The Role of the Circular Economy in the Labour Market and Employment Rate in the European Union

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The aim of this study is to examine the role of the circular economy in employment and to prove this with statistically significant results. The paper includes an analysis of the 27 European Union Member States along specifically selected indicators. The methodology of the study is based on general statistical approaches, and the results obtained with correlation and regression methods are compared with cluster and compatibility analysis. The background to the topic is the fact that the circular economy not only promotes sustainability, but also generates dynamic labour market changes that offer new opportunities for both workers and enterprises. By focusing on recycling waste and extending the life of products, this economic model encourages the emergence of new industries. Consequently, the shift towards innovative practices is also stimulating the growth of the service industry. However, while the circular economy model has never been more popular, the average EU-27 circular material use rate has increased from 11.0 % in 2012 to just 11.4 % in 2021. The research area of the paper was influenced by the availability of statistical data. The results can be used as situation analysis to green the employment market and labour economics.

Keywords:
circular economy,
material footprint,
labour market,
employment rate,
sustainability

JEL:
J40,
O13,
Q56.

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1 Introduction

The concept of the circular economy involves shifting from a linear production model to an economic system that conserves resources, minimizes waste, and emphasizes closed-loop processes (Ghisellini et al., 2016). It offers an alternative viewpoint focusing on reducing resource flows, extending product lifecycles through reuse and recycling (Bocken et al., 2016). Sustainable development requires a comprehensive evaluation of economic, environmental, technological, and social dimensions within the economy or industrial process in question (Ren et al., 2013). The circular economy, especially its strategy, can lead to various social consequences. These potential effects are determined by the different groups of people involved, such as employees, small enterprises, and local societies in the product supply chain, and consumers of products and services (Padilla-Rivera et al., 2020).

2 Theoretical background / Literature review

The circular economy aims to promote sustainable development by driving innovation at three interconnected levels: individual products, businesses, and consumers (micro level), industrial symbiosis and eco-industrial parks (meso level), and cities, regions, nations, and the Earth as a whole (macro level) (Saidani et al., 2019). The shift to a circular system is projected to significantly impact the social aspect of sustainable development through its radical transformation of production and consumption systems (Saidani et al., 2019). However, academic discussions primarily focus on its environmental and economic aspects with only marginal consideration for social factors such as labor practices, human rights, and community welfare (Geissdoerfer et al., 2017). The full understanding of the social implications in relation to more than 114 definitions of the circular economy remains limited (Kirchherr et al., 2017). The social impact of the circular economy on employment generation and economic localization has been widely discussed in academic research (Clube, 2022). Studies have found that core circular economy positions, such as waste management, maintenance, and rental services, may require a lower level of education compared to other sectors (Burger et al., 2019). On the other hand, jobs related to design and digitalization call for higher education and technical expertise. The challenges of securing a suitable labor force for both skilled enabling roles and manual core occupations in developed areas are anticipated. However, some academic research lacks empirical evidence and does not thoroughly explore aspects of overall welfare when discussing the generation of employment opportunities through corporate entrepreneurship (Geissdoerfer et al., 2017). Additionally, there is uncertainty surrounding the impact of job creation in circular economy. It remains unclear whether the population possesses the necessary skillset and interest in circular economy jobs and if job concentration in one area may result in decline elsewhere (Clube, 2022; Luthin et al., 2023). Given the limited research on quantifying job creation in the circular economy, Horbach et al. suggest using green jobs as a proxy measure based on UNEP's definition, which includes roles focused on preserving ecosystems, reducing resource consumption through efficient strategies, decarbonizing the economy, and minimizing waste and pollution. If we solely consider employment figures (gross jobs), it is difficult to determine whether the expansion of the circular economy will create extra (net) jobs or merely substitute/displace current ones (Mitchell & Morgan, 2015). While circular economy offers advantages for society, its correlation with societal effects lacks clarity including aspects such as regional disparities in demand distribution and existing required skill levels (Padilla-Rivera et al., 2020).

3 Methodology

The paper analyzes material footprint, circular material use rate, and employment in circular economy sectors in all European Union Member States from 2012 to 2021. The chosen timeframe is specific due to the availability of complete data for this period.

3.1 Data

Data on the material footprint, circular materials usage rate, and employment in the circular economy from 2012 to 2021 are available from Eurostat (Eurostat, 2024a,b,c). We have analyzed the development of each indicator over time and conducted cluster analysis to classify Member States. Additionally, we assessed full-time employment rates and their percentage of total employment. Furthermore, we standardized individual indicators for a three-phase triangular matrix analysis of employment distribution in Europe and different countries.

3.2 Application of the relative growth rate method

An examination of the material footprint, circular material utilization, and employment diffusion in the context of a circular economy was conducted across Europe and at the level of individual Member States using time series analysis and visual representation. The relative growth rate (RGR) was determined, according to Poorter & Garnier (1996) for the European Union Member States (Equation 1). The RGR was calculated for the period 2012-2021 for different indicators at EU-27.

$$RGR=\frac{\ln(NC_1)-\ln(NC_0)}{t_1-t_0} \quad (1)$$

where: RGR: relative growth rate; NC_1: value of the quantity of the analysed indicator at the end point in time; NC_0: value of the quantity of the analysed indicator at the initial time; t_1: end point in time; t_0: initial time.

3.3 Standardisation and single value formation

The initial phase involves standardizing baseline data with various units and dimensions to condense them into a unified metric scale (Equation 2) according to methods of Oliinyk et al. (2023). The subsequent stage entails defining a benchmark, where the values of EU Member States are contrasted against the maximum value within the specified set of values.

$$Z_{ij}=\frac{x_{ij}-\bar{x}_{ij}}{s_i} \quad (2)$$

This is succeeded by computing the Euclidean distance, which indicates how far the indicators are from a specific reference point. Ultimately, an integrated index with uniform dimensions is computed for three-axis matrix analysis.

4 Results

4.1 Material footprint in the EU-27

Between 2012 and 2021, the average per capita use of materials in the European Union (EU-27) was 14.385 tonnes per capita, rising from 14.393 tonnes per capita in 2012 to 14.763 tonnes per capita in 2021. The rate of change over the period under review is an increase of +2.57%. The biggest change (+83.1 %) was in Hungary, where the per capita use of materials was 8.134 tonnes in 2012, rising to 14.896 tonnes in 2021. The average annual change is +7.55 %/year. The largest decrease was calculated for Greece (-22.9 %). Greece's use in 2012 was 15.67 tonnes/capita, falling to 12.1 tonnes/capita in 2021. The average rate of change by year was -2.72 %/year between 2012 and 2021. Figure 1a illustrates the average EU-27 footprint and the evolution of its calculated RGR.

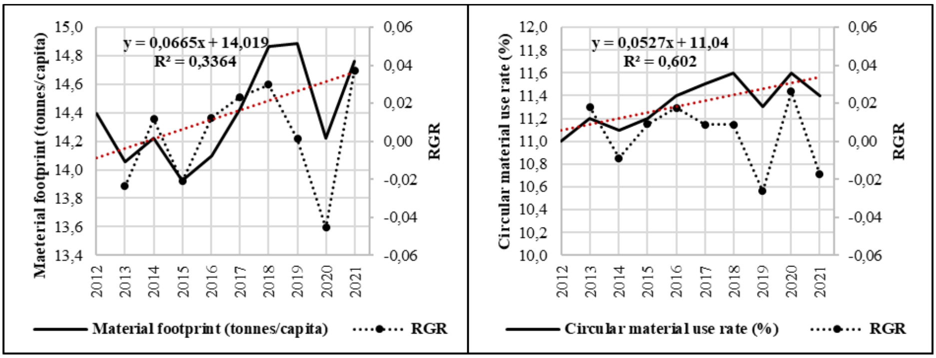

Figure 1.a: Relationship between material footprint and RGR results in the EU-27 between 2012 and 2021. b.) Relationship between circular material use and RGR results in the EU-27 between 2012 and 2021. The solid line in the data series represents material usage, whereas the dashed line illustrates the proportional growth.

The two series of values show similar patterns, with a slight fluctuation followed by an increase until 2018, then a decrease until 2020. The impact of the COVID-19 pandemic is unclear, as there was an increase in the footprint's evolution between 2020 and 2021.

4.2 Circular material use rate in the EU-27

Between 2012 and 2021, the average circular material use rate in the European Union (EU-27) was 11.3 %, rising from 11,0 % in 2012 to 11.4 % in 2021. The rate of change over the period under review is an increase of +0.40 %. The biggest change (+8.90 %) was in Malta, where the circular material use rate was 3.90 % in 2012, rising to 12.8 % in 2021. The average annual change is + 0.989 %/year. The largest decrease was calculated for Luxembourg (-13.50 %). Luxembourg's rate in 2012 was 17.6 %, falling to 4.10 % in 2021. The average rate of change by year was -1.50

%/year between 2012 and 2021. Figure 1b illustrates the average circular material use rate and its calculated RGR evolution. The circular material rate showed continuous increase until 2018, then declined in 2019 before sharply rising until 2021. The RGR displayed a fluctuating pattern, reaching a peak in 2016 and hitting its lowest point in 2019 within the timeframe of 2012 to 2018.

4.3 Employees working in the circular economy in THE EU-27

Between 2012 and 2021, the average full-time equivalent (FTE) of the persons employed in the circular economy in EU-27 was 4,014,343 FTE. This value represents approximately 1.99 % of total employment. The average FTE value of the EU-27 was rising from 3,786,069 FTE in 2012 to 4,284,745 in 2021. The rate of change over the period under review is an increase of +13.2 %. The biggest change (+58.1 %) was in Cyprus, where the employment rate of circular economy was 5,582 FTE in 2012, rising to 8,827 FTE in 2021. The average annual change is +5.38 %/year. Meanwhile, the rate of total employment rose by +0.6 %. The largest decrease was calculated for Finland (-4.38 %). Finland's value in 2012 was 43,654 FTE, falling to 41,744 FTE in 2021. The decline is minimal and the change in the rate of total employment is approximately -0.2 %. The average rate of change by year was +0.304 %/year between 2012 and 2021. Figure 2 illustrates the average FTE values of employees working in the circular economy and the evolution of its calculated RGR.

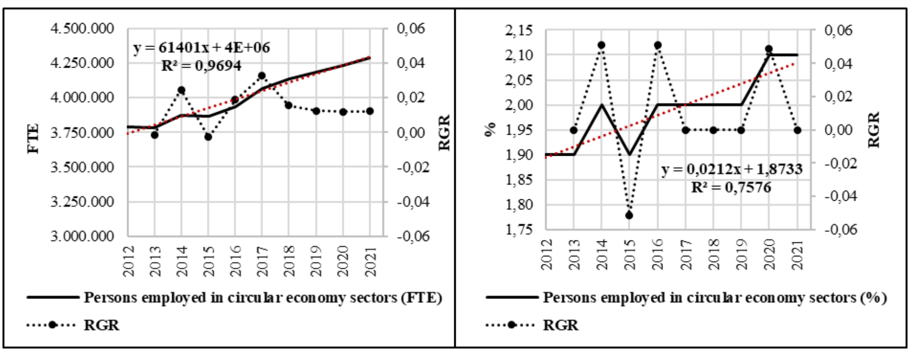

Figure 2.a: Relationship between FTE values of employment in circular economy sectors and RGR results in the EU-27 between 2012 and 2021. b. Relationship between percentage of total employment circular economy sectors and RGR results in the EU-27 between 2012 and 2021. The solid line in the data series represents material usage, whereas the dashed line illustrates the proportional growth.

Employment in circular economy sectors has consistently increased from 2012 to 2021. The RGR value, however, has shown fluctuating patterns with noticeable peaks in 2014 and 2017. This period can be divided into three phases: growth between 2012 and 2014, a plateau between 2015 and 2017, and subsequent stabilization until the year 2021.

5 Discussion

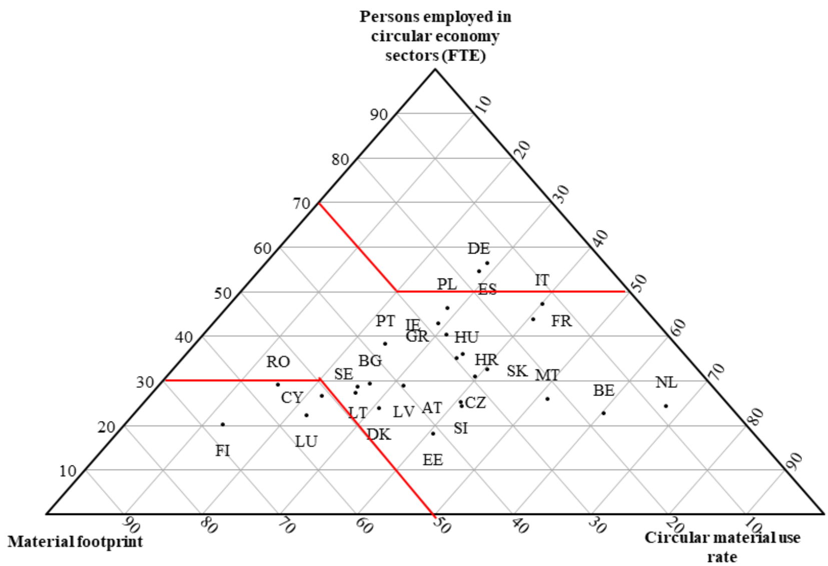

Figure 3: Clustering of European Union Member States in a three-factor matrix system

The countries with the highest employment rates in the circular economy were mainly from the second group of the 27 Member States based on material footprint (Figure 3). In 2021, Germany had 785,297 full-time equivalent positions (ranked 1st), a circular rate of 12.7% (ranked 8th), and a footprint of 16.003 tonnes per capita (ranked 16th). Similarly, Italy ranked second for employment rate, third for circular rate, and twenty-fourth for material footprint. In contrast to this situation, Netherlands had employed 105,173 FTE in the circular economy with a footprint of 7.484 tonnes per capita and a recycling rate of 28.5 %. Therefore, as observed from data showing high usage rates along with minimal environmental impact indicators denotes increasing sectoral employment trends. Cyprus, Malta, and Luxembourg had the lowest number of full-time equivalent employees in the circular economy in 2021. Cyprus was ranked 23rd with a circular rate of 2.80 %, while Malta held the 6th position at 12.8 % and Luxembourg was placed 21st with a rate of 4.10 %. In 2021, Malta had a per capita footprint of 12.371 tonnes (ranking 22nd), Cyprus had a footprint of 25.161 tonnes (ranking 7th), and Luxembourg had the EU-27's third highest footprint at 31.083 tonnes per capita. The analysis of these countries was based on three indicators as described earlier. Given the complexity of the topic, there is potential for further exploration, and one possible direction could be to consider adopting Kocsis (2014) method for future analysis.

6 Conclusions

In conclusion, the circular economy signifies a move towards sustainable development by redefining production and consumption patterns. The analysis shows that the influence of the circular economy on employment generation varies across different sectors, with core roles requiring diverse skill sets. However, there is often a lack of empirical evidence, leading to uncertainties about overall welfare effects and potential regional differences. An examination of employment rates in European Member States in 2021 indicates a correlation between high circular economy usage and increased sectoral employment. Germany and Italy illustrate this trend as leading countries in employment rates; however, disparities arise with Cyprus, Malta, and Luxembourg showing lower employment rates despite substantial material consumption. The complex relationship between circular practices requires further research for a comprehensive understanding. Furthermore, the findings highlight the importance of tailored policies and strategies for each country's circumstances.

References

Bocken, N. M. P., de Pauw, I., Bakker, C., & van der Grinten, B. (2016). Product design and business model strategies for a circular economy. Journal of Industrial and Production Engineering, 33(5), 308–320. https://doi.org/10.1080/21681015.2016.1172124

Burger, M., Stavropoulos, S., Ramkumar, S., Dufourmont, J., & van Oort, F. (2019). The heterogeneous skill-base of circular economy employment. Research Policy, 48(1), 248–261. https://doi.org/10.1016/j.respol.2018.08.015

Clube, R. (2022). Is job creation a legitimate social benefit of the circular economy? Resources, Conservation and Recycling, 181, 106220. https://doi.org/10.1016/j.resconrec.2022.106220

Eurostat (2024a). Material footprint. https://doi.org/10.2908/CEI_PC020

Eurostat (2024b). Circular material use rate. https://doi.org/10.2908/CEI_SRM030

Eurostat (2024c). Persons employed in circular economy sectors. https://doi.org/10.2908/CEI_CIE011
Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2017). The Circular Economy – A new sustainability paradigm? Journal of Cleaner Production, 143, 757–768. https://doi.org/10.1016/j.jclepro.2016.12.048
Ghisellini, P., Cialani, C., & Ulgiati, S. (2016). A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. Journal of Cleaner Production, 114, 11–32. https://doi.org/10.1016/j.jclepro.2015.09.007
Horbach, J., Rennings, K., & Sommerfeld, K. (2015). Circular economy and employment. In 3rd IZA Workshop: Labor Market Effects of Environmental Policies (pp. 1-39).
Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. Resources, Conservation and Recycling, 127, 221–232. https://doi.org/10.1016/j.resconrec.2017.09.005
Kocsis, T. (2014). Is the Netherlands sustainable as a global-scale inner-city? Intenscoping spatial sustainability. Ecological Economics, 101, 103–114. https://doi.org/10.1016/j.ecolecon.2014.03.002.
Luthin, A., Traverso, M., & Crawford, R. H. (2023). Assessing the social life cycle impacts of circular economy. Journal of Cleaner Production, 386, 135725. https://doi.org/10.1016/j.jclepro.2022.135725
Mitchell, P., Morgan, J. (2015). Employment and the circular economy Job creation in a more resource efficient Britain, Green Alliance, ISBN: 978-1-909980-35-8, https://doi.org/10.13140/RG.2.1.1026.5049
Oliinyk, O., Mishchuk, H., Vasa, L., & Kozma, K. (2023). Social Responsibility: Opportunities for Integral Assessment and Analysis of Connections with Business Innovation. Sustainability, 15(6), 5608. https://doi.org/10.3390/su15065608
Padilla-Rivera, A., Russo-Garrido, S., & Merveille, N. (2020). Addressing the Social Aspects of a Circular Economy: A Systematic Literature Review. Sustainability, 12(19), 7912. https://doi.org/10.3390/su12197912
Poorter, H., and E. Garnier. (1996). Plant Growth Analysis: An Evaluation of Experimental Design and Computational Methods. Journal of Experimental Botany 47 (302): 1343-1351.
Ren, J., Manzardo, A., Toniolo, S., & Scipioni, A. (2013). Sustainability of hydrogen supply chain. Part I: Identification of critical criteria and cause–effect analysis for enhancing the sustainability using DEMATEL. International Journal of Hydrogen Energy, 38(33), 14159–14171. https://doi.org/10.1016/j.ijhydene.2013.08.126
Saidani, M., Yannou, B., Leroy, Y., Cluzel, F., & Kendall, A. (2019). A taxonomy of circular economy indicators. Journal of Cleaner Production, 207, 542–559. https://doi.org/10.1016/j.jclepro.2018.10.014
UNEP. 2008. "Green jobs: Towards decent work in a sustainable, low-carbon world." Nairobi.