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The Current Transformation From A Linear To A Circular Economy

An Analysis Based On The Theory Of Evolutionary Economics

Abstract:

The economic system is undergoing a transformation from a linear capitalist system to a form of circular economy. However, many questions regarding this transformation are still open. This Written Assignment explores the concept of the circular economy and the transition of the current linear economic system to a more circular one with the lens of evolutionary economics, to gain insights into the mechanisms of change and innovation that are part of this transformation. Therefore it will firstly explain the concepts themselves and then apply them to each other. Also in relation to three case studies from different industries and regions, to give an practical example. Based on the understanding of these case studies it will then discuss the challenges and opportunities of transitioning to a circular economy and highlight the potential benefits of a circular economy. Ending with a conclusion about the connection between or application of evolutionary economics and the circular economy.

1. Introduction

As a result of surpassing our planetary limits, our world and society are confronted with increasingly daunting challenges that must be tackled (Küpers, 2020). One of these challenges is our current economic capitalistic system, printing as much money (Surz, 2021), and producing as much waste as never before (Statista, 2023). Therefore, new alternatives are needed that promise a more timely and current adequate economic solution, like e.g. Peer-to-Peer economies (Bauwens, 2012). But one of the best-known and most promising alternatives to our current system is the circular economy, which has partly replaced our old capitalist-oriented economic system already (Schröder, Lemille & Desmond, 2020).

The concept has gained much political attention in recent years as a sustainable alternative to the traditional linear economy (Rejeb et al., 2022), especially in China and the European Union , where it has already been partially implemented (McDowall et al., 2017). It describes a economic system in which resources are used for as long as possible. It tries to minimize waste and pollution and to recycle products and materials to reuse them in a closed loop system (Stahel, 2016). This shift to a circular economy is essential to mitigate the environmental impacts of economic growth and consumption patterns, that the world is facing right now (Schröder, Lemille & Desmond, 2020; Lacina, 2022).

However, the transition to a circular economy is not an easy task, as it includes significant changes in the way we design and produce goods, how we consume and use resources, and how we manage waste and pollution (Lacina, 2022). Moreover it also requires a deep understanding of the dynamics of the economy and the mechanisms of change and innovation that are necessary for a successful transition. This is where the field of evolutionary economics comes into play (Nelson & Winter, 1982).

The theory of evolutionary economics represents a theoretical framework for explaining the economy with an emphasis to the role of innovation, adaptation and change in the economy. It views the economy as a complex system that is constantly evolving and adapting to changing circumstances (Nelson & Winter, 1982), in contrast to our current quite linear understanding of economics (Sariatli, 2017). As such, evolutionary economics provides valuable insights into the mechanisms of change and innovation, which could be necessary for a successful transition to a circular economy.

By combining the principle of the circular economy with the lens of evolutionary economics, it might be possible to find out how to create a more resilient, efficient and sustainable economic system that benefits both people and the planet, which is the ultimate goal of a circular economy (Social Circular Economy, Winston Churchill Memorial Trust & The Frank Jackson Foundation, 2018).

The circular economy promotes the elimination of waste, the circulation of products and materials and the regeneration of nature (Ellen Mac Arthur Foundation Introduction, 2023), while evolutionary economics provides a framework for understanding the economic dynamics necessary for such a transition or comparable one. (Nelson, 2008)

2. Circular Economy

The concept of a circular economy is not new at all. In fact, the modern idea can be traced back to the year 1966 when Spilhaus said “Ideally, the system would be completely closed. All water would be purified and reused; all solid wastes would be sent back as resources for making more things“ (Ekins et al., 2019, Historical Background (Paul Ekins); Spilhaus, 1966). Besides Spilhaus, the economist Kenneth Boulding was in theses years also concerned with a more sustainable approach, who in the 1960s proposed the concept of a "spaceman economy, in which the earth has become a single spaceship, without unlimited reservoirs of anything, either for extraction or for pollution, and in which, therefore, man must find his place in a 8 cyclical ecological system which is capable of continuous reproduction of material form even though it cannot escape having inputs of energy.“ (Boulding, 1966, page 7)

But at that time, the general focus was still more on maximizing production and profit, and waste was simply seen as an inevitable by-product of the process. It took another 20 years and a lot of other researches to make the idea really prominent. Because a few years later, around 1980 Walter R. Stahel further developed the concept, in the course of a study for the European Union and coined the term "cradle-to-cradle" to describe a closed-loop approach to resource use and waste management and in comparison to the saying cradle-to-grave (Product Life Institute, 2008). Stahel believed that resources should be used for as long as possible and that waste should be seen as a valuable resource that can be reused and recycled rather than a problem that needs to be disposed of (Ellen Mac Arthur Foundation II, 2023).

„However, Cradle-to-Cradle as a design concept was first introduced in 2002 by Michael Braungart and William McDonough in their book Cradle-to-Cradle: Re-making the way we make things“ (Ismayilova & Silvius, 2021, Cradle-to-Cradle (p.57); McDonough, 2002). This was followed by numerous other researchers who helped to push the issue of circular economies forward and probably ensured that the principle is so popular today.

So at its core, the idea of a circular economy is about preventing waste and pollution, using products and materials for as long as possible and regenerating natural systems. It is a system in which resources are used in a closed loop, with waste from one process serving as an input to another. This approach not only reduces waste and pollution, but also creates new economic opportunities and promotes innovation (Ekins et al. 2019).

As the environmental impact of industrialization became more apparent with the years, the need for more sustainable approaches to resource use and waste management was increasingly recognized (Ito, 2021). Therefore, the concept of the circular economy has gained considerable momentum as a response to the current environmental and social challenges (Rejeb et al., 2022).

The most prominent figure nowadays is the Ellen MacArthur Foundation, a charity founded by former British yachtswoman Ellen MacArthur (Ellen McArthur Foundation - About US, 2023), which promotes the circular economy as a path to a more sustainable and prosperous future because they think that a Circular Economy will provide improved results for both individuals and the ecosystem (Ellen McArthur Foundation I, 2023).

To sum up, the current transition to a circular economy includes significant changes in the way our society designs, produces, consumes and uses resources and includes a move away from the linear "take-make-dispose" model, that emphasizes resource efficiency, product longevity and the regeneration of natural systems (Hetgroenebrein, 2023; Sariatli, 2017).

3. Evolutionary Economics

The concept of evolutionary economics, pioneered by scholars such as Joseph A. Schumpeter and later Richard R. Nelson, has also gained increasing attention in recent years. The concept serves as a way to understand the role of innovation and change in economic development (Nelson & Winter, 1982; Dosi & Nelson, 1994). At its core, the term evolutionary economics, as the name suggests, emphasizes the importance of adaptation and learning in understanding economic action, partly also in connection with Darwin's and biological theories (Hodgson, 1988; Shiozawa, 2004).

In most of the cases the term describes a set of theories that take a non-classical view of economics that focus on change and evolution. Most people consider the theory of evolutionary economics to belong to the field of heterodox economics (Lawson, 2006). Michael, K. & Abbas, R. described the field of evolutionary economics in their latest work: "Evolutionary Economic Theory“ as follows:

> “Evolutionary economics is broadly concerned with how economic change occurs, and is focused on innovation and entrepreneurship, industrial and institutional dynamics (as opposed to profits), and on patterns and trends as they relate to economic growth and development … Fundamental to the ideology of evolutionary economics is that innovation and economic change are intertwined“. - (Micheal & Abbas, 2023, Introduction)

This presents a view in which the economy is a complex and dynamic system, that is constantly evolving and adapting and in wich technology plays an important role. Such a consideration is particularly exciting now, as it is a time full of new technical inventions and possibilities (Hipsky, 2020).

A compelling example for the understanding of evolutionary economics can be provided by an analysis of the impact of technological progress on the evolution of the music industry (Cardinali & Mazzanti, 2011). The advent of digital music technologies created a new environment that facilitated direct interaction between musicians and consumers (Wilson, 2022).

This has led to the emergence of independent artists, and the industry has evolved into various niche markets. Many of the old music giants came down and were replaced by new adapted companies. Or they have evolved, as in the case of Warner Music Group (Zippia, 2023).

From this example it becomes clear, that by applying a perspective of evolutionary economics, it's able to examine how an industry has adapted or is changing in response to certain technological innovations. This includes e.g. examining the emergence of new business models, the role of network effects, and how consumer preferences have influenced the evolution of an industry. In principle, this view can be applied to just about any region of the economy and branches to gain a new understanding of their evolution, especially in connection to technology and a focus on it's adaptation.

To provide a more elaborate and eloquent analogy, one could also envision the concept of evolutionary economics as a living organism, where each economic entity represents a unique life form. In order to not only survive but flourish in a highly competitive environment, these organisms must continuously adapt and evolve. This is essential because, over time, businesses and enterprises that fail to remain competitive, perhaps due to a lack of technological advancements, will inevitably face the grim prospect of "extinction." By understanding the need for change, one can see how economic growth is a delicate process, with only the most flexible and quick-to-respond businesses succeeding in the end.

Even though evolutionary economics is often said to lose the ability to capture the complexity of the current economic system, as opposed to traditional economics, proponents such as R. Nelson believe that such a framework can even better capture the complexity of the economic reality. (Nelson, 1995)

In the context of the transition to a circular economy, the principles of evolutionary economics could be highly relevant. By emphasizing the role of innovation, adaptation, and competition in economic development, evolutionary economics can provide valuable insights into the mechanisms of change that are necessary for a successful transition and might also provide insight into possible barriers or driving forces for the transformation of the economic system towards a circular one.

4. Understanding the Linear Economic System and its transition

The current economic system is based on uneven wealth distribution, with OECD economies consuming resources and sourcing materials globally. It creates inequalities between different regions and social groups, with some benefiting from resource extraction and production while others bear the brunt of the negative impacts (Schröder, 2018). This results in cheap materials and expensive human labor, leading to business models that rely heavily on materials and neglect recycling and waste reduction (Sariatli, 2017). Essentially, humankind takes things from the earth, turns them into something useful, uses it for a while, and then throw it away when it's done (Hetgroenebrein, 2023).

This linear model of production and consumption that thrives for profits has been the dominant economic model for centuries and led to a lot of economic growth and technological innovation (Sariatli, 2017), but it has become increasingly unsustainable in the face of environmental and social challenges (Jørgensen & Pedersen, 2018). Not least because the the linear economic model relies on the availability of cheap, abundant resources. But as these resources become scarcer and more expensive to extract, the linear model becomes increasingly inefficient and unsustainable (European Environment Agency, 2020).

This unsustainable economic form of capitalism creates an inconceivably large amount of waste (Harriss-White, 2006). The accumulated global mass of waste naturally leads to far-reaching impacts with significant impacts on the environment and human health (WHO, 2023), and mostly lands in countries from the Global South (The World Counts, 2023). A quote from the website TheWorldCounts describes the frightening proportions that the linear economy has assumed quite well:

> „Every year we dump a massive 2.12 billion tons of waste. If all this waste was put on trucks they would go around the world 24 times. This stunning amount of waste is partly because 99 percent of the stuff we buy is trashed within 6 months.“
>
> (The World Counts, 2023, A world of waste)

This happens because the current linear economic system often neglects the environmental and social impacts of its activities (SDGZIN, 2022). For these reasons, the economic landscape is slowly changing towards a circular economy, which seems to be one of the most promising alternatives for the current economic systems (Schröder, Lemille & Desmond, 2020). The shift towards a circular economy necessitates a significant degree of ingenuity and adaptability across all levels of the economy, spanning from individual enterprises to entire industries and geographical regions. This entails innovations in diverse fields like material science, product design, and waste management. (Stahel, 2016)

5. Applying Evolutionary Economics

As already mentioned, the theory of evolutionary economics provides a valuable framework for understanding the mechanisms of change and innovation in the economy, and especially for understanding the transformation to a circular economy, including the emergence of new technologies, business models, and policies that support the reuse and recycling of materials and products, and minimize waste and pollution.

By adopting the theory of evolutionary economics for better understanding innovation, adaptation, and collaboration, it might be possible to create a more sustainable, efficient, and resilient economic system that enables humankind to live within it’s planetary boundaries again (Rockström et al., 2008).

One key factor in the perspective of evolutionary economics is innovation. It is described as the driving force behind change and emerges from the interactions of diverse actors and influences (Nelson et al., 2018). In the context of the circular economy, innovation can take many forms, such as designing novel technologies or business models but also introducing new social norms and values that encourage sustainable production and consumption practices (Suchek et al., 2021). This requires a supportive regulatory and policy environment that encourages innovation and change, and creates incentives for sustainable production and consumption. This can include policies that promote the use of renewable energy, support the development of sustainable transportation systems, and create incentives for the adoption of sustainable business practices (OECD, 2023).

Since the degree of innovation is the most important basis as well as the driving force from the point of view of the circular economy as well as from the point of view of the evolutionary economy, everything should be done to keep the degree of innovation as high as possible, as new innovations have the ability to reduce environmental damage and promote resource efficiency (Lehmann et al., 2022). A good example is the Circular Economy Action Plan adopted by the European Union in 2020 as part of the European Green Deal, which enables the framework and incentives for a transition to a circular economy and emphasizes on innovation (European Commission Environment, 2023).

Adaptation itself is also very crucial in the evolutionary economic understanding of the transition to a circular economy. A significant shift in the mindset of every economic entity is required, including changes in organizational structures, business practices, as well as changes on an individual level (Küpers, 2020). For a better understanding, let's take the example of the climate crisis. In the wake of the climate crisis, it first took people dealing with the problem on a personal individual level to use it to draw the attention of political as well as business organizations (Geiger, Swim & Gruszczynski, 2022). Only since the climate crisis seems to have reached every individual can real action be taken against it and an adaptation of organizations or laws and policies takes place at the institutional level.

Another important point, both in the old understanding of the economy and in the "new" one, is competition. From a classical point of view, one could initially argue that innovation is also promoted there by ever further competition, but these innovations have often been promoted with a view to profit (Tsoulfidis, 2011). In the case of the circular economy, too, there would of course be competition (UNECE, 2023). Because basically, competition in itself and the associated need to adapt is not a bad thing. Especially not from the point of view of evolutionary economics, in which change can be understood as a result of adaptation and therefore competition.

However, this would come about primarily because of the new and sustainable framework conditions that a circular economy brings with it. Now, companies with a focus on sustainability and waste management are not only politically better positioned, but in most cases also more profitable (McKinsey, 2017). Moreover, considering the numerous challenges our planet faces, it's crucial to advance solutions that address these issues, as failing to do so could lead to our eventual demise. So from an evolutionary economics perspective, adaptation is an inherent necessity in the face of such challenges.

In addition to the key elements (innovation, adaptation and competition e.g.) that contribute to the identification of the necessary drivers for a successful transformation towards a circular economy, evolutionary economics also enables the identification of obstacles that stand in the way of such a change. (Hopkinson et al., 2018)

It's easy to see that the values driving a shift towards a circular economy, such as sustainability and questioning our current economic system, align closely with the principles of evolutionary economics. Both approaches prioritize adaptation, innovation, and transformation. Evolutionary economics asserts that innovation is the primary driver of change, while the circular economy emphasizes that innovation and change are the essential prerequisites for initiating a successful transition. Therefore the theory of evolutionary economics can play a vital role in comprehending the shift towards a circular economy.

5.1 Applying Evolutionary Economics - Case Studies

To enhance comprehension of how evolutionary economics relates to the circular economy, three distinct case studies are presented. These examples center on the conversion of sectors or industries to a circular economy model. Their aim is to demonstrate the transition to a circular economy that is already taking place, and to, from an evolutionary economics standpoint, to highlight the adjustments and modifications that have propelled this industry transformation.

1. Automotive industry

The automotive industry is an industry known for its high environmental impact and resource consumption (ACEA, 2022). Moreover, due to the technical background of the industry, it naturally leads to new innovations and market adjustments every day.

One innovative business practice in the automotive industry is the transition to electric vehicles (U.S. Bureau of Labor Statistics, 2023). They have the potential to significantly reduce CO2 emissions from the automotive industry and reduce humanities dependence on fossil fuels (EPA, 2023). This transformation could have been contributed to, among other things, resource scarcity, more promising profit opportunities, or increasing pressure from the population resulting in policies in favor for electric vehicles. It can therefore be said that the entire automotive industry has been transformed as a result of the new innovations surrounding electric vehicles, and that this innovation has thus had very far-reaching economic as well as social effects.

Another example is the concept of car sharing, which is already a common practice in many large cities (Waszkowski, 2020). Car-sharing companies have the potential to reduce the need for private vehicles and thus reduce general environmental impact of the automotive industry (Migliore, D'Orso, G. & Caminiti, 2020). The reasons for this innovation are likely also the increasing pressure from the population for the communal use of vehicles. In both cases, there is a new innovative technology at the end, to which society as well as the economy must adapt in accordance to the understanding of evolutionary economics.

2. Fashion industry

Another industry with a significant resource demand is the fashion industry (European Commission, Upcycling, 2023), and therefore also offers an exciting opportunity to understand the transition towards a circular economy. For instance, an evolutionary approach can e.g. reveal how fashion firms are experimenting with new materials, production processes, and business models to minimize waste and extend the lifespan of their products (Jacometti, 2019).

One example of an innovative business practice in the fashion industry is the concept of upcycling, where old garments or materials are transformed into new products (Aus et al., 2021). Upcycling has the potential to significantly reduce resource consumption and waste in the fashion industry. The reasons for this, apart from the major impact on the environment (Jacometti, 2019), could be, the profitability of the venture, the willingness of large fashion labels to work with used materials, or the technical feasibility of recycling.

The fact that even luxury brands such as Prada now practice the principle of upcycling shows that the industry is already undergoing a major shift towards a circular economy (Prada, 2023). With more and more people looking for a more sustainable solution for clothes, an industry with opposing principles had to adapt to society and thus to economic demand.

3. Construction industry

Last but not least the construction sector is a further industry known for its high environmental impact and resource consumption (Miller, 2021). „Construction and demolition waste (CDW) accounts for more than a third of all waste generated in the EU“ (European Commission, Construction and demolition waste, Overview, 2023). For this very reason, it is extremely interesting to look at the construction sector in the course of a transition to a circular economy.

If we take a closer look at the innovations in the construction sector, one example is the concept of building with recycled materials (Bolden, Abu-Lebdeh & Fini, 2013), such as from recycled concrete or recycled glass. Using recycled materials reduces the need for new resources, thus reducing the resource consumption and environmental impact of the construction industry. From an evolutionary economic point of view and in view of the new requirements for this sector in the area of sustainability, a normally very conservative industry (Wegelius-Lehtonen & Pahkala, 1998), thus had to adapt to the new circumstances of resource scarcity and the need for more sustainable solutions.

All these case studies show how the application of evolutionary economics can help in the understanding of the transformation of our economic system to a circular economy in different industries and contexts and especially to understand the role of technology or innovation that leads to the adaptation of the sector. By applying evolutionary economics, one can understand the mechanisms that lead to innovative business practices and in this way analyze the changes that contribute to creating a sustainable and resilient economy.

7. Challenges and Opportunities

It is important to note, however, that the transformation to a circular economy comes with many challenges and obstacles as well as enormous opportunities for businesses, including the creation of new jobs, the development of new industries, and the promotion of sustainable and inclusive economic growth (Hopkinson et al., 2018).

The biggest challenges in implementing a circular economy is the dominance of the linear economic model. Many industries and societies are geared towards consuming resources and producing waste. It requires a rethinking of the way we do business and requires a comprehensive understanding of the interconnections between the different elements of the value chain. It would need more close cooperation between businesses, governments, academics and civil society and appropriate frameworks to encourage the spread of innovative business practices. (Hopkinson et al., 2018)

Another challenge is the availability of technologies and resources. Even tough the circular economy avoids the use of non-renewable resources, the new technologies and materials required for such a shift are often not yet widely available (Winterstetter et al., 2021). This point also becomes quite interesting in terms of a perspective through evolutionary economics.

Because if one assumes that evolutionary economics sees innovation and with it technology as a driver for change, then resource allocation related to the ability to create new technologies is quite important. Does the evolutionary development of an economy, therefore, also depend on the availability of resources for technological change?

Despite these challenges, there are also tremendous opportunities for businesses, governments and our society. Besides all the environmental benefits, and contrary to many assumptions, a circular economy often actually represents the more profitable solution. The adoption of circular economy practices is in many cases more profitable than traditional business practices. A study by the Ellen MacArthur Foundation has shown that the shift to a circular economy in Europe could potentially add €1.8 trillion in value and create 3 million new jobs by 2030. (Ellen Mac Arthur Foundation PDF, 2023)

In addition, a circular economy e.g. can help to promote social justice by creating jobs and reducing income inequality. By creating new business opportunities and integrating marginalized groups into the value chain, the circular economy can help to create a more inclusive economic system. (Schröder, 2018)

Furthermore a circular economy can also help to increase the resilience of the economy (Kennedy & Linnenluecke, 2022). By creating local cycles and reducing dependence on imported raw materials, the economy can become more resilient to external shocks such as natural disasters or geopolitical crises. Something that one had to quickly realize during the times of Corona (OECD, 2021). Many of the products were no longer available because their import was no longer possible. During this time, many people became aware of the dependency in which our supply chains are located.

As a result, the circular economy represents a realistic and, above all, implementable alternative that is already finding its implementation. It has the potential to create a fairer economy with a greater focus on environmental and social issues. But after all, one has also to admit that the idea of a complete circular economic system resembles wishful thinking more than anything else in practice (Bocken et al., 2023).

8. Conclusion

In summary, the transformation to a circular economy is a necessary step to create a sustainable and resilient economy, which is already taking place. Such an economic system would makes it possible to tackle the challenges our planet is facing nowadays. However, there is still a long way to go before our economic system is completely restructured.

In the meantime, the theory of evolutionary economics offers valuable insights through which the transition to a circular economy can be explained. By comprehending the ways in which innovation , competition and adaptation unfold within various industries and circumstances, evolutionary economics can assist in identifying the drivers that foster the adoption of sustainable business models, in this case of a circular economy.

Evolutionary economics as well as the circular economy emphasize the importance of innovation. In the case of evolutionary economics it’s more about the adaptation to meet the challenges of economic development and in the case of the circular economy it’s more about continuous innovation and adaptation to meet the demand of shifting to a new way of doing business.

By applying evolutionary economics to the system of a circular economy, it's easier to understand how innovation and adaptation can take place in the circular economy as well as our economic system and how they can contribute in creating a more sustainable economic system.

Finally, it is important to emphasize that moving to a circular economy is not an easy or quick process. It requires cooperation, a long-term perspective and the ability to adapt to changing conditions to achieve the necessary changes. Essentially, this hits the core of Evolutionary Economics - the adaptation of an economic system or an agent over time to ever changing environments. This is why it is worth looking at the transformation towards a circular economy through the eyes of evolutionary economics.

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