraints that these global trends may pose. Top managers, who are generally the most positive, may possess that view due to 1) better/broader/longer perspective and vision, 2) a positive perspective that characterize good leaderships, 3) a lack of perfect visibility of operational constraints, or 4) the weight/obligation to embody an encouraging outlook.

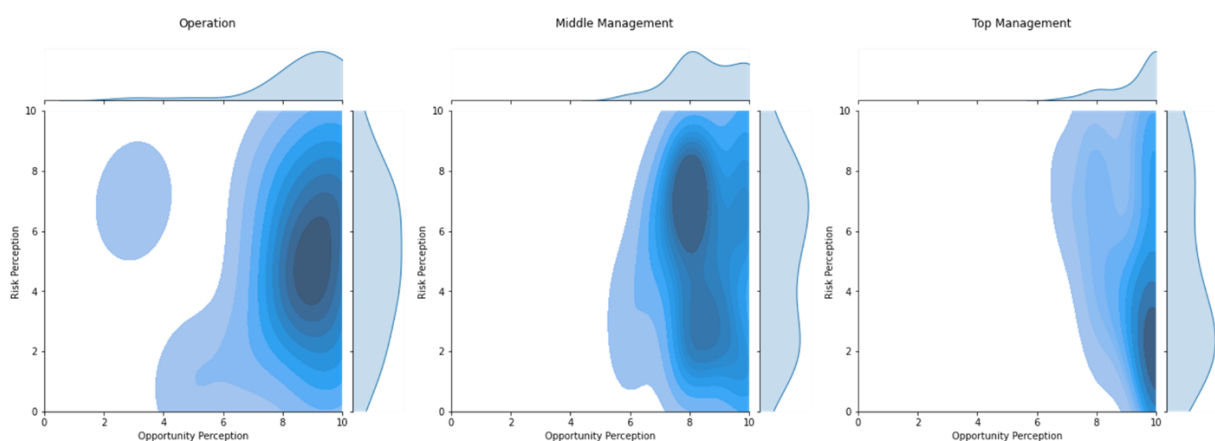


Figure 8 – Distributions of risk and opportunity perception of individuals towards the effect of globalization and digital transformation in Portuguese companies (ranked between “1-Lowest” and “10 – Highest”), split by the hierarchical level of individuals.

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It is also observable that these risk/opportunity perceptions are also correlated with the size of the organization where people work (*Figure 9*). On average, the bigger the organization, the lower the perceived risk and greater the perceived opportunity. This makes perfect sense since, as a general rule, greater companies are more resilient and have more resources to develop key strategic areas, critical to their ongoing success.

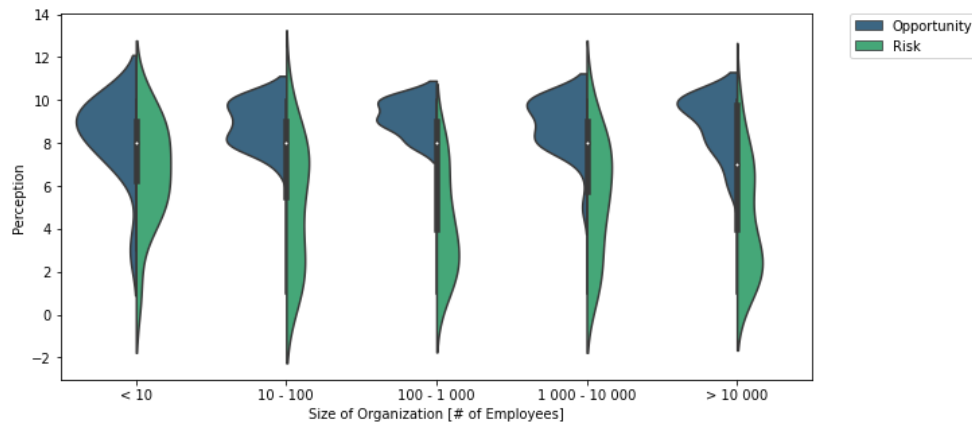


Figure 9 – Distributions of risk and opportunity perception of individuals towards the effect of globalization and digital transformation in Portuguese companies (ranked between “1-Lowest” and “10 – Highest”), split by the size of the organizations where they work.

When asked to grade the importance of the different types of Digital Transformation categories in respect to their importance, people generally identify them as being very critical and equally important (with a mode of 8/10 or 9/10). No great variation exists between the four categories, with probably the exception of the “Exploration of Novel Business Models”, which operational level and middle management personnel value slightly lower than top managers, and lower than the other categories (*Figure 10*). This may be the result of a greater vision/ambition of top managers in terms of business development, or the relatively higher sensitivity of all others in respect to more operational-type constraints. It is also worth mention that no discernible difference was identified when these answers were classified by the size of the organization where participants work. In other words, it seems that the perception of importance of each type of initiative is not dependent on the size of the organization (*Figure 11*).

Minding the Gaps

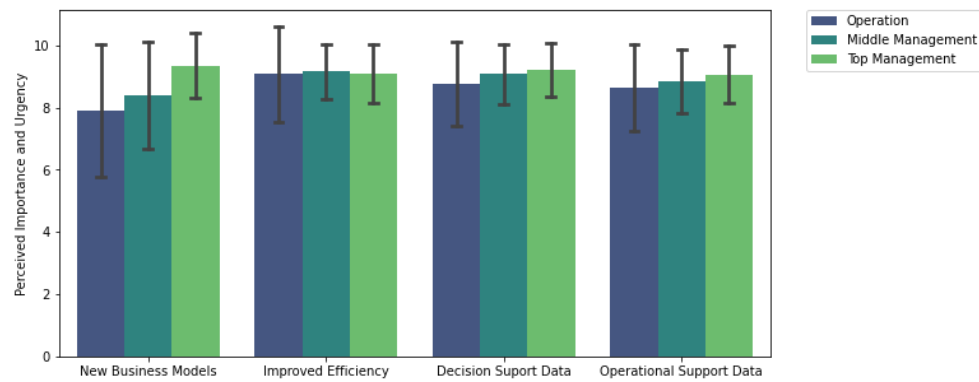


Figure 10 – Perceived importance and urgency of the different Digital Transformation categories, split by the hierarchical level that of the participants in the survey. The vertical black lines represent the standard deviation of each question for the represented population.

It is, however, curious to note that the level of importance that people generally attribute to Digital Transformation is not entirely compatible with their historical involvement in projects of this nature, as summarized above in *Table 7*. We hypothesize that this bias can be attributed to several reasons: 1) People are failing to be consequent in respect to their perception and urgency of what needs be done; 2) The former is simply an historical view of their experience and has only limited alignment to how they view the future; 3) Although urgent, not all people are necessarily required to / called upon to participate in such initiatives.

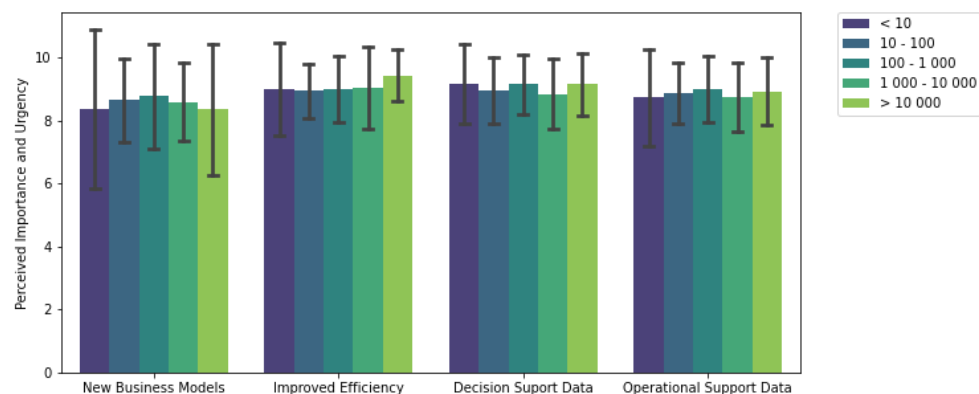


Figure 11 – Perceived importance and urgency of the different Digital Transformation categories, split by the size of the organization where of the participants in the survey work. The vertical black lines represent the standard deviation of each question for the represented population.

When focusing on “Data” and whether processes and decisions should be analytically supported, individuals working at an operational level of organizations typically rank this necessity lower than other people. In fact, this was still evident when one breaks-down the perception of importance of data-supported decisions/processes along the different layers of the organization (*Figure 12*). We find

Minding the Gaps

this curious since it is at an operational level that automation is generally more easily applicable and beneficial. One possible interpretation is simply based on the probable data-literacy and professional experience biases between these individuals and all others. Also, and on average, individuals from greater organization seem to also value slightly less data-supported decisions and processes (*Figure 13*). This is again surprising since it is on bigger organizations that specialization, economies of scale and automation are often more beneficial. This can be the result of a hidden pattern of more relatively more operation level and middle managers in bigger companies, and their putative perception biases.

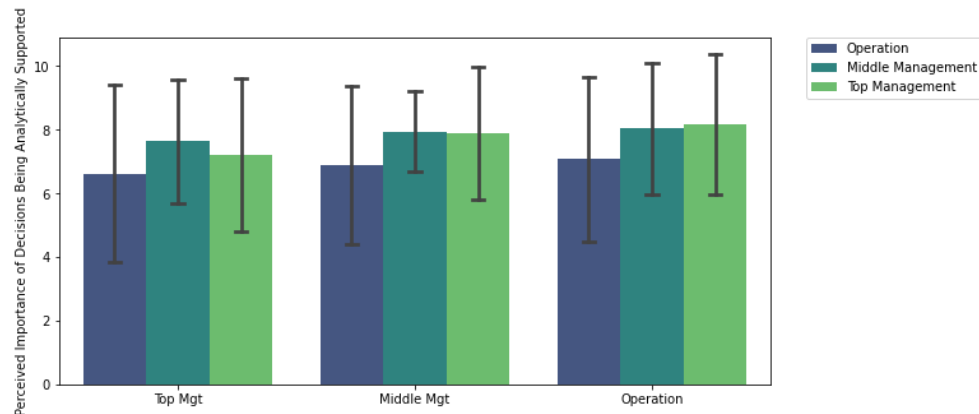


Figure 12 – Perceived importance of decisions being analytically supported throughout the different levels of the organization (horizontal axis), split by the hierarchical level of the participants in the survey (colour of each bar, as indicated in the legend). The vertical black lines represent the standard deviation of each question for the represented population.

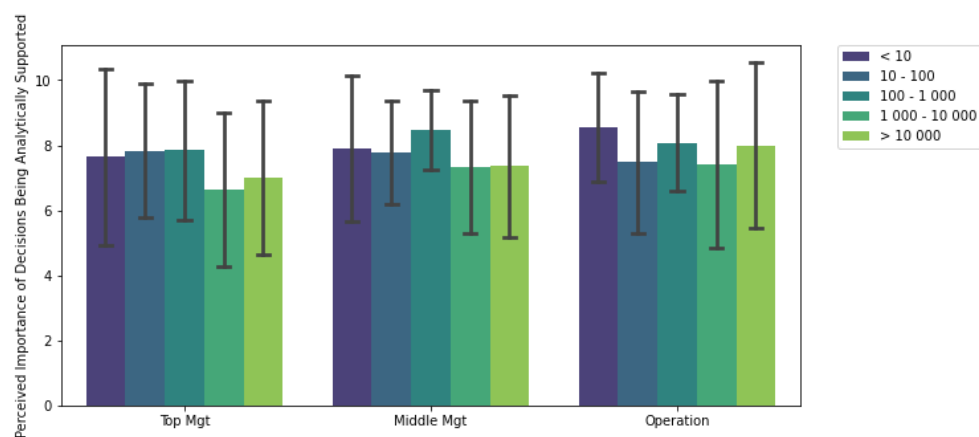


Figure 13 - Perceived importance of decisions being analytically supported throughout the different levels of the organization (horizontal axis), split by the size of the organization where of the participants in the survey work. The vertical black lines represent the standard deviation of each question for the represented population.

Minding the Gaps

When asked on the value of data-supported decisions and processes specifically in the different areas and departments within the organizations, participants in the survey generally apply the same level of importance to all of them. The exceptions are the “Legal” and “Human Resources” areas, where people tend to not recognize as equally critical in terms of data dependence (*Figure 14*). Furthermore, this evaluation does not significantly change depending on the size of the organization (*Figure 15*). As a validation side note, one observes that people’s perception on the importance of analytically supported decisions and processes is equivalent whether one is discussing the organization as a whole or the departments within those organizations (compare, for example, the values plotted in *Figure 13* and *Figure 15*) .

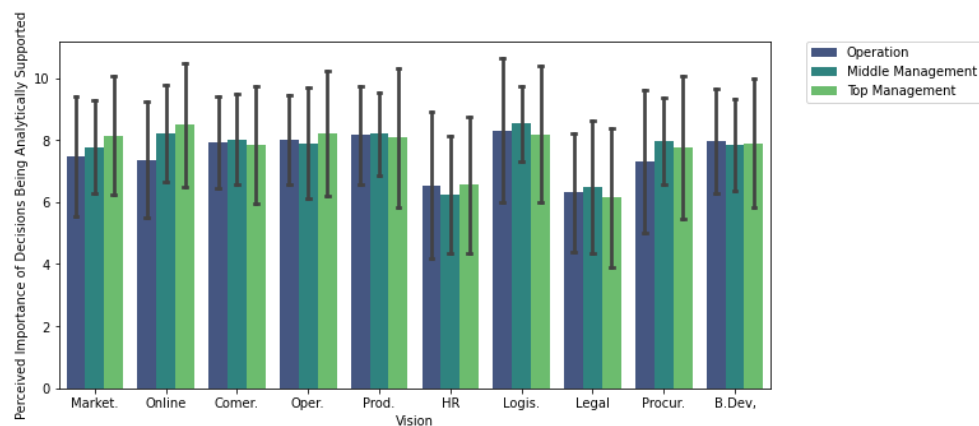


Figure 14 – Perceived importance of decisions being analytically supported throughout the different departments of the organization (horizontal axis), split by the hierarchical level of the participants in the survey (colour of each bar, as indicated in the legend). The vertical black lines represent the standard deviation of each question for the represented population.

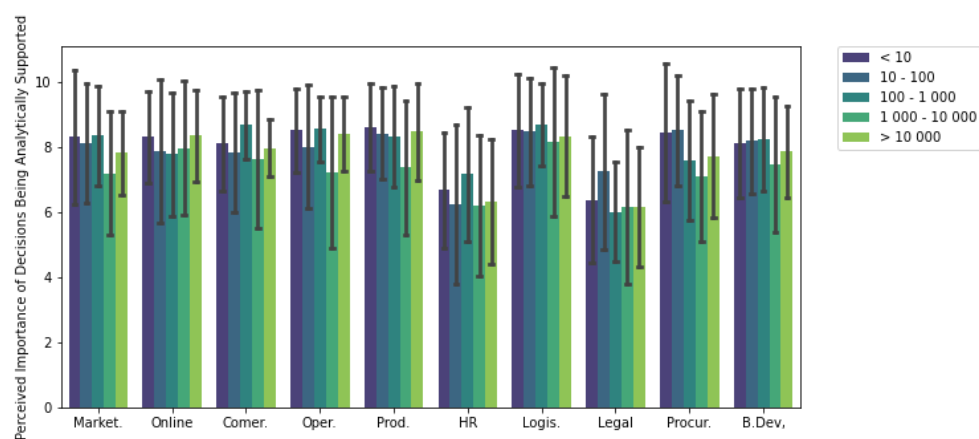


Figure 15 – Perceived importance of decisions being analytically supported throughout the different levels of the organization (horizontal axis), split by the size of the organization where of the participants in the survey work (colour of each bar, as indicated in the legend). The vertical black lines represent the standard deviation of each question for the represented population.

When asked about their organizations, in particular their awareness regarding the implementation of several key strategic dimensions, one observes that higher complexity elements are naturally less commonly adopted (*Figure 16*). Also notably, the sophistication of the organizations is positively correlated with their size (*Figure 17*), which confirms the critical gap between SME's and other organizations. One can also highlight that, on average, people have a balanced perception regarding the importance of data-supported decisions (see for example *Figure 13*) and the actual implementation within their organization (*Figure 16* - Statement "D"). The fact that the statements "E" and "F" were typically lower than "D" may lead to the conclusion that people understand that there is "room for improvement". The most notable difference when comparing organizations of different sizes is the gap regarding the existence and communications of a long-term vision (*Figure 16* - Statement "B"). Although one is forced to keep in mind that, since this data was obtained via a survey, it compounds the effect a specific element either existing or not, and the participant in the survey either being aware of its existence or not, smaller organizations are typically less sophisticated/robust and may indeed lack a long-term vision.

As to the production of the business intelligence data that is available at their organization, people were asked to what extent a centralized BI or departmental BI units prepare it, and to what extent the final users had to be themselves the ones to produce it (*Figure 18*). Without surprise, in organizations with less than 100 employees, final users of the information tend to be the ones that most commonly prepare the data that they require. For organizations with 100 to 1 000 employees, it seems that a centralized logic of information preparation is most relevant. However, for even greater organizations, their size and specialization trigger the necessity of departmental specific information, thus relatively reducing the weight of centralized produced information. Interestingly, regardless the size of the organization, self-produced information is always highly relevant, either as a result of the absence of a specialized Business Intelligence department within a company (most likely in small organizations) or as a result of highly specific information needs that a general employee requires (*Figure 19*).

When asked to evaluate the digital footprint of their organization, along the different dimensions listed in Table 9, two main observations strike one's attention. First, although the digital presence was generally considered quite critical (typically >8/10; *Figure 20* – Statement "A"), all aspects of its implementation fall short in respect to that perceived need (typically < 8/10; *Figure 20* – Statements "B-H"). Second, there is a remarkable positive correlation between the probability of an organization having implemented any given element relevant to its digital footprint and its size (*Figure 20*). Furthermore, it is in smaller organizations that the gap between the perception of importance and the implementation of the different dimensions is greater. Not only do small companies most often lack a functional website, aligned with current best-practices and client needs, they also tend to lever less communication on third-party platforms, not optimize their digital presence with standard SEO best practices, and not make good use of the information that they might already possess via their online presence (*Figure 20*). Interestingly, the hierarchical level of the survey participant had little or no effect on how each person evaluated their company in respect to these dimensions (*Figure 21*).

Table 8 – Complete description of the statements, relative to the perception of each participant in the survey regarding their organization, as referred in Figure 16 and Figure 17.

Index	Question
A	There is full knowledge of global trends in the sector
B	There is a consistent and well-communicated vision for the company, with a horizon of more than 5 years
C	The company continually allocates resources to develop critical areas to keep it competitive
D	The company assumes a management logic mainly based on numbers, and little on intuition
E	Management information is centralized in databases across the entire company (Data Warehouse) and made available to all users
F	Processes are highly automated and use artificial intelligence in some elements

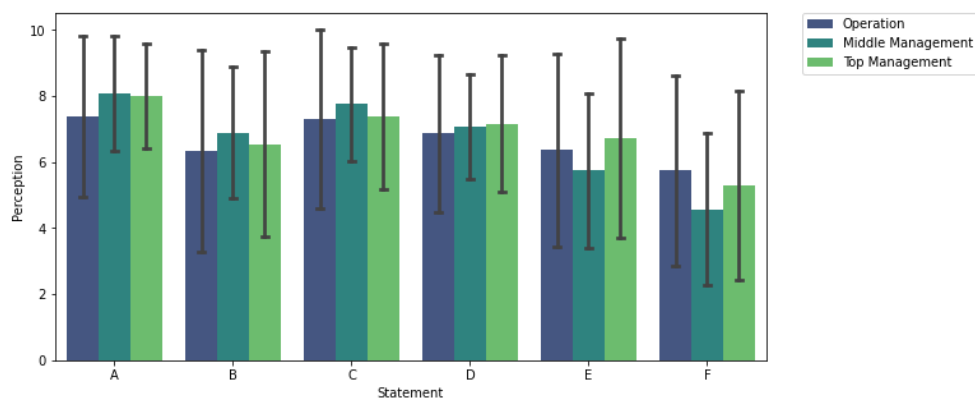


Figure 16 – Perception on the awareness and implementation of several organizational strategic dimensions (please see Table 8 for the description of statements A-F), split by the hierarchical level of the participants in the survey (colour of each bar, as indicated in the legend). The vertical black lines represent the standard deviation of each question for the represented population.

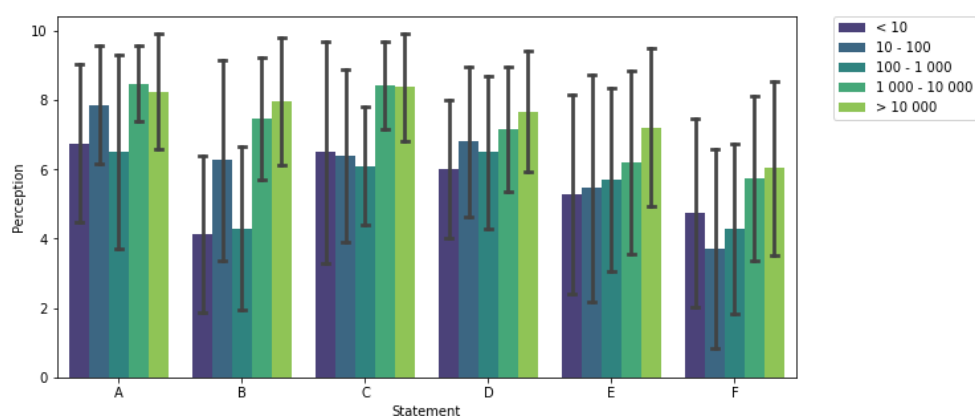


Figure 17 – Perception on the awareness and implementation of several organizational strategic dimensions (please see Table 8 for the description of statements A-F), split by the size of the organization where of the participants in the survey work (colour of each bar, as indicated in the legend). The vertical black lines represent the standard deviation of each question for the represented population.

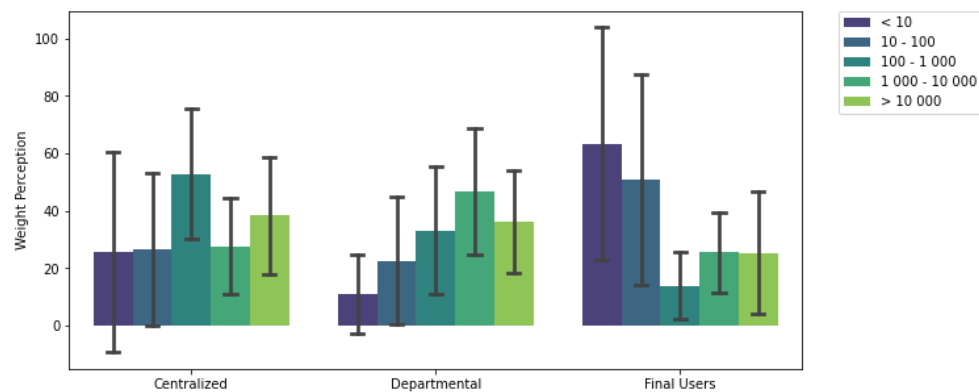


Figure 18 – Relative weight of different sources of business information (“Centralized”, “Departmental”, or produced by the “Final Users”), as a function of the size of the organization where of the participants in the survey work. For each user, the partial weight of each possible source of business information was such that the three would sum 100. The vertical black lines represent the standard deviation of each question for the represented population.

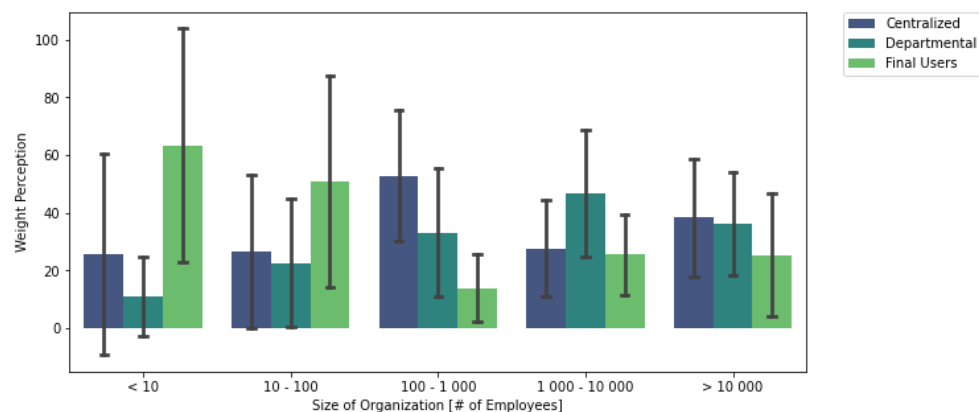


Figure 19 – Partial weight of different sources of business information (“Centralized”, “Departmental”, or produced by the “Final Users”), detailed by the size of the organization where of the participants in the survey work. For each user, the partial weight of each possible source of business information was such that the three would sum 100. The vertical black lines represent the standard deviation of each question for the represented population.

Table 9 – Complete description of the statements, relative to the digital footprint of the organization where each person works, referred in Figure 20 and Figure 21.

Index	Statements
A	A digital presence is critical in the sector where it operates
B	The organization is digitally present through a website perfectly aligned with the needs of its customers
C	The organization's website is at the level of the best in the sector
D	The organization has an application on the main platforms (IOS, Android) at the level of the best in the sector
E	The organization is present on social networks and is very close to its community
F	The organization invests in digital communication on third-party platforms
G	The company's digital presence is optimized in terms of search engine results (SEO)
H	The organization makes good use of the information it collects through its digital presence

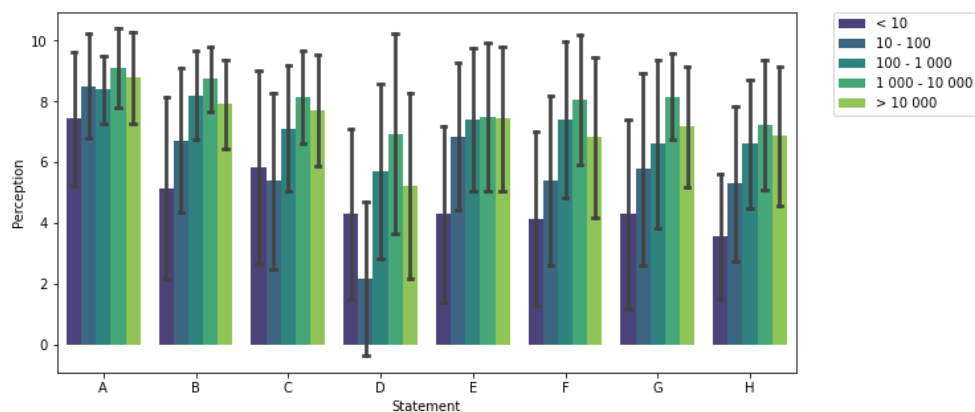


Figure 20 – Perception of different dimensions of the digital footprint of the organization where each participant in this survey works (please see Table 9 for the description of statements A-F), split by the size of the organization. The vertical black lines represent the standard deviation of each question for the represented population.

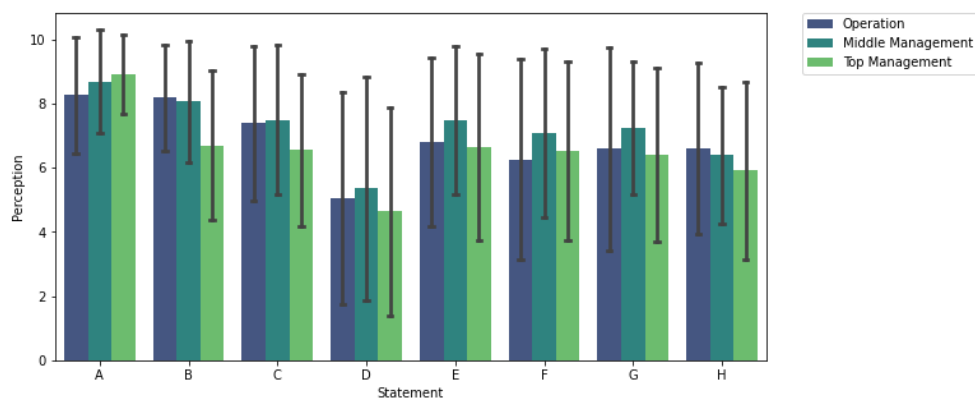


Figure 21 – Perception of different dimensions of the digital footprint of the organization where each participant in this survey works (please see Table 9 for the description of statements A-F), split by the hierarchical level of the participant. The vertical black lines represent the standard deviation of each question for the represented population.

3.2. MACRO-ASSESSMENT OF SME'S IN THE CONTEXT OF THE PORTUGUESE ECONOMY

3.2.1. An Analysis and Evolution of Portuguese Enterprises in the Past Decade

An analysis was made on structural business statistics of Portuguese enterprises based on consolidated data obtained via INE (see “Materials and Methods” section). The use of microdata would have been beneficial but, this being a master thesis, and the author of this thesis not being a member of a research group, the use of microdata was not directly permitted. Plus, this work is meant as a public document, so confidentiality constraints would have to apply all the same if we were to present detailed data. We opted to use pre-validated data from INE’s “Sistema de Contas Integradas das Empresas” (SCIE) that could be obtained on-demand and were offered with the level of granularity presented below.

A deeper dive on a finer geographical distribution would have been relevant, as also a finer characterization of business sectors (*i.e.*, lower than level 1 of the NACE/CAE classification) but, unfortunately, that level of detail was not permitted, again on grounds of confidentiality.

This SCIE database offers information from 2008 onwards. Data from earlier on exists but was obtained using a different methodology/assumptions and panel of enterprises. As of April 2022, SCIE contains info up until 2020, and thus already contemplates the effect of the first year of the Covid19 pandemic. One should note that INE uses the classification of SME's of IAPMEI, as depicted in Table 10, where companies have to comply both in terms of economic scale and number of persons employed.

Table 10 – Classification of SME's, according to IAPMEI (INE, 2020).

Category	Persons Employed (Year Average)	Economic Scale
Medium Companies	< 250	≤ 50M€ Turnover or ≤ 43M€ Balance
Small Companies	< 50	≤ 10M€ Turnover or ≤ 10M€ Balance
Micro Companies	< 10	≤ 2M€ Turnover or ≤ 2M€ Balance

It is also important to mention that “Number of Employees” and “Persons Employed” are different measures, and that the latter is meant to additionally account *e.g.* the effect of outsourced personnel and that of people without a permanent contract with the company.

We opted to analyse the evolution of “Number of Enterprises” and “Number of Persons Employed” as a way to quickly obtain a landscape on the fabric of the economic structure of Portugal. The “Turnover” and “Value Added” were measures that were used to characterize the economic scale of those business and their net contribution to the Portuguese economy. “Labour Productivity”, which is the ratio between “Value Added” and “Persons Employed”, offers a view on the average economic efficiency of labour. The “Rate of Investment” offers a view on the average expansion of businesses within given dimensions, and was compared with the evolution of the “Number of Enterprises” and “Number of Persons Employed”.

All the information described below follows the NACE Rev. 2 convention, which is the standard statistical classification of economic activities in the European Community (Table 11) (EUROSTAT,

2008). In Portugal, the NACE Rev.2 classification has been adapted into the CAE classification by the “Sistema Estatístico Nacional” (INE, 2007).

Table 11 – Classification of economic activities according to the NACE Rev2.

CAE Rev.3 Code	Portuguese Designation	English Designation
A	Agricultura, produção animal, caça, floresta e pesca	Agriculture, farming of animals, hunting and forestry
B	Indústrias extractivas	Mining and quarrying
C	Indústrias transformadoras	Manufacturing
D	Electricidade, gás, vapor, água quente e fria e ar frio	Electricity, gas, steam, cold and hot water and cold air
E	Captação, tratamento e distribuição de água	Water collection, treatment and distribution - sewerage, waste management and remediation activities
F	Construção	Construction
G	Comércio por grosso e a retalho	Wholesale and retail trade - repair of motor vehicles and motorcycles
H	Transportes e armazenagem	Transportation and storage
I	Alojamento, restauração e similares	Accommodation and food service activities
J	Actividades de informação e de comunicação	Information and communication activities
L	Actividades imobiliárias	Real estate activities
M	Actividades de consultoria, científicas, técnicas e similares	Consultancy, scientific and technical activities
N	Actividades administrativas e dos serviços de apoio	Administrative and support service activities
P	Educação	Education
Q	Actividades de saúde humana e apoio social	Human health and social work activities
R	Actividades artísticas, de espectáculos, desportivas e recreativas	Arts, entertainment, sports and recreation activities
S	Outras actividades de serviços	Other service activities

3.2.1.1. A view on the Number of Persons Employed

In Portugal and in 2020, the average “Number of Persons Employed” per Big Enterprise was 706.8, per Medium Enterprise 88.2, Small Enterprises 18.3, and for Micro Enterprises 1.5. The most significant portion of people work on micro enterprises (Figure 22) and, since the average size of them is roughly 1.5, a great portion of the population is self-employed. The distribution of persons employed then seems balanced between small, medium, and big-sized companies. There was general decrease in the number persons employed until 2013, where unemployment peaked at 17.1% (data not shown). It then maintained a steady increase until 2020, when the Covid19 pandemic started.

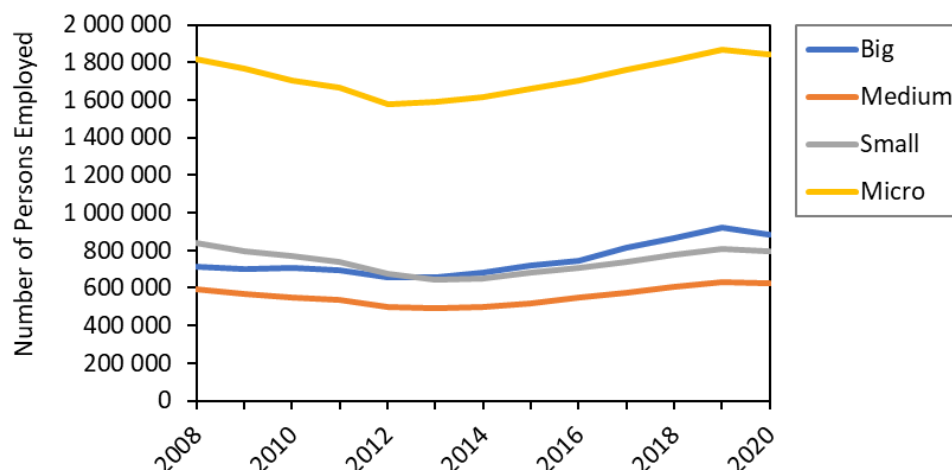


Figure 22 – Evolution in Portugal of the total number of persons employed by big, medium, small and micro enterprises.

Looking at persons employed on the various sectors, manufacturing and wholesale/retail, have consistently being the sectors employing most people (Table 12 and Figure 23).

Table 12 – Persons Employed in Portugal, per economic activity sector, on average during 2020.

CAE Code	CAE Designation	Number of Persons Employed
A	Agriculture, farming of animals, hunting and forestry	207 522
B	Mining and quarrying	9 639
C	Manufacturing	718 176
D	Electricity, gas, steam, cold and hot water and cold air	13 852
E	Water collection, treatment and distribution	36 296
F	Construction	362 320
G	Wholesale and retail trade	798 826
H	Transportation and storage	186 628
I	Accommodation and food service activities	365 895
J	Information and communication activities	130 889
L	Real estate activities	79 048
M	Consultancy, scientific and technical activities	285 841
N	Administrative and support service activities	487 197
P	Education	98 983
Q	Human health and social work activities	201 813
R	Arts, entertainment, sports and recreation activities	62 606
S	Other service activities	94 605

Consistent with the origin of the 2008 economic crisis, the construction sector has substantially decreased in respect to number of persons employed, never to fully recover since then (Figure 23). Agriculture and farming of animals seems to have had a steep increase during 2012 and 2013, and

maintained that plateau. Also worth noticing, the “Housing and Food Services” and “Administrative and Support Services” sectors have continuously grown since 2012 until 2019.

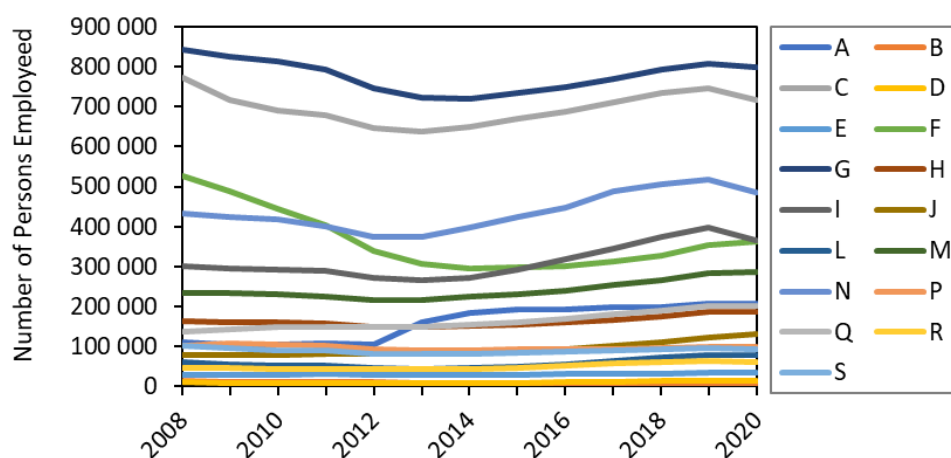


Figure 23 – Evolution in Portugal of the total number of persons employed in the different classes of economic activities. Please refer to Table 11 for a description of the NACE Rev2 codes indicated in the figure legend.

3.2.1.2. A view on the Number of Enterprises

In Portugal, there is a vast predominance of micro companies and roughly an order of magnitude difference in terms of the number of enterprises between each “adjacent” class (Number of enterprises in 2020: Big = 1 250; Medium = 7 062; Small = 43 351; Micro = 1 249 337). This relative proportion between the different categories of companies have been fairly constant during the past decade (Figure 24).

The net number of enterprises decreased between 2008 and 2013, and then during 2020. This trend was observed for enterprises of all sizes (Figure 25), and was naturally the result of a net negative difference between the number of enterprise births and deaths (Figure 26). One should also note that, between 2016 and 2019 both the birth and death rate of enterprises increased, which demonstrates a relatively higher level of turnaround/experimentation in the Portuguese business scene. The number of businesses ceasing activity in 2020 did not decrease as much enterprise births, which could reflect a positive effect of political decision making on ongoing businesses.

Within this analysis, one should mention that it does not make sense to drill-down businesses births and deaths according to their size since most enterprises are born small and only later on expand to a bigger dimension. To understand the turnaround of, *e.g.*, medium-sized companies one would have to access microdata and compare adjacent years to understand which companies started and ceased operating under that size category.

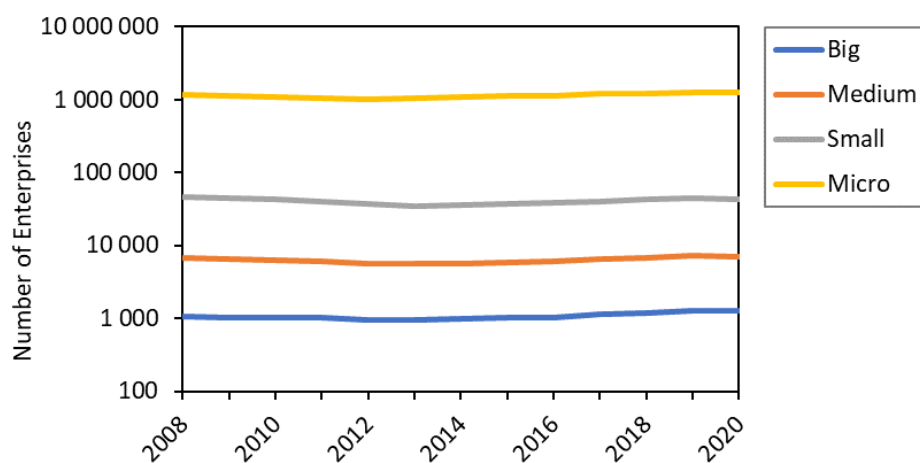


Figure 24 – Evolution in Portugal of the total number of big, medium, small and micro enterprises.

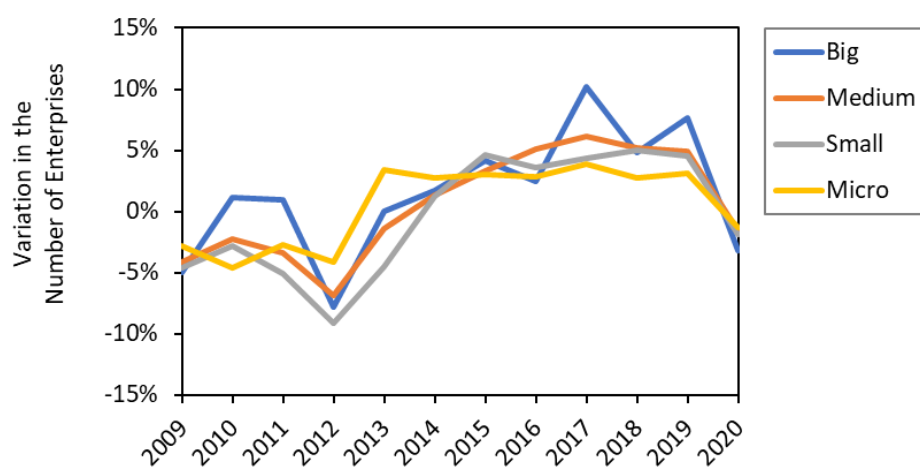


Figure 25 – Annual variation in Portugal of the total number of big, medium, small and micro enterprises.

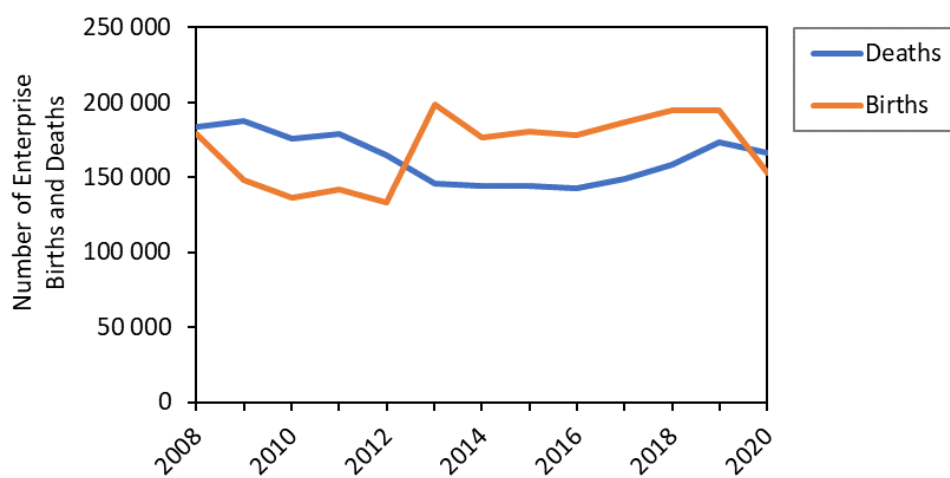


Figure 26 – Evolution in Portugal of the total number enterprise births and deaths.

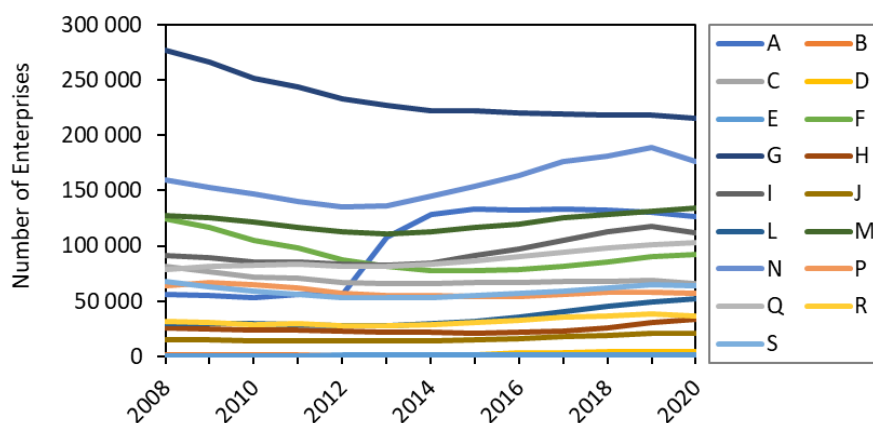


Figure 27 – Evolution in Portugal of the total number enterprises in each economic activity sector. Please refer to Table 11 for a description of the NACE Rev2 codes indicated in the figure legend.

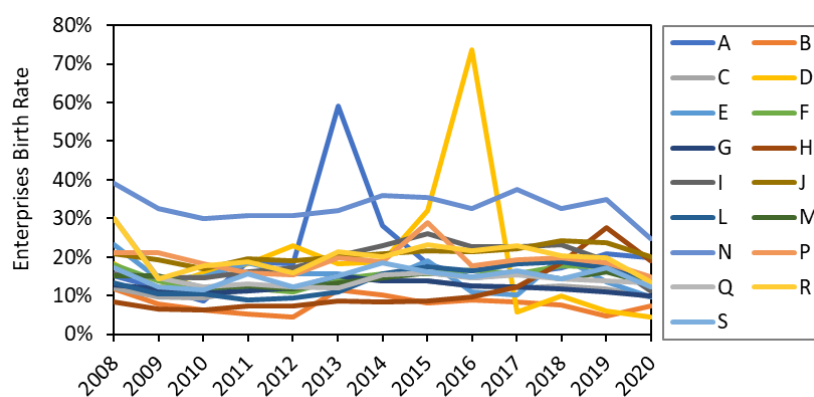


Figure 28 – Evolution in Portugal of enterprises birth rate, according to their economic activity sectors. Please refer to Table 11 for a description of the NACE Rev2 codes indicated in the figure legend.

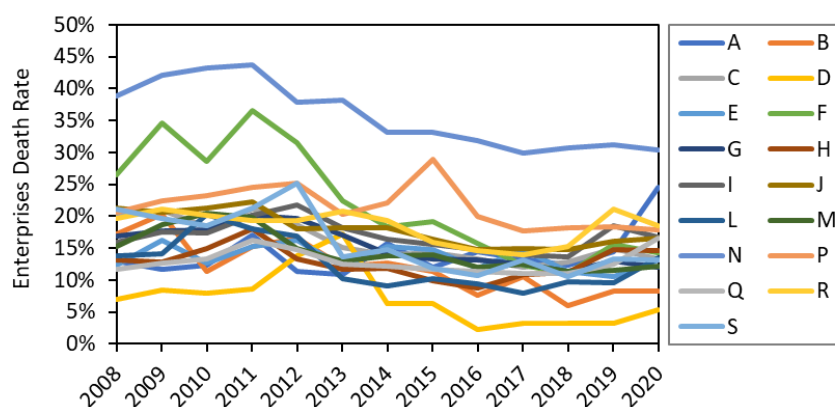


Figure 29 – Evolution in Portugal of enterprises death rate, according to their economic activity sectors. Please refer to Table 11 for a description of the NACE Rev2 codes indicated in the figure legend.

Similar to what is observed with the number of persons employed, wholesale/retail is the economic activity sector with most registered businesses (Figure 27). However, the number enterprises has continuously decrease, confirming the thesis that the sector is consolidating and bigger companies are, on average, replacing smaller ones.

The administrative and support service activities is typically the one with highest rate of enterprise births and deaths, although the number of new agriculture/animal farming businesses spiked in 2013 and new energy sector businesses in 2016 (Figure 28). Also, during 2008-2014 there was an above-average enterprise death rate in the construction sector (Figure 29), consistent with the decreasing number of persons employed in that sector during that period, as mentioned above.

3.2.1.3. Business Turnover

Looking at the economic scale of business, big companies dominate in terms of global business turnover (Figure 30), even though the number of big companies is much more minute than all others, as seen above. Although the number of businesses under each class of size varies greatly, the total business turnover of all micro enterprises is roughly equal to that of small enterprises and to that of medium companies, but each of them historically half of that of big companies (Figure 30).

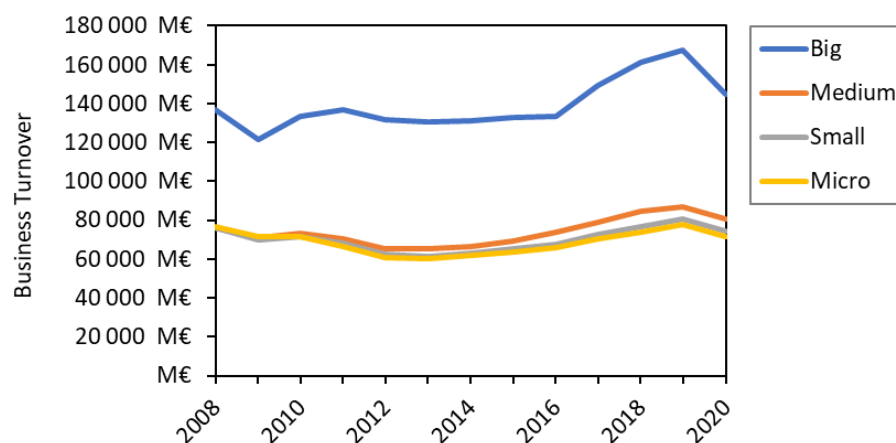


Figure 30 – Evolution in Portugal of the global turnover of big, medium, small and micro enterprises.

In respect to the sector of economic activities, wholesale/retail dominates in terms of total business turnover, followed by manufacturing (Figure 31). All other sectors are dwarfed by these two. Construction also had, back in 2008, a much higher participation in the economy but that has substantially decreased between 2008-2014, never to quite recover until now.

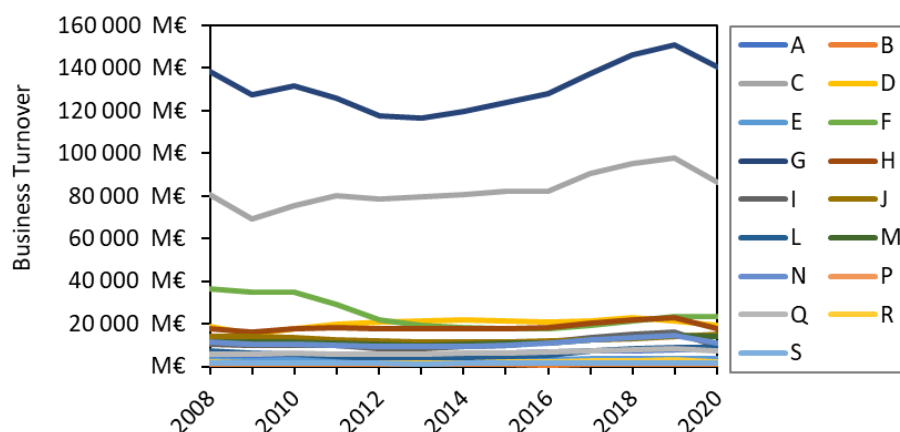


Figure 31 – Evolution in Portugal of the global turnover of enterprises in the different classes of economic activities. Please refer to Table 11 for a description of the NACE Rev2 codes indicated in the figure legend.

3.2.1.4. Value Added at Factor Cost

Although business turnover is a good measure of the magnitude of transactions between companies and their customers, it fails to describe the economic gain of those transactions. That is best observed via the “Value Added” profitability measure. Typically, “Value Added at Factor Cost” is used, as opposed to “Value Added at Market Prices”, since it discounts the effect of taxes and subsidies and serves as a benchmark to the economic merit of the enterprise. Also worth mentioning, the Gross Domestic Product (GDP) of each country is technically the sum of the “Value Added” of all companies within each country, discounting the effect of imports and exports.

In terms of the relationship between the size of companies and their value added, the observation that was made for business turnover remains valid. In other words, the total value added of big companies had been historically twice as big as that of all other three size classes of enterprises (which are roughly equal among the three) (Figure 32).

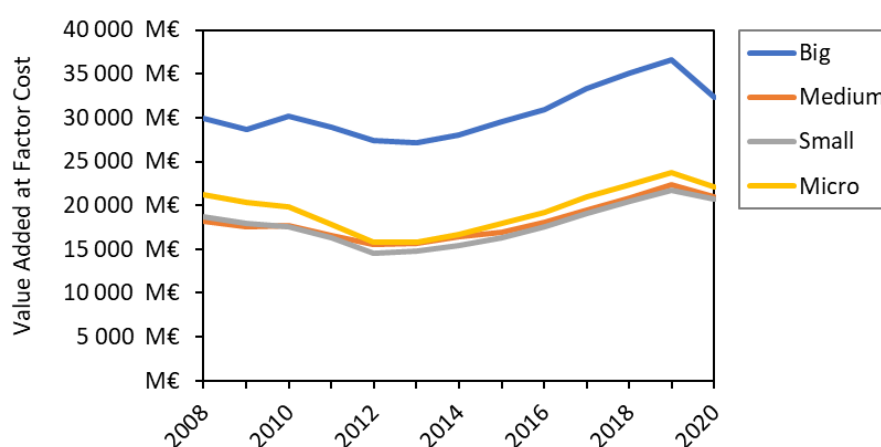


Figure 32 – Evolution in Portugal of the global Value Added (at Factor Cost) of big, medium, small and micro enterprises.

On the other hand, when analysing the value added on average by business of each sector of economic activity, one observes that manufacturing becomes the most contributing class (Figure 33). Wholesale/retail, although quite close to manufacturing, seems to operate at a much lower margin, since the “Value Added” / “Turnover” ratio is quite lower than the average (data not shown). The contribution of the construction sector decreased during 2008-2014 but seems to have since partially recovered and, by 2020, is already again the third sector registering the highest global value added.

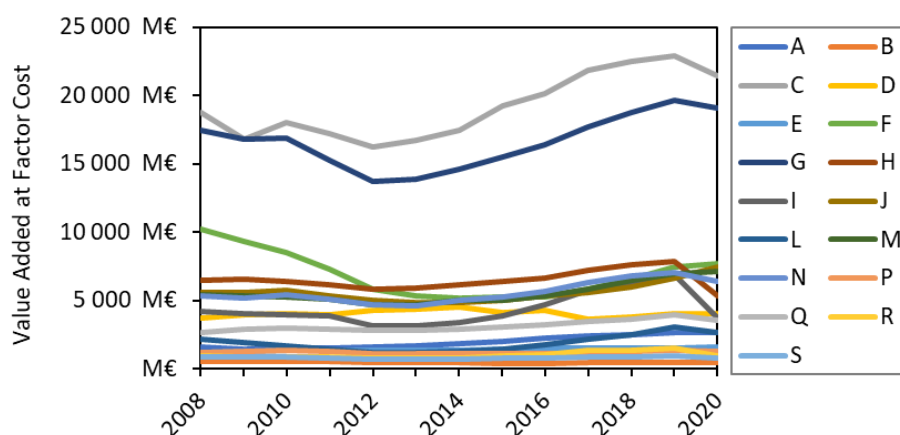


Figure 33 – Evolution in Portugal of the global Value Added (at Factor Cost) of enterprises in the different classes of economic activities. Please refer to Table 11 for a description of the NACE Rev2 codes indicated in the figure legend.

3.2.1.5. Apparent Labour Productivity

“Apparent Labour Productivity” is the reference metric that is used to assess the economic gain of each enterprise, normalized by the magnitude of human effort invested in its activities. It is defined as the ratio between “Value Added at Factor Cost” and “Number of Persons Employed”. Unexpectedly, economies of scale operate in a way such that the labour productivity increases, on average, with the size of the company (Figure 34). Also, one expects that successful companies are characterized (almost by definition) both by an above-average “Value Added” and a tendency to expand business, which also helps explain this labour productivity bias of bigger companies (akin to the “natural selection”, but applied to independent businesses).

Looking at the Portuguese economy, and comparing labour productivity of the various sectors of economic activities, it is clear that there is a tremendous discrepancy between the energy sector and all others (Figure 33). It is also curious to note that the energy sector seemed to follow a counter-cyclical dynamic, increasing relevant economic metrics (turnover, value added, labour productivity) when most other sector were experiencing a contraction (2008-2014), and then greatly falling between 2014 and 2017.

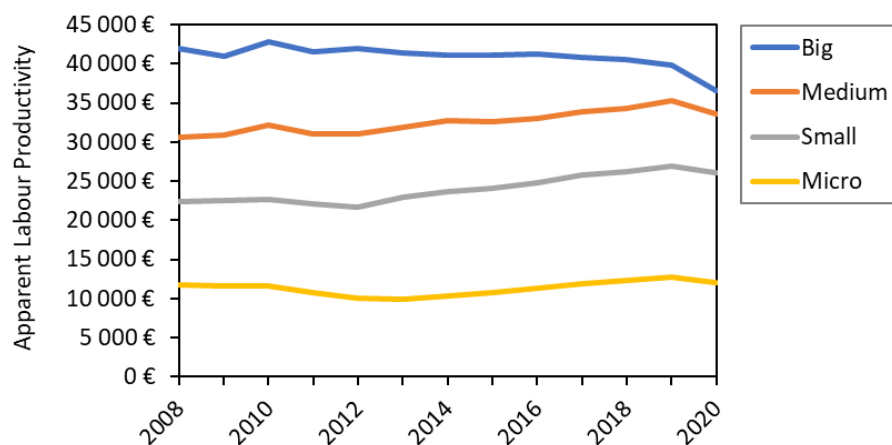


Figure 34 – Evolution in Portugal of the Apparent Labour Productivity of big, medium, small and micro enterprises.

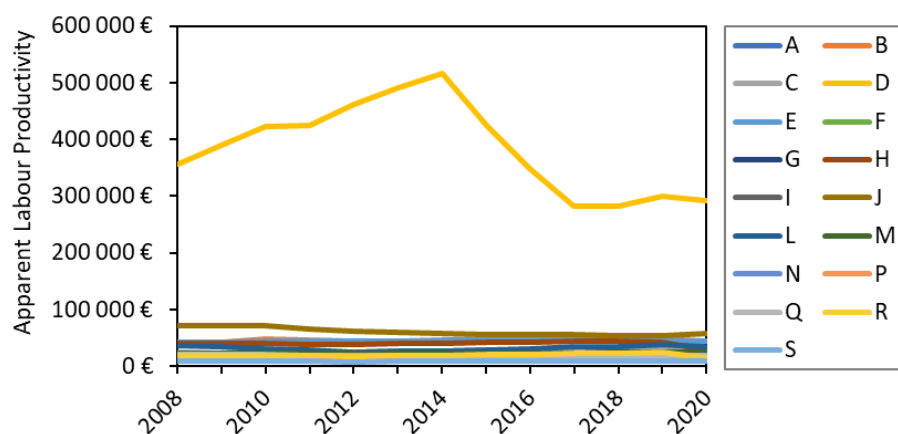


Figure 35 – Evolution in Portugal of the Apparent Labour Productivity of enterprises in the different classes of economic activities. Please refer to Table 11 for a description of the NACE Rev2 codes indicated in the figure legend.

3.2.2. Benchmarking Structural Business Statistics with other European Countries

In order to shed light into unexpected discrepancies between the different sizes of enterprises within each sector, one needs to drill-down the analysis of the previous section simultaneously in terms of the binomial pairs of sector-size. Naturally, differences will always arise comparing equal size companies of varying sectors, or equal sectors and varying sizes. That is the nature of the influence of both size and sector.

Therefore, we set on to perform such analysis using information from other European countries as benchmark. As described above, in the “Materials and Methods” section, such information was obtained via Eurostat’s SBS database. This cross-analysis was performed using 2019 as the reference year, as this was the latest timeframe for which most information was made available. We opted to use all current 27 EU member countries, as well as partners, candidate or potentially candidate countries for which information was made available in such database. As such, a total of 33 countries was considered in the benchmarks presented below. However, as a downside of the Eurostat’s SBS database, comparing it with INE’s SCIE, is that it only contains data from “B” to “N” classes of economic activities, and only up to 2019. Also, one should note that the SBS does not include an IAPMEI-like size classification of enterprises, but offers an enterprise-size classification dimension that is based purely on the number of persons employed.

To detect abnormal patterns of Portuguese companies, when comparing them to the European homologues in the different dimensions, several approaches were attempted. Ultimately, we opted to use Python’s Seaborn Clustermap as a means of both representing (in a heatmap-like way) and classifying the different sample groups (via a dendrogram) in terms of their similarity. PCA and k-means approaches were equally tested (data not shown), but failed to provide meaningful and easily explainable outputs. Our analysis is that numerous factors account for country-specific differences (each country tells its own story) so it tends to be hard to find clusters around which countries can be easily classified, or some few variables/principal components that explain most of differences among them. To compensate for the exponentially increasing complexity of drilling-down both sector and enterprise size on multiple countries/regions, EU and Germany were singled out to offer a detailed benchmark at that finest level of granularity.

3.2.2.1. A view on the Number of Persons Employed

While analysing the number of persons employed, it is worth mentioning again that, compared to a “simpler” number of employees metric, it attempts to exhaustively account for all the effort made by human labour into each enterprise. However, whilst analysing a single country one expects that the set of assumptions (both in terms of work labour legislation and accounting) remain roughly stable in time (as occurs with the data presented in the previous section), the comparison of different countries may be affected by country-specific idiosyncrasies (“recibos verdes” and other types of outsourced or temporary employment contracts). Another caveat relative to the data presented below is that not all sectors of economic activities are considered (*e.g.* agriculture), so only an incomplete picture is possible to analyse.

Having noted that, the number of persons employed in the various European countries is consistent with their global population, and presents Germany in the first place, with France, Italy, Spain and Poland following, and Portugal occupying the 9th position in this metric (Figure 36).

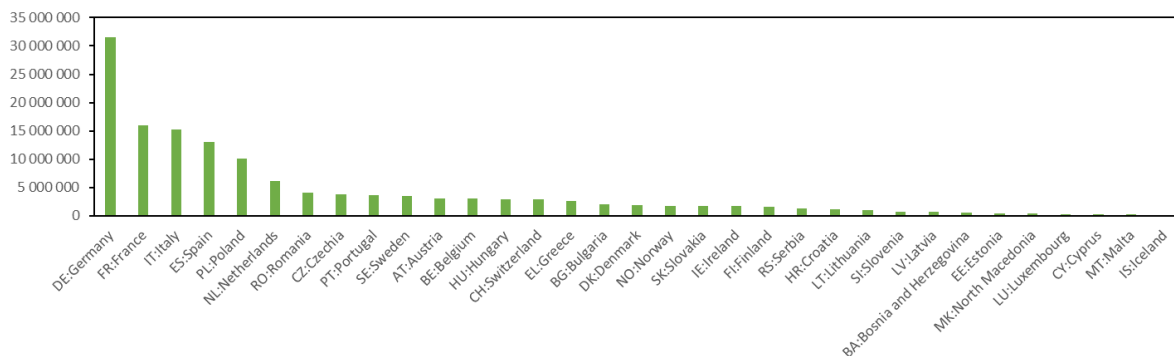


Figure 36 – Total number of persons employed throughout European countries (Year 2019).

In terms of the distribution of the number of persons employed in different sectors, Portugal does not appear to show a significantly different reality than many countries, with both manufacturing and wholesale/retail account each for more than 20% of the workforce (Figure 37). The most notable highlights is the European-lowest workforce dedicated to Information and communication activities and to Transportation and storage. The former is a clear indication of low advancement of technologies within the country, whereas the later likely the result of the peripheric localization of the country (where, furthermore, most population is highly concentrated in a few regions and mostly along a narrow coast line).

In respect to the distribution of labour according to the size of companies, one observes that Portugal has one of the highest number of persons employed in micro companies, and one of the lowest number of persons employed in big ones (Figure 38). For example, Germany has percentually the double of people working for big enterprises, and half of those working on micro sized ones. This general bias is roughly conserved throughout all sectors (Figure 40).

When drilling-down simultaneously sector and enterprise size, it is strikingly evident the disproportionate big participation of the “Administrative and support service activities” sector within the workforce of big companies (Figure 39). This constitutes a grave difference between the countries, and a disabler of a linear comparison of the true labour productivity, since this sector includes “Temporary employment agency activities” and “Activities of employment placement agencies”.

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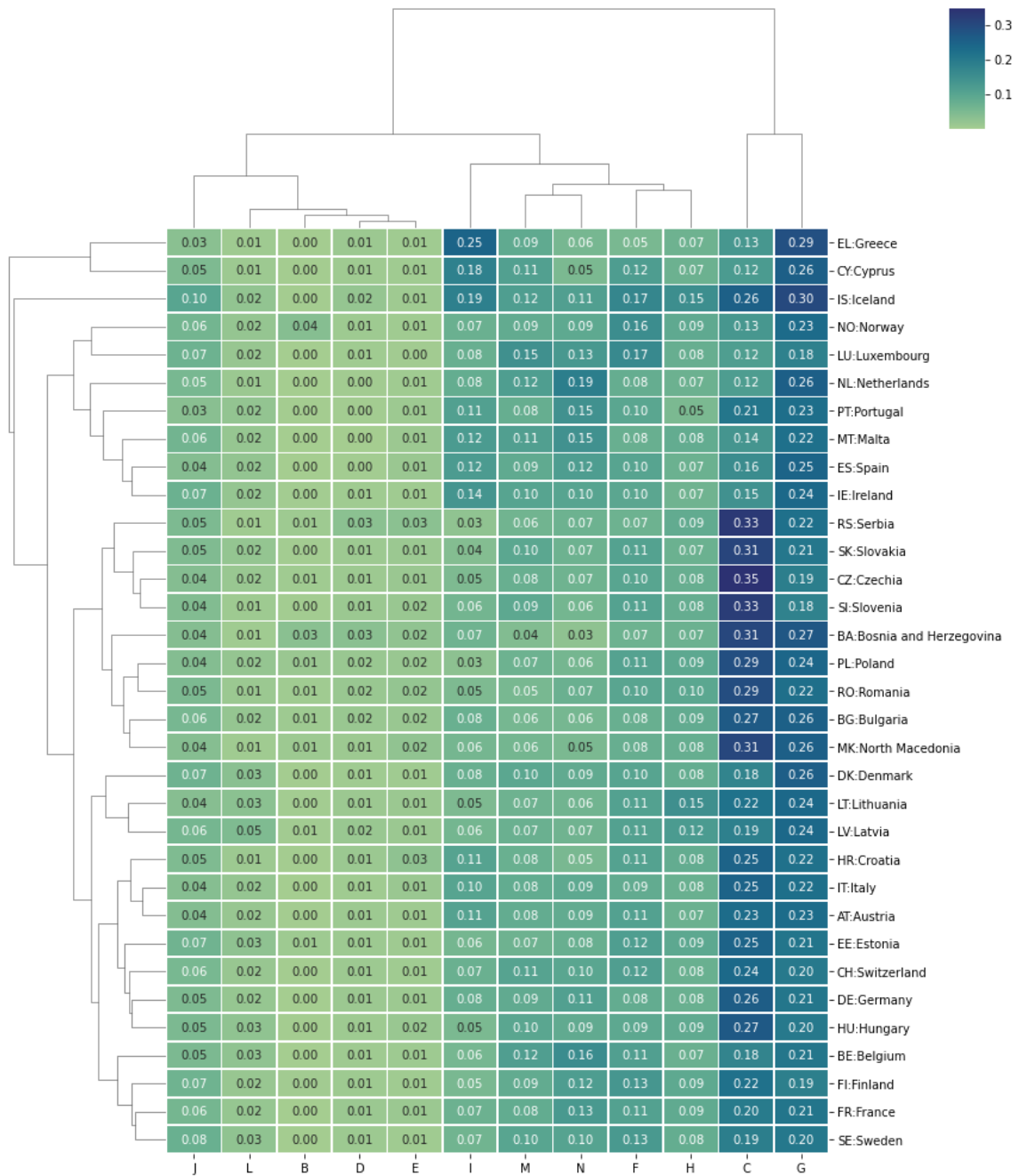


Figure 37 – Contribution of each sector to the total number of persons employed throughout European countries.

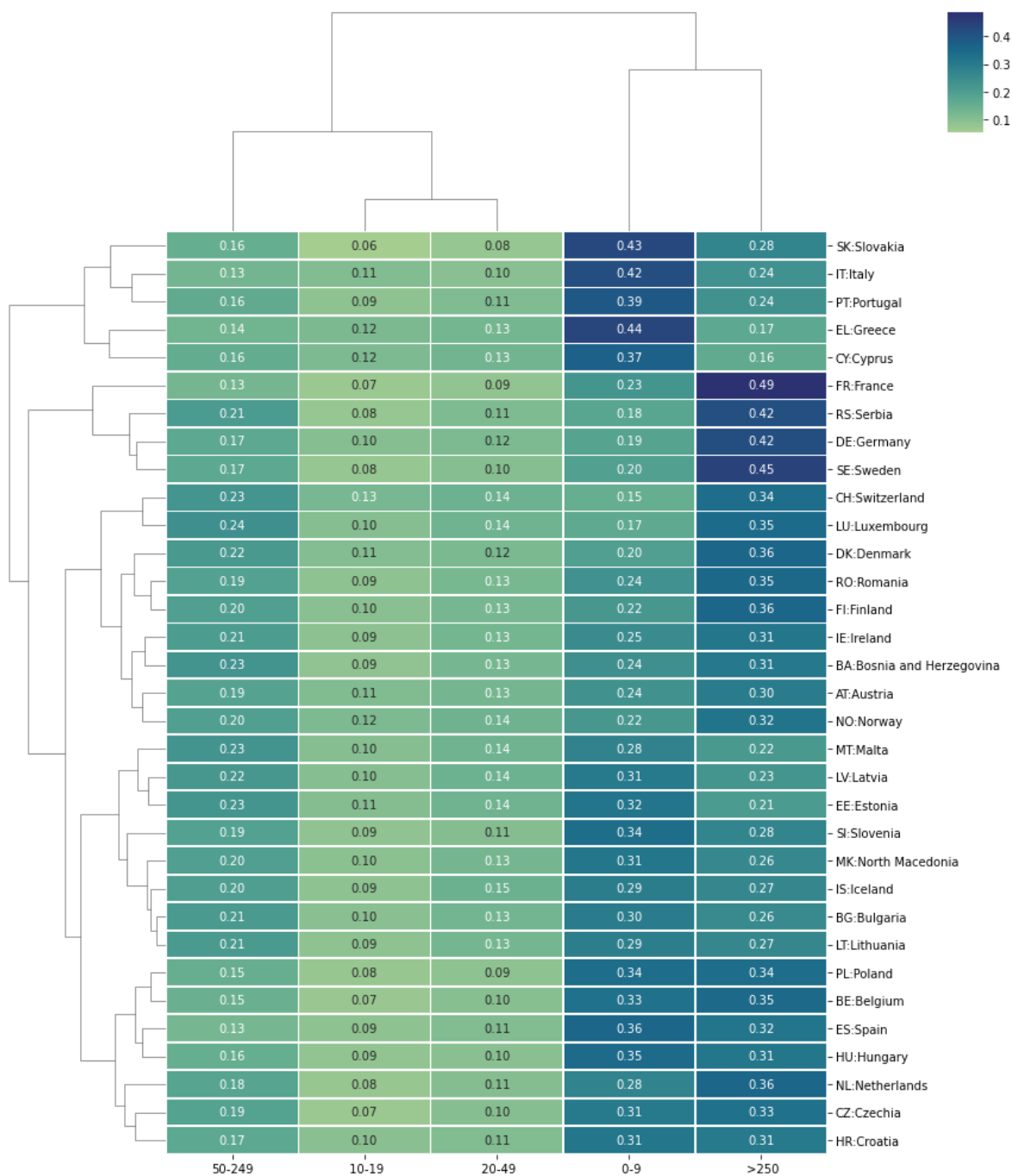


Figure 38 – Contribution of different enterprise sizes to the total number of persons employed throughout European countries.

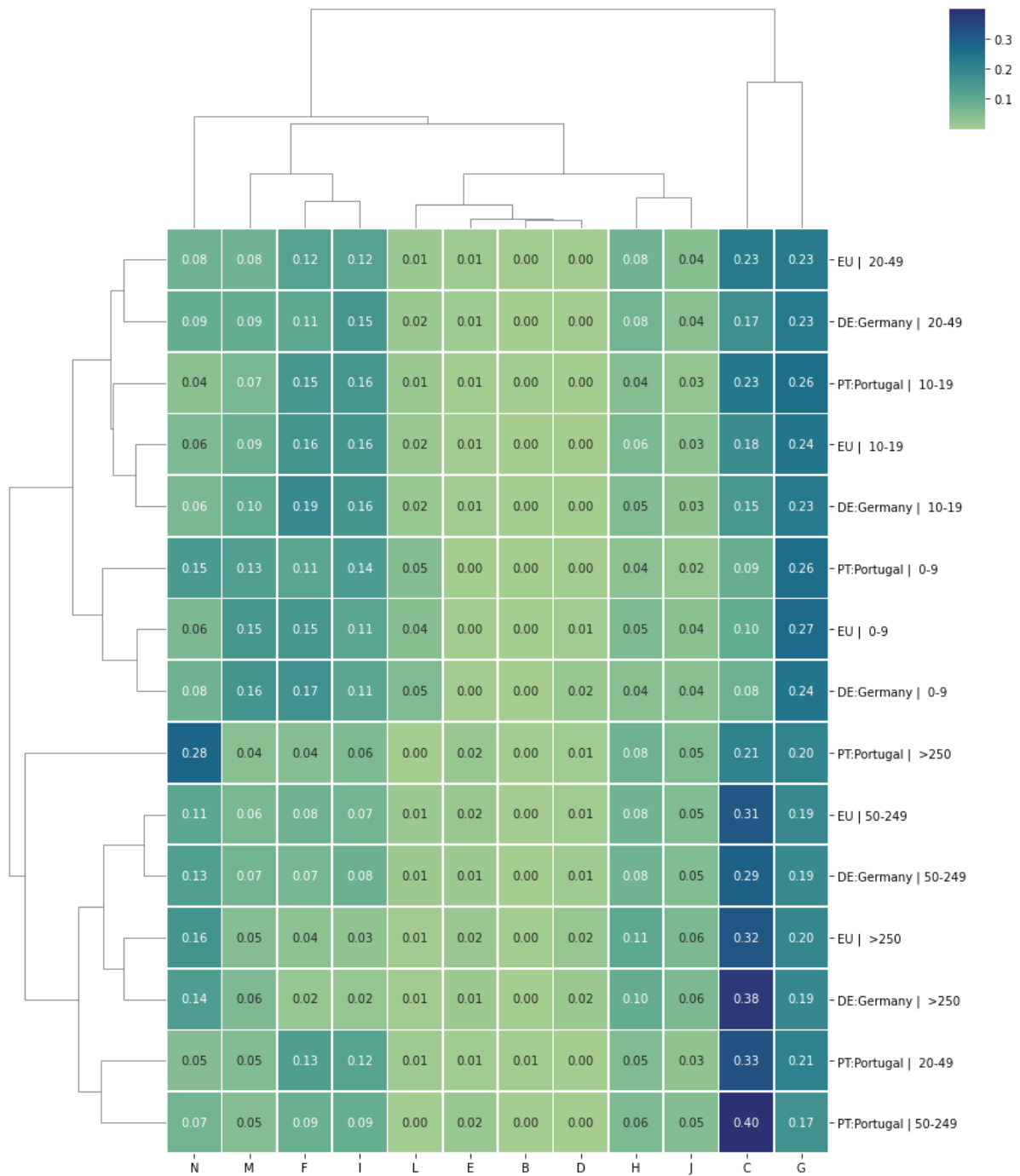


Figure 39 – Relative weight of business sectors, measured in number of persons employed, for each enterprise size in Portugal, Germany and the European Union.

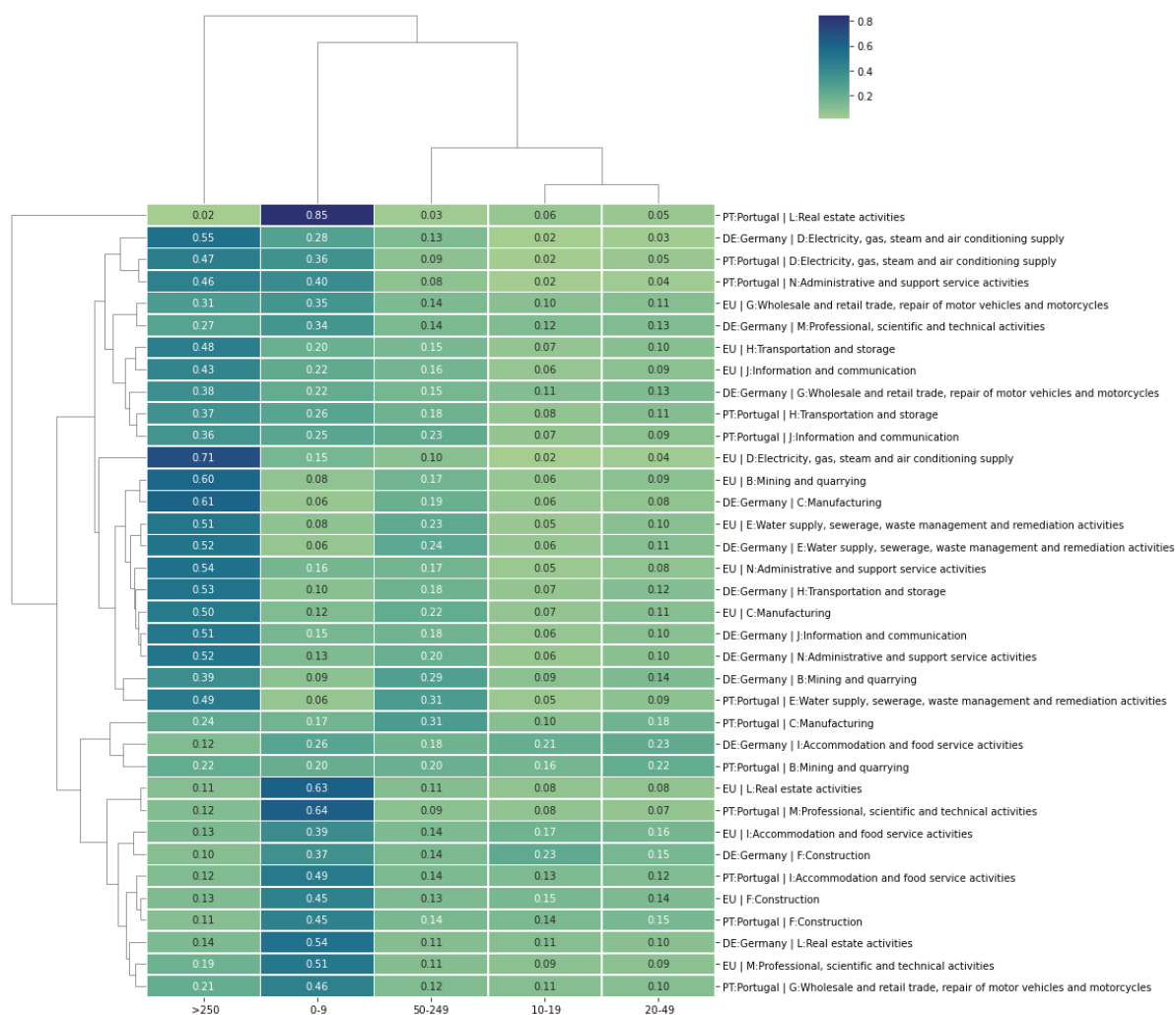


Figure 40 – Relative weight of each enterprise size, measured in number of persons employed, for each business sector in Portugal, Germany and the European Union.

3.2.2.2. A view on the Number of Enterprises

Looking at the absolute number of enterprises per country, Italy leads with more than 3.5 million registered enterprises in the B-N sectors, and Portugal appears quite on top, on the 8th place, with approximately 1 million enterprises (Figure 41). Naturally, micro sized companies are the ones that contribute the most to the total in every country (Figure 43), typically accounting for more than 90%.

When analysing these values in terms of their distribution along the various sectors, one again verifies the positive bias towards the overrepresentation of “Administrative and support service activities” companies in the Portuguese economic fabric (20% in Portugal versus a typical 6-8% of most countries) (Figure 42). This is partially due to an overrepresentation of micro sized companies, which are the vast majority, operating in this sector (Figure 44).

Portuguese companies with 20-49 persons employed are more likely to operate in the manufacturing sector than those from Germany or the EU on average (32% versus 16% and 21% respectively) (Figure 44), whereas in Germany and in the EU on average this sector is predominantly more populated by

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bigger companies. Overall, and on average for all sectors of economic activities, in Germany and in the EU, the relative weight of micro companies is lower than in Portugal (Figure 45).

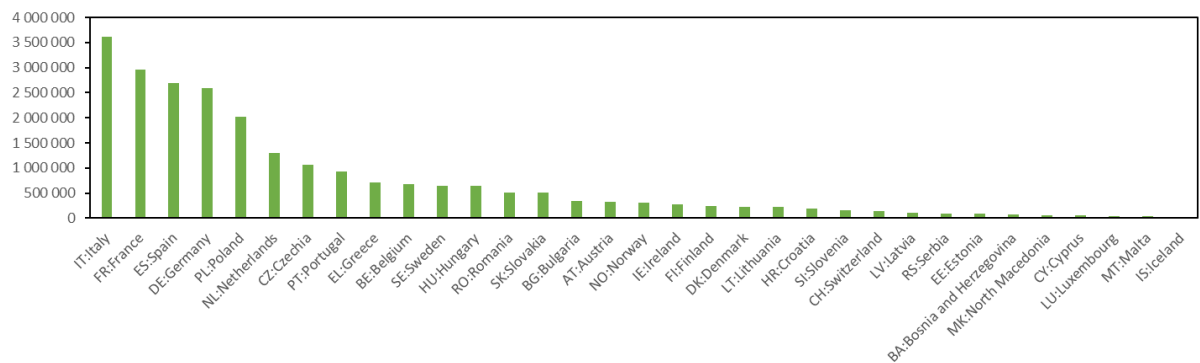


Figure 41 – Total number of enterprises throughout European countries.

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Figure 42 – Contribution of each sector to the total number of enterprises throughout European countries.

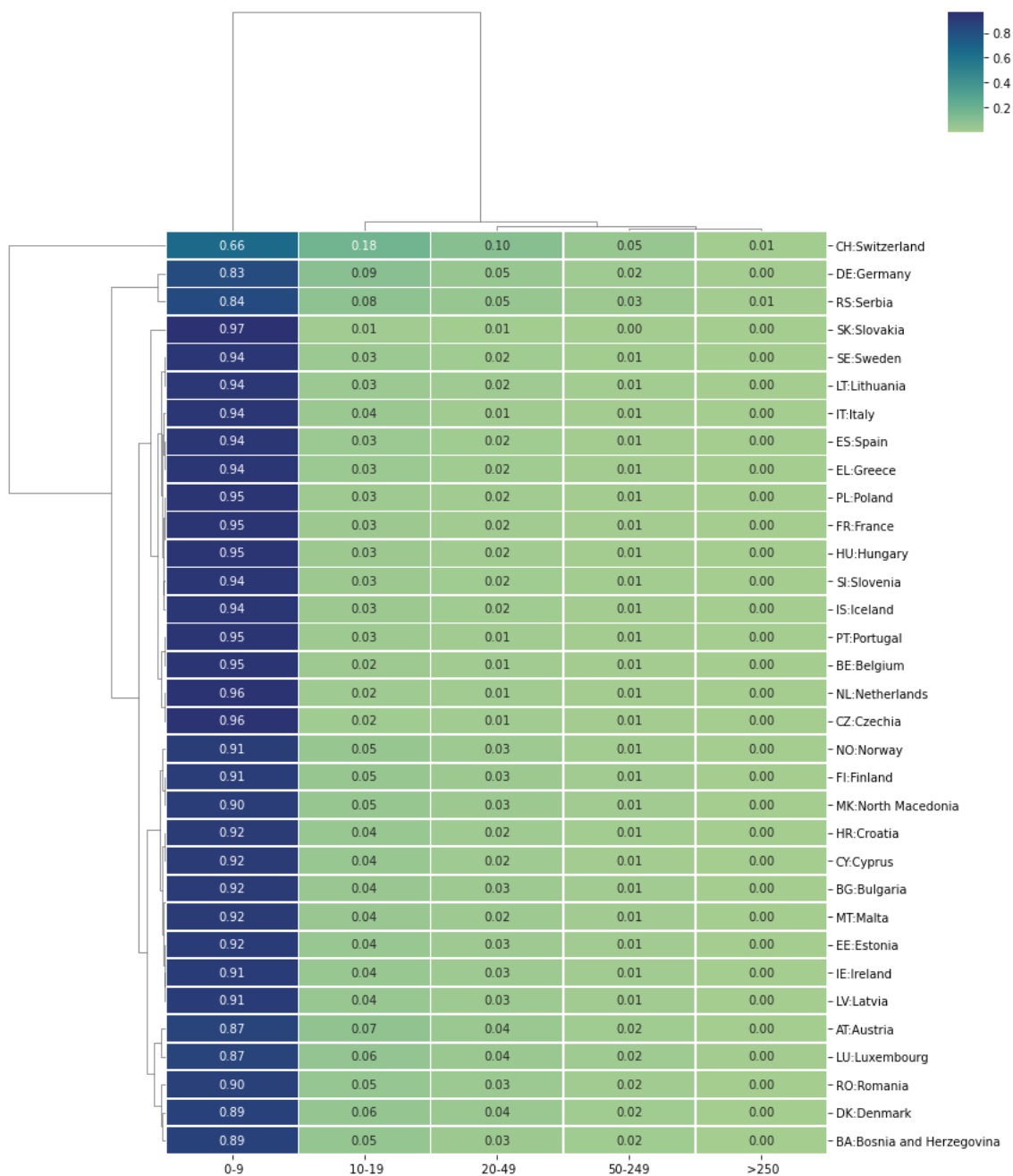


Figure 43 – Contribution of different enterprise sizes to the total number of enterprises throughout European countries.

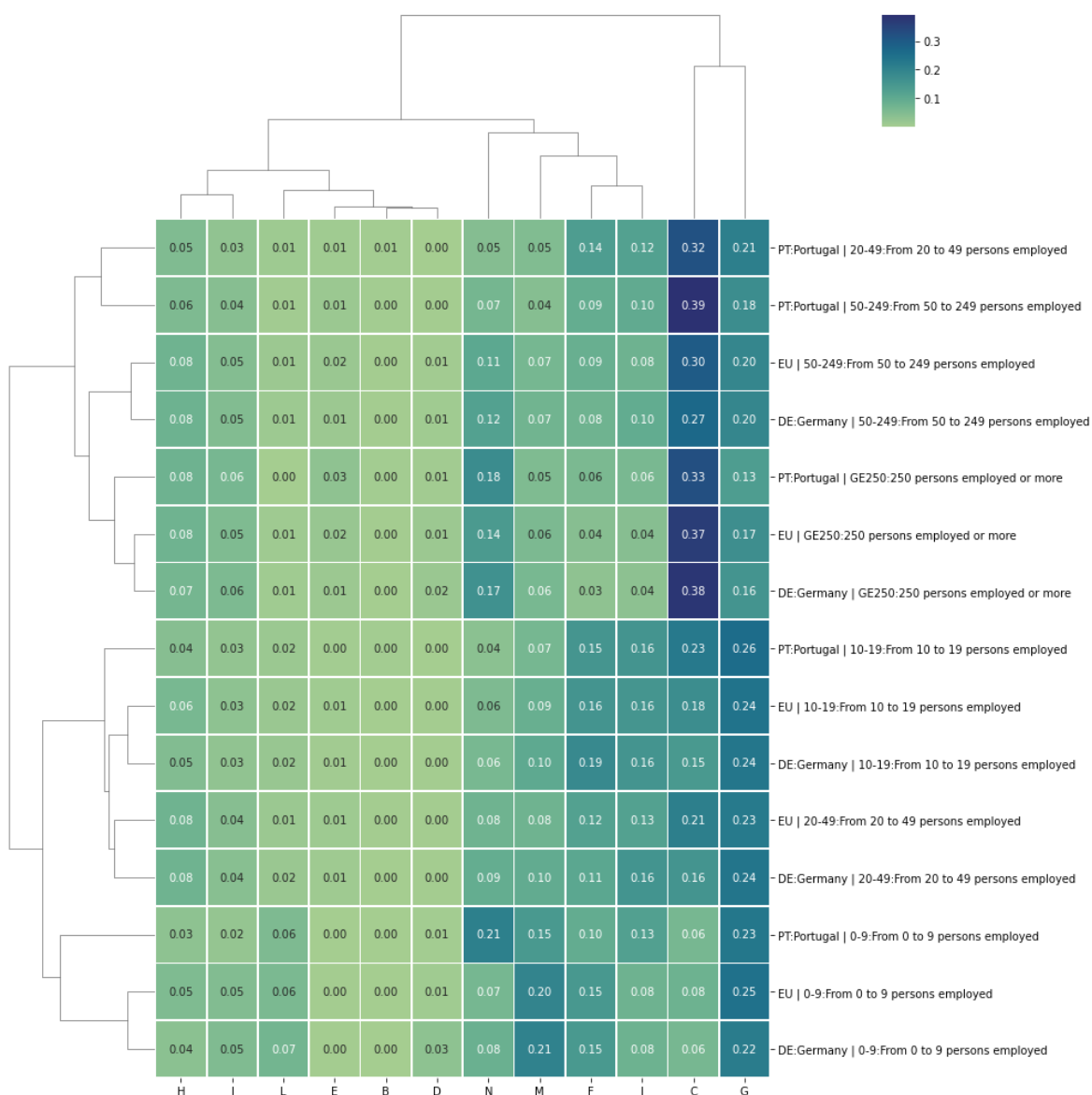


Figure 44 – Relative weight of business sectors, measured in number of enterprises, for each enterprise size in Portugal, Germany and the European Union.

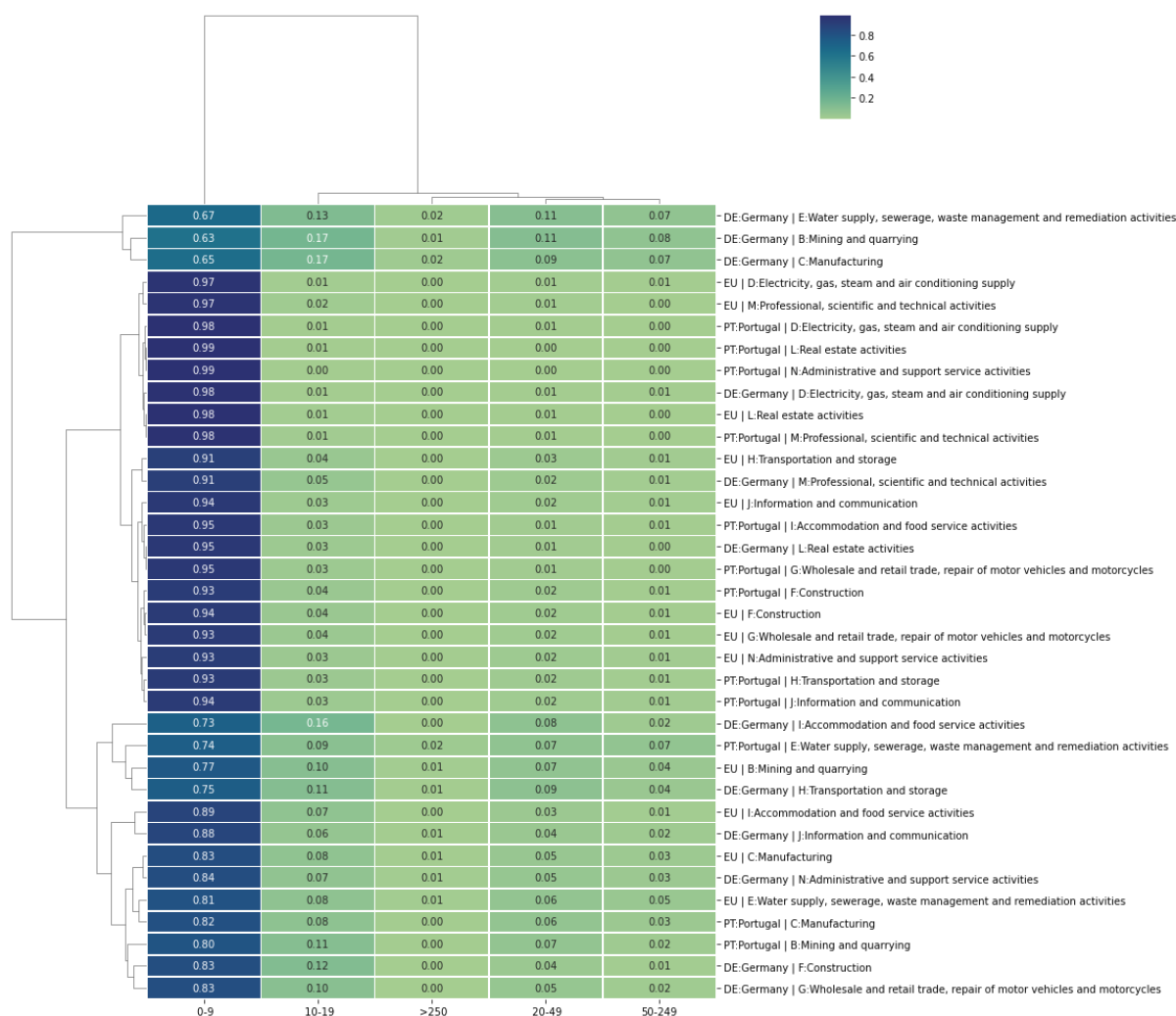


Figure 45 – Relative weight of each enterprise size, measured in number of enterprises, for each business sector in Portugal, Germany and the European Union.

3.2.2.3. Turnover or Gross Premiums Written

Germany is the country whose enterprises (sectors “B” to “N”) globally produce the highest total business turnover, more than twice than France and Italy, that occupy the second and third place in that ranking (Figure 46). Portugal is the ninth highest country in Europe in this list.

Portugal demonstrates a similar distribution of business turnover among the different sectors like most countries, and clusters close to Spain and France (Figure 47). The biggest bias on the distribution of enterprises across the various sectors is found for companies with 20 to 49 persons employed, where in Portugal there is a higher fraction of business in manufacturing (Figure 49).

However, in Portugal the contribution of big companies towards the total business turnover is much less significant than in most countries, being approximately half of that found in Germany or France (Figure 48). This general trend of relatively greater contribution of smaller businesses is valid across all sectors (Figure 50). Another striking observation is that, unlike what can be found in Germany and in

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the EU on average, in Portugal in no business sector the contribution is greater than 60% (“Information and Communication” is the sector where big companies contribute most to the total business turnover, with a participation of 56%)

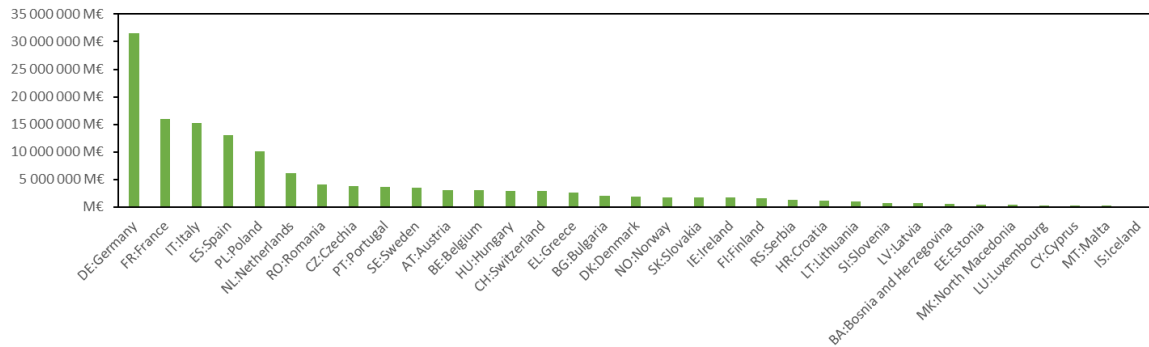


Figure 46 – Global business turnover throughout European countries.

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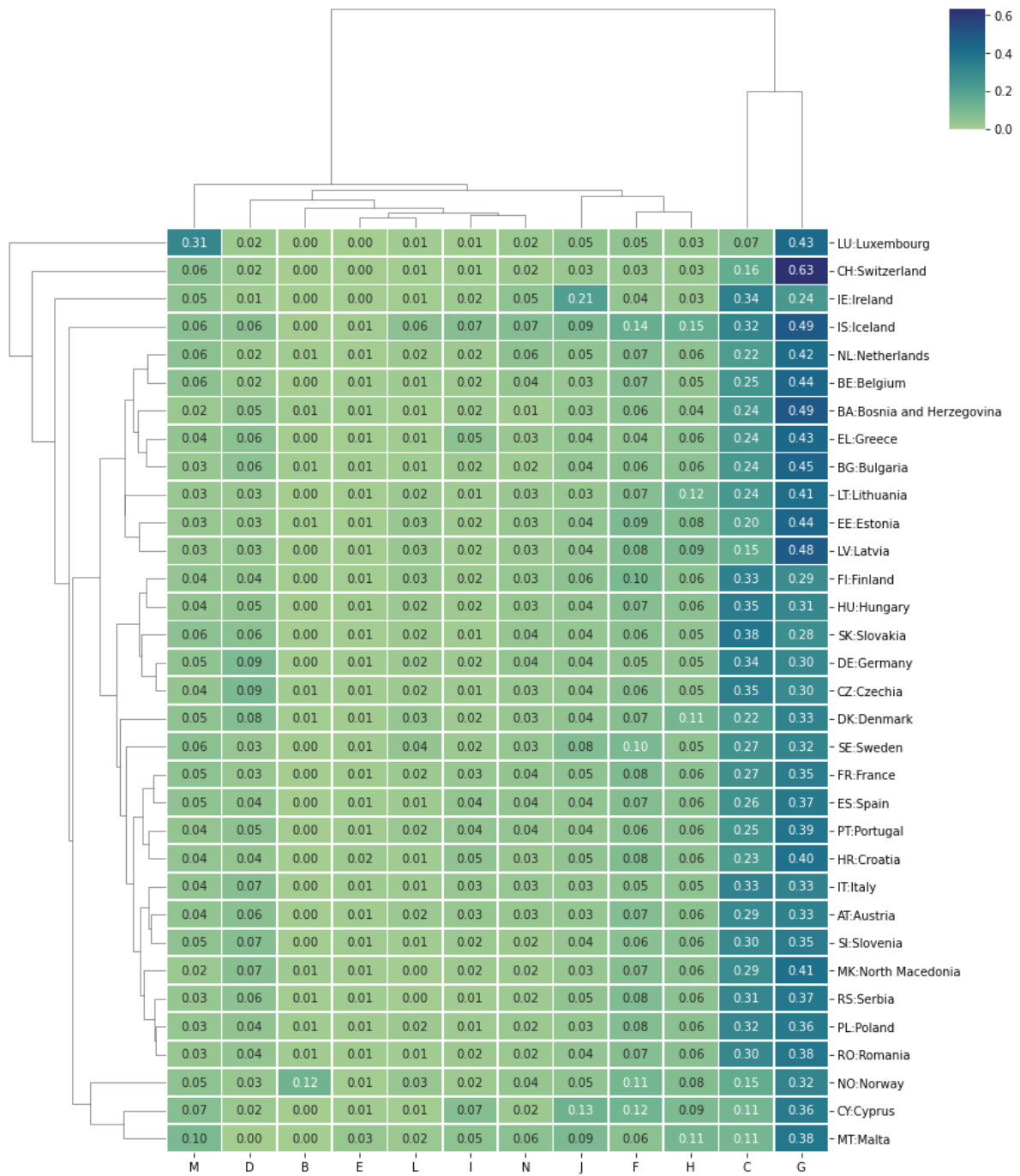


Figure 47 – Contribution of each sector to the total business turnover throughput European countries.

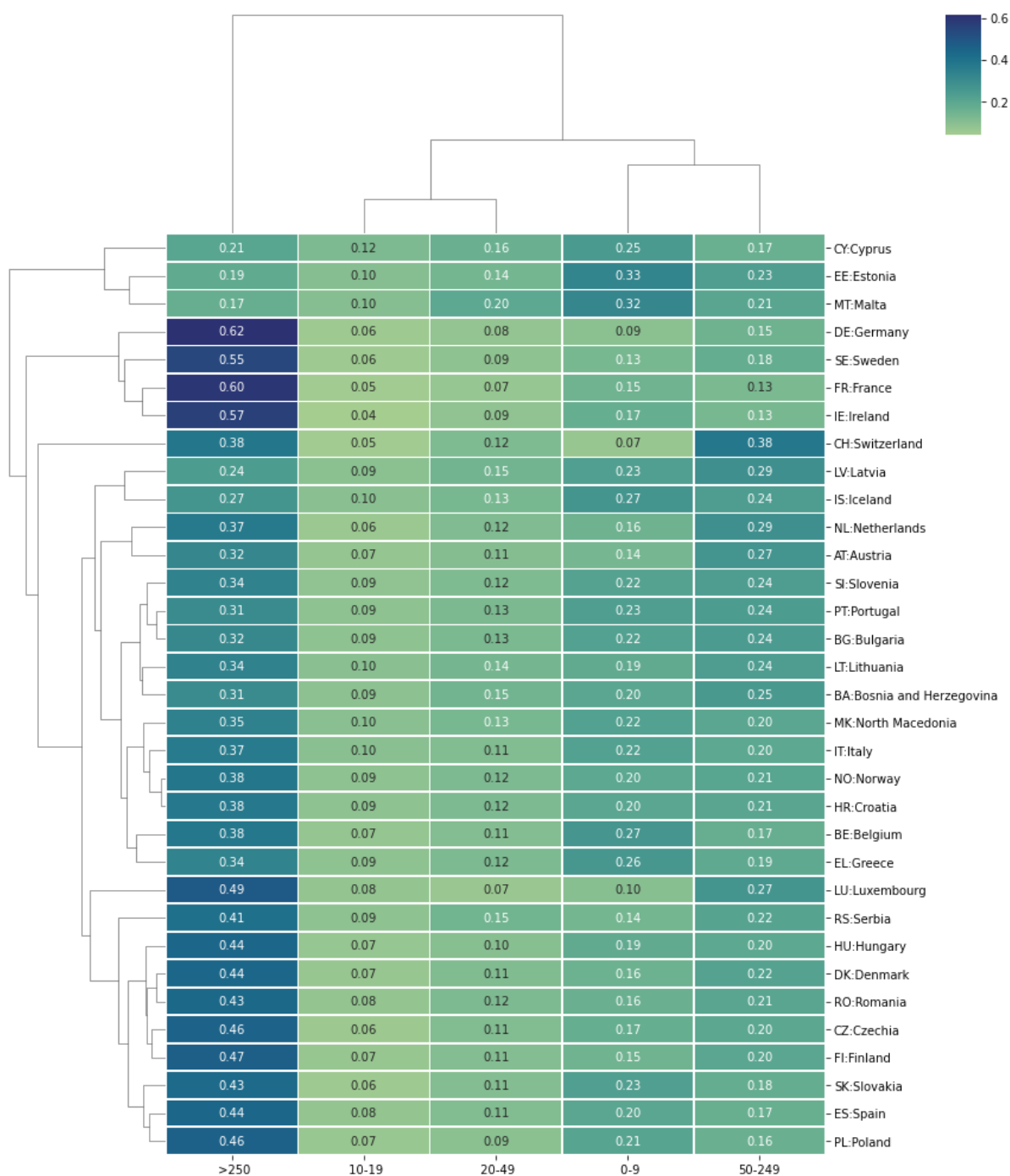


Figure 48 – Contribution of different enterprise sizes to the total business turnover throughout European countries.

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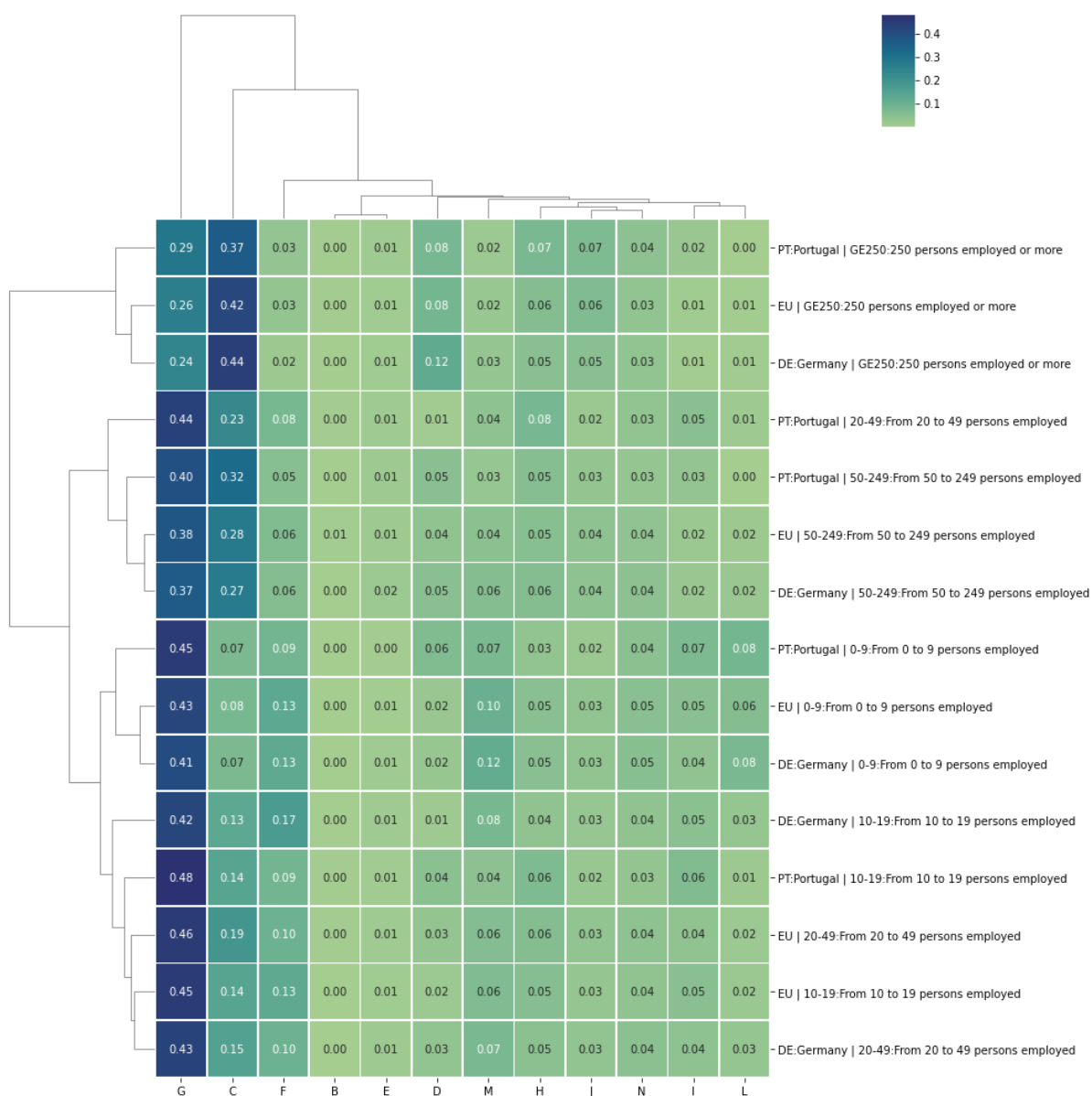


Figure 49 – Relative weight of business sectors, measured in business turnover, for each enterprise size in Portugal, Germany and the European Union.

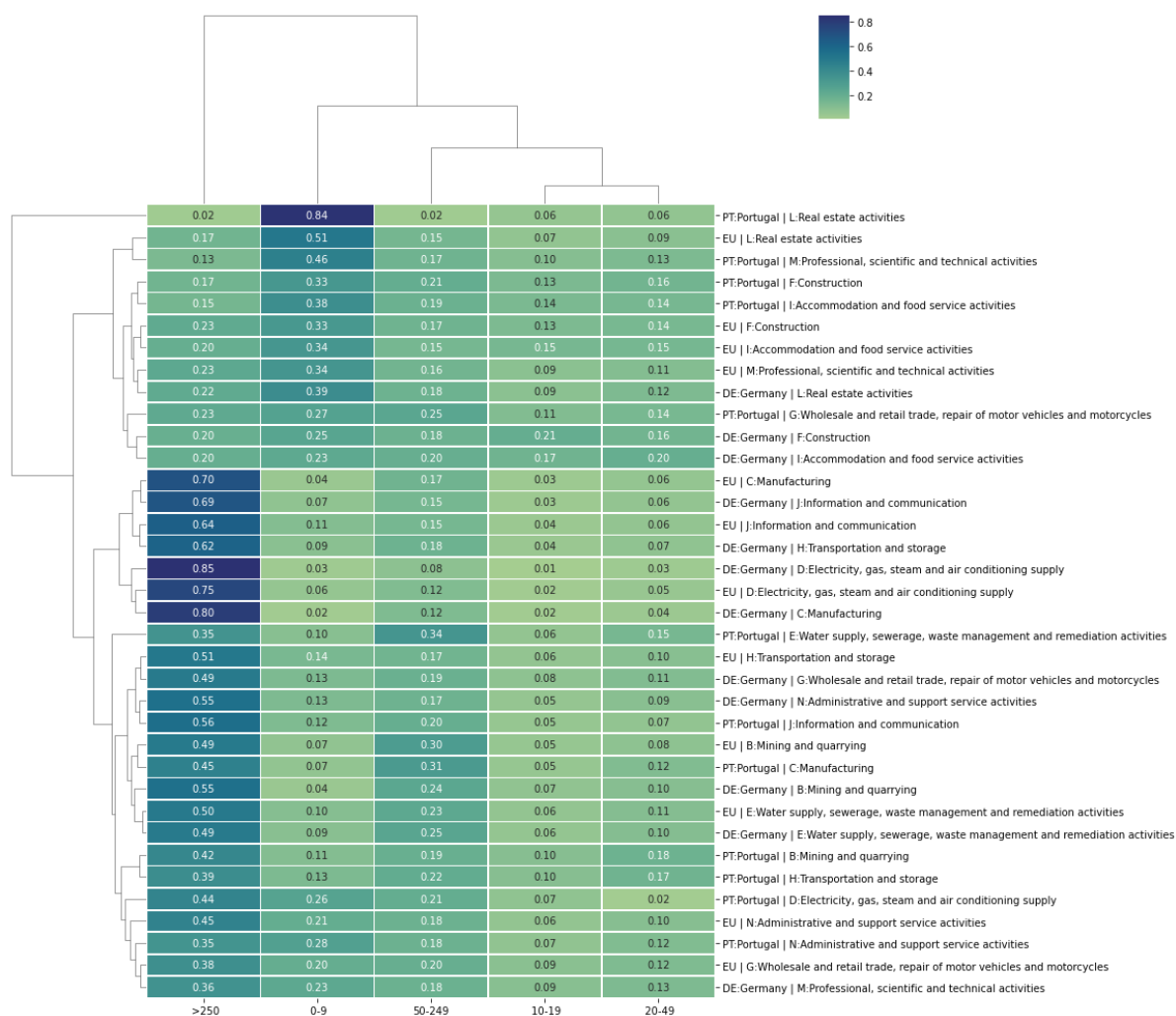


Figure 50 – Relative weight of each enterprise size, measured in business turnover, for each business sector in Portugal, Germany and the European Union.

3.2.2.4. Value Added at Factor Cost

Using “Value Added” as a measure of profitability of businesses, one unfortunately verifies that Portugal falls along the ranking of European countries, and occupies a mere 16th position (Figure 51). The fact that Portugal “loses” so many positions, when compared to total business turnover, evidently translates to a poor “Value Added” per “Turnover” ratio.

The contribution to the total “Value Added” by each sector is not particularly different in Portugal, when compared to other countries, and is again quite like those found in France and Spain (Figure 52). This is quite a significant observation since it goes to show that the deficit of value added by business to the Portuguese economy is not a problem of the mix/relative importance of particular sector, but rather a global issue affecting all sectors across the board. In Portugal, as in most countries, manufacturing and wholesale/retail are the sectors contributing the most to the total economy (Figure

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52). The only significant sector-business size dimension where a “Value added” gap seems to exist is the relative lower contribution of big companies in the manufacturing sector (Figure 54 and Figure 55).

Part of this business efficiency can be credited to a relatively lower weight of big companies (Figure 53), that tend to use economies of scale in the benefit of their operation. However, this bias is not extremely significant as it is shared among many other countries, and the fact that Portugal clusters together with *e.g.* the Netherlands suggests that this business efficiency problem is valid across the board of all businesses of all dimensions and sectors.

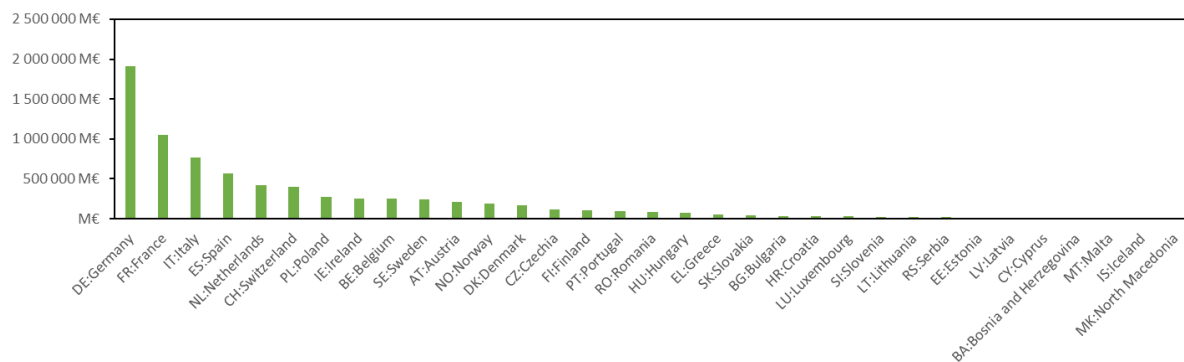


Figure 51 – Global value added by businesses throughout European countries.

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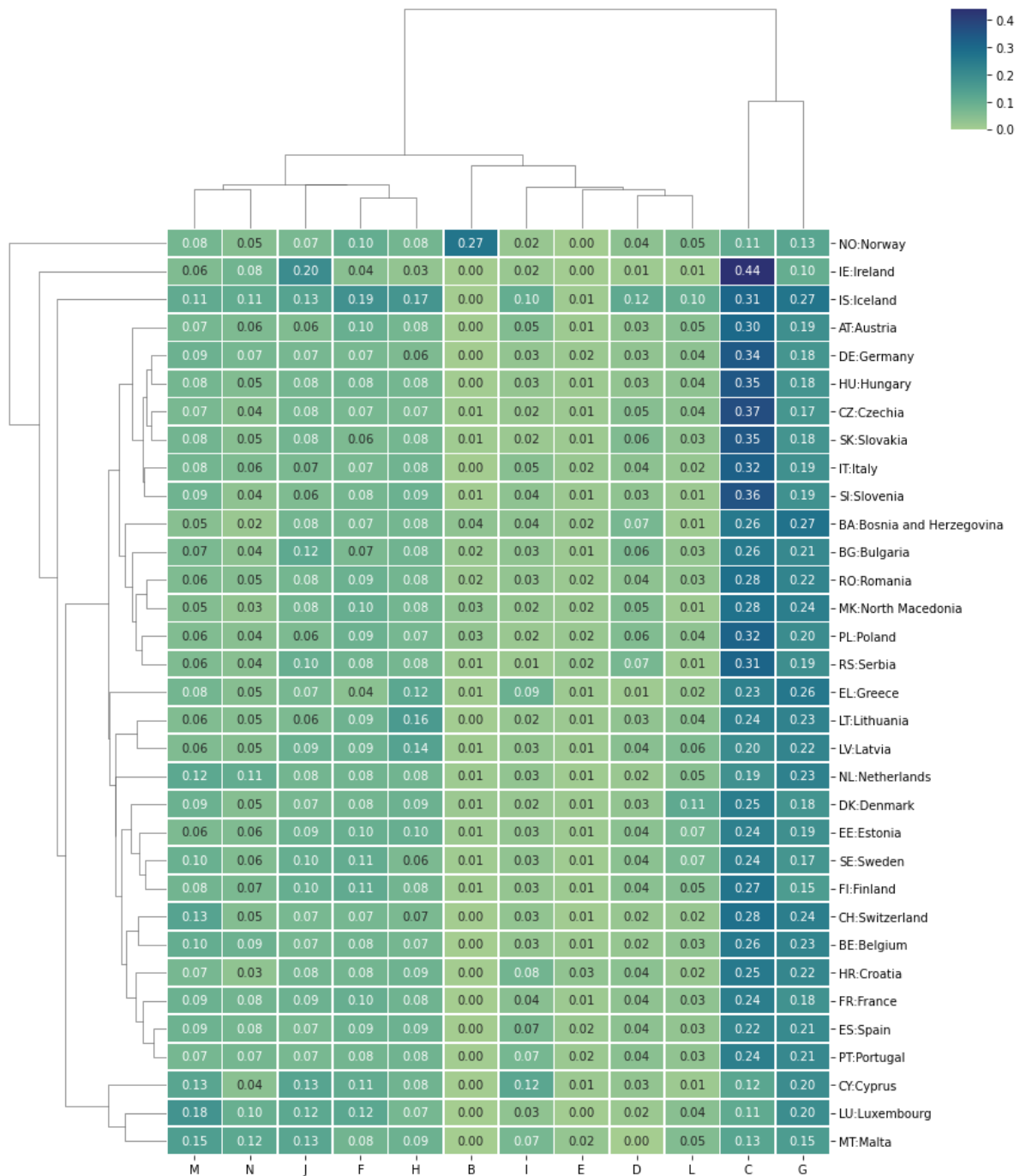


Figure 52 – Contribution of each sector to the global value added by businesses throughout European countries.



Figure 53 – Contribution of different enterprise sizes to the global value added by businesses throughout European countries.

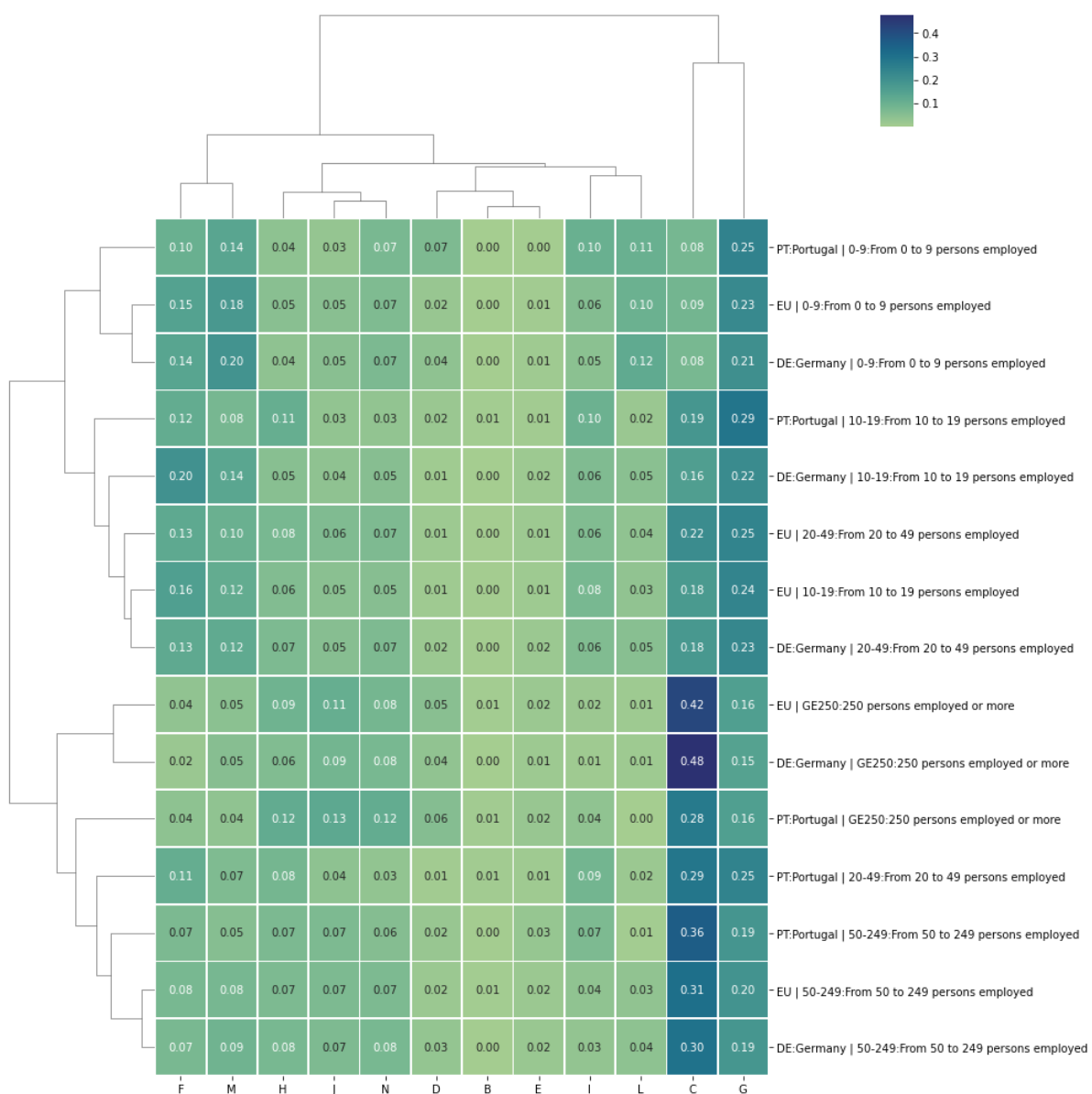


Figure 54 – Relative weight of business sectors, measured in global value added by businesses, for each enterprise size in Portugal, Germany and the European Union.

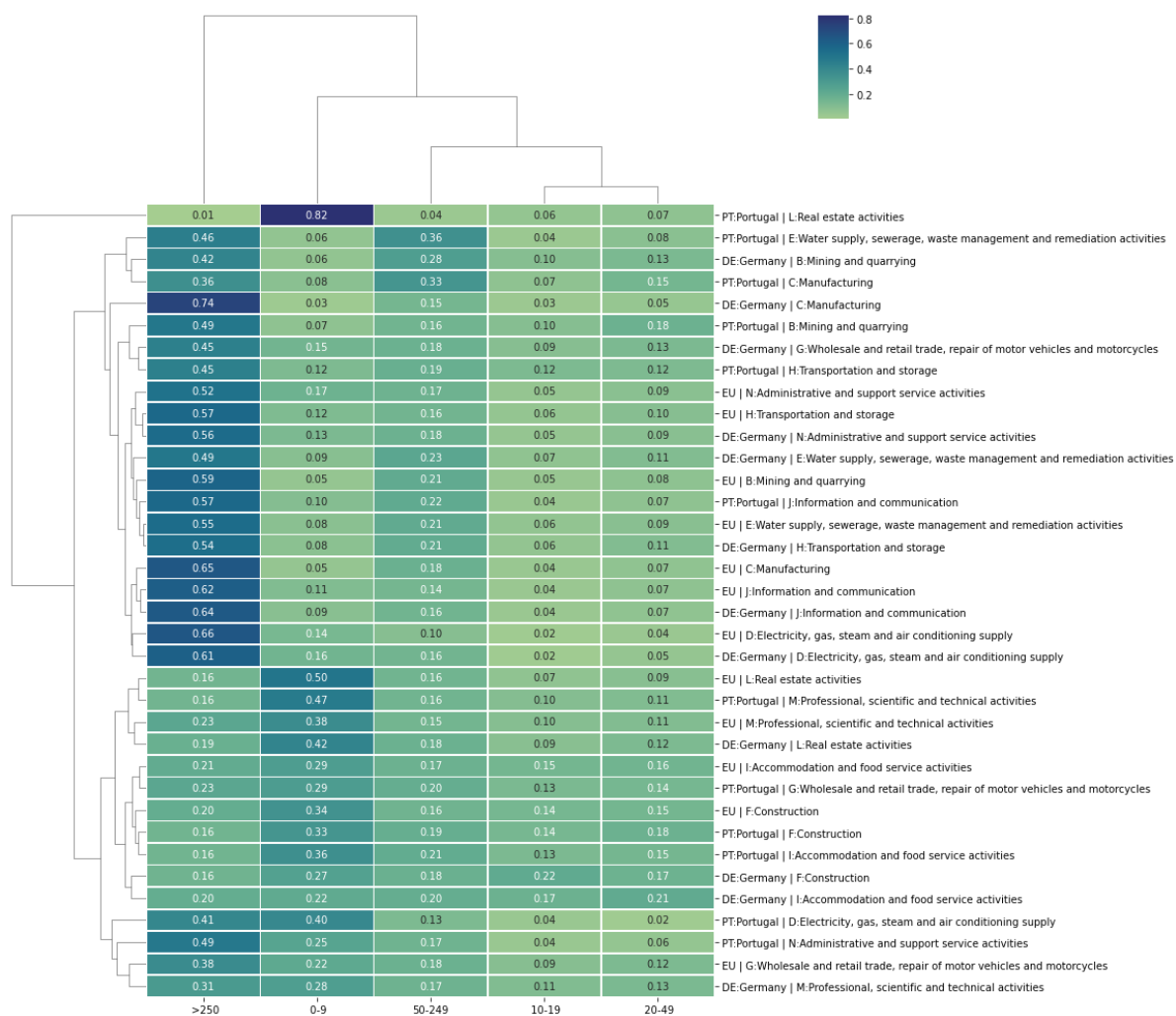


Figure 55 – Relative weight of each enterprise size, measured in global value added by businesses, for each business sector in Portugal, Germany and the European Union.

3.2.2.5. Apparent Labour Productivity

“Apparent Labour Productivity” is meant to take into account the human effort invested in the activities of each company, in respect to the wealth that they generate, and is technically defined as the ratio between “Value Added at Factor Cost” and “Number of Persons Employed”. Compared to the above business turnover and value-added benchmarks, the position of Portugal is even more dire when looking at labour productivity: Portugal occupies a mere 22th place in the same list of European countries (Figure 56).

In Portugal, the energy sector is the one that is characterized by the highest value and, although not particularly different from those in many other countries (Figure 57), it corresponds to the highest above-country-average bias of all sectors within all analysed countries (Figure 58). In fact, when

normalizing for the global labour productivity of each country, Portugal and Spain seem to share an equal pattern in respect to the expected labour productivity of each sector (Figure 58).

At this point, it is useful to remember the above observation that in Portugal a disproportionate number of people work in “Administrative and support service activities” (see *e.g.* Figure 39), meaning that one should expect that the *de facto* amount of labour invested in other sector is higher than what can be directly measured by “Number of persons Employed”, with a direct influence in the labour productivity values being discussed. In other words, labour productivity is likely lower than what is shown in Figure 57 in at least some sectors. Unfortunately, we were not able to assess the real distribution of *e.g.* temporary workforce within each sector.

As to the average labour productivity of Portuguese businesses in respect to the number of persons employed, there is no remarkable difference compared to what is observed in most other countries (Figure 59). If anything, there can be a slightly better-than-expected labour productivity bias of medium sized companies (50-249 persons employed), when compared to the country average (33% higher) (Figure 60), which could be attributed to above mentioned bias of an overrepresentation of companies of that size class in some sectors (such as manufacturing), versus a greater dominance of big companies in other countries (Figure 44). This could be explained on grounds that Portugal is a “middle-of-the-road” country in terms of scale, which could constrain the “cap” of the dimension of reference companies in consolidated sectors. This hypothesis can have some value since a similar observation can be made on other smaller and wealthier European countries, such as the Netherlands (Figure 60).

When drilling-down both enterprise sector and size simultaneously, we opted to leave out the energy sector, as it was a clear outlier in this analysis. All values described in the following paragraphs, and shown in Figure 61 and Figure 62 were obtained by dividing the corresponding apparent labour productivity by the national (Portugal and Germany) or regional (EU) averages.

In Portugal, enterprises with up to 9 persons employed from the Mining and Administrative and Support Services sectors display particularly lower labour productivities than what is observed in EU (67% and 32% compared to national average, respectively) (Figure 61).

Across all enterprise sizes, in EU in general and Germany in particular, Real Estate Activities are characterized by a much bigger labour productivity than Portugal. Interestingly, both accommodation/food services (although below the country average) and transport/storage display better-than-expected apparent labour productivities in Portugal, when compared to national/regional averages (Figure 61 and Figure 62).

In Portugal, the biggest labour productivity gaps of micro and small sized companies, when compared to medium and big companies within the same sector, are the ones in the Information and Communication sector, as well as the ones that operate in Mining and Quarrying (Figure 62). Again, this observation is bound to be even more extreme considering the effect of temporary workers not directly being accounted as persons employed.

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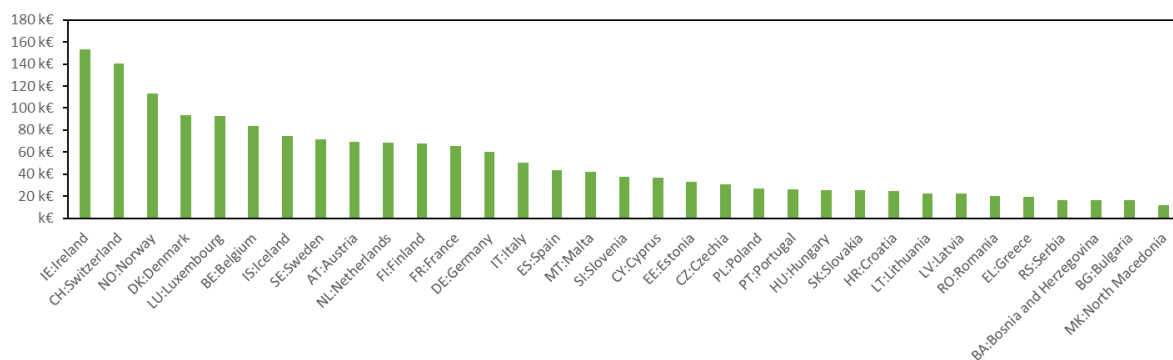


Figure 56 – Apparent labour productivity throughout European countries.

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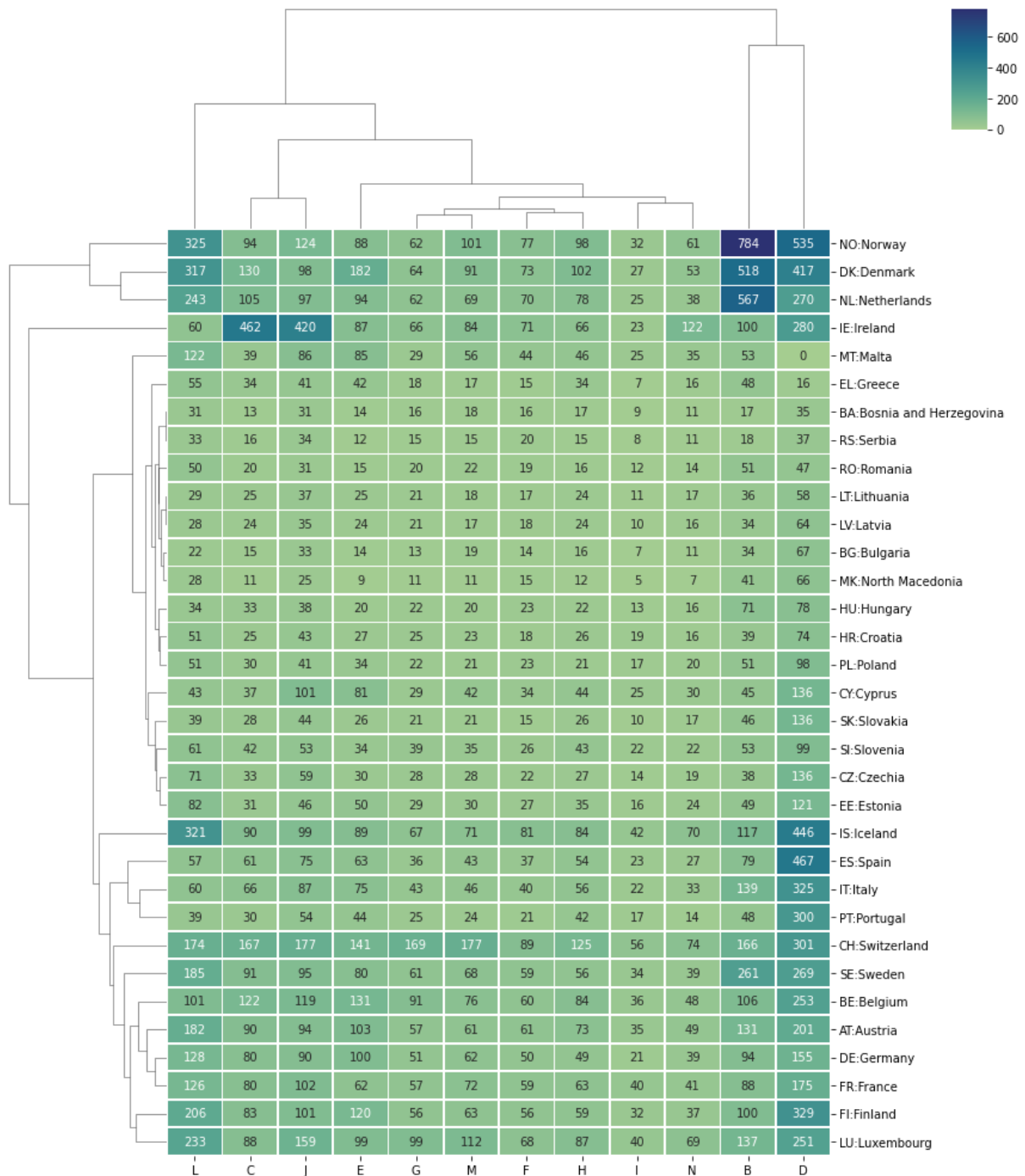


Figure 57 – Apparent labour productivity within each sector throughput European countries.

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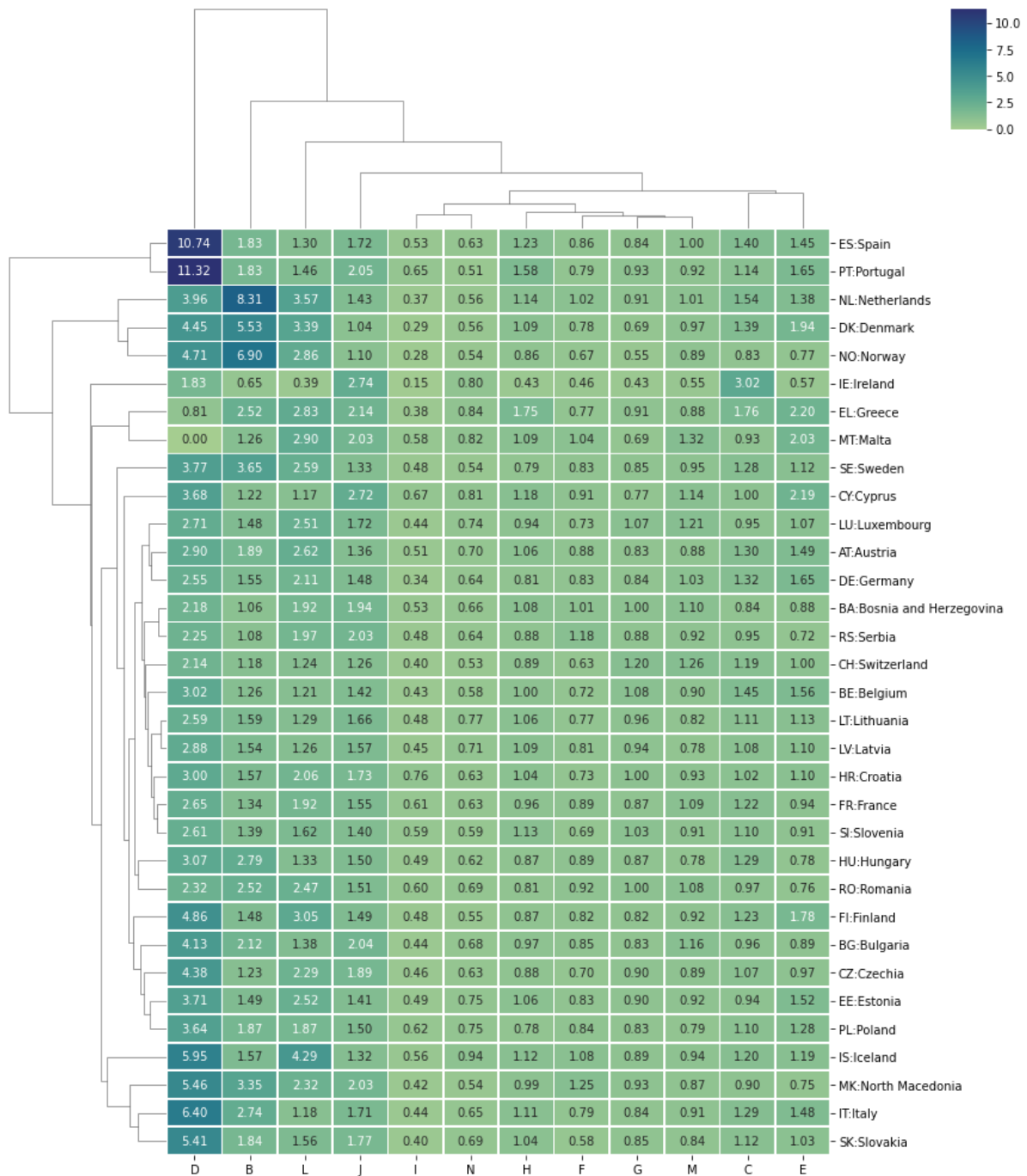


Figure 58 – Apparent labour productivity biases of each sector, compared to national averages, throughput European countries.

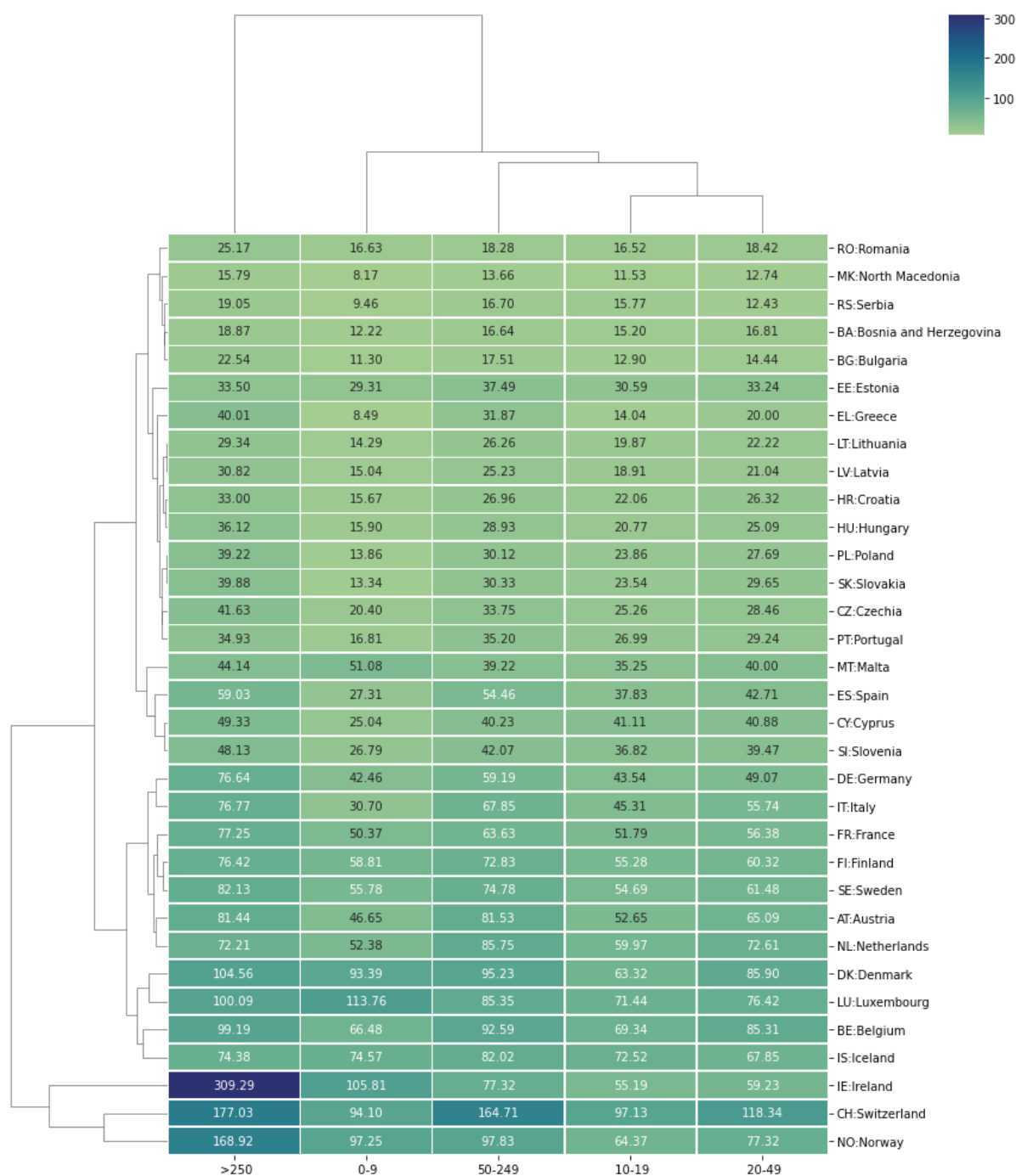


Figure 59 – Apparent labour productivity of enterprises of different sizes (number of persons employed classes on each column) throughout European countries.

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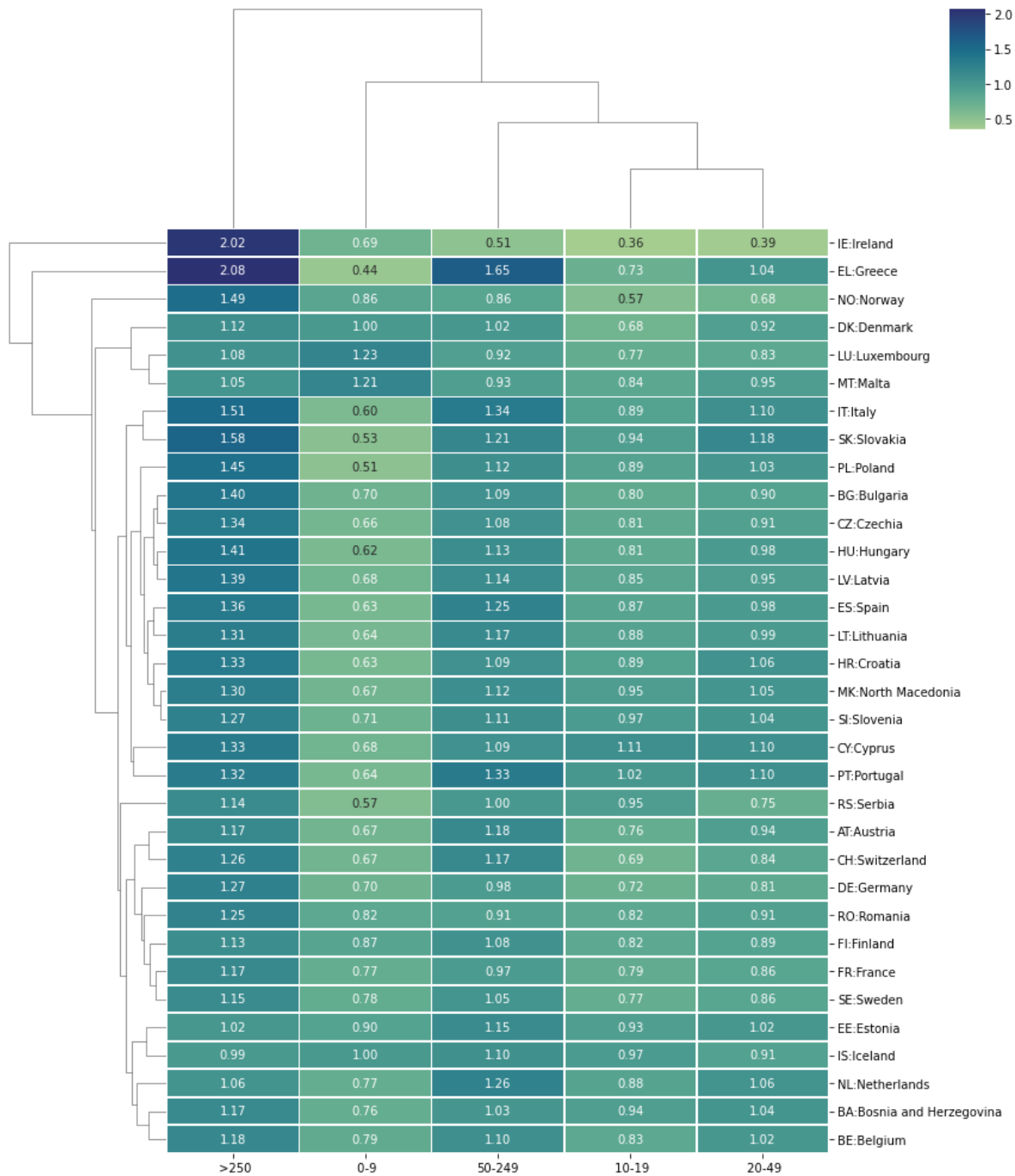


Figure 60 – Apparent labour productivity biases of enterprises of different sizes (number of persons employed classes on each column), compared to national averages, throughout European countries.

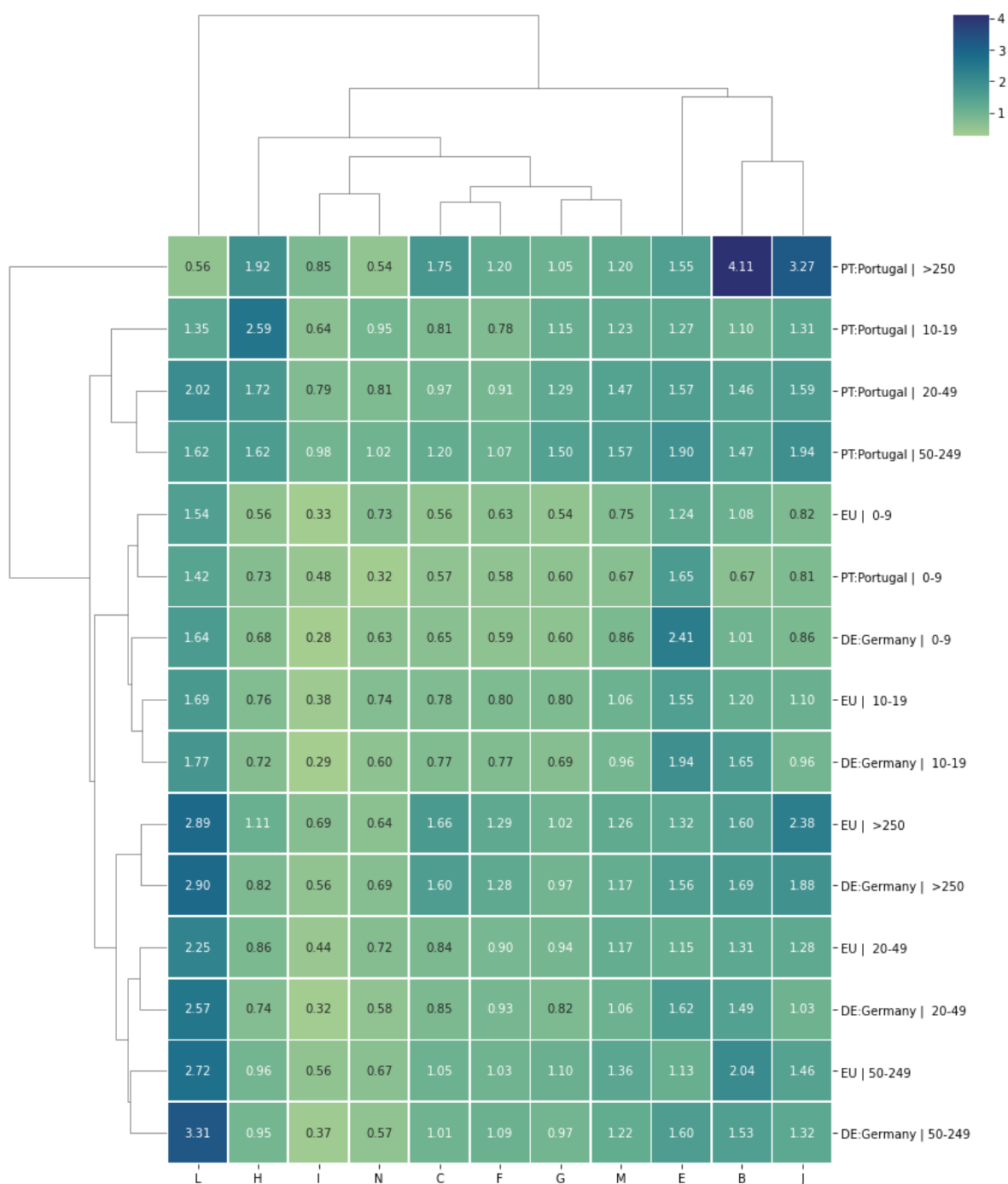


Figure 61 – Apparent labour productivity biases of enterprises of different sizes (number of persons employed classes on each column), compared to national averages, in Portugal, Germany and the European Union.

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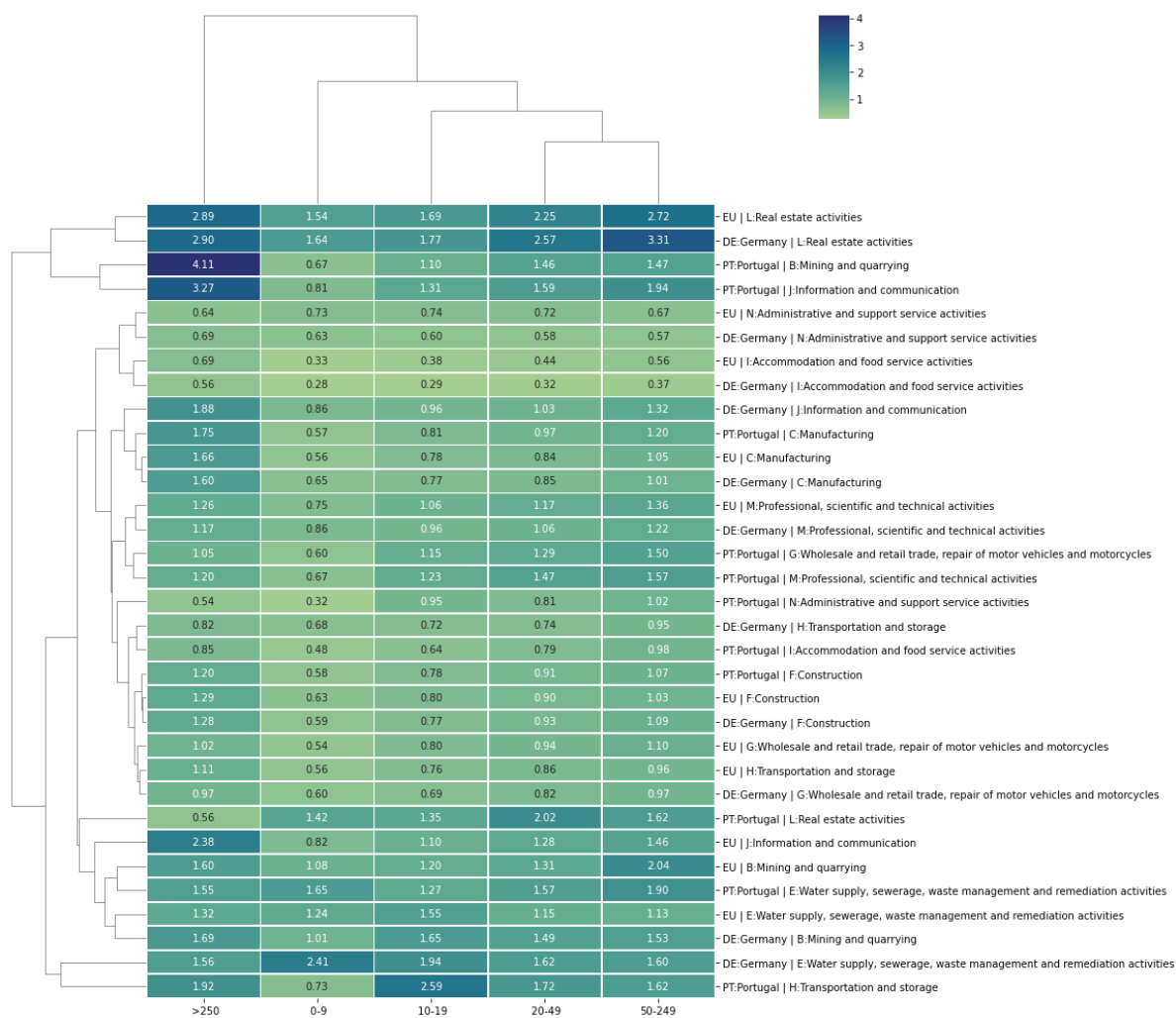


Figure 62 – Apparent labour productivity biases of each sector, compared to national averages, in Portugal, Germany and the European Union.

4. CONCLUSION

Data obtained via survey confirms the natural expectation that smaller companies tend to be less sophisticated than bigger ones. This was observed not only in respect to the use of advanced tools (such as *e.g.* centralized BI Databases), but also seen on the higher probability of inexistence of long term goals/vision or operational tools.

However, not all seems merry for big companies: among other observations, a generalized under-participation of BI development initiatives, including an infrequent participation of top management in the development of information that they consume, is indicative of micro-management and daily-operations-oriented type of management. Consistent with this, there is a relative lack of concern towards the existence of consistent information across the entire organization.

Another aspect that can be critical in the continuous development of big companies is that, probably due to its scale and specialization of its personnel, the bigger the company, the lower the chance of people participating in development initiatives. Naturally, a reduced involvement of people in such initiatives hampers change management globally.

Overall, and across enterprises of all sizes and sectors, there is global sense that daily concerns dominate an eventual long-term/strategic vision. It is the supremacy of the urgent over the important.

When analysing business metrics of Portuguese enterprise, and in particular comparing them to those of other European countries, one sees that there is a general lack of value created, both compared to the level of total business turnover (which is relatively good) and the level of human effort invested in all economic activities. In fact, labour productivity in Portugal is one of the worst in Europe (22nd place in the panel used in this work), particularly when one considers that scale of its economy (9th place in in total business turnover and number of persons employed).

This lack of economic performance of Portuguese companies is perplexing, particularly since there does not seem to exist any sector “mix” difference when compared to most other countries. Rather, a lower global level of wealth affects the expectation and *de facto* returns of capital and labour investment made in all activities. The low value added and low labour productivity in Portugal is virtually true for all activities. Thus, and since we operate in an open market economy, this highlights the importance of being particularly innovative and competitive in the sectors that compete with other countries, at the risk of only continuing competing on red ocean markets and offering low value commodity products (Kim & Mauborgne, 2005).

In respect to micro and small companies, the biggest labour productivity gaps within enterprises of the same sector occurs in the Information/Communication and Mining/Quarrying sectors.

Besides the data presented in this work, which describe past facts, it would be relevant to obtain data on investment on innovation and continuous improvement, as leading metrics on what is to be expected in the future. Unfortunately, such comprehensive information is not available at the level of granularity necessary for this analysis. Innovation and Continuous Improvement is an eluding quantifiable concept. Related metrics such as Investment Rate is defined (also by INE) as the ratio between the “Gross fixed capital formation” and the “Gross Value Added”, in a given time period. We argue that this can hardly be a measure of “Continuous improvement”, as an increase in “Fixed Capital”

mainly measures an adaptation to conduct and operationally expand businesses, rather than improve them. As another example, Investment in Research and Development is defined by INE as the sum of developed projects and the increment of software expenditure (INE, 2022a). We believe that, in the spirit of innovation and continuous improvement, many other investments are actually made, but not under any of these two items. On the other hand, software expenditure can be made just on the basis of an operational necessity, and far from being consistent with R&D.

We believe that innovation is like any other good habit, like exercise and good diet: It has an immediate cost while the benefit is obtained usually only on the medium/long term. The solution to balance long term important dimensions and short-term urgent matters is literacy, practice, and the confidence of knowing that there is business evidence in support of innovation and continuous improvement initiatives.

5. LIMITATIONS AND RECOMMENDATIONS FOR FUTURE WORK

On an “operational” side, the Covid19 pandemic was surely a significant constraint in the execution of this work, as it hampered the contact with people with whom the discussion of all the data presented in this work would be beneficial, in particular a more exhaustive understanding of what lays behind those numbers.

Relative to the execution of the survey, quite a lot more participants would have been necessary to breakdown the analysis into smaller sections of the population, while maintaining statistical significance. For example, an analysis of workers from particular classes of business would have been quite relevant, and could have been used to complement the analyses documented in section “3.2”.

When comparing business data from Portugal against other countries, in particular in respect to the accounting of persons employed (and dependent metrics such as labour productivity), it would have been positive to dive deeper into the differences of labour legislation among the different countries. Eventually, a more comprehensive understanding on the *de facto* allocation of temporary personnel to all business sectors could be used to estimate truer labour productivity metrics. Also, follow-up interviews would be relevant to discuss and examine, for example, the labour productivity discrepancies against the EU benchmark. Additionally, a comparison of Profit and Loss Statements of representative companies within specific sectors and size, could ultimately help explain the origin of those differences.

6. BIBLIOGRAPHY

AI Index Steering Committee - Stanford University. (2019). *The AI Index Report*.

Cathy O'Neil. (2016). *Weapons of Math Destruction*. Penguin.

Chang, S.-C., Chang, H.-H., & Lu, M.-T. (2021). Evaluating industry 4.0 technology application in smes: Using a hybrid mcdm approach. *Mathematics*, 9(4), 1–20. Scopus. <https://doi.org/10.3390/math9040414>

Dan Brown. (2018). *Origin*. Corgi.

Dan Vesset, David Schubmehl, Lynne Schneider, Ali Zaidi, Peter Rutten, Carl W. Olofson, ... Megha Kumar. (2018). *IDC FutureScape: Worldwide Analytics and Artificial Intelligence 2019 Predictions*. IDC. Retrieved from IDC website: <https://www.idc.com/getdoc.jsp?containerId=US44389418>

Data Never Sleeps 7.0. (2020). Retrieved 21 June 2020, from <https://www.domo.com/learn/data-never-sleeps-7>

EUROSTAT. (2008). *NACE Rev.2*. Luxembourg: Office for Official Publications of the European Communities.

Eurostat. (2022). *Eurostat: Small and medium-sized enterprises (SMEs)*. Retrieved from <https://ec.europa.eu/eurostat/web/structural-business-statistics/small-and-medium-sized-enterprises>

Gabriel Coimbra. (2020). *IDC FutureScapes 2020—The Future Enterprise: Technology, Leadership and Value*. Presented at the Transformation Methodologies and Solutions, Nova IMS.

Ghobakhloo, M., & Iranmanesh, M. (2021). Digital transformation success under Industry 4.0: A strategic guideline for manufacturing SMEs. *Journal of Manufacturing Technology Management*, 32(8), 1533–1556. Scopus. <https://doi.org/10.1108/JMTM-11-2020-0455>

Google Trends. (2020). Retrieved from <https://trends.google.com/>

Hortense de la Boutetière, Alberto Montagner, & Angelika Reich. (2018). *The keys to a successful digital transformation*. McKinsey & Company. Retrieved from McKinsey & Company website:

<https://www.mckinsey.com/business-functions/organization/our-insights/unlocking-success-in-digital-transformations>

Ian McEwan. (2019). *Machines Like Me Hardcover*. Jonathan Cape.

Ian Sample. (2020, February 20). Powerful antibiotic discovered using machine learning for first time. *The Guardian*. Retrieved from <http://www.theguardian.com/society/2020/feb/20/antibiotic-that-kills-drug-resistant-bacteria-discovered-through-ai>

INE. (2007). *Classificação Portuguesa das Actividades Económicas*. INE. Retrieved from https://www.ine.pt/ine_novidades/semin/cae/CAE_REV_3.pdf

INE. (2018). *INE: Empresas em Portugal—2016*.

INE. (2020). *Guia do utilizador relativo à definição de PME*. Comissão Europeia. Retrieved from [https://www.iapmei.pt/getattachment/PRODUTOS-E-SERVICOS/Qualificacao-Certificacao/Certificacao-PME/Como-obter-uma-certificacao-PME/Guia-do-utilizador-relativo-a-definicao-de-PME-\(Comissao-Europeia,-2020\).pdf.aspx](https://www.iapmei.pt/getattachment/PRODUTOS-E-SERVICOS/Qualificacao-Certificacao/Certificacao-PME/Como-obter-uma-certificacao-PME/Guia-do-utilizador-relativo-a-definicao-de-PME-(Comissao-Europeia,-2020).pdf.aspx)

INE. (2022a). *Empresas em Portugal—2020*. Retrieved 31 May 2022, from *Empresas em Portugal—2020* website: https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_publicacoes&PUBLICACOESpub_boui=15413305&PUBLICACOESstema=55579&PUBLICACOESmodo=2

INE. (2022b). *INE, Sistema de contas integradas das empresas 2008-2020*. Retrieved from <https://ine.pt/>

Jeff Bladt & Bob Filbin. (2014, May 16). Who's Afraid of Data-Driven Management? *Harvard Business Review*. Retrieved from <https://hbr.org/2014/05/whos-afraid-of-data-driven-management>

Karla Pequenino. (2018). A inteligência artificial está na moda e as marcas aproveitam. *PÚBLICO*. Retrieved from <https://www.publico.pt/2018/05/26/tecnologia/noticia/inteligencia-artificial-em-todo-o-lado-1831331>

Karla Pequenino. (2020). ONU quer usar inteligência artificial para ajudar países a combater pobreza e desigualdade de género. *PÚBLICO*. Retrieved from

- <https://www.publico.pt/2020/06/03/tecnologia/noticia/onu-quer-usar-inteligencia-artificial-ajudar-paises-combater-pobreza-desigualdade-genero-1919163>
- Kim, W. C., & Mauborgne, R. (2005). *Blue Ocean Strategy: How to Create Uncontested Market Space and Make Competition Irrelevant* (1st edition). Boston, Mass: Harvard Business Review Press.
- Masood, T., & Sonntag, P. (2020). Industry 4.0: Adoption challenges and benefits for SMEs. *Computers in Industry*, 121. Scopus. <https://doi.org/10.1016/j.compind.2020.103261>
- Matplotlib: Visualization with Python. (2022). Retrieved from <https://matplotlib.org/>
- Nick Bostrom. (2014). *Superintelligence: Paths, Dangers, Strategies*. OUP Oxford.
- Pedro Domingos. (2015). *The Master Algorithm: How the Quest for the Ultimate Learning Machine Will Remake Our World*. Penguin.
- Peter Bisson, Bryce Hall, Brian McCarthy, & Khaled Rifai. (2018). *Breaking away: The secrets to scaling analytics*. McKinsey & Company. Retrieved from McKinsey & Company website: <https://www.mckinsey.com/business-functions/mckinsey-analytics/our-insights/breaking-away-the-secrets-to-scaling-analytics>
- PORDATA. (2018). *PORDATA - Pequenas e médias empresas*. Retrieved from <https://www.pordata.pt/>
- Qualtrics. (2021). Retrieved 1 October 2020, from <https://www.qualtrics.com/>
- Rita, L. P. S., Silva, J. R., & Junior, R. R. F. (2022). *Best Regional Practices for Digital Transformation in Industry: The Case of the Industry 4.0 Program in Portugal*. 54, 163–181. Scopus. https://doi.org/10.1007/978-3-030-94617-3_13
- Rui Soares. (2020). *Digital Transformation—Use-cases and the importance of non-technological factors*. Presented at the Transformation Methodologies and Solutions, Nova IMS.
- Seaborn: Statistical data visualization. (2022). Retrieved from <https://seaborn.pydata.org/>
- The Jupyter Notebook. (2022). Retrieved from <https://jupyter.org/>
- The Total Economic Impact™ Of The Databricks Unified Data Analytics Platform*. (2020). Forrester.

7. APPENDIX A – “TRANSFORMAÇÃO DIGITAL EM PORTUGAL” SURVEY

0_Intro

O Mundo está em permanente aceleração tecnológica! A globalização aliada à incorporação de tecnologias digitais nas organizações (transformação digital) está a acelerar a consolidação de várias indústrias, a favorecer ganhos de eficiência e a potenciar o aparecimento de novos produtos e serviços.

Enquanto muitos consideram a transformação digital como um factor crítico de sucesso, outros questionam qual poderá ser a real aplicabilidade no seu sector de atividade, em particular em empresas ou operações de menor escala.

Pedimos-lhe por favor 5 minutos do seu tempo para partilhar connosco a sua visão e experiência sobre estas questões, obrigado!

1_Header Sobre você:

1_1 Género:

- ☐ Masculino (1)
- ☐ Feminino (2)
- ☐ Não responde (3)

1_2 Idade:

1_3 Indique por favor o seu grau de escolaridade mais elevado:

- ☐ Ensino Básico (1)
- ☐ Ensino Secundário (2)
- ☐ Cursos de especialização tecnológica (CET) (3)
- ☐ Licenciatura (ou equivalente) (4)
- ☐ Mestrado (ou equivalente) (5)
- ☐ Estudos Pós-Graduados (6)
- ☐ MBA (7)
- ☐ Doutoramento (8)

1_4 Local de trabalho:

- Região (1)
- Distrito / Ilha (2)
- Concelho (3)

1_5 Em que nível da organização desempenha as suas funções:

- ☐ Administração / Direção (1)
- ☐ Gestão Intermédia (2)
- ☐ Operação (3)
- ☐ Outro - Por favor especifique: (4) _____

1_6 Em que área desempenha as suas funções - Por favor selecione todas as opções aplicáveis que melhor caracterizam a sua atividade:

- ☐ Administração (1)
- ☐ Financeiro / Controlo de Gestão (2)
- ☐ Comercial (3)
- ☐ Produção (4)
- ☐ Marketing (5)
- ☐ IT - Sistemas de Informação (6)
- ☐ Online / App / Social Media (16)
- ☐ Recursos Humanos (7)
- ☐ Operações (8)
- ☐ Logística / Aprovisionamento (9)
- ☐ Procurement (10)
- ☐ Legal (11)
- ☐ Desenvolvimento (12)
- ☐ Business Intelligence (13)
- ☐ Outro #1 - Por favor especifique (14)

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- ☐ Outro #2 - Por favor especifique (15)
-

1_7 Participa diretamente na transformação digital na organização onde trabalha? Se sim, que domínios melhor classificam a sua participação - Selecione por favor apenas as opções que se apliquem:

- ☐ Exploração de novos modelos de negócio (1)
- ☐ Melhoria dos processos e eficiência económica da empresa (2)
- ☐ Melhoria de produção de informação de suporte à direção da empresa (3)
- ☐ Melhoria de produção de informação de suporte aos processos e operação da empresa (4)
- ☐ Outro #1 - Por favor especifique (5)

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- ☐ Outro #2 - Por favor especifique (6)
-

2_Header Sobre a organização onde trabalha atualmente:

2_1 Qual o sector / industria onde atua:

- ☐ Agricultura, produção animal, caça, silvicultura e pesca (1)
 - ☐ Indústrias extractivas (2)
 - ☐ Indústrias transformadoras (3)
 - ☐ Electricidade, gás e água (4)
 - ☐ Construção (5)
 - ☐ Comércio por grosso e a retalho (6)
 - ☐ Transporte e armazenagem (7)
 - ☐ Alojamento, restauração e similares (8)
 - ☐ Actividades financeiras e de seguros (9)
 - ☐ Actividades imobiliárias (10)
 - ☐ Educação (11)
 - ☐ Actividades de saúde humana e apoio social (12)
 - ☐ Estado (13)
 - ☐ Organização não governamental (ONG) (14)
 - ☐ Outros - Por favor especifique: (15)
-

2_2 A organização onde trabalha tem a principal sede em:

- ☐ Portugal (1)
- ☐ Outro país da União Europeia (2)
- ☐ Outro (3)

2_3 Qual o número aproximado de trabalhadores, globalmente, na sua organização:

- ☐ 1 a 10 (1)
- ☐ 10 a 100 (2)
- ☐ 100 a 1.000 (3)
- ☐ 1.000 a 10.000 (4)
- ☐ Mais de 10.000 (5)

2_4 Quantos anos de atividade tem a organização:

- ☐ Menos de 1 ano (1)
- ☐ Entre 1 e 2 anos (2)
- ☐ Entre 2 e 5 anos (3)
- ☐ Entre 5 e 10 anos (4)
- ☐ Entre 10 e 20 anos (5)
- ☐ Mais de 20 anos (6)

3_Header Na sua opinião:

3_1 A globalização e digitalização dos negócios: (1 = Discorda Absolutamente, 10 = Concorda Absolutamente)

Oferecem grandes oportunidades às empresas Portuguesas (1)

Trazem grandes riscos às empresas Portuguesas (2)

3_2 Na sua opinião, e à luz de uma maior digitalização e globalização dos negócios, como avalia genericamente a urgência e importância de: (1 = Irrelevante; 10 = Absolutamente relevante)

Explorar novos modelos de negócio (1)

Melhorar a eficiência dos processos e operação das empresas (2)

Melhorar o acesso a informação de suporte à gestão das empresas (3)

Melhorar o acesso a informação de suporte aos processos nas empresas (4)

3_3 Na sua opinião, ao longo da hierarquia, os processos e as decisões que são tomadas dentro das organizações deveriam ser inteiramente suportadas analiticamente e "com números": (1 = Discorda Absolutamente, 10 = Concorda Absolutamente)

Pela administração e direções (1)

Nas áreas de gestão intermédia (2)

Nas áreas operacionais (3)

3_4 Na sua opinião, nas várias áreas da empresa, os processos e as decisões que são tomadas dentro das organizações deveriam ser inteiramente suportadas analiticamente e "com números": (1 = Discorda Absolutamente, 10 = Concorda Absolutamente)

Marketing (1)

Online / App / Social Media (12)

Comercial (2)

Operações (3)

Produção (4)

Recursos Humanos (5)

Logística / Aprovisionamento (6)

Legal (7)

Procurement (8)

Desenvolvimento (9)

Outro #1 - Por favor especifique (10)

Outro #1 - Por favor especifique (11)

4_Header Atualmente na sua empresa / organização:

4_1 Na sua opinião, dentro da sua organização: (1 = Discorda Absolutamente, 10 = Concorda Absolutamente):

- Existe pleno conhecimento sobre as tendências globais no sector (1)
- Existe uma visão, consequente e bem comunicada, para a empresa num horizonte superior a 5 anos (2)
- A empresa aloca continuamente recursos para desenvolver áreas críticas para a manter competitiva (3)
- A empresa assume uma lógica de gestão sobretudo apoiada em números, e pouco em intuição (4)
- A informação de gestão é centralizada em bases de dados transversais a toda a empresa (Data Warehouse) e disponível a todos os utilizadores de acordo com o seu nível de acesso (5)
- Os processos estão extremamente automatizados e recorrem em alguns elementos a inteligência artificial (6)

4_2 De forma global, a informação de gestão disponível na empresa é produzida por: (Por favor distribua um percentual por estas 3 opções. O total deve perfazer 100%)

- _____ Uma equipa central de analistas, comum a toda a empresa (ou equivalente): (1)
- _____ Equipas de analistas afetas a áreas específicas da empresa (ou equivalente): (2)
- _____ Pelos utilizadores finais da informação: (3)

4_3 Na sua opinião, relativamente à presença digital da sua organização: (1 = Discorda Absolutamente, 10 = Concorda Absolutamente):

A presença digital é crítica no sector onde opera (1)

A organização está presente digitalmente através de um site perfeitamente alinhado com as necessidades dos seus clientes/utilizadores (2)

O site da organização está ao nível dos melhores no sector (8)

A organização possui uma aplicação nas principais plataformas (IOS, Android) ao nível dos melhores do sector (6)

A organização está presente nas redes sociais e é muito próxima da sua comunidade (3)

A organização investe em comunicação digital em plataformas de terceiros (4)

A presença digital da empresa está otimizada no que diz respeito aos resultados de motores de busca (SEO) (9)

A organização faz boa utilização da informação que recolhe através da sua presença digital (5)

4_4 Quais os processos/áreas, dentro da sua organização, que considera mais avançados relativamente a transformação digital?

4_5 Quais os processos/áreas, dentro da sua organização, que considera mais deficitários relativamente a transformação digital?

4_6 Na sua opinião, quais os maiores constrangimentos/riscos/oportunidades quanto a uma maior implementação de transformação digital?

5_Header

Obrigado pela sua participação neste inquérito!

Se tiver interesse em receber o resultado global do mesmo, deixe-nos o seu contacto:

5_1 Nome:

5_2 Email:
