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European Circular Economy Plan influence on real economy performances: a mixed methods study

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1. Chapter One: Introduction

i. Introduction

The impact the human species is having on planet earth has become massive and entrenched to such an extent that leading sociologists have given a name to the historical era characterized by the impacts humans are having on the biosphere: the Anthropocene. More specifically, the Anthropocene is defined, in accordance with leading scholars of the subject, by the Treccani encyclopedia as: "The present geological epoch in which the Earth's environment, in the totality of its physical, chemical, and biological characteristics, is being strongly affected on both local and global scales by the effects of human action, with particular reference to the increase in CO2 and CH4 concentrations in the atmosphere." (Lewis and Maslin, 2015) (Bernardi, 2021). Thus, climate change is now a proven consequence of human technical and industrial activity; Although this data began to emerge in the 1970s, the first meteorological evidence began to manifest itself only in recent decades: the increase in extreme weather phenomena with devastating consequences for the inhabitants and territories of the affected areas. Climate change, however, is not impacting the safety of human beings during natural disasters; rather, increasingly frequent and increasingly anomalous unpredictable climatic phenomena threaten to have disastrous consequences for global value chains, agricultural production, and in general the functioning of our contemporary society.

With this in mind and having identified carbon dioxide, the result of combustion processes, as the main culprit of climate change (Reilly et al., 2003), policies of sovereign states began to reach increasingly important decarbonization agreements unfortunately not binding enough to allow for rapid lowering of emissions.

An example of such agreements were later summarized in documents such as the Kyoto Protocol, which came into force in 2005, and the Paris Agreement, which came into force in 2016.

As global awareness of the need for more sustainable behaviours increased, predominantly in Western countries new regulations began to direct investments in creating markets for new products that were the result of remanufacturing,

redevelopment, recycling and reintroduction into the market. This kind of shift also had repercussions in fashion and communication trends, shifting more and more interest and market demand for products that were certified "green" or more generally low impact.

The European Union, which is in its entirety in an area that is poor in much of the strategic resources (Report on critical raw materials for the EU. European Commission) (Massari et al., 2013) decided to invest in sustainable development huge investments both political and economic. According to the EU's political strategy, a cleaner economy is an internationally safer and also more competitive economy.

Several projects were approved to promote the transition of industries and to convey to consumers that environmentally friendly purchasing choices are preferable to alternatives. Over the years, investment plans for sustainability and decarbonization projects have also increased. Within the broader framework of these measures, two action plans for the development of the circular economy were implemented, one in 2015 and the second in 2020. These ambitious plans promote and support, at a regulatory level, the adoption of circular behaviors by companies in European Union countries.

Circularity often requires more effort than other, more specific measures; the circular economy is a development model that encompasses every aspect of a company's life: from the choice of raw materials to transportation methods, relationships with the local community, sales, and the management of residual materials (commonly referred to as waste).

The adoption of the circular economy as a new economic paradigm would not only bring environmental benefits but also aim to foster economic cohesion within the European Union. Since the model involves significant relationships between business partners both horizontally and vertically, it could also be a reason to generate industrial clusters among countries that exchange waste resources, thereby extending the life cycle of raw materials and increasing the overall competitiveness of the economy in which they are situated (Stahel, W. R., 2013) (Alonso-Almeida et al., 2020).

This thesis thus contributes to the contemporary debate regarding which measures to adopt, what statistically notable effects are generated, and what the perception of businesses is in this regard. To achieve this goal, the research structure first dedicates

several chapters to outlining the key economic, historical, and legislative milestones that led the European Union to identify the circular economy as a development strategy to invest in.
The political and economic reasons for a development model that takes into account the environment, not just unlimited growth, date back to the 1970s when literary works began questioning the development models commonly adopted until then. Historical and geopolitical events, such as the 1973 oil crisis, were certainly catalysts for bringing the relationship between humans and resources, as well as human and environmental cycles, to the forefront of political discourse.

The historical and legislative analysis then focuses on the situation in Italy, a country that plays a significant role in the adoption of circular economy policies within the European context. Italy, due to its geographical conditions, lacks expendable and valuable resources for the production of technical and technological by-products. This scarcity of resources led the country to start recycling for civilian use much of the material previously employed for military purposes, starting from the mid-20th century, at the end of World War II (Denton et al., 2022).
In the chapter dedicated to Italy, the circular economy plan published in 2017 and updated in 2022 is also summarized and briefly analyzed. This plan provides some insight into Italy's situation regarding the development of circular economies and medium-term objectives for maintaining the trend. After providing the necessary context, the research attempts to analyze both quantitatively and qualitatively the "real economy" in order to capture the effects of a trend favoring the development of the circular economy. This trend would also confirm positive outcomes regarding the EU's circular economy plan, specifically referring to the first circular economy plan (2015). It's worth noting that the implementation of measures from the second plan approved in 2020 is still ongoing, making it premature to investigate its effects.

To pursue this goal, as mentioned earlier, a mixed analysis method was used, considering both European statistical data on the Circular Economy and the impressions of some entrepreneurs who, with their companies, represent the main actors in the economic transition process.

The quantitative analysis required a preparatory phase to identify the variables to be

considered, the sample of countries of interest for the analysis, and the choice of a database with sufficient data on the circular economy of the selected countries over a time range that would allow for analysis. The choice of the database was the first step in the quantitative analysis; Eurostat has specifically created a section for the circular economy that collects various measurements that may be of interest to evaluate the circular economy. Among the various variables, I chose to focus on four variables that could measure the performance of the private sector. These variables were already used by the Commission in the 2019 report on the state of implementation of the Circular Economy in the EU. Furthermore, these variables have an updated dataset annually for all EU countries from 2010 to 2019. The dependent variables are as follows:

- *Patents related to recycling and secondary raw materials (PAT)*
- *Circular Material Use Rate (CMUR)*
- *Persons employed in circular economy sectors (EMPL)*
- *Private investment and gross added value related to circular economy sectors (PR_INV)*

The independent variables, on the other hand, are variables of different nature and units of measurement that could influence the dependent variables. Through linear regression analysis, studying the coefficients of these independent variables allows us to formulate hypotheses about which external factors influence the circular economy indicators. In this case, I chose the variable of R&D expenditure as a percentage of GDP as one independent variable to represent innovation and research efforts. I also included variables representing time trends and geographic variables that corresponded to the selected countries. These countries, chosen based on their GDP size and demographics, include France, Germany, Italy, Poland, and Spain.

Linear regressions revealed peculiarities and similarities among the various indicators. Italy was also used as a statistical reference point, both for cross-referencing information with what emerged from the interviews and for measurement purposes, as linear regression requires a "reference."

From the quantitative analysis, several interesting results emerged regarding the

performance of circular economy indicators in European countries. Depending on the significance of the coefficients of the indicators, it was possible to determine, or rather estimate, potential legislative, geographical, or economic causes that explained the numerical results. The qualitative analysis, on the other hand, consists of impressions gathered from three interviews conducted directly with executives of three different companies. These interviews were semi-structured, featuring precise questions and, at times, generating wide-ranging dialogues. Subsequently, I worked to extract relevant information for the research's purposes. The interviews served both a complementary and confirmatory role in relation to the information obtained from the quantitative analysis. In particular, they helped understand the limitations and opportunities within Italy's economic landscape and the perceptions that business executives have regarding the administration of the transition process by local, national, and European institutions. The selected companies all have their headquarters in the northeastern part of the country, an area already known for its positive results in terms of implementing the circular economy. The choice of these companies also considered sector differentiation. The selected companies are as follows:

- *Amorim Cork Italia S.P.A.*
- *Contarina S.P.A.*
- *Ori Martin Group*

The overall research effort has served to measure the market's behavior towards the circular economy at a very particular moment in European history and politics. The war in Ukraine and profound transformations in international geopolitics have brought the importance of secure resource and raw material supply routes back to the center of political agendas. The circular economy is considered strategically central, especially in view of reducing dependencies on third countries.

In conclusion, a summary of the information obtained from quantitative data and the information emerging from interviews is provided. The situation that emerges does not yet represent clear, consolidated temporal trends, except for the data related to the shift of work towards circular economy sectors. In other cases, the development of the indicator is often correlated with geographical location, indicating the need for more

cohesive European regulations. Additionally, common strategies are required for the removal of bureaucratic barriers and regulatory delays that can create disadvantageous situations among businesses in the market. This latter aspect emerged particularly during the interviews, where private actors often reported relying on an outdated regulatory framework and a lack of political vision regarding public investments. Possible solutions to these limitations would require further research. Nonetheless, the thesis contributes to the European political discussion regarding what measures can not only promote the European market and competitiveness but also revitalize regulatory convergence policies. This, in turn, can foster greater security and mutual trust among member states in contrast to the geopolitical fragmentation in the international context.

ii. Introduction to the research question

The concept of a circular economy has gained significant attention in recent years as a potential solution to address the environmental challenges posed by the traditional linear economic model. By emphasizing the principles of the five R: Rethink, Refuse, Reduce, Reuse, Recycle.[1]
There is no formal theory around the principles. Some examples collected three, five or six R. The key concept is about the prefix “Re” in order to visualise a repetitive action in time, far from the concept of singular use that is typical of the linear model.

The circular economy aims to minimize waste generation and promote sustainable practices across various sectors.
In Europe, policymakers have recognized the need to transition towards a more circular economy, leading to the introduction of two significant initiatives: the European Circular Economy Package of 2015 and the subsequent European Green Deal's Circular Economy Action Plan in 2020[2]:

1) The EU’s Circular Economy Action Plan (CEAP) was a comprehensive body of

[1] “The Great Five R’s of Circular Economy”, 2022, ReGeneration 2030
[2] “The EU’s Circular Economy Action Plan, Ellen Macarhur Foundation

legislative and non-legislative actions adopted in 2015, which aimed to transition the European economy from a linear to a circular model. The Action plan map was composed of 54 action points.

2) The European Commission adopted the new circular economy action plan (CEAP) in March 2020. It is one of the main building blocks of the European Green Deal, Europe's new agenda for sustainable growth.[3]

These two European Circular Economy Plans (CEPs) represent comprehensive strategies designed to drive the transition towards a circular economy across the European Union (EU). They outline a range of measures, including regulatory frameworks, financial incentives and support programs, to encourage businesses to adopt more sustainable practices.

This research aims to investigate if and how the European policy initiatives, particularly the two Circular Economy Plans, encourage the creation or the development of more sustainable business models. By examining the policies and strategies outlined in these plans and their implementation across different sectors, the study seeks to identify the key drivers and barriers that businesses have encountered in adopting circular practices. Furthermore, it aims to collect feedback and direct comments obtained from personal interaction with 5 companies of different sectors that are active in the promotion of a more sustainable and circular way of business or that took part in the transition process.

Understanding the extent to which the European Circular Economy Plans have influenced the adoption of sustainable business models is of great significance, as it provides insights into the effectiveness of policy interventions and highlights areas that require further attention. This research can contribute to the ongoing discourse surrounding circular economy implementation and offer recommendations to business managers in navigating the transition towards more sustainable practices. With this work, I am trying to investigate the correlation between the public R&D of EU countries and how it influenced positively the Circular Economy indicators. More qualitatively, I

[3] The European Green Deal is a package of policy initiatives, which aims to set the EU on the path to a green transition, with the ultimate goal of reaching climate neutrality by 2050.

am trying to investigate if the public agents (and in particular Italy) promoted the creation of circular business and if possible to find the influence of the Circular Economy Action plan implemented in 2015.

The dissertation is organised into seven chapters with the aim to deepen the business relationship with the EU policies formulated with the aim of creating the switch to more sustainable practices. The first chapter aims to explain the research question and methodology in which the research is conducted. This part focuses on explaining the importance of a mixed way of research, combining qualitative and quantitative research from the public dates of Eurostat to direct interviews conducted with local companies. The second chapter aims to draw a theoretical and historical background, trying to show the current debates open in order to define what CE is and which kind of variables are important to consider for measures. The third chapter focuses more geographically and politically on the European Union looking to developments and phases that made the CE part of the Union's economic strategy. In this part, statistics are collected with the aim to compare the different European national achievements. In the fourth chapter, I choose to deepen the circular progress, achievements and challenges of Italy, considering the fact that all the companies that I choose for the interviews are part of the national legal and social background. The EU is making progress towards the CE but any country is specializing and focusing with different intensity; the peculiarity of the Italian situation is at the centre of this part. In chapter five is possible to find the four interviews with the different companies with a brief introduction that explains the selection of interviewers and the questions. Chapter seven is dedicated to the impression that came from the academic main actors and also from organizations of civil society. The Circular Economy is a process to develop including all the different parts of the society; the contribution of the third sector[4] is fundamental for the spreading of ideas, good practices and values of sustainability. In the seventh and last chapter, I will express some brief conclusions in order to summarize the pieces of information and some considerations that emerged after the theoretical framework and the considerations of the Interviewed companies.

[4] The third sector, which includes charities, social enterprises and voluntary groups, delivers essential services, helps to improve people's wellbeing and contributes to economic growth.

This dissertation enters the contemporary debate about several interconnected important topics such as the future's development paradigm, the development and changes in the European Union's approach to resources supply and supply chain security.

iii. European Sustainability Network

The European Union players and organizations working on the Circular Economy are several and each of them has a different area of competencies, usually not strictly formalized. The organizations have different roles and objectives in this "environment" of stakeholders, focusing together on the promotion of circular economy practices and solutions. Is possible to find institutions of different levels, companies of different dimensions, universities and several third-sector players such as associations and foundations.

All of them actively participate and work for the promotion of the CE, fostering collaboration and sharing among various stakeholders.

Usually, these organizations organize events with and, more in general, a common moment where is possible to share ideas and level of progress. These moments are really important in order to understand the future possible paths of the green transition in Europe and because of it, they have significant political and economic value.

Seven key events or organizations that are central to the circular debate in the EU and that were crucial for the development of this dissertation thanks to a good example and publications realized:

1) *Circular Economy Stakeholder Conference*: Organized by the European Commission, this annual conference gathers stakeholders from different sectors to discuss and share insights on the circular economy. It serves as a platform to network, learn about the latest developments, and foster partnerships for implementing circular economy initiatives.

2) *European Circular Economy Stakeholder Platform (ECESP)*: ECESP acts as a hub for circular economy stakeholders, bringing together businesses, NGOs, research institutions, and public authorities. It facilitates the exchange of best practices, showcases innovative circular initiatives, and advises policymakers

on circular economy strategies. The platform was launched in March 2017 during the Circular Economy Stakeholder Conference by the EESC[5] and the European Commission. Companies are fostered to share good practices and projects in order to stimulate other EU partners.

3) *European Resource Efficiency Knowledge Centre (EREK)*: EREK supports businesses and industry sectors in improving their resource efficiency and transitioning to circular economy models. It provides guidance, tools, and best practices, along with organising events and workshops to facilitate networking and capacity-building. EREK also supports national, regional and local organisations across Europe that work with SMEs[6] to improve their environmental performance, helping them to become more resource-efficient.[7] EREK is an initiative of the European Commission and is implemented by a consortium of organisations from different EU countries.

4) *European Circular Economy Network (ECEN)*: ECEN is a network of organisations, businesses, and governments from various EU member states. It aims to accelerate the transition to a circular economy by sharing knowledge, promoting cooperation, and supporting the implementation of circular economy policies and initiatives at the local, regional, and national levels. Launched by ACR+[8], the Circular Europe Network aims to work on the priorities defined by its members, delivering methodological tools and access to good practices on those priorities.

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[5] The European Economic and Social Committee (EESC) is an EU advisory body comprising representatives of workers' and employers' organisations and other interest groups. It issues opinions on EU issues to the European Commission, the Council of the EU and the European Parliament, thus acting as a bridge between the EU's decision-making institutions and EU citizens. More details on: www.eesc.europa.eu/en

[6] According to Eurostat definition: *"SMEs are defined as employing less than 250 persons. They should also have an annual turnover of up to EUR 50 million, or a balance sheet total of no more than EUR 43 million."*

[7] Resource efficiency is the maximising of the supply of money, materials, staff, and other assets that can be drawn on by a person or organization in order to function effectively

[8] ACR+ is an international network of cities and regions sharing the aim of promoting a sustainable resource management and accelerating the transition towards a circular economy on their territories. More details on: www.acrplus.org/en

5) *European Platform on Circular Economy (EPEC)*: EPEC is an expert group established by the European Economic and Social Committee (EESC). It brings together stakeholders from civil society, academia, and businesses to provide recommendations and advice on circular economy policies to the European Commission and other relevant institutions.

6) *Ellen MacArthur Foundation*: While not specifically focused on the EU or a European project, the Ellen MacArthur Foundation works with organizations, decision-makers, and academies throughout Europe to hasten the shift to a circular economy. Through programs like the Circular Economy 100 (CE100)[9] network, it supports innovative design, CE and systemic changes.

7) *The European Sustainable Development Networks (ESDN):* ESDN is an initiative bringing together diverse stakeholders from across the continent to address pressing environmental and social challenges. It is not part of the EU environment but it is influential due to the number of countries that are involved[10]. With a shared commitment to achieving sustainable development goals, the ESDN serves as a powerful platform for collaboration, knowledge exchange, and policy integration. By fostering cross-sectoral partnerships, the network promotes innovative solutions, encourages sustainable practices, and accelerates the transition to a low-carbon and resilient future.

I chose to add this enumeration at the beginning of this work because I consider the knowledge of these organizations as necessary for the understanding of the next phases of the research and of the historical deepening. It also helps to show that the political and economic debate is reinforced by articles and scientific products from different organizations, with different aims and goals. There are many infrastructures built around the concept of sustainability and Circular Economy and each of them represents a different level of collaboration and integration between economic or

[9] The CE100 is a collaborative network of businesses promoted by Ellen MacArthur Foundation. Innovators, cities and governments, universities and thought leaders work together to accelerate the adoption of circular economy practices and processes that maximize the use of resources.

[10] The European Sustainable Development Networks is composed by 33 countries in the European continent.

political organizations; a complexity that is fundamental to consider in the debate for the future of Europe.

2. Chapter Two: Historical Background

i. History of the Circular Economy Model

The Circular Economy Model has a quite recent history and evolution. About the topic, only these days we are starting to reorganize the sequences of events, discoveries and personalities that allowed the growth of the model. Unfortunately, a common misunderstanding minimizes the definition of circular economy to the familiar Reduce-Reuse-Recycle approach. Andrew Morlet, Ellen MacArthur Foundation CEO, explained during a Leading Disruption Panel in 2020: “Recycling alone will not save us.”[11] The circular economy is a “bigger idea” — a significant restructuring that forces us to rethink how we’ve done things since the rise of the first steam engine. According to the World Economic Forum, a circular economy is “an industrial system that is restorative or regenerative by intention and design.”[12]

Looking at the origin of this notion of circularity, is clearly impossible to attribute it to a single person or place. Over time, the circular economy has been developed and refined by a small group of academics, thought leaders and businesses.
The circular economy idea has its roots in several historical and intellectual cultures that functioned within cyclical and regenerative systems, stressing the effective use of resources and reducing waste. The environmental movement gained traction in the 1970s and brought attention to the drawbacks of linear patterns of production and consumption, starting to consider a new way of imagine the values chain by the concept of "closing the loop".[13]

The first Volume of Circular Economy and Sustainability[14] has described a framework order to divide into three phases the historical evolution of the CE that I would briefly summarize. The division is not recognised as the official way in which this new model

[11] The Circular Economy forum at National Geographic headquarters February 26 in Washington D.C.
[12] Definition used in most the documentation produced by the WEF
[13] A closed-loop economy is an economic model in which no waste is generated; everything is shared, repaired, reused, or recycled
[14] Circular Economy and Sustainability. Volume 1: Management and Policy (2021). Elvesier.

has developed but it is an attempt of the authors[15] to create a temporal distinction for a better understanding of the topic.

1) Pre-1990s

The theorization of a new paradigm of development started in the XX Century with the first work of Simmonds (1862) where the author suggested a new approach of industrialization, suggesting win-to-win practices to exist, with benefits for both the economy and the environment. The 1960s was the decade where the industrial linear model was challenged together with other cultural and social standards.

One of the main contributions to the debate was by Buckminister (1969) with his seminal publication titled: *Operating Manual for Spaceship Earth.*

In this elaborate, the author highlighted the tensions between population and consumption growth and the limited capacity of the environment. He also suggested switching approaches in the relationship between the environment with an effective metaphor: from the “cowboy economy” to the “spaceman economy”.

This new ideology was echoed in the works of Meadows and colleagues[16] in their seminal report to *The Club of Rome in 1972: The Limits to Growth* with the formalization of the fact that there are limits to growth and the fact that the world’s resources are limited.

2) 1990 - 2010

From 1990, other economists began to join the CE line of thinking by recognizing the flaws in economic theories about environmental issues. Another phase, another metaphor. The one used in this phase is by Daly (1992)[17]. He elaborated on the image of a boat that needs both balance and weight. If one of these two elements would miss

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[15] Alisha Tuladhar, Konstantinos Iatridis, and Dimo Dimov (School of Management, University of Bath, Bath, UK)

[16] Robinson, W.C. The limits to growth: A report for the club of rome’s project on the predicament of mankind Donella H. Meadows, Dennis L. Meadows, Jergen Randers, and William W. Behrens, III. Demography 10, 289–299 (1973).

[17] Herman E. Daly. (1992). Allocation, distribution, and scale: towards an economics that is efficient, just, and sustainable. Ecological Economies. Volume 6. Pages 185-193.

the boat would sink. He stresses the importance of the allocation and distribution of resources, combining CE and economic efficiency.

At the same time, another concept started to spread: Industrial Ecology (IE). Is fundamental to notice how the theoretical approach to CE is now trying to link with economic and business practices in order to create a new way of imagining economic growth and industrial standards.

In these years we could observe the growth of courses and scholarly works related to topics like natural capitalism, regenerative design and biomimicry.

An important elaborate of this period, characterized by the connection of the CE with the economic rules, is *Zero Emissions: The Ultimate Goal of Cleaner Production* by G. Pauli (2010) where he presents innovative solutions with the idea of a cluster of industries where the waste of one is input for another.

3) 2010 - Present

In this third phase, the CE model moves strongly from theory to practice thanks to the political motivation to invest in Circularity as a way to the ecologic transition and also thanks to the creation of Circular Business Models (CBM) that are good attempts to convert the CE strategies in organizational procedures.

In our contemporary phase is possible to find three differences compared to the past decades:

a) CE is considered a solution that involves the systems and not only the optimization of some parts of the industrial sectors. (Mendoza et al., 2017)

b) It moves beyond the idea of eco-industrial parks, where geographical closeness is a prerequisite, toward establishing closed-loop supply chains that are focused on positive collaboration between actors regardless of geographical proximity. (Ludeke-Freund et al., 2019)

c) From the 3Rs to 10Rs theory (Reike et al. 2018) (*Picture 3 and 4*)

3 Rs

Reduce, Reuse, Recycle

10 Rs

Refuse, Rethink, Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle Recover.

ii. The Club of Rome and the Necessity of a New Development Paradigm

In the deepening of the sustainability and circular economy, is impossible to do not to consider the political and historical relevance of the Club of Rome as the first concrete modern attempt to propose a theoretical alternative to the linear capitalistic standard of development. This paragraph aims to underline and collect the historical notions of the Club for the development of public and political awareness about the consequences of unsustainable development. These challenges are now an undisputable part of our present time.

In the second half of the 20th century, as the world grappled with unprecedented challenges of population growth, resource depletion, and environmental degradation, a group of eminent scientists, economists, and policy experts came together to form an organization that would shape the discourse on global sustainability[18]. This organization, known as the Club of Rome[19], would advocate for a new development paradigm that would address the pressing issues facing humanity.

It was founded in April 1968 by Aurelio Pecce, an Italian industrialist[20], and Alexander King, Director-General for Scientific Affairs at the OECD in Rome grouping relevant intellectual experts from various disciplines who recognized the need for a holistic approach to global challenges.

Their seminal report, "The Limits to Growth," published in 1972[21], captured the attention of policymakers and the public alike. It presented a computer-based model that explored the consequences of exponential growth in population and consumption within a finite planet. (*Picture 5*)

The report warned that “if humanity continued on its current path of relentless economic expansion and resource exploitation, it would face dire consequences in the

[18] "History: 1968". Club of Rome. Retrieved 2017-11-29.

[19] The Club was founded in Rome; the meeting was hosted in Villa Farnesina

[20] After the Second World War, Aurelio Peccei was engaged in the rebuilding of Fiat. He was concurrently involved in various private and public efforts then underway to rebuild Italy, including the founding of Alitalia.

[21] Meadows, D. H., Meadows, D. L., Randers, J., & Behrens, W. W. (1972). The Limits to Growth.

form of environmental collapse, resource scarcity, and societal disintegration". (Meadows et al., 1972).
Moreover, the Club puts forth the concept of sustainable development arguing about how economic growth should be pursued in a manner that safeguards the integrity of natural systems and meets the needs of both present and future generations. Furthermore, they advocated for

The prevailing economic paradigm, characterized by an insatiable drive for growth, was deemed unsustainable and in urgent need of transformation. The Club advocated for In their view, sustainable development required a fundamental shift away from the prevailing model of growth-oriented development towards a more balanced and equitable approach. They emphasized the importance of integrating environmental, social, and economic considerations into policy frameworks, highlighting the interdependence of these dimensions. rethinking societal priorities and a departure from the short-term thinking that had dominated decision-making. In order to achieve this transformation the Club proposed a range of policy recommendations such as resource conservation, renewable energy adoption and the pursuit of an equitable economic system; Some of them are theoretical pillars at the origin of the Circular Economy theories.

While the Club of Rome faced its share of criticism and scepticism, its influence on global discourse cannot be overstated. The organization brought together experts from diverse fields and fostered a multidisciplinary approach to problem-solving. Its work laid the foundation for subsequent initiatives; it was also taken as inspiration for the creation of the United Nations Sustainable Development Goals (SDGs)[22], which aim to guide global development efforts towards a more sustainable and inclusive future. On the other hand, they are active around the world in the promotion of policies and research on sustainability solutions.

[22] The Sustainable Development Goals or Global Goals are a collection of seventeen interlinked objectives designed to serve as a "shared blueprint for peace and prosperity for people and the planet, now and into the future".
Definition by "The 17 Goals". *Sustainable Development Goals*. UN. Retrieved 10 August 2022.

iii. Circular Economy, a new model.

In the promotion of the European Green Deal and a new paradigm of development, the Circular Economy Plans have a fundamental role. Clearly, all the policy framework promoted by the European Commission has to work with different goals and in different sector but the reach of the Circularity has a central role in the general strategy.
This chapter aims to give a more comprehensive definition of what the Circular Economy is, in order to have a better solid background on the topic.

"The circular economy is a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. In this way, the life cycle of products is extended."
European Parliament News. (2023). Rif. 20151201STO05603.

"A circular economy (CE) can be defined as an economic model aimed at the efficient use of resources through waste minimisation, long-term value retention, reduction of primary resources, and closed loops of products, product parts, and materials within the boundaries of environmental protection and socioeconomic benefits."
Piero Morseletto. (2020). Targets for a circular economy*. Resources, Conservation and Recycling (Volume 153). p.3*

"The circular economy tackles climate change and other global challenges like biodiversity loss, waste, and pollution, by decoupling economic activity from the consumption of finite resources."
Ellen MacArthur Foundation. (2020). *Circular Economy Webpage.*
Link: ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview

The definition of the European Parliament website is reported, "circular economy is a model of production and consumption", a new way to conceive our relations with objects, goods and resources. This model works thanks to the creation of new value from the refuses of classic and linear production processes.
The strategy aims to overcome the linear model of growth, the main used paradigm

since the Second Industrial Revolution.[23] The linear model is based on a take-make-consume-throw-away pattern with the main goal of the quantity and efficiency of production for a large and insatiable audience of consumers. It was developed in an era of a theoretically illimited number of resources and market frontier. The linear model was and usually still is at the base of the economic systems because of the great benefits that it created in the last century. The simplification of the reality for the model does not take into account the waste and the equipment of materials.

The application of the circular economy model is about changing the general perception of goods that citizens have. Every part of the products and services development needs to reconsider its role and impact to obtain more durable and reusable goods; *Picture A* shows the main macro area where the circular model needs to be implemented.

The new model for the Circular economy is not only a matter of new goods endurance and economic but is fundamental also in order to pursue a more strategic management of our raw materials, leading to a more efficient and innovative market. At the same time, we will be able to reduce our dependencies on other countries for the linear and guaranteed transfer of raw materials and resources. The European Union, following this path, could gain a position in the geo-political scenario and the economic one without sacrificing the necessity of measures and solutions for a more sustainable system. From an economic point of view, the circular economy is not only an innovation driver but at the same time it will boost economic growth (an additional 0.5%*ad GDP) creating 700.000 jobs by 2030[24]; the long-term return for customers and companies will be even further considering the spill-over effects and the saving accumulation created by the new model.

iv. The Reach of a Common Framework

This paragraph delves into the fundamental principles that underpin the circular economy, offering a comprehensive exploration of ten key principles that guide its implementation and provide a roadmap for its successful adoption. These principles

[23] 1870 - 1914
[24] Cambridge Econometrics, Trinomics, and ICF (2018), Impacts of circular economy policies on the labour market.

have emerged through extensive research, practical applications, and stakeholder engagement, serving as guiding beacons for businesses, policymakers, and individuals seeking to transition towards a more circular future. The implementation of the model is not a one-size solution to apply in different scenarios. Moreover, it requires collective efforts in various contexts.
The documentation and the research work on the topic is a contemporary topic and for this reason, it is hard to draw a line between what is scholarly development and what is more close to economic speculation.

The necessity of a common view is deeply opposed by the lack of a common theoretical base; A result of this, is the creation of not aligned goals between political or business leaders and, more in general, a lot of chaos in the green transition debate. The boost that the EU Commission gave to the Circular Economy also promoted the research for a common formalization of what the CE is and which factors define a process as *Circular*.

The first regulation was the creation of Seven Pillars in order to define Circularity[25] (*Picture B*). The debate leads to these common bases that have to lead to any choice and any measure of what is Circular. These seven characteristics describe the end state of the circular economy once it has been genuinely achieved. The implementation of all of them is probably hard for any business but they create long-run targets and each of them can be more quantitative characterized according to the economic sector considered. Following is a brief description of the seven pillars:

1) Materials

Materials are cycled at continuous high value and incorporated into the economy in such a way that in order to keep the high value. For example, a couple of good practise connected with these points are the ability to produce final products easy to reconduct to the original source materials and the importance of keeping the geographical supply route as short as possible.

2) Energy

[25] Ogunmakinde, O.E., Sher, W. & Egbelakin, T. Circular economy pillars: a semi-systematic review. Clean Techn Environ Policy 23, 899–914 (2021)

All the energy consumption should be based on venerable sources and storage in a way that increases the amount of solar energy in order to optimize daylight production by the solar panels. As the first point, energy could be considered an extraordinary material; the optimization of the supply route should be also part of an efficient energy strategy.

3) Water

Is possible to reconduct this point with the definition of the previous two; In a circular economy, the value of water is maintained, cycling it for indefinite re-use while simultaneously recovering valuable resources from it whenever possible.

4) Biodiversity

One of the main goals of the Circular Economy is to preserve complexity in its ecological manifestation on the planet. The linear model is based on the idea of human *domination* of the natural system for the production of goods. Material and energetic losses are tolerated for the sake of the preservation of biodiversity

5) Society and Culture

As biodiversity aims to preserve and find harmonization with natural habitats, these pillars focus on the necessity to preserve human cultures and social cohesion. Any economic transformation has stakeholders to respect and understand, even in the way of a more circular development.

6) Health & Well-being

The necessity of a more respectful process leads to solutions that are usually connected with a solution less stressful for the environment and in the same way for the human physician and psychological safety.

7) Value

The optimization of materials, energy and water in a more sustainable holistic way, means also the creation of new value beyond the economic and financial way. Eva Gladek, Founder and CEO of Metabolic[26] suggest considering a new system of value

[26] Founded in 2012, Metabolic is a group of organizations based in Amsterdam, working to drive systems change and build a sustainable economy. Website: www.metabolic.nl

that moves beyond the common standard of the Consumer Society: aesthetic, emotional and ecological values are just some examples.

To conclude, I will return to the picture (*Picture B*) that visualizes the seven pillars just to underline the importance of the three proprieties that surround the key points. We can read the definition of three proprieties: Equitable, Transparent and Resilient.
As I briefly describe in the last pillar, a new path of development would probably lead to a new customer scale of values[27] that will change radically our market preferences. The transition through a more sustainable way of the market has to include this "values environment" in order to be achieved.

v. Measuring circularity, new variables for new standards

Traditional economic metrics like Gross Domestic Product (GDP) do not adequately reflect the resource efficiency, waste reduction, and sustainable practices associated with circularity. As a result, new standards are being developed to assess circularity more accurately. Measuring circularity is a central quest for sustainable development and it is considered an essential responsibility in order to build a society that is more resource-efficient and environmentally sensitive. Traditional measures, however, frequently fail to capture the complexity of circularity adequately. In order to create novel standards that more accurately represent the circular economy, new variables are emerging in response to this problem. These factors include material utilization, product longevity, recyclability, and waste management. (G. Moraga et al., 2019)
Furthermore, the adoption of new circularity standards fosters transparency and accountability, allowing stakeholders to make informed decisions. It enables companies to assess their environmental impact more accurately, identify areas for improvement, and track progress towards circularity goals. Policymakers can utilize these measurements to develop targeted regulations and incentives that promote a circular economy on a larger scale.

Recently, the European Commission (EC) proposed a monitoring framework for CE

[27] The Personal Values Scale is a psychological instrument which measures the importance of 24 values for an individual. It was developed by Shalom H. Schwartz.

(EC, 2018a) and the Ellen MacArthur Foundation has contributed to the roots of CE concept formulation (Ghisellini et al., 2016) but despite these actions, the economic actors and stakeholders have today distinct interpretations of where the connections with sustainability are. (Kirchherr et al., 2017).

The classification of existing CE indicators according to their capability can map the state of play for the development of new CE indicators; according to contemporary scholars, there are two ways to represent CE: in *sensu stricto* and *sensu latu*. (Moraga et al., 2019)
The first definition, *sensu stricto*, is an adaptation of the work of Brocken et al. (2016) where the main characteristic that defines CE from the linear is the effective capability of the system to close resource loops.
On the other hand, the *sensu latu* definition has a broader focus. It is the result of the work made by Murray et al. (2017) and is less focused on the resources loop in order to keep more attention to the external effect of the CE: the focus is on the effects that CE strategies have on the economy, environment and society.

Awerned of this dual theoretical definition, according to Graedel et al. (2011), Gent et al. (2012) and Moraga et al. (2019) the CE indicators can be classified into three measurement types:

1) *Direct CE with Specific Strategies*
Indicators can focus on one or more identifiable CE strategies.
2) *Direct CE with Non-specific Strategies*
Indicators always focus on more than one strategy, and it is not possible to recognise explicit strategies.
3) *Indirect CE*
Indicators may evaluate aspects of CE strategies but with the use of different approaches to assessing CE.

Taking into consideration these theoretic frameworks, the European Commission developed widely used circularity measurement tools such as the Circular Economy

Performance Indicator (CPI)[28] and Circular Economy Index (CEI)[29]. The CEI includes indicators such as the share of recycled materials in the economy, waste generation per capita, and the use of renewable energy sources. It provides a quantitative assessment of progress towards a circular economy. Another important metric is Material Flow Analysis (MFA)[30], which tracks the flow of materials throughout the economy, including extraction, production, use, and disposal. MFA helps identify inefficiencies, waste generation hotspots, and areas for improvement in the resource management system.

The specific indicators show that the EU has an understanding of CE similar to the *sensu stricto* definition but mostly restricted to the circulation of materials. In the EU documentation are frequent terminologies such as “Contribution of recycled materials to raw materials demand” or “Recycling for specific waste streams” with a focus on monitoring the loops of materials. Particularly, the idea of resource and environmental decoupling is not present in the ‘CE monitoring framework’. Resource decoupling is an intermediate objective from the European CE (Gisellini et al., 2016).

Table 1 which is attached to this dissertation's paper shows how the focus of the EU indicators is mainly on materials (strategy 4); Four indicators are Direct CE with Specific Strategies; the other four are Indirect CE indicators.

According to the European Economic and Social Committee (EESC, 2018), all indicators from “The CE monitoring framework’ are ‘heavily focused on waste as a result of the reliability of waste data and lack of other options. Additionally, none of the analysed indicators seems to focus on functions, such as multifunctionality or product sharing.

Already different scholars are suggesting implementing a more comprehensive way to measure and evaluate with more social indicators the effect of the CE because of its multidimensional impact on our society that should be better considered on a macro scale. (Potting et al., 2017) (Moraga et al., 2019)

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[28] Huysman, S., De Schaepmeester, J., Ragaert, K., Dewulf, J., & De Meester, S. (2017). Performance indicators for a circular economy: A case study on post-industrial plastic waste. *Resources, conservation and recycling*, *120*, 46-54.

[29] Di Maio, F., & Rem, P. C. (2015). A robust indicator for promoting circular economy through recycling. *Journal of Environmental Protection*, *6*(10), 1095.

[30] Bringezu, S., & Moriguchi, Y. (2018). Material flow analysis. In *Green accounting* (pp. 149-166). Routledge.

While specific data on circularity measurement may vary across countries and regions, the development of new variables and standards is crucial for accurately assessing progress in the transition to a circular economy. By employing these metrics, policymakers and stakeholders can track and compare circularity performance, identify areas for improvement, and inform policy decisions to drive the circular economy agenda forward.

3. Chapter Three: European Circular Economy Policies

i. Introduction: The Strategic Role of CE in the European Union

The implementation of the circular economy is crucial for the geopolitical role of the European Union (EU) due to several key reasons that I want to summarize in five bullet points based on the outcomes of the last Circular Economy Stakeholder Conference[31]:

1. Resource security: The EU is heavily reliant on imports of raw materials, and many of these resources are finite and located outside its borders. By transitioning to a circular economy, the EU can reduce its dependence on scarce resources and enhance resource security. By optimizing resource use, promoting recycling, and extending product lifecycles, the EU can decrease its vulnerability to resource price fluctuations and disruptions in supply chains, thereby strengthening its geopolitical position.
2. Economic competitiveness: The circular economy presents significant opportunities for innovation, job creation, and economic growth. By embracing circular practices, the EU can foster the development of new industries and business models, such as recycling and remanufacturing, which can drive economic competitiveness. By becoming a global leader in circular economy expertise, the EU can enhance its position in global markets, attract investment, and create a competitive advantage over other regions.
3. Environmental leadership: The EU has been actively pursuing ambitious environmental goals, including the reduction of greenhouse gas emissions and the protection of natural resources. The circular economy aligns with these objectives by promoting resource efficiency, waste reduction, and sustainable consumption and production patterns. By leading the transition to a circular economy, the EU can enhance its environmental reputation and influence on

[31] Circular Economy Stakeholder Conference. *Recovery, Open Strategic Autonomy and Resilience*. 27th - 28th February 2023.

the global stage, shaping international norms and standards for sustainable development.

4. Climate change mitigation: The circular economy offers significant potential for mitigating climate change. By reducing resource extraction, minimizing waste generation, and promoting the use of renewable energy, the EU can decrease its carbon footprint and contribute to global efforts to combat climate change. As climate change becomes an increasingly critical geopolitical issue, the EU's commitment to the circular economy can enhance its standing as a responsible and proactive actor in addressing this global challenge.
5. Soft power and international cooperation: By championing the circular economy, the EU can leverage its soft power and foster collaboration with other countries and regions. The EU can engage in partnerships, share best practices, and provide technical assistance to support circular economy initiatives globally. By promoting sustainable practices and influencing global supply chains, the EU can shape international norms, enhance its diplomatic influence, and build cooperative relationships with other countries, reinforcing its geopolitical role.

Overall, the implementation of the circular economy is vital for the EU's geopolitical role as it enables resource security, boosts economic competitiveness, strengthens environmental leadership, contributes to climate change mitigation, and enhances soft power and international cooperation. Embracing the circular economy positions the EU as a forward-thinking, sustainable, and influential actor in the global arena.

ii. Historical background of the European path for sustainable development

The circular economy was taken seriously into consideration as part of the European political dialogue during the 2007 economic and financial crisis. The main reasons were economic. The countries of Europe needed to find new ambitious targets to relaunch the union after the complicated phase of the economic crisis. The circularity seemed a good meeting point between the different national interests.

In 2015, the European Commission adopted the first circular economy action plan. The claim was to "close the loop" bringing benefits to both the environment and the economy of the countries involved. The plan provided 54 actions divided into areas of expertise and different phases of product life. The results over the years were measured by Eurostat and other independent actors.

The challenge, as was already specified in this dissertation, was also in the field of statistics, looking for indicators strong enough to properly capture the successes (or failures) of actions taken by individual countries. Some macro indicators considered are the self-sufficiency of raw material and waste generation, the level of waste recycling, The number of secondary materials remaining in the market after use and the level of private investment that takes place to make the product durable or easily recyclable.

The plan, however, is not a solitary legislative action on the part of the committee, it was the beginning of a process of European "circularization" that in addition to increasing the economic competitiveness of the member countries, has created a new circular awareness also of the citizens of the union.
In March 2020, at the beginning of the COVID-19 pandemic, the European Commission approved the new Circular Economy Action Plan, however, in the framework of the European Green Deal. The new agenda includes not only the transformation of industrial sectors but also the need for sustainable development through greater intra-sectoral dialogue for the creation of sustainable supply chains.

The objectives of this plan were immediately more concrete, with a positive impact on employment in the Union and an ambitious EU's 2050 climate-neutral target. The measures in this plan are less: 35 total, 19 less than the 2015 plan[32]. But they do not aim to replace the previous ones already introduced but increase the details for a better application. Some concrete examples were the adoption of a new regulation on battery sustainability (10 December 2020) and the new rules for waste shipments on

[32] European Commission (2020). *A new Circular Economy Action Plan. For a cleaner and more competitive Europe*. Luxembourg: Office for Official Publications of the European Communities.

17 November 2021.

Thanks to the European Green Deal, the new circular economy plan was financed massively thanks to European public investments, which had the parallel aim of cushioning the recession caused by the pandemic. The adoption of the European Green Deal is a high moment of European solidarity in the last two decades[33]. The new circular economy plan, in the context of the European Green Deal, has allowed the development of more stringent regulations and more ambitious targets for both the 2030 interim horizon and the 2050 project timeline.

iii. The legislative development of the European Union circularity

For a better understanding of the legislative process that leads the European Union to the plans, it is important to consider a long-term political and legislative process that leads the Union to bond the economic future of the EU with a new development paradigm.

The concept of a circular economy has been evolving over several decades and it started with the theorization of the circular economy model since the contemporary development of the European Green Deal. To show that, the next part of this chapter collects a temporal framework of which events and legislation compose the path of circularization. The division is inspired by the official documentation and analyses provided on the topic by the European Commission.[34]

1. Early Concepts:

The idea of a circular economy emerged in the 1970s as a response to growing concerns about resource depletion, waste generation, and environmental degradation associated with the linear "take-make-dispose" model.[35]

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[33] According to IDDRI, a think tank which facilitates the transition towards sustainable development. In the words of Nicolas Berghamans (2022)

[34] European Commission. Official website. Available online on https://environment.ec.europa.eu/index_en

[35] It means that raw materials are collected, then transformed into products that are used until they are finally discarded as waste.

Early thinkers, such as economist Kenneth Boulding[36] and architect Walter Stahel[37], proposed the idea of a regenerative economy that minimizes waste and keeps resources in use for as long as possible underlining the conduction of limitless that is intrinsically part of a limited system such the planet Earth is.
Contemporary, as previously mentioned, the Club of Rome started to develop its critical work against the linear paradigm of development.

2. EEC Environmental Policy:

The development of European policies in the environmental sector as well as in other areas concerning social welfare was regarded as a necessary element in the process of economic integration itself (Scott 1998) and evolved primarily according to the contingent economic, political and social circumstances (Hildebrand 2002).[38] The European Economic Community (EEC) began addressing environmental issues through policies and directives in the 1970s and 1980s. These focused primarily on waste management and pollution control. The Paris Summit meeting of heads of state and government of the EEC in October 1972 is often used to pinpoint the beginning of the EU's environmental policy. The result was the adoption of the first Environmental Action Programme (EAP) in July 1973. Furthermore, the task force within the Commission that drew up this action programme eventually led to the formation of a Directorate General for the Environment in 1981.[39]
This structure, which already is working in the EU framework, was created during the decades-old action programme that fixed legislative and political targets for the member states. The 8th EAP sets a legal framework to ensure that EU climate and environment laws are effectively implemented by putting forward enabling conditions and setting up monitoring to measure economic performance and societal progress “beyond GDP”. In the words of the Commissioner for the Environment, Oceans and Fisheries Virginijus Sinkevičius: “The 8th Environment Action Programme is the EU’s

[36] Boulding, K. E. (1953). Toward a general theory of growth. *Canadian Journal of Economics and Political Science/Revue canadienne de economiques et science politique*, *19*(3), 326-340.
[37] Knill, C., & Liefferink, D. (2021). The establishment of EU environmental policy. In *Environmental policy in the EU* (pp. 13-32). Routledge.
[38] Orlando, E. (2013). *The evolution of EU policy and law in the environmental field: achievements and current challenges*. Instituto Affari Internazionali.
[39] Judge, D. (1992). A green dimension for the European community?. *Environmental Politics*, *1*(4), 1-9.

joint programme for implementing the European Green Deal on the ground until 2030”[40]

During the 80s, several NGOs based in Brussels, where the political centre of the Community was settled and this phenomenon, promoted by the Commission fostered the creation of an environmental community in the capital city of the EEC. Furthermore, The European Commission has even actively encouraged their participation in policy-making by setting up consultative committees and other bodies and providing funds to establish and maintain certain core groups.[41]

The Single European Act (SEA), adopted in 1986, introduced an explicit legal basis for environmental legislation at the European level.

The Treaty of Maastricht (1992) and the Treaty of Amsterdam (1997) introduced no substantial changes to the environmental legislative layout set up by the Single European Act (Orlando 2013). Nonetheless, both treaties. contributed to further enhancing the environmental foundations of EU environmental law and policy.

In particular, Maastricht introduced for the first time a specific reference to environmental protection among the objectives of the European Union. Amsterdam complemented this by adding a reference to sustainable development among the Union’s objectives and expressly mentioning the achievement of “a high level of protection and improvement of the quality of the environment” among the tasks of the Community. (Orlando 2013). Subsequently, the EU's commitment to sustainable development was formalised as one of the EU's fundamental goals.

The political and institutional crisis that faced the EU in 2005 after the rejection of the EU Constitution, pushed the Sustainable Development Strategy back up the political agenda.

3. Development of Circular Economy Policies: Europe 2020

In 2010, the European Commission adopted the Europe 2020 Strategy, recognising the importance of a resource-efficient and sustainable economy.

“Europe faces a moment of transformation. The crisis has wiped out years of economic and social progress and exposed structural weaknesses in Europe's economy. In the

[40] EU Directorate-General for Environment. (2021). *Commission welcomes political agreement on the 8th Environment Action Programme.*

[41] Cini, M., & Borragán, N. P. S. (2022). European union politics. oxford university press.

meantime, the world is moving fast and long-term challenges – globalisation, pressure on resources, ageing – intensify. The EU must now take charge of its future."[42]
These are the words in the introduction of the Europe 2020 strategy that aims at a "smart, sustainable, inclusive growth" with greater coordination of national and European policy. The Europe 2020 Strategy, which succeeds the Lisbon Strategy (2000-2010), was designed as a European exit strategy from the global economic and financial crisis that started in 2008; it has highlighted the need for increased European economic cooperation in order to deal with the causes of the crisis.

The Europe 2020 Strategy sets out the vision of a social market economy for Europe in the 21st century. It aims at transforming the EU into a smart, sustainable and inclusive economy with high levels of employment, productivity and social cohesion and at reinforcing the EU as an actor in global governance (Begg et al. 2010)
The strategy was organized in two strands: First, it identifies three priorities that come to clarify the nature of growth that the EU envisages: smart growth, developing an economy based on knowledge and innovation; sustainable growth, promoting a more efficient economy in terms of resource utilisation that is more ecological and more competitive; and inclusive growth, fostering an economy with high employment levels and which ensures social and territorial cohesion. Second, five headline targets serve as benchmarks for the EU in 2020[43]:

- To raise the employment rate of the population aged 20–64 from the current 69% to at least 75%.
- To achieve the target of investing 3% of GDP in R&D in particular by improving the conditions for R&D investment by the private sector, and developing a new indicator to track innovation.
- To reduce greenhouse gas emissions by at least 20% compared to 1990 levels or by 30% if the conditions are right, increase the share of renewable energy in final energy consumption to 20%, and achieve a 20% increase in energy efficiency; as known as the 20-20-20 target.

[42] European Commission. (2010). *A strategy for smart, sustainable and inclusive growth.* Brussels.
[43] European Commission. (2010). *A strategy for smart, sustainable and inclusive growth.* Brussels.

- To reduce the share of early school leavers to 10% from the current 15% and increase the share of the population aged 30–34 having completed tertiary from 31% to at least 40%.
- To reduce the number of Europeans living below national poverty lines by 25%, lifting 20 million people out of poverty

In 2015, the EU launched its Circular Economy Action Plan (CEAP), which aimed to accelerate the transition to a circular economy and reduce Europe's resource consumption and environmental impacts. The Action Plan covered several policy areas, material flows, and sectors alongside cross-cutting measures to support this systemic change through innovation and investments. It also announced a sectoral strategy for plastics. More than EUR 10 billion of public funding was allocated to the transition between 2016 and 2020. These data come from the final report from the Commission to the other European institutions on the implementation of the Circular Economy Action Plan The Circular Economy Package, adopted in 2018, introduced a comprehensive set of measures and targets to promote recycling, waste reduction, eco-design, and resource efficiency.

“The 54 actions under the action plan have now been completed or are being implemented, even if work on some will continue beyond 2019”, this is the introduction of the final report implemented by the European Commission at the end of 2019.

First Vice-President Frans Timmermans, responsible for sustainable development, said: *"Circular economy is key to putting our economy onto a sustainable path and delivering on the global Sustainable Development Goals.”*

4. Development of Circular Economy Policies: The European Green Deal

The European Green Deal, launched in 2019, marks a significant milestone in the EU's journey towards a circular economy. It builds upon a rich history of circularity efforts within the European Union, including initiatives such as the New Circular Economy Action Plan and the Waste Framework Directive. It is composed of different policies that are briefly presented:

- The proposal for a *Regulation on Ecodesign for Sustainable Products* addresses

product design, which determines up to 80% of a product's lifecycle environmental impact. All regulated products will have Digital Product Passports. This will make it easier to repair or recycle products and facilitate tracking substances of concern along the supply chain.

- The *Farm to Fork Strategy* lays down a new approach to ensure that agriculture, fisheries and aquaculture, and the food value chain contribute appropriately to the objective for a climate-neutral Union in 2050. The agricultural sector is not only a strategic and protected sector in the EU but in addition, the manufacturing, processing, retailing, packaging and transportation of food make a major contribution to GHG emissions[44], air, soil and water pollution, and have a profound impact on biodiversity.

- The new *2030 Biodiversity Strategy* is a comprehensive, systemic and ambitious long-term plan for protecting nature and reversing the degradation of ecosystems. With an objective to put Europe's biodiversity to recovery by 2030, the Strategy sets out new ways to implement existing legislation more effectively, new commitments, measures, targets and governance mechanisms.

- The *Zero Pollution Action Plan* provides a compass to mainstream pollution prevention in all relevant EU policies, to step up implementation of the relevant EU legislation and to identify possible gaps. As the European Commission's official website claims: "The action plan aims to strengthen the EU's green, digital and economic leadership, whilst creating a healthier, socially fairer Europe and planet. It provides a compass to mainstream pollution prevention in all relevant EU policies, to step up implementation of the relevant EU legislation and to identify possible gaps."[45]

- The *Revision of the Packaging and Packaging Waste* Directive aims to put an end to wasteful packaging, boosting reuse and recycling. Today, the diversity of packaging items and materials is considerable. Between 2009 and 2020, the total mass of packaging waste generated in the EU rose by 20 %.[46] The initiative's objective is to

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[44] GHGs: Greenhouse gases in the earth's atmosphere that trap heat.

[45] European Commission. (2021). *Towards Zero Pollution for Air, Water and Soil.* Brussels

[46] European Commission. *EU rules on packaging and packaging waste, including design and waste management.* Available online at https://environment.ec.europa.eu/topics/waste-and-

ensure that all packaging is reusable or recyclable in an economically feasible way by 2030. The aim is to reinforce the essential requirements for packaging to ensure its reuse and recycling, boost the uptake of recycled content, and improve the requirements' enforceability. (Ragonnaud 2023)

- The Industrial Emissions Directive sets strong mandatory due diligence rules for companies that want to place relevant products on the EU market or export them. The new rules aim to reduce carbon emissions caused by EU consumption and production of the relevant commodities by at least 32 million metric tonnes a year.[47] Companies will also be required to collect precise geographical information on the farmland where the commodities that they source have been grown so that these commodities can be checked for compliance.

-*The New Circular Economy Action Plan or Circular Economy Action Plan 2.0* (CEAP II) is also part of the EGD roadmap to sustainability. It was launched in 2020 as an updated roadmap to further advance the circular economy agenda and align it with the EU's Green Deal and climate objectives. The CEAP II focuses on resource-intensive sectors where the potential for circularity is high, aiming to keep resources in economic cycles as long as possible, the plan addresses key product value chains: electronics and ICT, batteries and vehicles, packaging, plastics, textiles and food. “To achieve climate neutrality by 2050, to preserve our natural environment, and to strengthen our economic competitiveness, requires a fully circular economy,” said Frans Timmermans, the Commission’s vice president in charge of overseeing the European Green Deal. In March 2022, the European Commission adopted the package of measures proposed in the circular economy action plan; In total, 35 legislative and non-legislative actions were announced.

Briefly, some key Circular Economy proposals or actual policies that are part of the CEAP II:

recycling/packaging-waste_en#law

[47] European Commission. *Industrial Emissions Directive.* Available online at https://environment.ec.europa.eu/topics/industrial-emissions-and-safety/industrial-emissions-directive_en

- EU strategy for sustainable and circular textiles:

  The strategy aims to create a greener, more competitive sector that is more resistant to global shocks. The Commission's 2030 Vision for Textiles is that all textile products placed on the EU market are durable, repairable and recyclable, to a great extent made of recycled fibres, free of hazardous substances and produced in respect of social rights and the environment. The last action taken to pursue this policy was on January 26th 2023, with the launch by the European Commission of the "*ReSet The Trend*" campaign, aiming to engage Europeans in the battle against fast fashion and raise public awareness about the EU textiles strategy.
- Proposal on common rules promoting the repair of goods:

  It will ensure that more products are repaired within the legal guarantee and that consumers have easier and cheaper options to repair products that are technically repairable (such as vacuum cleaners, or soon, tablets and smartphones) when the legal guarantee has expired or when the good is not functional anymore as a result of wear and tear. The Commission's proposal has to be adopted by the European Parliament and the Council.

- Revision of the Industrial Emissions Directive:

  The Industrial Emissions Directive (IED) is the main EU instrument regulating pollutant emissions from industrial installations. The integrated approach means that permits must take the whole environmental performance of the plant into account. This covers emissions to air, water and land, generation of waste, use of raw materials, energy efficiency, noise, prevention of accidents, and restoration of the site upon closure. The proposals aim to improve the Directive by increasing the focus on energy, water and material efficiency and reuse, in addition to promoting the use of safer, less toxic or non-toxic chemicals in industrial processes.[48]

[48] European Commission. (2022). *Industrial Emissions Directive Revision.* Brussels

iv. Political Divisions and the Future of the EU

The European Green Deal will have profound geopolitical repercussions, some of which are likely to have an adverse impact on the European Union's partners. (Leonard et al. 2021). It is so highly ranked as important in all the Union in order to allocate public expenditure, to organize new regulations and to privilege some businesses at the expense of others. As such, it is a foreign policy development with profound geopolitical consequences.

The Green Deal is at its root an effort to transform the European economy and European consumption patterns; A greener Europe will be more dependent on imports of products and raw materials that serve as inputs for clean energy and clean technologies. For example, rare-earth elements, of which China is the largest producer, are essential for battery production. Moreover, Europe could remain a major net importer of energy but that energy will need to be green, such as green hydrogen produced in sun-rich parts of the world.(Leonard et al. 2021).

The European Commission has already recognised that it will either need to export its standards or create a border adjustment mechanism to maintain European competitiveness and prevent carbon leakage. This political effort, according to the European Council of Foreign Relations[49], will guarantee the success of the European market development and at the same time, promote the role of the EU as the leader in the political-economy transition of the world.

During crises and political reforms, European countries still tend to foster national priorities and interests at the expense of the pluralistic European objective. Considering this, an important factor that is fundamental in order to develop common European policies, especially regarding environmental and climate change issues such as the European Green Deal, is the trust that European citizens rely on institutions of different levels.

According to *The Scale of Trust: Local, Regional, National and European Politics in Perspective* realized by Groupe d'études géopolitiques (GEG)[50] Europeans almost

[49] The European Council on Foreign Relations is a pan-European think tank with offices in seven European capitals. Launched in October 2007, it conducts research on European foreign and security policy and provides a meeting space for decision-makers, activists and influencers to share ideas.

[50] Groupe d'études géopolitiques is an independent center of research, as well as a publisher and a

always favor local ties over wider national or regional power (Arrighi et al. 2022). Different factors explain this trend but the most important is the fact that is simpler and more immediate for citizens to evaluate policies and the work of institutions if the results it is observable or in general immediate. National governments have to deal with macroeconomic issues where the results are hard to catch and in general, are connected with sectors that do not influence directly any citizens' lives. Every European country has different data observable about the level of trust between citizens and institutions of different levels. The article written by Arrighi et al. (2022) illustrates the fact that in any country there are preferences for local authorities. However, in the south of Europe, European institutions are preferred to national ones; European institutions are still usually perceived as more stable and reliable than some national institutions because of their intangible presence in the political debate. In other words, citizens understand that the European Union institutions are promoting worthy political ways but due to the fact that they are not responsible for everyday policies or political debates are considered more concrete and able to be trusted. A widespread sense of trust is fundamental for the excellent work, at every level, of the European institutions, for the achievements of the European Green Deal and also for the favourable future of the European Union.

Trust is important not only for the success of the political path of Europe but also because the Circular Economy and in general, all the political challenges contained in the European Green Deal, require active and mutual citizen participation. States have to provide supplemental services in order to mitigate the transformation that could be dangerous for social stability. In other words, to achieve the objectives of the EGD, EU member states (MS) must implement the right education, health, and social protection policies to make sure that the transition out of carbon leaves no one behind, particularly disadvantaged households. (Sanchez-Reaza, Javier, Diego Ambasz, and Predrag Djukic 2023). The transition to new economic and social models requires coordination between sectors and support by institutions in order to prepare the environment for transformations (radical or not) that a new development paradigm could trigger. Support services such as mental health programs, measures in order to match more efficiently the offer and demand of labour and health policies are just some

think tank, located at the École normale supérieure, with an office in Brussels. Founded in 2017.

examples of public policies that are required for helping the adaption to the shocks of the market. (Hollingsworth, Ruhm, and Simon 2017)

Low- and middle-class workers bore the highest costs of the trade and technological transitions in the EU (World Bank 2023), this is why the European Green Deal must be congruent with economic and social needs in regions and sectors that rely heavily on the carbon and fossil fuel-related industries. In order to coordinate this complexity is necessary goods financial efforts to the public actors: the European Commission (EC) established a Just Transition Mechanism mobilizing up to €150 billion from the Just Transition Fund, InvestEU, and the European Investment Bank (EIB) to support regions and individuals most adversely affected by the green transition through worker reskilling, enterprise development, and circular economy projects (Más Rodriguez 2021). To summarize, the new economic model requires a deep work of political harmonization of the social environment. A green transition could not be defined as successful if the European Member States are not able to guarantee social equity in the transition phase.

The Green Transition, including the circular economy, requires political motivations and measures that will influence, change and shape the future of the European Union. Consequently, the battle for the prevention of climate change and for the application of a more sustainable way of living turns out to be part of the everyday political debate. *The politicisation of climate change attitudes in Europe* (Fisher. Et al. 2022) shows voters in Europe do, in fact, divide themselves between mainstream parties partly based on climate change attitudes. The authors used data taken from the European Social Survey (ESS)[51] data from 21 countries of the EU and they confirm some differences: voters for Green parties are the most worried about climate change, while populist-right voters are among the least worried. (Fisher. Et al. 2022) That does not mean voters are necessarily choosing parties based on their climate attitudes. “It could be that left-wing parties, and more broadly left-wing activists and newspapers on the left, have persuaded left-wing voters to care more about climate change. It could be both, and both are processes that produce the politicisation of climate change in domestic electoral politics” said Professor S. Fisher arguing about the matter of the

[51] The European Social Survey is a social scientific endeavour to map the attitudes, beliefs and behaviour patterns of the various populations in Europe.

research. The positive side of this phenomenon is the fact that climate change is nowadays part of the public debate, a matter of discussion in the mass media. On the other hand, it is always a great risk to measure the relevance of a global crisis on the consensus that it provides.

4. Chapter Four: The Italian Circularity

i. Overview of the Italian Progress on Circular Economy in the EU Framework

This dissertation aims also to analyse and picture the path Italy took reaching the implementation of Circular Economy strategies and practices through Italian citizens and businesses. The choice to focus on the country came mainly from three reasons:

- The first reason is historical. Since the Industrial Revolution, and the affirmation of the mechanization systems and industries, the Italian peninsula faced the hard challenge of finding and providing raw materials like crude oil, coal and other precious metals. This reinforces political and social behaviours in order to save and reutilize goods because of this natural scarcity.
- The second motivation is connected with the good results that Italy achieved in the last years in the development of a Circular Economy culture. Several notable documents that are cited later in this chapter argue and analyse the results and the data in comparison with other European countries. The influence that the two Circular Economy Action Plans had on the success of the Italian model and vice versa will be material for discussion.
- The third reason is connected with political reasons. In the last years, politicians and political parties have taken positions in sustainable development, green economy and circular economy with different conjugations and objectives. These terms are easy to insert in political debates and programs without a good sustainable political agenda but with the aim to proceed a political greenwashing. In the future, the political debate around these topics will be central to the development of the EU. Arguing how it has developed in Italy, one of the main political and economic players in the Union could be important for contemporary and future discussion on the topic.

In the reach of a complete and polyhedric framework of the Italian role, path and results on the development of a circular economy strategy are important to consider the main reports and documents that evaluated operations, results and actors that contributed to this path since the CE entered in the political and social debate of the country.

According to the annual report published by Circular Economy Network (CEN) in collaboration with the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (Enea), Italy has retained its position as the leading circular economy in Europe in 2023. Citing the report: *"On a global level, the circular economy, unfortunately, is lagging behind, but Italy remains a leading country among the major European economies."*

The Circular Economy Network is a project developed by the Sustainable Development Foundation, in line with its objectives of promoting a green economy. The Foundation is committed to stimulating, supporting and facilitating the change of the current production and consumption model to achieve the objectives of the green economy and, with it, of circularity with the organization of reports, events and promoting the network between Italian companies that share the code of values.[52]

Based on seven indicators related to resource productivity, waste generation to material consumption, the share of energy from renewable sources in total gross energy consumption, rate of repairs, rate of use of land, rate of use of recycled material, and rate of waste recycling, the report ranks the top five economies in the European Union. The report shows, thanks to a set of interviews, the increase of good practices among Italian consumers with the specific action of sharing, reusing, leasing and purchasing second-hand products.

As the Circular Economy Network report describes, Italy is a leader when it comes to circular economy applications in Europe. In particular, it performs well for the amount of recycled material (68% against the European average of 57%) and the use of recycled material (19.3% against the European average of 11.9%). It appears that Italians are also producing less waste per citizen (488kg/person against the average European of 502kg/person).

Another important document to take into consideration in the circular economy of Italy is the note written by The Autorità Garante della Concorrenza e del Mercato (AGCM) for the OECD on June 2023.

The OECD collected in the same months' different experiences and best practices in

[52] A code of ethics in business is a set of guiding principles intended to ensure a business and its employees act with honesty and integrity in all facets of its day-to-day operations and to only engage in acts that promote a benefit to society.

a roundtable by the name *"Competition in the Circular Economy".*[53] The focus of the roundtable was to show the possible balance between economic growth and the shift to a circular economy. The event allowed some selected member states (Australia, Egypt et al.) to share good practices and business experiences. Italy was invited as a country with important cases of business models related to circular economy.
Returning to the note realized by AGCM, it underlines the scarcity of raw materials and supply-chain disruptions that choked the post-pandemic growth of Italy's classic linear economic model and contributed to the current situation of high input prices and inflation; the transition towards circular productions and consumptions gain a strategic role beyond the ecological sustainability of the country. It represents a good chance to foster a more stable economic development, reducing the exposure to virgin materials and to other countries that control their markets.[54]

As was argued before, this document also repeats the importance and the good position of Italy's organisation of waste recycling in the context of the CE development but it also keeps attention to the fact that the country still has important possibilities of development of the strategy to better neutralise the dependency of imported raw materials and to increase the life-cycle of already imported goods. The main fragility of Italy is the fragmentation of the private sector which is composed of thousands of small private and public companies and only a small percentage can be considered middle-big / big companies. The high presence of small-middle enterprises in the Italian economy represents a strong advantage for the good additivity of the market to exogenous shock and crisis; is well known that one of the main lacks of the Italian SME system is the accumulation of capital in order to guarantee long-term investments. The circular economy transformation requires a scale economy to reach efficiencies; to summarise, the presence of some more big market actors could be able to gain market trust and attract more investment for the specific department of the value chain of the CE product.

[53] In June 2023, the OECD held a roundtable to discuss how to balance economic growth and the shift to a circular economy. As the circular economy may lead to different incentives, business models and dynamics than traditional linear economy systems

[54] See European Commission, New Circular Economy Action plan, March 2020

In order to maintain some of the business models that could aid in the shift to a more resource-efficient and circular economy, the AGCM encouraged the Government to take a coordinated set of measures into consideration.

The set suggested by the AGCM contained measures such as:

- Recommends favouring more competitive processes in order to select companies that are responsible for the waste management sector.
- It suggests the adoption of more privatisation good practices for what concerns the management of public services that are responsible for the transportation of waste materials and the treatment of them.
- It underlined the importance of covering the infrastructural gap compared with other European countries; it means public investments in waste treatment centres. They are mostly located in the northern part of Italy or outside the country. The AGCM advocated for the introduction of long-term incentives to invest in new and more efficient treatment plants and improve their geographical distribution (to reduce transport costs). Referring to this point the note also specified that *"This infrastructural gap prevents adequate competition in the downstream stages of collection, with the result of concentrating excessive market power in the hands of a few existing plants, with a possible increase in municipal waste management costs"*.[55]

Several of the proposed reforms were included in the National Strategy of Italy, and integrated into the *Next Generation EU* framework. National Recovery and Resilience Plan (NRRP). The above-mentioned AGCM's advocacy and enforcement experience has demonstrated that conventional competition policy might be used to promote the circular economy without causing any special tensions to arise. In the end, according to the note, promoting competition in the circular economy market has positive effects on consumers and producers but "it also generous spillovers in terms of efficiency of circular business models."[56]

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[55] *Competition in the Circular Economy - Note by Italy*. (2023). OECD. Directorate for Financial and Enterprise Affairs. Competition Committee. Chapter 3. Available on: https://www.oecd.org/competition/competition-in-the-circular-economy.htm

[56] *Competition in the Circular Economy - Note by Italy*. (2023). OECD. Directorate for Financial and Enterprise Affairs. Competition Committee. Chapter 5. Available on: https://www.oecd.org/competition/competition-in-the-circular-economy.htm

These contributions show how much Italy is at the centre of the international debate on CE development and is usually taken as a case study in order to make a comparison with other countries, usually in the EU context. These reports are not to be taken as the final path of the evolution of the CE paradigm; quite the opposite, they show how much is still dynamic in the international debate on the field and inspire more studies and research on the Italian model of development.

ii. The Italian Strategy for circular economy and business models

One key initiative in Italy's circular economy progress is the National Strategy for Circular Economy, which was launched in 2017 during the G7 meeting on the Environment in Bologna and adopted in 2022. The strategy sets out a comprehensive roadmap for Italy's transition to a circular economy, focusing on multiple sectors such as agriculture, manufacturing, energy, and waste management.
Furthermore, at the end of 2022, was published a general overview of the Italian CE development and strategy for future investments; the name of the document is *"Verso un modello di economia circolare per l'Italia, Documento di inquadramento e di posizionamento strategico"* ("Towards a Model of Circular Economy for Italy, Overview and Strategic Framework")
The document takes into account strategies taking into consideration the Italian industrial context, predominantly by Small and Medium-sized Enterprises (SMEs).

According to the fact that the CE paradigm requires a general switch to new production and consumption practices, the document agreed with the necessity of coordinating the upstream and the downstream dimensions, promoting innovation in new business management strategies and at the same time encouraging every other actor to adopt more sustainable practices and consumption choices (public administrations, citizens, associations etc.).[57]

[57] Towards a Model of Circular Economy for Italy, Overview and Strategic Framework- Citation from page 13.

It is also true that CE represents a great opportunity for a country that is historically rare in raw materials and is globally recognised for its creativity. Investing in Research and development through a cooperative network is a real possibility for our SMEs, especially the manufacturing ones, to rethink and change their production model and consolidate their presence in global value chains.[58]
In order to lead this transformation it is however necessary to structurize the national economic system in order to welcome and be adaptive to the transformation. This is also crucial for the prevention of economic shock with consequent political struggles that could slow down or even stop the transformation process. According to the ministerial document, one key role in which public institutions could help is the sharing of practices and information in the business sector: “Transparency on the one hand helps reduce illegal practices, both in phase of production and waste disposal, on the other hand, thanks to traceability, allows consumers, who are increasingly attentive and aware, to reward virtuous enterprises for the quality of their productions.”[59]

Even if the document proceeds by deepening different aspects of the CE development in Italy, I would like to focus and report on the three main agents in which are mainly argued: business companies, consumers and the public sector.

a) Business Companies

Companies had an important role in order to rethink the life cycle of products. There are different phases and steps that could be modified and converted to the new paradigm.

- The one that should be more appropriate to start is the business management culture. New production paths require leaders or managers who are aware of the social and environmental mission that the company is required to engage. A good ecologic culture could help to imagine and completely understand the role and the externalities that the company have. What is desirable, is that the

[58] Towards a Model of Circular Economy for Italy, Overview and Strategic Framework- Citation from page 23.
[59] Towards a Model of Circular Economy for Italy, Overview and Strategic Framework- Citation from page 23

same awareness joins the company identity and spreads into the code of values of every worker.

- The products or services should be disassembled for the evaluation of the impact by all the stages and rethought following the principles of *eco-design*[60] such as the rationalisation of the materials necessary for the production, the optimization of energy in the production process, the disassemblability, recyclability and repairability.
- One aspect, usually undermining, is the importance and the environmental impact of logistics. Goods are not consumed in the same places where they are produced. Is important to favour a small chain of value and an appropriate way to deliver products to the consumers. In order to pursue more sustainable supplies it is possible to use models already available as the Minimum Environmental Criteria (CAM).[61]
- Companies should also invest in switching from product to service and creating platforms or sharing values between users/consumers. Promoting communication and interaction with a "pay-per-use" approach or by the creation of a reparation hub.
- One last point that is also cited in the first circular economy action plan is the importance of Industrial Symbiosis. Companies should abandon some competitive methods for the valorization of other approaches to competitor industries. (They should not just be seen as competitors but as different value creators). The aim is the promotion of competitive advantage not only for one company but for the entire "industrial environment" creating a new frontier of sharing and collaboration of materials, energy, water, and products gaining economic, and environmental benefits with relevant positive externalities. The networks are also based on appropriate platforms for meeting demand and offer and to make known the characteristics of residues, in order to carry out evaluations and investigations on the possibilities of use in new production

[60] The integration of environmental aspects into the product development process, by balancing ecological and economic requirements. Eco-design considers environmental aspects at all stages of the product development process, striving for products which make the lowest possible environmental impact throughout the product life cycle.

[61] The Minimum Environmental Criteria (CAM) are the environmental requirements defined for the various stages of the purchasing process, aimed at identifying the best design solution, product or service from an environmental point of view along the life cycle, considering the market availability.

processes, addressing the problems related to the exchange of confidential information and specific know-how.[62]

b) The Consumers

The Circular Economy model requires investments of efficiency in production but at the same time, it requires a change in consumption patterns.
This represents an important challenge for countries because the trends and the choices of consumers are connected with factors that are not influenceable because of the nature of any individual behaviour. Changing behaviour and personal choices is a very difficult topic to deal with because it has to do with a variety of sensibilities, needs, necessities and desires, priorities, habits, places, and personal stories.[63]
However, increasing the level of awareness and the ecological education of people could promote a more sustainable culture of consumers based on reuse, second-hand products and a less linear approach to purchases.

Therefore, it is important to develop a citizen's education in any stage of life, starting from the childish until the elder age. It is a change that has to be promoted in schools and in the third sector. A new code of values and priorities, in the long run, will transform families' habits with simple and less simple topics such as preferring sharing and use rather than ownership of some goods, having responsible and informed attitudes in consumption and introducing the recycling of waste as a natural good education habit.

According to the Italian overview, families could play an important role in the development of the new paradigm if they are able to distinguish between sustainable or not sustainable products and moreover, if they will have the spending capacity to afford the choice. From this link, the relevancy that social equity has in the transformation of society. Participation in the process has to be democratic; however,

[62] Towards a Model of Circular Economy for Italy, Overview and Strategic Framework- Citation from page 33

[63] Towards a Model of Circular Economy for Italy, Overview and Strategic Framework.Citation from page 37

in order to be democratic it has to be inclusive. Citing the second principle of the Agenda 2030 of the UN: “Leave No One Behind”.[64]

c) The Public Sector

The public sector has the responsibility to promote the transformation in both the categories previously discussed. According to the ministerial document, the Green Public Procurement (GPP) became one of the main instruments; but what is the GPP? Green Public Procurement is “a voluntary instrument available to European public authorities that allows them to choose environmentally friendly goods, services and works”[65]

Basically, the public sector interiorizes the environmental priorities in its rules for public procurement and promoting CAM choices. The application, in Public Administration tenders, of considerations and criteria of a social nature is important not only for ethical and social aspects but also for economic and environmental ones.[66] The application of these criteria could boost and foster good practices not only in the business but in the civil sector as well.

One last consideration about the public sector should be on the Extended Producer Responsibility (EPR) which requires manufacturers to take responsibility for the entire lifecycle of their products, including their disposal and recycling. c[67] While variations of EPR now have a worldwide presence, the European Union (EU) was the first to introduce and implement the legislative tool in the 1990s and 2000s. One important key milestone in the EU’s adoption of EPR was the Waste Framework Directive (2008/98/EC); This directive established the basic principles of waste management, including the "polluter pays" principle and the promotion of EPR schemes for specific product categories.[68]

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[64] UN Sustainable Development Group. Informationa available on: https://unsdg.un.org/2030-agenda/universal-values/leave-no-one-behind

[65] Definition by: https://green-business.ec.europa.eu/green-public-procurement_en

[66] Towards a Model of Circular Economy for Italy, Overview and Strategic Framework. Citation from page 47

[67] *History of EPR : Multi-Material Stewardship Western*. (2001, June 13). History of EPR : Multi-Material Stewardship Western. https://www.mmsk.ca/residents/history-epr/

[68] *Waste Framework Directive*. (n.d.). Environment. https://environment.ec.europa.eu/topics/waste-and-recycling/waste-framework-directive_en

Unfortunately, Italy has not implemented a comprehensive nationwide EPR framework, the last news about an advancing step is from February 2023, when the Ministry of the Environment and Energy Security together with the Ministry of Enterprise and “Made in Italy” (MIMIT) identified the new obligations to be fulfilled by producers in the textile sector with regard to the design, production, disposal, and recycling of textiles.[69]

In conclusion of this chapter, Italy has made significant strides in the development of a circular economy. Through its National Strategy for Circular Economy, waste management initiatives, focus on eco-design, promotion of the sharing economy, and investments in research and innovation, Italy has positioned itself as a leader in the transition towards a more sustainable and resource-efficient future.
This chapter is mostly based on the National Strategy for Circular Economy document released by the Italian Ministry of the Environment and the Ministry of Economic Development in 2017.
In order to properly evaluate the efficiency of this system and to understand its relevance in the EU framework, is important to consider Italian and EU data provided in these years of CE implementations.

[69] E. (2023, February 3). *Tessile sostenibile, in consultazione il decreto sull’EPR*. Economia Circolare. https://economiacircolare.com/tessile-sostenibile-epr-responsabilita-estesa-del-produttore/

5. Chapter Five: Methodology of research and Quantitative Analysis

i. Introduction

In this chapter is possible to find the core of the analysis proposed by this dissertation. The analysis is conducted with mixed methods of analysis that would try to observe and measure if is possible to observe a positive and controlled pattern of development of CE in the EU due to the development of the European Union Circular Economy Action Plan. More precisely, the scope of the quantitative analysis aims to estimate relations between the new indicators on CE by Eurostat and the variation of public investment in R&D. On the other hand, the qualitative method aims to capture impressions and opinions of the business leaders that should be the main protagonists in this transformation. The analysis results are not directly correlated but are the observation of the same phenomena from different scales.

The remainder of the chapter is structured as follows:

5.1 - Literature review on the importance of using mixed method analysis in a dissertation with a cross focus: economic and social. It is also possible to find a collection of articles by scholars that also try to measure new CE trends in the economy

5.2 - Methodology of research where the two methods of analysis are explained in more detail. In this paragraph is possible to notice the process that led to the selection of the dataset, variables, countries and statistical method

5.3 - Graphs on the linear regressions and brief comments on the results obtained.

5.4 - General observation of which information data is provided to use thanks to the econometric analysis conducted.

ii. Literature review

The goal of this dissertation is to deepen how the circular economy policies implemented by the EU are translated into real and concrete results for the creation of more sustainable businesses and new good industrial practices.

I choose to combine theoretical research made on primary and secondary sources on the related topics but, at the same time, I wish to "get more in touch" with the protagonists of the circular economy: business and economic actors that implemented or that are implementing new solutions and innovations intending to of more sustainable production.
However, the contributions of the interviewed should be anticipated by a proper historical and theoretical introduction.
In recent years, the necessity for the implementation of CE measures to mitigate the effect of climate change and the fundamental necessity to implement the world's economics more sustainable practices, lead to the production of a great number of scholar's papers and research.
This phenomenon is particularly evident in the European Union consequently to the implementation of the European Green Deal and NextGenerationEU that boost the necessity of more work in the field of CE and of the Green Transition[70].

Quantitative and Qualitative research are usually presented as two different research paradigms. The basic theoretical rule to choose between one or the other is to focus if the dissertation is looking to confirm or measure something (quantitative) or to understand the impact and ex-post feedback of a phenomenon (qualitative). The first one, due to its statistical nature, requires more use of statistics methods and it is more affirmed in the economic environment. The second paradigm, due to the possibility to capture the complexity of a situation and also for the necessity to consider different points of view is more appreciated in the political science field.
However, considering the multidisciplinarity of this dissertation, I believe in the importance of crossing both the different analysis strategies. As is longly argued in the paper "*Mixing Methods: The Entry of Qualitative and Quantitative Approaches into the Research Process"* by Julia Brannen (2005) since the beginning of this century the approaches that are more appreciated and required by scientific research to work with more generalistic approach rather then specialistic. (Hammesley, 2000).
This appears to be more evident in studies and research that are not focused only on econometrical sources such as political science or social dissertation that has to take

[70] The green transition is a general concept of moving from a carbon-based economy to a more sustainable economy.

into account different aspects and perspective of the same research field for a more comprehensive work. In accordance with that, this dissertation n follows both ways of research. Social scientists tend to use qualitative research aiming to accumulate a detailed account of human behaviour and beliefs within the contexts they occur (Rubin & Rubin, 2005).
Thanks also to this reason, the debate on the topic is very high and quite contemporary even if is possible to find some guidelines on what CE is and if the EU economy strategy is going in the right way. The theoretical framework came from a deep preparation of the research books *Circular Economy and Sustainability Volume 1: Management and Policy* (2021) and *Circular Economy and Sustainability Volume 2: Environmental Engineering* (2022) where the authors try to “pull the strings” on the last progress on the research and the development of CE practices and findings.
However, this dissertation is focused on the EU level and requires more specific documentation according to the political and economic peculiarity of the EU.

In order to obtain the most recent information on the matter I found two practical solutions for this research: the first one is a deep exploration of the EU Parliament and the EU Commission's official documentation as *Circular Economy Action Plan* (2020) published by the officials European Commission press agency or *Green Deal: New proposals to make sustainable products the norm and boost Europe's resource independence* (2022) where is possible to reach more official communication and infographics directly computed by the institutions.
The second principal source consulted for the theoretical framework is another scholarly book focused on the political implementations and results of the CE in the UE: *The Circular Economy in the European Union. An Interim Review* (2020) published by Springer.

About the Circular Economy, the scholarly debate has a relevant dimension, even just considering the EU, the materials offered by magazines and universities are numerous due to the fact that CE is not considered just an ecological approach to businesses or to economic development but also because the EU invested great political and financial efforts on the CE way of development. It represents a matter of resource security and a strategic priority for the safe development of the Union (Taifouris and Martín, 2023). In the preparation of this dissertation I focus my studies on scholars’

work that focused on the attempt to measure a significative impact of the Circular Economy in the European Union with most of the sources realised in the past 10 years. The debate is important and it involves every side of Circular Economy development: the political implementation, the economic measurement, the social impact, the geopolitical importance etc.

A great number of articles try to summarise the progress and evolution of the Circular Economy Plan considering the hard crises (COVID-19, the conflict in Ukraine) that faced and put at risk the ambition of the European Commission. The basis of this work starts from more generalist papers that tried to investigate if circular economy development in Europe was able to promote the switch of the paradigm; from this perspective, the results seem to be ambiguous. N. Johansson (2021) observed that the political promotion of the circular economy is not totally followed by legislative and economic support such as the ambition to increase extraction primarily driven by geopolitical concerns regarding critical raw materials. However, a resource policy with the ambition to simultaneously increase circulation and natural resource extraction means that the environmental impact in the form of, for example, climate emissions will increase from both the circular economy and the extractive economy. (Johansson, 2021). Another important issue about the Circular Economy is how to measure the impact and the results that it has on the economies of different member states of the EU. Recently, Eurostat incorporated a set of new data that observe econometrical changes due to the Circularity characteristic of companies or businesses. The hard point is that in each member state the definition of Circular could be set differently. An important contribution to the definition of a set of variables for the circularity measures is proposed by the article of De Pascale et al. (2021) in which emerges the necessity to set CE indicators for the support of CE development. In the case of the EU, almost every project at the European level is given “its own set of indicators”. and the presence of ambiguity could be a limit to the creation of more sustainable practices because of the limits on the understanding of results and meritocracy. Furthermore, The construction of a framework that collects the various indicators of the CE, helps to understand their limits and offers a starting point for rationalizing and redesigning by simplifying the current measurement scenarios. This step is a necessary condition that can facilitate a real and wide transition to a widespread CE. (De Pascale et al., 2021) (Del-Aguila-Arcentales et al., 2022)

Despite that, scholars are successful in setting different analysis approaches in order to summarise the signs of progress of CE at the EU level. In different papers the clusterization of Europe and the information on different member states, if combined, paint a trend at the macro level. According to scholar Ewa Mazur-Wierzbicka (2021), " the old EU (EU-15) are the most advanced in terms of CE, especially Germany, Belgium, The Netherlands, but also Spain, France, Italy and the United Kingdom." The author conducts a multidimensional comparative analysis of the implementation of CE by EU countries based on indicators already assessed by the EU in terms of their usefulness, reliability and accessibility. (Ewa M. W., 2021) This paper creates the theoretical base of the dissertation about the work on the measurement of CE results and progress through statistic analysis and cross-political and economic comment.

Moving forward to the macro level, several scholars contributed to a more "local" measure of progress, evaluating the differences between member states or regions in different member states. One of the most crucial papers about Italy is by P. Ghisellini and S. Ulgiati (2020) in which they claim that "Eco-innovation has become a prerequisite to maintain the advantage on competitive international markets for Italian companies". They also underline the importance of Italian micro-scale entrepreneurship and the important role of no-profit organizations in the promotion and diffusion of practices, values and a new ecological culture.

In conclusion, is clear that the EU Commission and more in general the EU political institution are investing in the CE in order to create durable and sustainable progress for the European economy. The aim is to build up a system in which is possible to link the economy, society and environment in terms of sustainable development goals providing benefits for each of them (Hanumante et al., 2019) (Cavallo and Cencioni, 2017). Many researchers and scholars are considering the implementation of a Circular Economy as one of the main tools in order to promote sustainable practices in business practices (Chen et al., 2020) and the achievement of the SDGs (Hysa et al., 2020) (Schroeder et al., 2019)

iii. Methodology of Research

The dissertation aims to find what are the effective results of the European Circular Economy Plans for the development of more sustainable businesses. The complexity

and the contemporaneity of the topic required a mixed strategy for finding information, and data and consideration of different natures and different sources. The CE is also a wide topic that can include consideration and scholarly papers coming from sociology, economy, political science etc.

To ensure a comprehensive investigation, we adopted a mixed-methods research design that integrated quantitative data analysis and qualitative interviews.

The quantitative component of our study consists of a dataset analysis using the data provided by Eurostat. The selection of the countries is based on the level of percentage of GDP that was invested in research and development. Assuming this as determinant conduction in order to develop circular economy transition. The other statistics data that are important to consider are the quantity of secondary war material recycled, the number of private investments in circular economy sectors and the percentage of Labour that moves in the CE sectors.

Recently, Eurostat developed a specific database focused on Circular Economy measures and indicators. Consequently, I consider this specific database as a pre-indicated source of useful data keeping in mind the indication of the European Commission in its report in 2019[71], where some of these indicators were indicated and suggested by the legislator.

The methodology of this work and the necessity of more studies on the effect of public R&D expenditure was led by other scholars' work that already opened the debate on how the Circular Economy Action Plan of the EU find application in the real economy. The research for economic pieces of evidence is treated by Domenech and Walkowiak (2019); in their article, scholars highlighted that the Europe 2020 strategy sets the target to increase combined public and private investments in R&D to 3% of GDP by 2020" stressing on the importance of targeted R&D for the CE development. Others focused on the importance of R&D investments correlated with the development of CE practices and SMEs, considering differences and peculiarities in the EU member states. (Prada et al., 2021) (Škrinjarić, 2020).

Quantitative Analysis

[71] COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS on a revised monitoring framework for the circular economy. (15/05/2023). Available on:

The quantitative research is based on statistical methods and software with the aim to estimate the R&D expenditure, geographic origin and time impact on five European Union countries, selected for common characteristics from the economic, political and demographic points of view. The work is conducted with the statistical software R [72] for the creation of linear regressions that can show coefficients of estimations between data.

The measurement on which I would try to show the estimation is part of the new dataset on the Circular Economy provided by Eurostat.[73] (The section dedicated to CE is split into the following 5 thematic areas: production and consumption, waste management, secondary raw materials, competitiveness and innovation, global sustainability and resilience.[74]

The aim is the draw and detect macro trends in the European Circular Economy market and how it is developed since 2010. Thanks to the measurement is also possible to understand if is already possible to reach a correlation between the development of the first Circular Economy Action Plan of the EU (2015) and the data. Finally, this way of interpreting data could provide general macro information on how much is relevant economically and politically to the environmental transition.

Qualitative Analysis

This second stage is necessary for this dissertation as a micro measurement of how the Circular Economy progresses and how legislation on them is perceived by the main actors that are called to sustain the economic and financial switch: business companies. In this sector, I individuated five companies in the North East of Italy. The area is already relevant for the great positive results on waste management data (Cucchiella et al., 2017) also compared with other regions in Italy. (Garofalo et al., 2019).

The questions list was formulated with the aim of discovering characteristics and why the company define itself as circular or part of a circular chain of value. At the same

[72] R is a language and environment for statistical computing and graphics.
[73] Eurostat is the statistical office of the European Union situated in Luxembourg. Its task is to provide the European Union with statistics at the European level
[74] More information on: www.ec.europa.eu/eurostat/web/main

time, the interview asks about how the development of a circular culture in the company is due thanks to external factors such as public policies or legislative measurements in favour of private investments in CE.
The interviews are semi-structured. Differently from structured interviews where all the set of questions are defined, the semi-structured model combines a pre-determined set of open questions (questions that prompt discussion) with the opportunity for the interviewer to explore particular themes or responses further. (Kallio et al., 2016).

Consequently, I will explain the process that led me to the selection of the dataset, which variables I used for the quantitative analysis, which countries I selected and why and in the end, which kind of statistical operation I completed in order to obtain some numeric information for this dissertation.

Selection of Dataset
The first step in order to analyse the European advancement and data on Circular Economy was the selection of the Dataset. Eurostat is the statistical office of the European Union, established to provide high-quality, accurate, and reliable statistical information about the EU and its member states. Eurostat is responsible for measurements of several economic, social and demographic indicators of countries that are not part of the European Union but with similarities or relevance for statical purposes: An example are measurements taken also of EFTA[75] countries or from countries that are responsible or important economic relationship with EU member states such as Japan, Canada, Australia etc. The institution has been active since 1952 and it has shown its importance over the decades providing empirical bases for political and social purposes. “In politically tense processes, indicators are attractive, as they can be used to depoliticise goal-setting and move it from traditional political arenas into the hands of expert groups”. (Alastalo, 2023)
Measurements are taken every year in units of measure that are selected according to the sector and with reference to the subject of the detection.

[75] EFTA stands for European Free Trade Association. It is a regional trade organisation and a free trade area between each of the Member States. It has 4 Member States: Iceland, Lichtenstein, Norway and Switzerland.

Eurostat was selected because of the availability of data and the guarantee of the quality of data. Since 2011, Eurostat adopted the Quality Assurance Framework (QAF) of the European Statistical System (ESS)[76] that serves as guidance about collection methods, tools and good practices for a good representation of data.

Selection of Variables

The first in order to complete a good statistical analysis is the creation of a valid dataset composed of variables and temporally defined. The current monitoring framework on Circular Economy by Eurostat was set up in 2018 and divided into 5 sections with the aim of measuring the progress towards Circular Economy in EU Member States and in order countries (Russia, Japan etc.) that could be relevant for statistic purposes. The indicators collected are eleven, some of which have additional sub-indicators.

The measurement aims to understand better if the public expenditure of EU countries in the last decade influenced the growth of Circularity. However, every nation has a complex budget composed of different expense items. Scholars usually consider CE as one way of sustainable development and so part of R&D expenditure (Bimonet et al., 2021) (McCarthy et al., 2018); this information was a driving element in the research of the key data. The variable that could "contain" the Circular Economy investments should regard the public expenditures for R&D. Eurostat on the Sustainable Development Indicators[77], under the voice *"Goal 6, Industry Innovation and Infrastructure"* includes the *"Gross domestic expenditure on R&D by sector"* express in the percentage of the GDP. The description provided by Eurostat is: *"Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society and the use of this stock of knowledge to devise new applications" (Frascati Manual, 2002)"*

The choice of which Circular Economy Indicators try to correlate with that percentage was led by the selection of the dataset by Eurostat. As I have already written before,

[76] The European Statistical System (ESS) is a partnership between Eurostat – the Statistical Office of the European Union – and the National Statistical Institutes (NSIs) of the EU and EFTA States

[77] Eurostat's section that provide key findings of the most recent Eurostat monitoring of the EU's progress towards the SDG

the Circular Economy has effectively been part of the EU policy framework since 2015. The database title is dedicated to the measurements of EU policies with the selected category of Circular Economy Indicators.
In the database are collected several important for CE however, for the dissertation purpose I focused on the indicators that are more connected to changement of Labour in countries and that are more correlated with the topic of innovation. I choose to exclude waste management because of the complexity of the abundance and the complexity of the waste management sector which is usually considered an important part of CE and treated separately. (Pires et al., 2011)
In the part that follows I will collect the variables that I selected, the description provided by Eurostat and the unit of measurement. More information about them is available on the website of Eurostat.

- *Circular Material Use Rate*

Unit of Measure: Percentage
The indicator measures the share of material recycled and fed back into the economy - thus saving extraction of primary raw materials - in overall material use. The overall material use is measured by summing up the aggregate domestic material consumption (DMC) and the circular use of materials. DMC is defined in economy-wide material flow accounts. A higher circularity rate value indicates means that more secondary materials substitute for primary raw materials thus reducing the environmental impacts of extracting primary material.

- *Patents related to recycling and secondary raw materials (PAT)*

Unit of Measure: Average number
The indicator measures the number of patents related to recycling and secondary raw materials. The attribution to recycling and secondary raw materials was done using the relevant codes in the Cooperative Patent Classification (CPC)

- *Private investment and gross added value related to circular economy sectors*

Unit of Measure: Million Euro
The indicator includes “Gross investment in tangible goods” and “Value added at factor costs” in the following three sectors: the recycling sector, repair and reuse sector and rental and leasing sector.

- *Persons employed in circular economy sectors*

Unit of Measure: Number of persons employed on a full-time contract

The indicator measures the “Number of persons employed” in the following three sectors: the recycling sector, repair and reuse sector and rental and leasing sector.

As for the independent variables, I chose indicators that could economically influence the development of the circular economy. The geographic value of Italy is defined as a comparison base value that is statistically necessary in the linear regression to have a comparison data for the coefficients.

The variables that I found interesting to study over the period 2010-2019 are of three types: economic, temporal and geographic.

The variable GDE_RD is the percentage rate (relative to GDP) that is spent in European countries. The variable then "explains" to us at each unit spent on research and development, how much the variable related to the observed circular data varies.

The variable Time, on the other hand, is the same as the previous observation with the purpose, in this case, of observing whether the passage of time (excluding any other factors) is relevant to the observed dependent variable. This independent variable is important for observing any time trends.

The other geographic variables, on the other hand, are used to identify whether geographical presence alone in the country under consideration has an influence on the dependent variable. Interpretations of these variables are to be attributed to exogenous (or environmental) factors such as regulatory aspects and conditions that do not depend on purely economic conditions but on the social, cultural, historical, and thus geographical setting in which they are embedded.

Selection of Countries

The process for the decision of the countries to analyse followed a combination of requirements that the target countries have to satisfy to define them as similar to each other. The first conduction that countries have to satisfy is the geographic position consequently, I removed from the dataset all the countries that Eurostat included in his measurements that are not from the European Union. This process removes countries that are geographically in Europe but that are not formerly members of the European Union for instance, all countries associated with the Union through its

membership of the European Economic Area (EEA), signed in 1992 and established in 1994.

After that process, the second filter that was applied was the selection of countries with available data on the decade from 2010. Most of the countries collected this data, but in some cases, the information was not always clear or reliable. It is the example of the United Kingdom which due to Brexit, reduced the availability of information.

Despite that, some indicators started later than others or were not already available for most recent years. In the end, the decade that guaranteed me a proper amount of data was the one between 2010 and 2019.

The selection of similar targets is now a matter of comparative analysis between data about GDP, population and relevance of the data that I want to study. This process led me to select five countries that we could consider similar and comparable: France, Germany, Italy, Poland and Spain.

Despite this selection, there were other countries with important investments in Circular Economy and with strong activism on sustainable development, for instance, Sweden, The Neederland and Belgium. However, the demographic and economic "dimensions" of these countries did not allow me to include them in the measurements. The possible solution to aggregate Belgium, The Neederland and Luxemburg (Benelux) did not guarantee the correct analysis and could lead to some statistical errors. In this dissertation, the information that is compared between countries could lead to legislative comments that are precise for each country since every country provided political support, legislative structures and financial investment singularly and according to political priorities.

Selection of Analysis

The comparative analysis was conducted by the use of linear regression for each variable on the Circular Economy in order to determine if these variables are influenced by the R&D investments, the geographical provenience or if possible to determine a time estimation with the growth on the CE indicators.

Linear regression has some cons such as the simplification of the case study and the impossibility of capturing the complexity of reality or it could lead to misinterpretation due to lack or limitation from data. Despite these conditions, it has also other important pros such as the simplicity of the model in order to analyze a scenario of different information and the replicability in a short time. Considering all these factors, linear

regression remains a useful statistical tool in order to gain some general and prudential information on a complex environment. An important scholarly example of linear regression applied to the evaluation of CE policies was completed by Robaina et al. (2020). Another option was considered for the dissertation: panel analysis. This method is good in order to observe temporal differences but it was considered too sophisticated for the purposes of the research question according also to the short availability of data sectioned by year about CE.

In linear regression, linear predictor functions are used to model relationships, with the model's unknown parameters being estimated from the data. These models are referred to as linear models. The conditional mean of the response is typically considered to be an affine function of the values of the explanatory variables (or predictors). (Seal, 1967)

The case of one explanatory variable is called simple linear regression; for more than one, link in the case of this dissertation, the process is called the multivariate regression model. (Freedman, 2009)

In mathematics terms, linear regression looks for a straight-line equation (linear equation) that minimizes the discrepancy between the predicted values of the dependent variable and the actual observed values. Usually, to do this, the sum of squared discrepancies (also known as residuals) between the anticipated values and the actual data points are minimized. The linear model's equation is written as:

$$Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \ldots + \beta_p X_{ip} + \epsilon_i$$

Where:

- Y represents the dependent variable.
- X1, X2… are the independent variables.
- β1, β2… are the coefficients, indicating the slope and intercept of the line.
- ε represents the error term, accounting for the variability not explained by the model

Consequently, pieces of information are recognised in graphs for better visualization of interactions (if any are notable).

iv. Data on Europe and Italy: The Quantitative Analysis

Descriptive statistics

The first part of the paragraph is important to picture the European Circular Economy data and differentiate the five countries selected from the rest of the EU member states. The visualisation of data allowed us to have a graphical explanation of the selection of the five target countries and at the same time connect the European Union macro trend with our dissertation.

Each of them refers to all five variables, In the first graph is observable the table obtained from the Eurostat database tools and in the second one the revelation of the five countries' targets.

Looking at them is possible to notice the numeric difference between GDP and investments between them and the other Member states; Even if the graphs seem more or less similar, is fundamental to observe the unit of measure and their scale.

These graphs can give us important pieces of information about the temporal differences between member states in the variation of the Circular Economy indicators. Is important to notice that results are of different sizes of numbers in the four tables originated by the different units of measure that every variable has. The confrontation includes percentage rate, numbers and also millions of Euro.

Full Name	Abbreviation	Time Coverage	Unit of Mesure	Mean	Standard Deviation
Gross Domestic Expenditure on R&D	GDE_RD	2010 - 2019	Percentage of GDP	1,61	0,88
Patents related to recycling and secondary raw materials	PAT	2010 - 2019	Number	22,69	60
Circular Material Use Rate	CMUR	2010 - 2019	Percentage	8,62	6,22
Persons employed in circular economy sectors	EMPL	2010 - 2019	Persons employed	269022,89	7,25E+05
Private investment and gross added value related to circular economy sectors	PR_INV	2010 - 2019	Million Euro	6544,84	18825,77

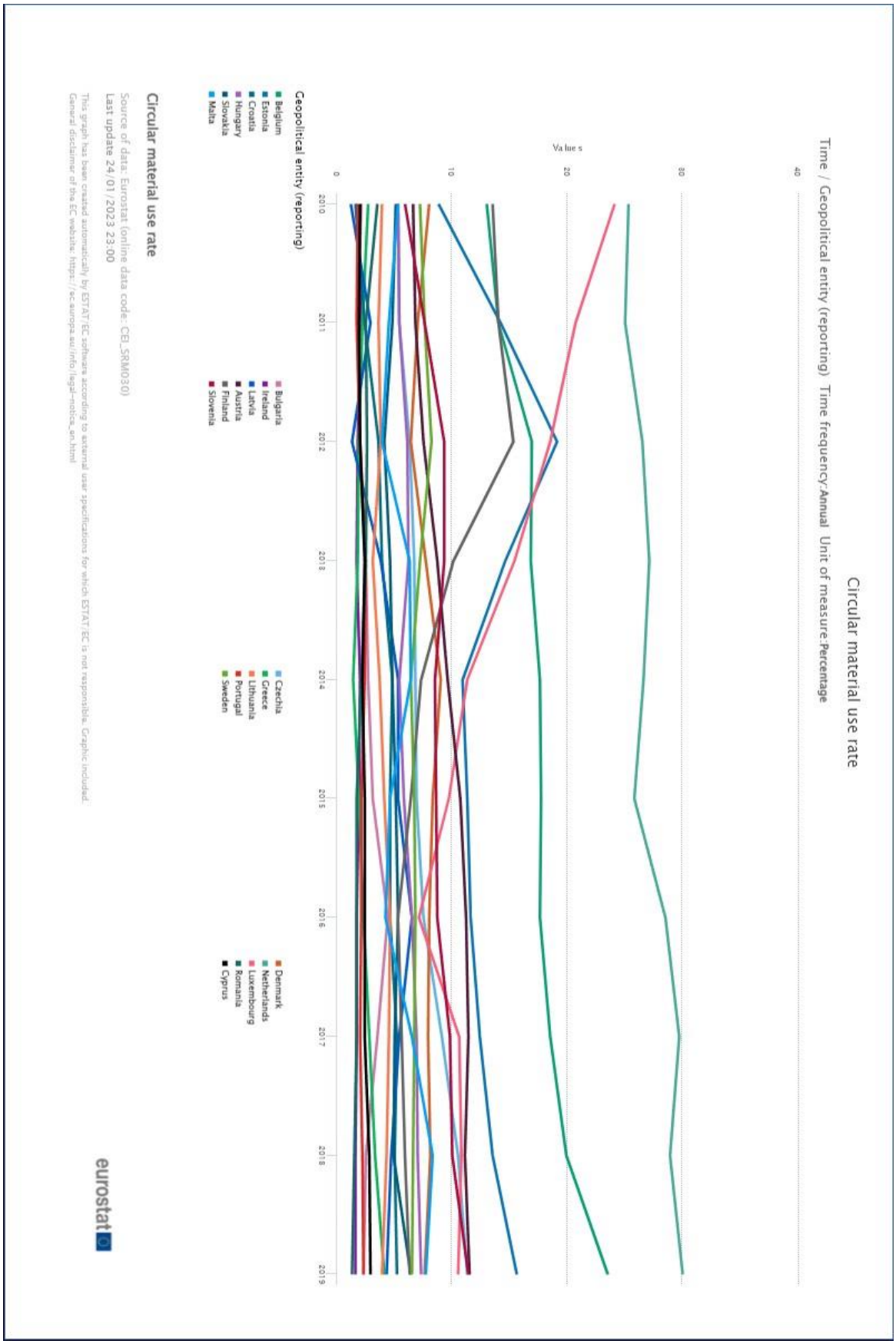
Figures description

Figure 1, shows the Circular Material Use Rate in EU member states. The figure refers to the period 2010-2019 and the data is expressed in percentages. From the figure is possible to notice how Benelux countries and Baltic countries are higher compared to the average of countries. In *Figure 2* is possible to notice the EU's five main economic countries' measurements.

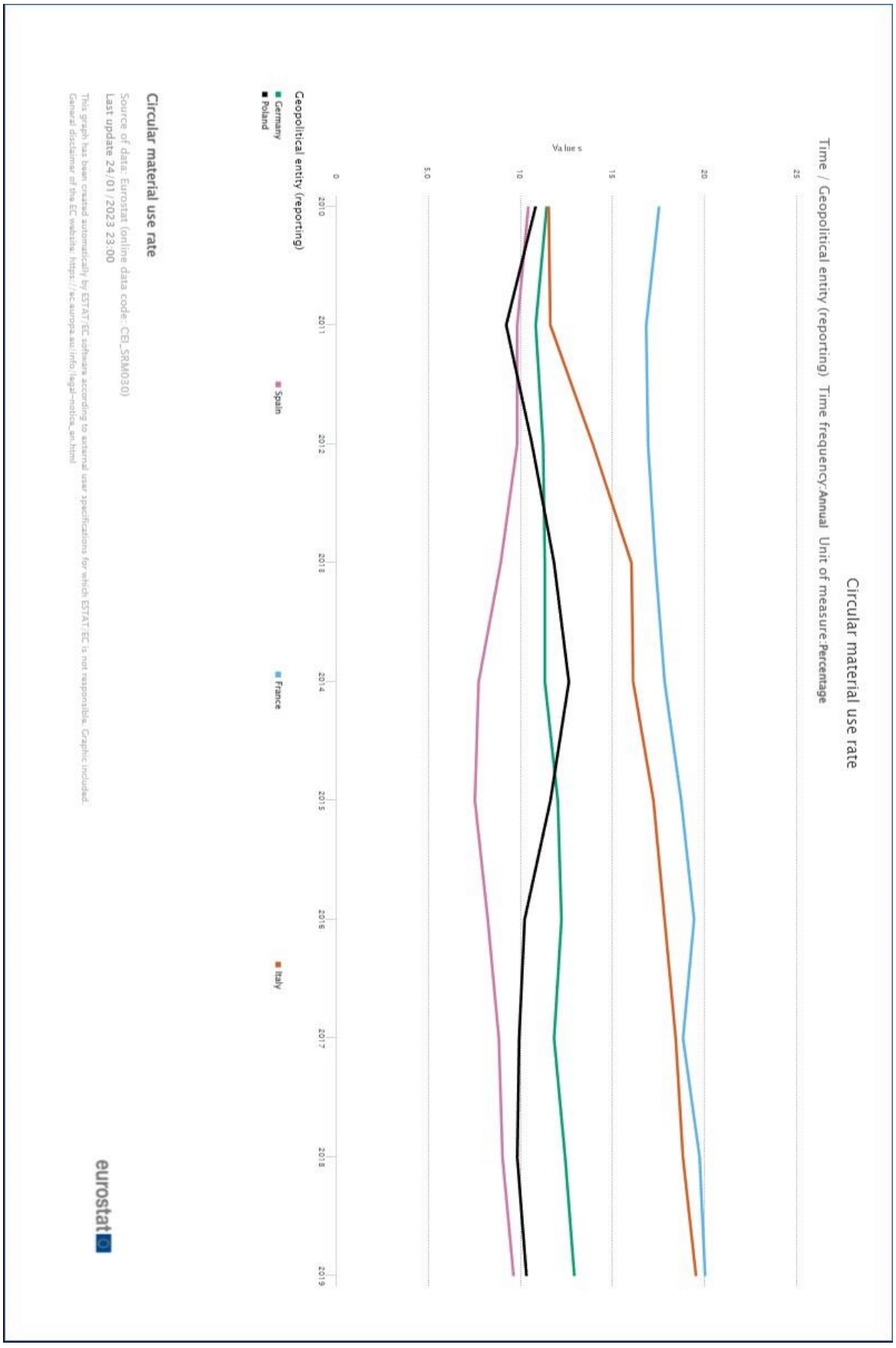
Figure 3, shows the Patents related to recycling and secondary raw materials implemented in EU member states. The figure refers to the period 2010-2019 and the data is expressed in average number per year. From the figure is possible to notice how the Scandinavian countries have a higher propensity to drive efficiently the creation of new patents related to Circular Economy. In *Figure 4* is possible to notice the EU's five main economy countries' measurements.

Figure 5, shows the *Private investment and gross added value related to circular economy sectors* expended in EU member states. The figure refers to the period 2010-2019 and the data is expressed in Million Euro. From the figure is possible to notice that countries that are more attractive to investments reflect this trend compared to other member states; in this case is clear the trend of Belgium, The Netherlands and Austria. In *Figure 6* is possible to notice the EU's five main economy countries' measurements. *Figure 7*, shows the *Persons employed in circular economy sectors* in EU member states. The figure refers to the period 2010-2019 and the data is expressed in average number per year referring to full-time contract employment. From the figure is possible to notice that the trend is slowly increasing in each country but generally the data reflect the general employment conduction of each member state. In *Figure 8* is possible to notice the five main economy countries' measurements.

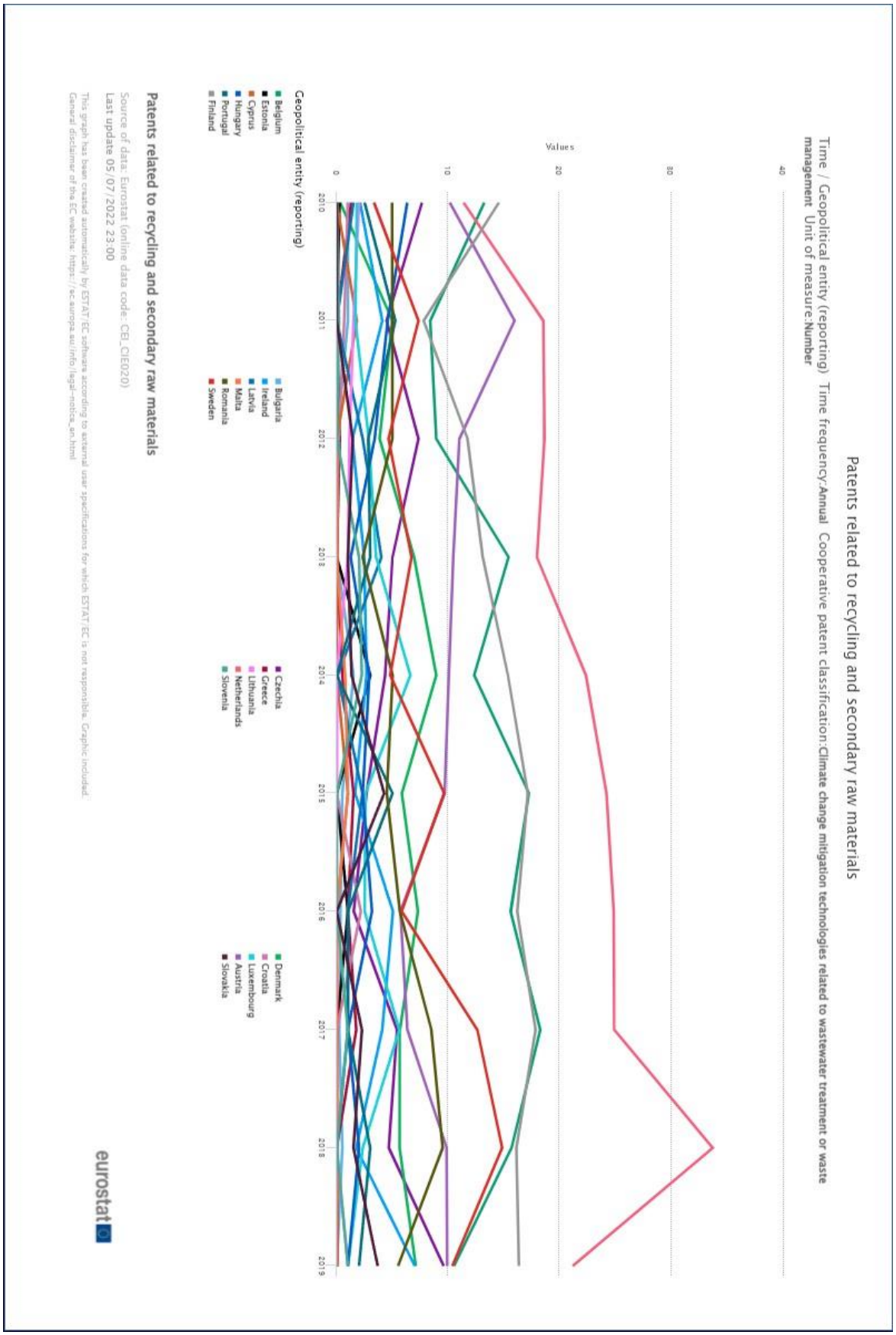
Circular Material Use Rate - Figure 1



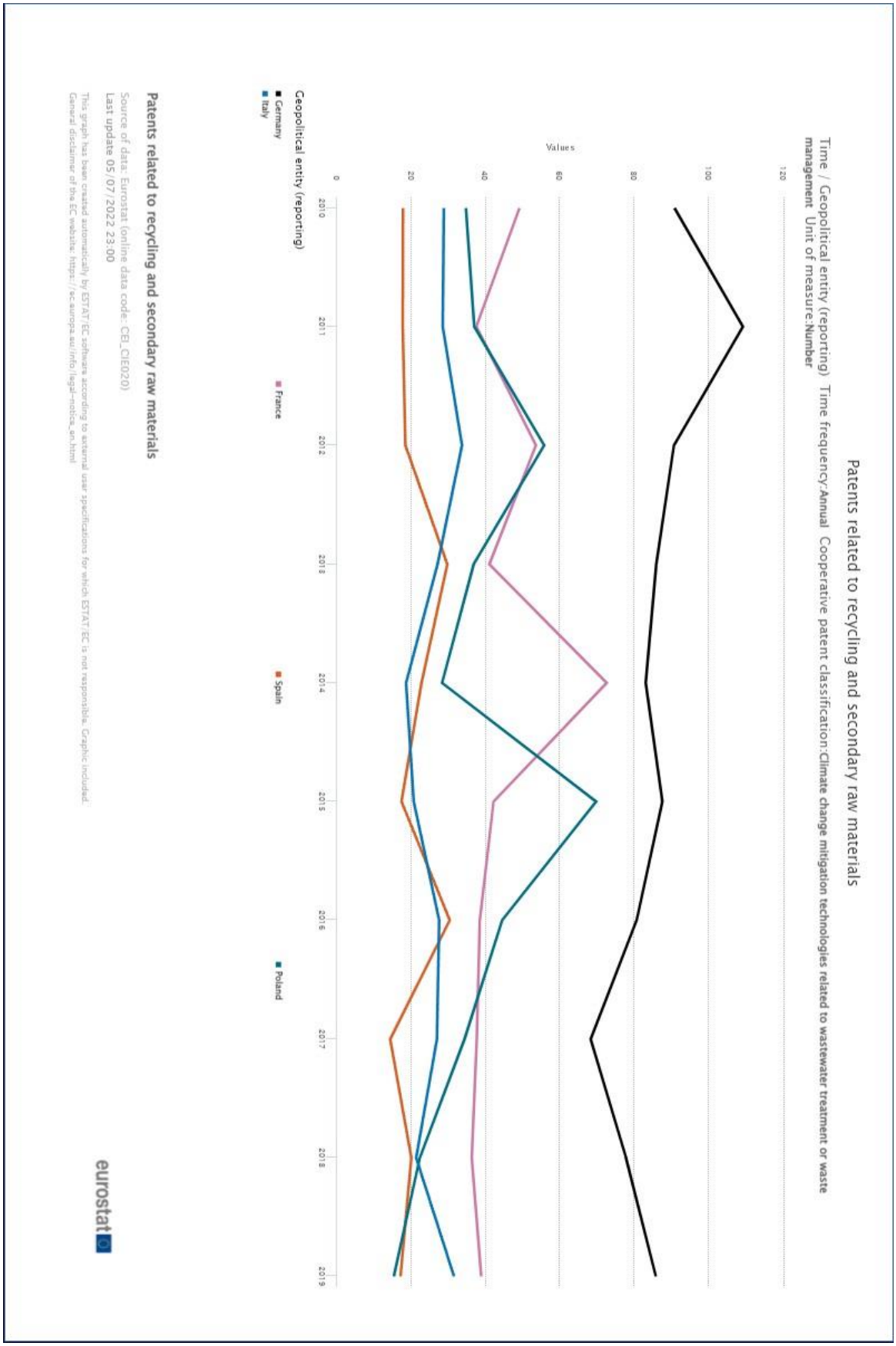
Circular Material Use Rate - Figure 2



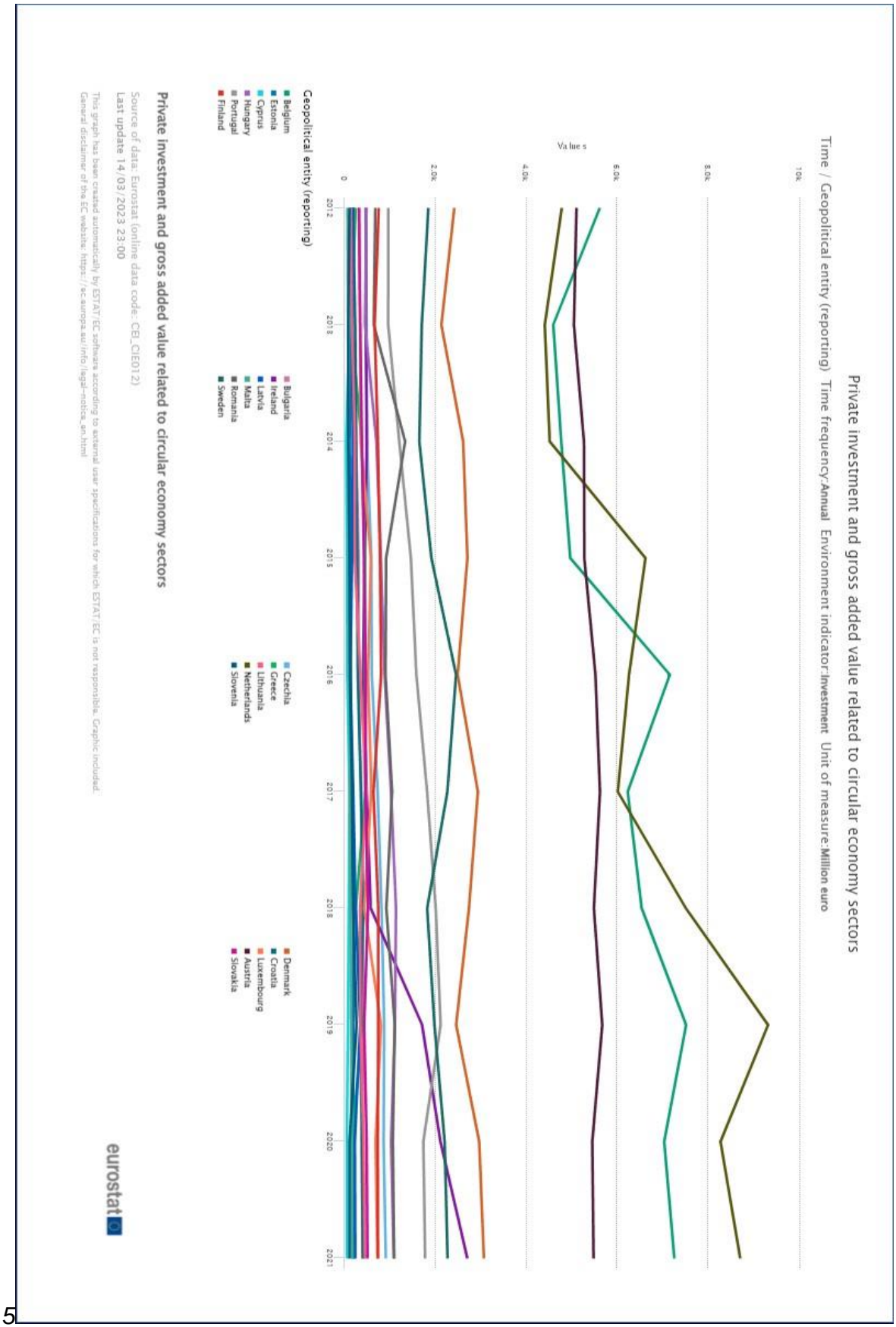
Patents related to recycling and secondary raw materials - Figure 3



Patents related to recycling and secondary raw materials - Figure 4

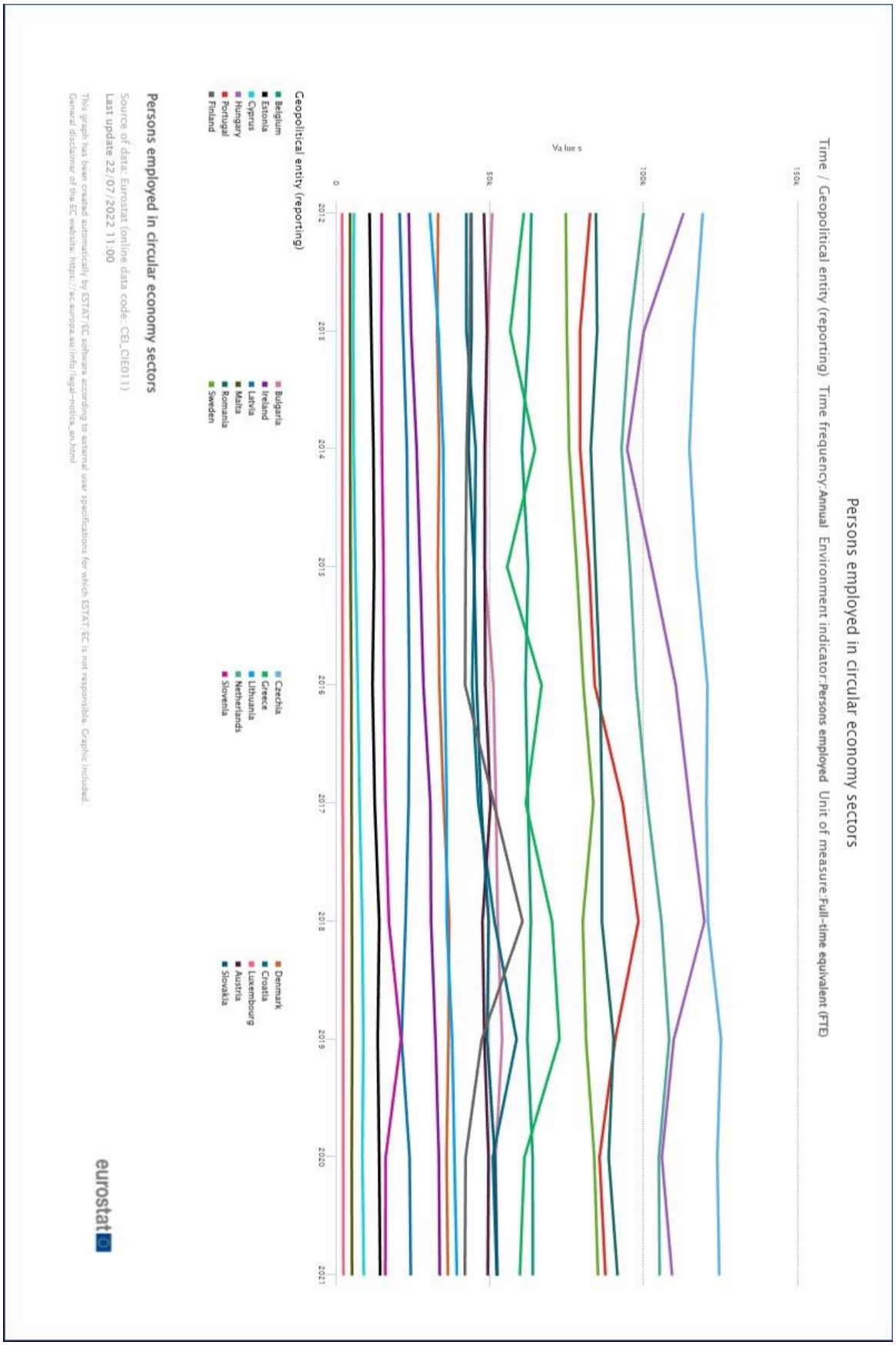


Private investment and gross added value related to circular economy sectors - Figure

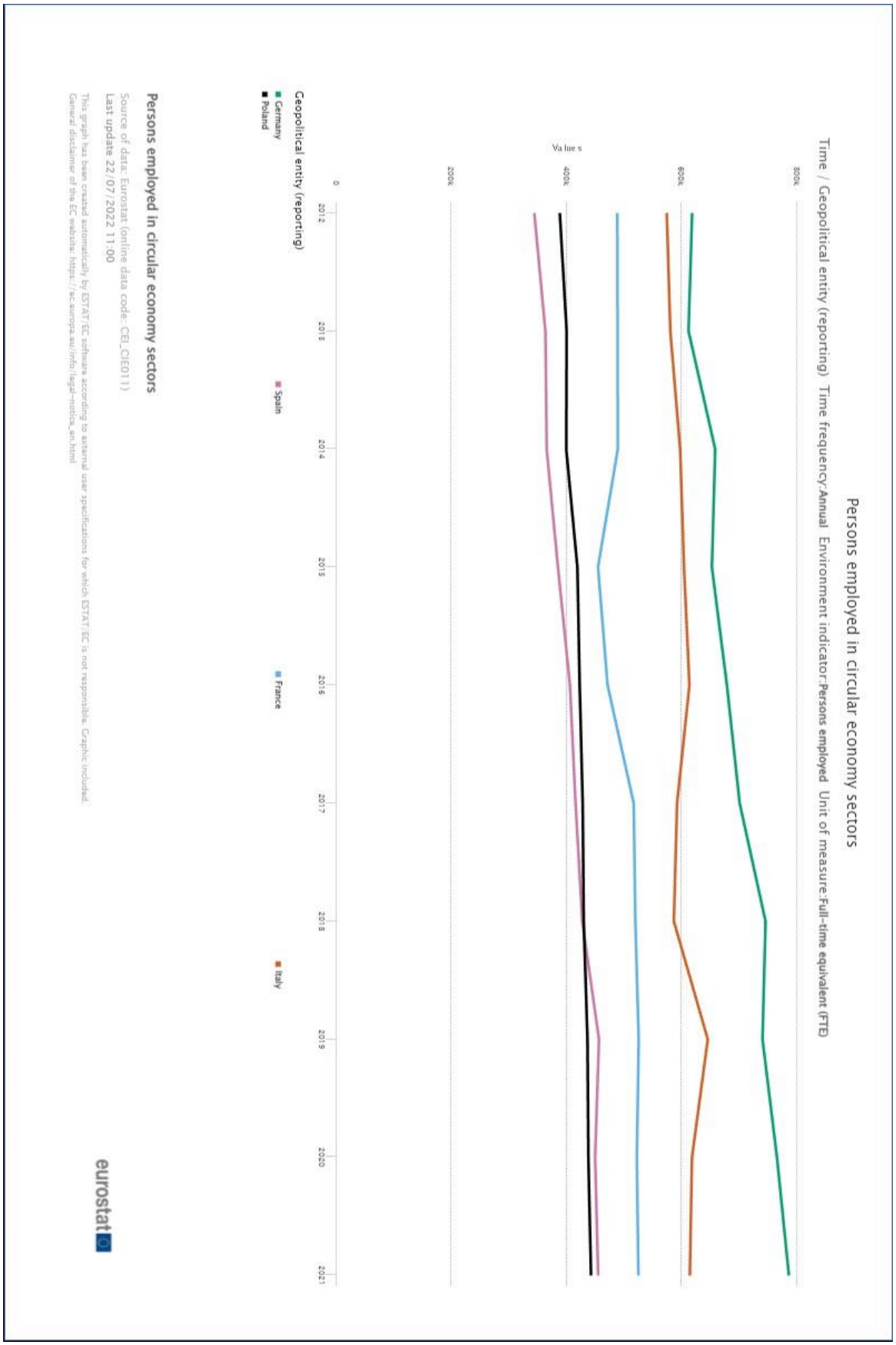


Private investment and gross added value related to circular economy sectors - Figure 6

Persons employed in circular economy sectors - Figure 7



Persons employed in circular economy sectors - Figure 8



Comment on graphs

From the graphs attached previously is possible to notice the similarities between the target countries compared to the rest of Europe. The lines explain the changes differentiated for years that EU countries have on the development of the selected Circular Economy variables. The target countries, due also to their GDP and population dimensions contributed largely compared to the average of the mensuration. Is also important to underline aspects of this phase that are contactable to the creation of the dataset:

- Is possible to notice as was previously commented, the deviation of some countries compared to the average, such as Belgium and Neederland. Thanks to the graphs, is possible to notice that even if they are distributed from the general position of other EU countries, the scale of value (Y-axis) is still very low compared to the target countries
- Higher GDP and population mean a higher impact on the political future of Europe. In this case, it is also better to consider an analysis of these countries as more relevant to arguing about EU development and policies. Every country faces different challenges and represents a valuable portion of European Union citizens. An analysis that took into account all the different administrative parts would require resources and time and probably would not lead to any valuable conclusion to the complex conditions.

Linear Regressions

In this paragraph are represented the four linear regressions with a brief comment on the mathematic results. For better comprehension, I would just list the voices that are explicated in the four tables.

- *(Intercept) [Italy]* represents the data of Italy and is considered a baseline for the comparison of the other data.
- *Time* represents the effect that time has on the development of each CE measurement
- *GDE_RD* represents the effect that the expenditure on R&D in the percentage of the GDP has on the development of each CE measurement
- Country [ ] represents the effect that the geographical origin has on the development of the measurement

After any table, there will be a small comment that considers the interaction of any different type of variable.

Linear Regression 1

Dependent variable (Y):

Patents related to recycling and secondary raw materials (PAT)

Predictors	*Estimates*	*std. Error*	*p*
(Intercept) [Italy]	60.11 **	19.93	**0.004**
GDE_RD	-22.54	16.25	0.172
Time	-0.69	0.61	0.264
Country [France]	38.15 *	14.99	**0.015**
Country [Germany]	95.68 ***	26.45	**0.001**
Country [Poland]	3.31	7.28	0.651
Country [Spain]	-7.40	4.49	0.107
Observations	50		
R^2 / R^2 adjusted	0.870 / 0.852		

** p<0.05 ** p<0.01 *** p<0.001*

The table represents the interaction between the independent variables selected and the Circular Economy indicator related to the creation of new circular patents.

GDE_RD: There is no significative estimation between the public investments in R&D and the number of patents implemented

Time: There is no significative temporal estimation between the number of patents implemented

Country: According to data, Germany is the only significant variable that has a positive effect on the variable patents compared to Italy. Other countries do not show any notable difference.

Comment: The linear regression shows an estimation with the geographical variable about Germany. It is possible that in Germany the economic and legislative environment promotes the development of patents (and so businesses) focused on the Circular Economy sector. A good development in these directions by Germany was already observed by another scholar in a dissertation mostly focused on waste management: *"Germany is the country with the highest annual number of patents (88) by a large."* (Grdic et al., 2020)

Linear Regression 2
Dependent variable (Y):
Circular Material Use Rate (CMUR)

Predictors	*Estimates*	*std. Error*	*p*
(Intercept) [Italy]	13.17 ***	2.81	**<0.001**
GDE_RD	1.25	2.29	0.589
Time	0.23 *	0.09	**0.011**
Country [France]	1.11	2.11	0.602
Country [Germany]	-6.35	3.73	0.096
Country [Poland]	-4.95 ***	1.03	**<0.001**
Country [Spain]	-7.03 ***	0.63	**<0.001**
Observations	50		
R^2 / R^2 adjusted	0.887 / 0.871		

** p<0.05 ** p<0.01 *** p<0.001*

The table represents the interaction between the independent variables selected and the Circular Economy indicator related to the Circular Material Use Rate.

GDE_RD: There is no significative estimation between the public investments in R&D and the Circular Material Use Rate

Time: There is little significative temporal estimation between the Circular Material Use Rate

Country: According to data, Poland and Spain have a significative and negative estimation with the dependent variable.

Comment: As already was explained previously, Italy is a leader in this data and I expected a negative trend from other variables. The only significant variables to comment on are the geographical estimation with variables Country [Spain] and [Poland]. In both the country is not already developing a market for recycled and secondary raw materials. As other scholars noticed, (Smol et al., 2021) (Alonso-Almeida and Rodriguez Antòn, 2020) the circular material sector is strongly developing in Poland and Spain and could reach the level of other Western European countries if connected with an important cultural campaign of responsibilization of citizens. This is also confirmed by the temporal trend notable in *Graph 2*.

Linear Regression 3

Dependent variable (Y):

Persons employed in circular economy sectors (EMPL)

Predictors	*Estimates*	*std. Error*	*p*
(Intercept) [Italy]	499195.11 ***	41064.61	**<0.001**
GDE_RD	32496.33	33469.90	0.337
Time	9085.76 ***	1253.16	**<0.001**
Country [France]	-132510.66 ***	30885.66	**<0.001**
Country [Germany]	13508.30	54496.22	0.805
Country [Poland]	-173785.62 ***	14995.54	**<0.001**
Country [Spain]	-204301.05 ***	9247.59	**<0.001**
Observations	50		

R^2 / R^2 adjusted	0.972 / 0.968

** p<0.05 ** p<0.01 *** p<0.001*

The table represents the interaction between the independent variables selected and the Person employed in the Circular Economy sector.

GDE_RD: There is no significative estimation between the public investments in R&D and the number of patents implemented

Time: There is a significative temporal trend that describes the moving of labour in the Circular Economy sector.

Country: According to data, France, Poland and Spain are significant with a negative estimation compared to Italy. There is no significant difference between Italy and Germany.

Comment: This linear regression has the highest number of significative variables involved. Even if it does not show an estimation of the public expenditure on R&D it expresses two important pieces of information: a temporal trend and a geographically significant negative trend compared to Italy. First, it confirms a temporal trend for the variable about the Labour moving toward circular economy sectors; in another world, in the last decade, there was every year a significative move of workers. This represents a strong assumption, important for the macro trend of the EU. Secondly, if we take into consideration the geographical origins, and we take the area of Spain, France or Poland, the estimation is significantly weak compared to Italy

Linear Regression 4

Dependent variable (Y):

Private investment and gross added value related to circular economy sectors (PR_INV)

Predictors	*Estimates*	*std. Error*	*p*
(Intercept) [Italy]	-13451.92	6880.01	0.057
GDE_RD	15265.05 **	5607.58	**0.009**

Time	389.04	209.96	0.071
Country [France]	-2763.14	5174.62	0.596
Country [Germany]	-14446.18	9130.36	0.121
Country [Poland]	-731.55	2512.37	0.772
Country [Spain]	-3710.54 *	1549.35	**0.021**
Observations	50		
R^2 / R^2 adjusted	0.856 / 0.836		

** p<0.05 ** p<0.01 *** p<0.001*

The table represents the interaction between the independent variables selected and Private investments and gross added value related to circular economy sectors.

GDE_RD: There is a significant and positive estimation between public investments in R&D and private investments in the circular economy sector.

Time: There is no significative temporal trend that describes private investments in the circular economy sector

Country: According to data, no significative information describes the use of the geographical impact on the variable of private investment

Comment: This circular variable seems to have no interaction with geographical origins or with temporal trends but it has a significant estimation with the R&D public expenditure. A possible interpretation is the fact that private investments usually tend to lead to public or political investments at the European level. Private investments are therefore likely to be driven by public R&D expenditure. In this regression is important also to notice the magnitude of the GDE RD; The magnitude of the correlation coefficient indicates the strength of the association. Practically, one unit of GDE_RD lead to the generation of 15265.05 units of Private investment keeping fixed the other factors; considering the fact that GDE_RD is measured in percentage of national GDP and private investments are measured in millions of euro we can assume that private investors require a public first expense in order to follow and reduce the risk correlated to the finance actions.

v. Results

The four regressions help to picture a macro situation in the five most important big internal economies of the European Union. Starting our analysis from the date of the patent, it seems that Germany is leading the Circular switch and the other countries are following without any strong difference. However, the next regressions demonstrate the importance of Italy, with a focus on the Circular Material Use Rate and Labour involved in the Circular sector. Additionally, this late variable is important to underline the temporal trend which could mean that the switching to circularity is an already working process in general. The estimation of R&D expenditure has proven only in the case of private investments and this is probably traceable to two possible interpretations: Firstly, EU member states are not investing enough in the circular conversion of the economic system. Secondly, private investors are still generally very prudential about CE investments. These results, on the whole, would not seem to say much, but they outline a fragmentation of European legislation. This fragmentation is also at the origin of significant deviations between data in the independent variables related to geographical location. Italy is positively placed in comparison with the other countries of the Union, but the circular economy is a model of development that, to aspire to success, requires cross-cutting collaboration between institutions and industrial sectors in different countries; legislative diversification does not help to achieve this.

As the only date with a time trend is Labour and private investment is only significant if driven by public investment in research and development, it is unclear whether the circularisation process is encouraged by European policies or whether More likely, it is the result of competitive pressures of the international market and the existence of large investment funds in the "green" sector. An interesting question is therefore: how well are the European institutions capable of leading an economic transformation process? Even today, in fact, a large part of the funds is channelled through the national and regional realities that have more grip and dialogue with the territories.

6. Chapter Six: Interview Model Development

As explained before, the necessity of a qualitative part of the research requires a methodological preparation of the interviews for the selected companies. In this introduction, I will briefly explain the theory that stands in the back of the model of the interview chosen and the reasons that justify the selection of the interviewed companies.

For the selection of the company, I chose to put some filters in order to collect five heterogenic samples. The first filter that I chose was the geographical perimeter, the northeast of Italy. The previous chapter analyses quantitative data from Europe and provides us with some information about the status of nations. For this second qualitative part, I focus on the most performant area of Circular Economy Development. (Garofalo et al, 2019).

The five companies are from five different sectors and present different characteristics in size and governance; however, they share similar attention and investments in the relationship with CE. All of these companies have the sustainability reports for at least two years and they define themselves as Circular or part of a circular chain of value.

The collection of the interviews was mixed and it followed a semistructed order. Interviews could be conducted in three different styles: structured, semi-structured and unstructured. (Adhabi, E., & Anozie, 2017). For this work, I chose the semi-structured, with a guideline of questions that allowed me to obtain quantitative and numeric answers mixed with impressions and contributions by the interviewed.

Following is the list of questions proposed to the companies responsible:

1 - How many employees does your company count?

2 - Have they been trained on the company's sustainable solutions? If so, are they active in reducing the company's ecological impact?

3 - What business practices do you take to reduce your company's environmental impact?

4 - Regarding the circular economy. how many and which projects increase the circularity of your company?

5 - In what year and in what way did/increase the company's attention to sustainability?

6 - Whether and in what way have European, national or regional policies favoured or not this process? Are there any regulatory frameworks that have favoured the circularity of the company?
7 - What are the limits for the development of new circular activities for your company?
From 1 to 10, how much do you feel that the regional regulations support the choices on the circularity?
From 1 to 10, how much do you feel that the national norms support the choices on the circularity?
From 1 to 10, how much do you feel that the European norms support the choices on the circularity?
8 - The role of marketing and greenwashing, how important is it to communicate the added value of the circular economy, you risk running into the phenomenon of greenwashing?
9 - Between companies that follow similar ecological battles, are there solidarity and collaboration phenomena? If so, what are the factors that promote them? Does competition or collaboration prevail?
10 - For how many years have you been writing the sustainability report?

In the following part of the chapter, I will collect the four different companies with a brief historical contextualization. For the descriptions of the three companies, information has been taken from the relative websites for correctness and transparency in the historical narration of the company. Links are available in the bibliography. Subsequently, I would summarise the information of the interviewed and the answer that she or he provided to me.

Amorim Cork Italia S.P.A.

The company was founded in 1870 by António Alves Amorim. He established a small cork-stopper factory in the heart of the Port wine region. Four generations later, the group operates in over one hundred countries on all continents and is a stock-listed company. Today the company is also focused on implementing circular economy principles in the business model. Cork is a material that, thanks to its characteristics, is possible to recycle almost completely and convert into other products' life cycles. The company is today collecting used cork stoppers for the production of design products and for the creation of soundproofing walls. According to the company's

report on sustainability, the company is focusing also on the supply aspects, looking for the production of recycled and new material; *"Since 2019, the incorporation of recycled products in production has seen a 20% increase. In 2022, the sales of products associated with this project exceeded €41 million"*[78]

The interviewee for the company was Dr. Carlos Manuel Veloso dos Santos, current CEO of AMORIM CORK ITALIA S.P.A.. The semistructured interview allowed me to have different information from the company and consequently, I am going to summarise the most relevant information obtained that could add information to the dissertation.

- The HQ of the company is in Scomigo (TV) and it has 130 employees.
- This year (2023) would be created the profile of the Sustainability Manager.
- One of the sustainability goals is to produce over 100% of the electric energy from solar panels and share it with the other companies in the industrial area.
- The main CE project is the recollection of used cork stoppers through containers supplied by the company itself, generating a value chain for this material. The project involves one thousand volunteers and 45 ONLUS in all the Italian national territory. This boosted the creation of a cork design line.
- Circularity, in this case, is also favoured by the product which is by its nature workable several times and reusable
- At a regulatory level, an insufficient contribution is perceived to encourage circular behaviour.
- The company has been publishing our sustainability report since 2006.

Contarina S.P.A.

Contarina is a public company responsible for the management of waste from the municipalities belonging to the Priula Consortium, in Treviso province, in the Veneto region (Italy), in an area covering approximately 1,300 square kilometres with about 554,000 inhabitants. The citizens' waste is managed through an integrated system involving waste from production to collection, treatment and recovery, generating a

[78] Information provided by https://www.amorimcorkitalia.com/

positive impact on the environment as well as on the lives of the people. The company's daily goals aim to increase the percentage of separate collection, reduce the amount of- produced waste (especially non-recyclable waste), raise the quality of the collected recyclable material, and improve the offered service, optimising the cost-benefit ratio.

The interviewee for the company was Dr Marco Mattiello, International Relations Manager of Contarina S.P.A.. Contarina is a public company; it is important to consider this characteristic in the analysis of the answers because it has different necessities and limits that are not the same for pure private companies.
From the interview with Dr Mattiello, I summarise the sequent information that could be useful for the dissertation:

- The HQ of the company is in Spresiano (TV) and it has 740 employees.
- The model of Contarina provides for the collection of waste door-to-door and the pay-as-you-throw (pay the bill based on the production of residual waste that you produce): following the philosophy that less waste produced means less to pay.
- An important focus of the company is therefore the recovery of materials, without the use of the incinerator. So it is important to empower the user.
- The model promotes product differentiation and the reduction of ecological impact with a local production of 410kg/inhabitant/year which is well below the national average (One example is Danish waste production: 840 kg/inhabitant/year)
- Contarina has existed for 33 years; Initially, it was a public and private half. Early 2000s. 23 years ago. The private partner was pushing for the construction of an incinerator. The mayors decided together not to follow the option and then the private left the group; since that event, the pay-as-you-throw was adopted and so we became the ourdays organization.
- The Commission's recent initiatives on circularity have certainly set the right course for what needs to be developed at the national and regional levels. If we tighten the focus and bring it to reality, Rome and the regional level is still problematic. Brussels is certainly making certain progress (also in the textile sector) but the national and regional regulations in Italy are not up to par.

According to the respondent, There is no legislation that allows to revision of the concept of rejection. The End of Waste of several products is out of date.

Ori Martin Group

Founded in 1933, ORI Martin is one of the main European integrated steel groups, active in the production of quality steels for the automotive, bolting, mechanical and construction sectors. With more than 200 grades of steel in production for the main special applications in the mechanical and automotive sectors, ORI Martin has a strong presence in all major European and non-European markets.

Today the Group includes ten companies, the result of a shrewd diversification strategy that began in the 1980s. The Group's growth and development are driven by the search for increasingly detailed qualitative niches and specialization in increasingly sophisticated steels, in order to better meet the demands of the European automotive industry. Activities conducted with resources and great attention to innovation, sustainability and research. At Ori Martin, we care as much for the external environment as for the internal one and have always considered this as an important part of the company's mission.

For this reason, we are following an internal policy for the reduction of any external environmental impact. This policy has been followed with investments linked with protecting the environment of about 20% of the total investments of the last years.

The interviewee for the company was Ing. Maurizio Zanforlin, R&D Dirigent of Ori Martin S.P.A.

- The HQ of the company is in Brescia (BS) and it has 940 employees.
- The company has different projects that are active to improve the circularity of the production of secondary material in order to reduce carbonization.
- The company, through PNRR funds, then tried to reduce internal consumption, solar power plants and several other projects stopped under scrutiny for PNRR funds approval. One recent relevant project that was also founded by the EU plans to connect the heating production of the company and the heating network system of the city of Brescia.

- Another important project where research is still going on is about the reuse of smoke dust, rich in sulphur, manganese, and various metals that are part of the critical raw materials identified by the EU Commission[79]
- According to the interviewee, there is a lack of foresight in the institutions. For example, with regard to waste disposal, provincial and regional institutions have too long a time frame and too little political will to follow the project. As a result, Europe's leading steel-producing region, Lombardy, is failing to help decarbonise the sector.
- European institutions are very active in research and contribute in part but without being decisive. Not because of their choice, but because the bulk of the planning is still in the hands of national institutions.
- The biggest obstacle to the development of circular economy projects is too much bureaucracy and a lack of fluidity in the decision-making processes of decision-makers which cause serious delays and little inclination for private companies to invest in innovation.

Comments

The interviews were an important qualitative contribution to the research. They add additional information to the data analysed in the statistical part; moreover, in some parts, they are moderately explanatory of some trends already observed at the quantitative level. With the linear regressions, we noticed a significant time trend; this seems to be confirmed by the interviews as in all three cases we talked about "growth in the number of employees and business volume". Some companies were born from circular ideas and the need to recover scarce raw materials in Italy (Ori Martin). In other cases, however, the importance of more sustainable choices has matured over time and has guided corporate investments, often creating a corporate identity consistent with sustainability choices.

To conclude this chapter it is important to note which are the negative and positive

[79] Critical raw materials (CRMs) are raw materials of high economic importance for the EU, with a high risk of supply disruption due to their concentration of sources and lack of good, affordable substitutes. Since 2011 they have been registered by the European Commission for reasons of economic security.

notes commonly observed by all three respondents. On the positive side, it is important to highlight the increased opportunities for sharing practices and know-how that companies (public and private) are creating. There are more and more events and moments of intra-sectoral sharing but also between different areas of expertise to generate new circular solutions. It is always the motivation and economics to drive the research to monetize the added value of circular choices; nevertheless, more and more sustainable and low-impact solutions are required by the market and adopted by companies. The most serious problem regarding the ecological transition seems to be attributed to the bureaucratic slowness and inefficiencies of the national administrative system. Occasionally tempered by the enthusiasm and political determination of the European institutions. These reflections are certainly valuable for formulating a more transversal conclusion to this dissertation.

7. Chapter Seven: Conclusions

This research aimed to observe in more detail any changes in the real economy of the sustainability policies approved at the European level: specifically the 2015 circular economy plan.
The first chapters of historical, legislative and political contextualization are important to develop a deep awareness of the uncertainty and the development path for a "European awareness of sustainability". But it is also true that the European Commission and most member countries are investing heavily in the circular economy, decarbonisation and overall waste reduction. Institutional and political aims go beyond ethical and environmental intentions. The need to ensure the economic security of raw material supply lines and the need to optimise the Union's economy competitively are reasons often considered to be more valid for a large part of politics and the electorate; Despite the motivations, the steps towards greater sustainability of the European continent are underway.

As already specified, the research took place with a mixed methodology; therefore, considering both the quantitative and qualitative aspects of the analyzed scenario.
In the quantitative part, through linear regressions we have been able to obtain information about the circular economy data obtained by Eurostat, taking as reference the five main economies of the European Union: France, Germany, Italy, Poland and Spain. The only statistically relevant historical trend is that of the data relating to people employed in sectors of the circular economy. For other data, it is premature to make temporal assessments. This can be interpreted as positive for the development of a more sustainable and circular European economy. Labour's shift to circular sectors can only reinforce the belief that the paradigm shift is underway but still difficult to notice. Phenomena such as the war in Ukraine have brought out the scarcity of raw materials and resources in the European continent. This probably had an impact on the transition. The other indicators, on the other hand, seem to have significance for geographic variables. This information suggests two important pieces of information:
- Italy, compared with its other European counterparts, is on a positive trend in the development of an internal circular economy. The data are more encouraging and positive regarding a general European trend however positive

- Geographical differences reveal differences in legislation in political promotion of the circular project and thus the fragmentation of EC implementation in Europe.

In other words, regulatory differences between countries combined with the efficiency of national administrative systems are key factors in developing sustainability practices in the private sector and accelerating the uptake of circular processes.
The qualitative analysis of this research has confirmed these hypotheses generated in the quantitative phase. The companies interviewed positively understand the European funding and projects for sustainability but unanimously identified the bureaucracy and inadequacy of the legislative infrastructure as the main barrier to the development of new, more sustainable practices. The interviews, however, showed a perception of the increase in recognizing the value of products that come from circular supply chains both by users (citizens) and by partners or business customers (b2b sector).

In conclusion, it is possible to say that the transition of the economy lead by the European Circular Economy Action Plan, from a linear to a circular order has begun. It is still difficult to see the impact of European policies even if qualitative perceptions would seem to be more effective in the European political push than the national one (as regards Italy).
There is no doubt that further political efforts and research will be needed to understand fully whether the choices on the circular economy will have the desired long-term effect, taking into account also the deadlines of international agreements and the objectives shared in the UN headquarters.
This dissertation is part of a contemporary political and economic debate to understand what are the decisive factors for the promotion of a more sustainable Europe both for reasons of security and economic competitiveness and for the need for a change development paradigm that is increasingly respectful of environmental availability, of the limits of our biosphere but also attentive to inclusiveness and human dignity in the hardest stages of transition. This dissertation is also important for the political debate on the future of the European Union now that, in a less globalized world and with increasingly regional value chains, must study a new strategy for the supply and security of raw materials more complex and more inclusive; therefore, taking into consideration the peculiarities of its territory in the different sensitive sectors

or rather, critical. Russia’s aggression against Ukraine has certainly increased public perception of the importance of managing its resources strategically because they are not unlimited and not always guaranteed. The tragedy of the war has brought the fragility of our bilateral and multi-regional economic agreements back to the centre. The circular economy, in this debate, is a possible tool for the efficiency and competitiveness of the European internal market; Therefore, together with the diversification of suppliers and the approach of international production chains, it is also possible to mitigate the geopolitical uncertainties of our resource dependencies by extending the life cycle of products and changing consumer preferences.

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European Circular Economy Plan influence on real economy performances: a mixed methods study

Relatrice

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Abstract in Italiano

L’impatto che la specie umana sta avendo sul pianeta terra è diventato imponente e radicato a tal punto che i principali sociologi hanno dato un nome all’era storica caratterizzata dagli impatti che l’uomo sta avendo nella biosfera: l’Antropocene. Più specificatamente Antropocene è definito, in accordo ai principali studiosi della materia, dall’enciclopedia Treccani come: “L'epoca geologica attuale, in cui l’ambiente terrestre, nell’insieme delle sue caratteristiche fisiche, chimiche e biologiche, viene fortemente condizionato su scala sia locale sia globale dagli effetti dell’azione umana, con particolare riferimento all'aumento delle concentrazioni di CO2 e CH4 nell'atmosfera.” (Lewis and Maslin, 2015) (Bernardi, 2021)

Il cambiamento climatico è quindi oramai provata conseguenza dell’attività tecnica ed industriale dell’uomo; Nonostante questi dati iniziarono ad emergere negli anni 70’, le prime evidenze meteorologiche iniziarono a manifestarsi solamente negli ultimi decenni: l’aumento dei fenomeni climatici estremi con devastanti conseguenze per gli abitanti ed i territori delle aree interessate. Il cambiamento climatico però non è impattante per la sicurezza degli esseri umani durante le calamità naturali; bensì, fenomeni climatici imprevedibili sempre più frequenti e sempre più anomali rischiano di avere conseguenze disastrose per le catene del valore mondiale, la produzione agricola ed in generale il funzionamento della nostra società contemporanea.

Con queste premesse e individuato il diossido di carbonio, risultato dei processi di combustione, come principale responsabile dei cambiamenti climatici (Reilly et al.,

2003), le politiche degli stati sovrani iniziarono a raggiungere accordi di decarbonizzazione sempre più importanti purtroppo non abbastanza vincolanti da permettere un rapido abbassamento delle emissioni.
Un esempio di tali accordi vennero poi sintetizzati in documenti come il Protocollo di Kyoto, entrato in vigore nel 2005 e l'Accordo di Parigi entrato in vigore nel 2016.
Con l'aumentare della consapevolezza a livello globale della necessità di assumere comportamenti più sostenibili, prevalentemente nei paesi occidentali le nuove regolamentazioni iniziarono a dirigere investimenti per la creazione di mercati per i nuovi prodotti che fossero risultati di progetti di rigenerazione, riqualificazione, riciclo e reintroduzione nel mercato. Questo genere di spostamento ebbe anche ripercussioni nella moda e nei trend comunicativi, spostando sempre più interesse e domanda di mercato per prodotti che fossero certificati "green" o più in generale a impatto ridotto.
L'Unione Europea che si colloca nella sua interezza in un territorio povero di buona parte delle risorse strategiche (Report on critical raw materials for the EU. European Commission) (Massari et al., 2013) decise di investire nello sviluppo sostenibile ingenti investimenti sia di carattere politico che economico. Secondo la strategia politica dell'Unione Europea una economia più pulita è un'economia a livello internazionale più sicura ed anche più competitiva.
Diversi progetti vennero approvati per favorire la transizione delle industrie e per raccontare ai consumatori che le scelte di acquisto ad impatto ambiente ridotto sono preferibili alle alternative. Negli anni sono anche aumentati i piani di investimento per la sostenibilità ed a favore di progetti di sviluppo o di investimento per la decarbonizzazione.
Nel grande quadro di queste misure vennero implementati due piani di azione per lo sviluppo dell'economia circolare, uno nel 2015 ed il secondo nel 2020. Due ambizioni piani che promuovono e sostengono a livello normativo, in maniera più articolata e complessa, l'adozione di comportamenti circolari da parte delle aziende dei paesi dell'Unione.
La circolarità richiede spesso uno sforzo in più rispetto ad altre misure più particolari; l'economia circolare è un modello di sviluppo che riguarda a 360° la vita dell'azienda: dalla scelta della materia prima, alle modalità di trasporto, al rapporto con il territorio fino alla vendita ed alla gestione dei materiali residui. (comunemente chiamati rifiuti).
L'adozione dell'economia circolare come nuovo paradigma economico non si

limiterebbe a dei vantaggi in termini ambientali ma perseguirebbe anche l'obiettivo di coesione delle economie all'interno dell'Unione Europea. Siccome il modello prevede che vi siano importanti relazioni tra i partner aziendali sia in orizzontale che in verticale, diventerebbe un motivo anche per generare cluster industriali tra paesi, che scambiano risorse di scarto allungando così il ciclo vita delle materie prime e aumentando la competitività generale dell'economia nella quale sono inseriti. (Stahel, W. R., 2013) (Alonso-Almeida et al., 2020)

Questa tesi si pone quindi nel dibattito contemporaneo in merito a quali siano le misure da adottare, quali siano gli effetti generati statisticamente notabili e quale sia la percezione delle imprese in merito.
Al fine di perseguire questo scopo, la struttura della ricerca dedica prima alcuni capitoli ad annoverare le principali tappe economiche, storiche e legislative che hanno portato l'Unione Europea ad identificare l'economia circolare come strategia di sviluppo economico sulla quale investire.
Le ragioni politiche ed economiche per un modello di sviluppo che tengano conto anche dell'ambiente e non solo della "crescita senza limiti" iniziano negli anni '70, con produzioni letterarie che iniziarono a porre in discussione i modelli di sviluppo comunemente adottati sino allora. Gli eventi storici e geopolitici (come la crisi petrolifera del 1973) furono sicuramente dei catalizzatori per portare al centro del dibattito politico la relazione tra uomo e risorse, tra uomo e cicli ambientali.
L'analisi storica e legislativa procede poi con un focus rispetto a quella che è la situazione italiana, paese che nel contesto Europeo presenta un rilevante ruolo in merito all''adozione di politiche per l'economia circolare.
L'Italia, per condizioni geografiche, è priva di risorse spendibili e di valore per la produzione di sottoprodotti tecnici e tecnologici. Questa scarsità di risorse ha fatto sì che il paese sin dalla prima metà del secolo scorso, al termine del secondo conflitto mondiale, iniziasse a riciclare per uso civile, gran parte del materiale che prima fu impiegato per uso bellico. (Denton et al., 2022)
Nel capitolo dedicato all'Italia è anche riassunto ed analizzato brevemente il piano per l'economia circolare pubblicato nel 2017 ed aggiornato nel 2022 che dipinge un po' la situazione dell'Italia in merito allo sviluppo di economie circolare e gli obiettivi di medio periodo per il mantenimento del trend.
Dopo le doverose contestualizzazioni la ricerca prova ad analizzare in modo

quantitativo e qualitativo “l’economia reale” per cercare di catturare gli effetti di un trend a favore dello sviluppo dell’economia circolare che confermerebbe quindi anche un buon risultato in merito al piano per l’economia circolare dell’UE; mi riferisco al primo piano per l’economia circolare (2015) perché sono ancora in corso le misure attuative del secondo piano approvato (2020) e sarebbe prematuro ricercare degli effetti.
Per perseguire questo scopo, come precedente detto, è stato utilizzato un metodo di analisi misto che cercasse di tenere in considerazione sia i dati statistici europei sull’Economia Circolare ma anche le impressioni di alcuni imprenditori che, con le loro aziende, rappresentano i principali attori nell’opera di transizione economica.

L’analisi quantitativa ha richiesto una fase preparatoria per l’identificazione delle variabili da considerare, il campione di paesi che fossero di interesse per l’analisi, la scelte di una database che fosse fornito di dati sull’economia circolare dei paesi identificati per un range temporale sufficiente da permettere una analisi.
La scelta del database è stato il primo passo dell’analisi quantitativa; Eurostat ha creato appositamente una sezione per l’economia circolare che colleziona le diverse misurazioni che possono essere di interesse per valutare l’economia circolare. Tra le diverse variabili, ho scelto di concentrare il lavoro su quattro variabili che potessero misurare l’andamento del settore privato. Variabili già utilizzate dalla Commissione nel report del 2019 sullo stato di implementazione dell’Economia Circolare in UE. Le variabili presentano inoltre un dataset aggiornato annualmente in tutti i paesi dell’UE dal 2010 al 2019.
La variabili dipendenti quindi sono le seguenti:

- ***Brevetti relativi al riciclaggio e alle materie prime secondarie (PAT)***
- ***Tasso di utilizzo materiali circolari (CMUR)***
- ***Persone assunte in settori relativi all’economia circolare (EMPL)***
- ***Investimenti privati e valore aggiunto lordo connessi ai settori dell'economia circolare (PR_INV)***

Le variabili indipendenti invece sono le variabili di diversa natura ed unità di misura che potrebbero influenzare le variabili dipendenti. Lo studio, tramite regressione lineare, dei coefficienti di esse, ci permette di formulare delle ipotesi su quali fattori

esogeni influenzano gli indicatori sull'economia circolare.
In questo caso, ho scelto la variabile di R&D in percentuale sul PIL, una variabile che rappresentasse il tempo ed alcune variabili che rappresentassero a livello geografico i paesi selezionati; paesi che, per dimensioni di PIL e demografiche sono: Francia, Germania, Italia, Polonia e Spagna.
Le regressioni lineari hanno fatto emergere peculiarità e similitudini dei diversi indicatori.
L'Italia è anche il paese che è stato utilizzato come valore statistico di riferimento sia per incrociare le informazione con quanto successivamente emerso dalle interviste ed anche per necessità di misurazione. (La regressione lineare richiedere un "riferimento").
Dalla analisi quantitativa sono emersi diversi risultati interessanti per quanto riguarda i dati sull'andamento degli indicatori dell'economia circolare nei paesi europei. A seconda della significatività dei coefficienti degli indicatori è possibile determinare, o meglio, stimare una possibile causa legislativa, geografica o economica che spieghi il risultato numerico.
L'analisi qualitativa è invece una raccolta di impressioni risultate da tre interviste condotte direttamente a responsabili aziendali di tre diverse compagnie. Il tipo di intervista è semi strutturata, quindi con domande precise ed alcune volte a generare un dialogo ad ampio raggio dove poi ho lavorato per estrapolare le informazioni rilevanti ai fini della ricerca. Le interviste hanno avuto sia uno scopo complementare che confermativo rispetto alle informazioni ottenuto dall'analisi quantitativa; In modo particolare, sono servite a comprendere i limiti e le opportunità del tessuto economico italiano e le percezioni che i responsabili aziendali hanno rispetto all'amministrazione del processo di transizione da parte delle istituzioni locali, nazionali ed europee. Le aziende selezionate hanno tutte sede nel nord-est del paese, area già nota per i positivi risultati ottenuti in termini di implementazione dell'economica circolare; le realtà economico sono state selezionate anche tenendo conto di una differenziazione di settore.
La aziende sono le seguenti:

- ***Amorim Cork Italia S.P.A.***
- ***Contarina S.P.A.***
- ***Ori Martin Group***

Il lavoro di ricerca è servito nel suo complesso a misurare il comportamento del mercato nei confronti dell'economia circolare in un momento molto particolare per la storia e la politica d'Europa: la guerra in Ucraina e le profonde trasformazioni nella geopolitica internazionale hanno riportato al centro delle agende politiche l'importanza di rotte sicure di approvvigionamento di risorse e materie prime. L'economia circolare è considerata strategicamente centrale anche in vista della riduzione delle dipendenze da paesi terzi.

In conclusione è fornita una sintesi delle informazioni ottenute dai dati quantitative e dalle informazioni emerse dalle interviste. La situazione che emerge non rappresenta ancora dei chiari trend temporali consolidati, tranne per il dato relativo al trasferimento di lavoro verso i settori legati all'economia circolare. Negli altri casi, lo sviluppo dell'indicatore è spesso correlato alla locazione geografica, denotando la necessità di creare norme ed incentivi europei che siano più coesivi in aggiunta a strategie comuni per la rimozione di barriere burocratiche e rallentamenti normativi che possono creare delle situazione di svantaggio tra le imprese nel mercato. Quest'ultimo aspetto è emerso particolarmente durante le interviste, dove spesso gli attori privati hanno segnalato di far affidamento ad una cornice normativa obsoleta e una mancanza di visione politica in merito agli investimenti pubblici.

Possibili soluzioni a questi limiti richiederebbero ulteriori ricerche. La tesi rientra comunque nella discussione politica europea in merito a quali possano essere delle misure che oltre a favorire il mercato e la competitività europee siano di rilancio per politiche di convergenza normativa e quindi più sicurezza e mutua fiducia tra gli stati membri in contrapposizione frammentazione geopolitica del contesto internazionale.