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A Structural Analysis on The Global Actors' Adaptive Change Tendencies Towards the Circular Economy

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A Structural Analysis on The Global Actors' Adaptive Change Tendencies Towards the Circular Economy
Abstract

This study is devoted to carrying out a structural analysis on the global actors' adaptive change tendencies towards the circular economy (CE) as a response to the climate crisis. By using the comparative case study method, the study focused on the relationship between China's, Japan's, the EU's and the USA's main structural patterns and their CE policies. In parallel with their existing institutional structure, China follows a top-down piecemeal social engineering approach, Japan a collaborative approach, the EU a functionalist approach, and the USA a market-centred approach. All these approaches target adaptive changes, and the institutional rationality of these actors could be given as the main reason behind this tendency. The institutional rationality has instrumental and historical components, and both favour an adaptive change over a transformative change. As a result, it could be argued that the structure matters in the global actors' response to the worsening climate crisis, and a gradual paradigm shift towards the CE seems the only feasible option. However, the structural inclination to strengthen the functionality of the existing linear system via adaptive changes might impede the success of it; thus, the piecemeal adaptive changes should be progressively coordinated towards the targeted circular system.

Küresel Aktörlerin Döngüsel Ekonomiye Yönelik Uyarlanabilir Değişim Eğilimleri Üzerine Yapısal Bir Analiz
Öz

Bu çalışma, iklim krizine karşı küresel aktörlerin döngüsel ekonomiye (DE) yönelik uyarlanabilir değişim eğilimlerinin yapısal bir analizini yapmaya adanmıştır. Karşılaştırmalı vaka çalışması yöntemi ile Çin, Japonya, AB ve ABD'nin temel yapısal özellikleri ve DE politikaları arasındaki ilişkiye odaklanılmıştır. Mevcut kurumsal yapılarına uygun olarak Çin yukarıdan aşağıya parçalı bir sosyal mühendislik yaklaşımı, Japonya işbirlikçi bir yaklaşım, AB işlevselci bir yaklaşım ve ABD piyasa merkezli bir yaklaşım izlemektedir. Tüm bu yaklaşımlar, uyarlanabilir değişiklikleri hedeflemektedir ve bahsi geçen aktörlerin kurumsal rasyonelliği, bu eğilimin ana nedeni olarak ortaya çıkmaktadır. Sonuç olarak, küresel aktörlerin kötüleşen iklim krizine yönelik tepkilerinde kurumsal yapıları oldukça etkili olmaktadır ve DE'ye doğru kademeli bir paradigma değişimi tek uygun seçenek gibi görünmektedir. Ancak, aktörlerin kurumsal yapılarından kaynaklı mevcut doğrusal sistemin işlevselliğini uyarlamalı değişiklikler yoluyla güçlendirme eğilimleri bahsi geçen paradigma değişikliğini engelleyebilir. Bu nedenle, parçalı bir şekilde uygulanan uyarlanabilir değişiklikler, hedeflenen döngüsel sisteme doğru ilerici bir şekilde koordine edilmelidir.

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1. Introduction

In the 1970s, the scientists realized the human driven climate change, and after that, tried to warn people. Despite those early warnings, the global actors failed to take prompt measures to deal with this serious crisis. The climate crisis is now an obvious fact which is being daily witnessed by everybody across the world in a devastating way. For example, extreme rainfalls, floods, droughts, and heat waves are being increasingly witnessed in every corner of the world. During this span of time, the complexity of the gradually worsening situation has also shown that a narrowly formulated environmental policy cannot handle the climate crisis, but a promising solution needs a holistic perspective and broader structural changes. With regard to this need, the circular economy (CE) as an alternative system to the existing linear one started to gain attention of the global actors especially after the 2000s. The existing system established after the industrial revolution in the world has a linear logic: the extraction of resources, converting them into products, and then the consumption and disposal of these products. Therefore, this take-use-dispose linear logic ruthlessly exploited the natural resources, and the Earth has neither further resources for this way of economic activities nor resilience capacity. From this point of view, the worsening climate crisis could be interpreted as an unsustainability crisis of the linear system. Alternatively, the CE aims to combine production and consumption processes and limit the leakage of resources via this circularity to prevent the exploitation of the Earth as much as possible. As a result, the global actors began formulating the CE policies after the 2000s. The common point in these policies are their targeting adaptive changes from the linear system to a circular system (see: Termeer et al., 2017; Hysing and Olsson, 2018). Through their adaptive change strategies, they aim to make incremental changes in their linear system and to develop their own CE system step by step. To put it another way, the global actors do not favour abrupt transformative changes towards the CE despite the worsening climate crisis (Kaplan, 2022). Therefore, it is scientifically interesting to analyse the structural factors behind the global actors' adaptive change tendencies towards the CE, and this study is devoted to carrying out this analysis.

The research is designed as a comparative case study, and focuses on China, Japan, the EU, and the USA. This method is particularly effective to connect theoretical knowledge and real-life developments in order to better explain social phenomena (Yin, 2003). The data related to these cases was collected through an analytical literature review and the documents released by several institutions of the targeted actors. Rather than giving descriptive narratives about the CE policies of these cases, the research tried to explain the main structural relationship between China's, Japan's, the EU's, and the USA's existing institutional structures and their CE policies. To more systematically carry out this comparative case study research, the study also benefited from the conceptual analysis method. This method especially enabled the researcher to decompose the concepts under scrutiny into their main components and re-conceptualize them in order to provide deeper

explanations about a social phenomenon (in this study: the circular economy) and its experiences in real-life (Berenskoetter, 2017; Tähtinen and Havila, 2019).

In the light of this methodological framework, the first section is dedicated to carrying out a conceptual analysis on three main concepts; sustainability, the circular economy and adaptive change. The second section carried out a case study analysis on China, Japan, the EU, and the USA to show how their institutional structures shape their CE policies. The last section provides a brief summary of findings and their further implications to discuss to what extent the global actors' adaptive changes could achieve a paradigm shift from the linear system to a circular system.

2. Sustainability, the Circular Economy and Adaptive Change: A Conceptual Analysis

The industrial revolution achieved a paradigm shift from the agrarian society to an industrial one since the paradigm of production and consumption to meet the basic needs in the agrarian system was replaced by the paradigm of mass production and consumption. Particularly, the discovery of machine power encouraged the human to dominate and exploit nature (rather than being a part of it). In this industrial paradigm, a linear logic depending on using and disposing of the natural resources became dominant in shaping production and consumption actions (Gardetti, 2019). However, scientific studies in the 1970s pointed out the unsustainability of this linear system due to the brutal exploitation of the Earth (Holdren and Ehrlich, 1974; Meadows et al., 1972). Therefore, sustainability arose as an important concept in the same era. For example, the 1972 United Nations Conference on the Human Environment was held in Stockholm, and the United Nations Environment Programme (UNEP) was established as an outcome of this conference. Moreover, the concept: sustainability started to be used as a means to achieve a symbiotic relationship between ecology and economics (Brown, 1981), and gradually evolved into a core concept with its environmental, economic and social pillars for the salvation of the human kind (Rout et al., 2020). In this regard, Our Common Future, the Brundtland Commission Report published in 1987, provides an initial clear conceptualization of sustainability. The report (1987) defines human as a part of life on the Earth; thus, the protection of the ecosystem emerges as a sine qua non for the development of human living standards. The report does not give a specific prescription for how to institutionalize a new symbiotic relationship between the environment and the human civilization due to the heterogeneity among the countries, but it highlights the point that sustainability is a normative concept looking forward to developing equity not only within a human generation but also between different generations. From this point of view, according to the report, a sustainability-centred action should not have short-run interests, but should contain long-run calculations with social and environmental aspects.

Hence, the accomplishment of sustainability needs major structural changes in the linear system. At this point, the circularity of economic actions as a crucial need for sustainability started to attract the attention of countries (Ayres, 1989) because these actions have a capacity to provide further economic growth/welfare while protecting the environment (Esposito et al., 2017). The circular economy as a sustainable model suggests that the economic actions from design to consumption should be connected and resources should be kept within this circularity as much as possible, because according to this understanding, the resource leakage from the economic system is the main reason behind unsustainability. Therefore, the CE model aims to reduce material and energy leakage from the economic system through "long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling" (Geissdoerfer et al., 2017). In this way, resources are not spoiled but recovered in the CE and their highest possible value is protected within the system even the lifetime of products end (Burger et al., 2019).

Despite its hypothetical promise, the circular economy is still an idea, and there is not any clear answer on the question how to achieve a change from the linear system to a circular one (Tang, 2011). In other words, the cradle to grave notion converting resources into waste in the linear system is unsustainable, and changing this notion with a more sustainable one: cradle to cradle (keeping resources within the system) needs a holistic approach covering all socio-economic actions from design to consumption (see: Ogunmakinde et al., 2021). However, there is not any guide showing how to implement this holistic approach. To illustrate, the CE has three main principles to arrange economic actions, namely; recycle, reuse, reduce (Ranta et al., 2018). Regarding the first principle, recycling is relatively an easy behavioural pattern which could be acquired by people, but reuse and reduce are more abstract behavioural change targets which need deeper structural and cognitive changes. To gain these behavioural changes, for instance, the notion of waste should be replaced by resource, and profit-oriented actions should be replaced by ecology centred actions (Den Hollander et al., 2017), but there is not any prescription for these behavioural changes.

Therefore, even though the necessity of a change from a linear system to a circular one is convincing, the way to achieve it is still under discussion. In this regard, adaptative and transformative change strategies emerge as two important options for the global actors. In terms of the adaptation-centred change actions, actors aim to maintain the main structure of their existing system while implementing incremental changes as a response to an external shock. Here, actors do not favour an abrupt change due to its unexpected costs (the uncertainty of a radical/revolutionary change) (Nelson et al., 2007). As an alternative to this, transformative changes aim to make a deeper structural change from an existing system to a new one with the anticipation of a better future (Parker, 2010; Redman, 2014). Ferguson et al. (2013) define a transformative change as a "fundamental system-wide change in the structure and functioning of a system". From Polanyi's (2001) perspective, therefore, a transformative change needs deeper

cognitive/behavioural changes appropriate to the new idea. From this point of view, a transformative change might represent a paradigm shift from a system to another one. Here, a paradigm could be defined as a particular logic or mental model constructing a broad structure which shapes cognitive processes and so do behavioural patterns and social institutions as more concrete outputs of these processes (Perlmutter and Trist, 1986), and a paradigm shift means a substantial change producing a new way of thinking and behaviours and a brand-new institutionalization as a result of this change (see: Kuhn, 1962).

If the circular economy as a promising new idea is evaluated from this theoretical point of view, at first glance, a transformative change might be considered as the best option to structure a CE system to deal with the climate crisis. However, the global actors are actually institutional structures and their institutional rationality might favour an adaptive change over a transformative change. Particularly, institutional rationality has two components: instrumental and historical rationality, and these two components favour continuity over change and an adaptive change over a transformative change if exogenous factors force them for a change (Kaplan, 2022; Redmond, 2004). As Rational Choice Institutionalism argues, unexpected costs of uncertainty drive actors to continue their institutional structure or at least to make adaptive changes as a response to exogenous changes around them (instrumental rationality) (Gorges, 2001). In addition to this, the global actors' historically evolved institutional structures open a logical path for their future actions, and these actors tend to follow this path when they need a change due to exogenous shocks, and this path-dependence prioritises an adaptive change to a transformative one (historical rationality). This path-dependence might affect actors both consciously and unconsciously. Actors might deliberatively consider the dependence on their existing structure as following a historical path will be less costly than a radical one; or if the institutionalization of a new idea takes a long period, the isomorphic effect of the existing structure might unconsciously dominate this long institutionalization process (DiMaggio and Powell, 1983; Pierson, 2004).

All in all, from this theoretical point of view, we can expect that the global actors tend to follow adaptive changes in conformity with their existing structures in their transition attempts towards the CE. To empirically test this theoretical expectation, the research has focused on China, Japan, the EU, and the USA as leading global actors who try to change their linear systems with a circular one. The main findings are given in the following section.

3. A Comparative case study analysis: China, Japan, the EU and the USA

The comparative case study analysis on the four global leading actors show that the global actors tend to follow adaptive changes towards the circular economy. This means that they follow an incremental change towards the CE and their CE policies are in harmony with their existing structure. In other words, their circular economy policies initially target to enhance the functioning capacity of their existing system through appropriate CE centred adaptations (see also: Gunderson and Holling, 2002). Therefore, they refer to an adaptive change rather than a transformative change towards the circular economy. At this point, it could be argued that their institutional rationality plays the key role in their choices about their CE policies. Particularly, their instrumental rationality does not support the uncertainty originating from a transformative change, and the path-dependence on their existing structure drives them towards an adaptive change while formulating their CE policies because their historically evolved structural paths are both less costly and cognitively more applicable.

The key findings could be given as follows:

3.1. China

China implements a top-down approach in its CE policy (Naustdalslid, 2014) as it wants to use the CE as a means for a deeper systemic change (McDowall et al., 2017). In this regard, the Chinese government wants to contribute more Chinese characteristics to its socialist system, and the CE related concepts like harmonious development or ecological civilization are strategically used to re-conceptualize the new China (see: Jingping, 2018; NPC, 2012; The State Council, 2005). To this end, the state authority/bureaucracy is used as the main driving force in this change process (Qi et al., 2016). In a concrete manner, after 1978, China witnessed a gradual transformation towards the market economy by following a piecemeal social engineering approach, and this transformation provided further economic growth and prosperity (Jing, 2009; Qian, 2006). Thanks to this successful historical experience, the Chinese government also applies this approach in its CE policy. Regarding the implementation of the CE related policies, China initially experiences the CE policies at the micro level (e.g. at industrial parks through enterprises), and then at cities and regions. If the results of these experiences are positive, they are used in the development of CE related national policies (Su et al., 2013; Zhijun and Nailing, 2007).

Moreover, China developed an export-oriented development strategy after 1978, and the mass production for export was the core of this strategy. In line with this macro-level strategy, mass production also forms the core of China's CE policy (Fan and Fang, 2020; Zhu et al., 2019). This could easily be observed in its key CE policy paper, namely, Circular Economy Promotion Law of the People's Republic of China (NPC, 2008). Additionally, Solid Waste Pollution Prevention Law (1995) and Cleaner

Production Promotion Law (2002) as antecedent regulations could be given as other examples showing the importance of the mass production in China's CE policy. Here, China's main motivation is not only to make the production efficiency more sustainable but also deal with pollution as the main side effect of its mass production oriented economic system (Zhao, 2018). China's export-oriented mass production also needs the import of a certain amount of foreign raw materials, and the dependence on international resources weakens the resource security in the country. At this point, the increasing circularity of materials in the production process is seen as an effective resource security measure (Bleischwitz et al., 2022). In addition to resource security, pollution is also another important problem China needs to deal with. In this regard, China aims that developing circularity in production related actions will automatically decrease pollution. For example, the eco-industrial parks and their integration to the local systems in a symbiotic way is expected to decrease pollution. In addition to this, China used to import foreign recycled waste as a resource for its mass production, but the recycling process of this waste was an extra pollution reason in the country. For example, China faces dangerous heavy metals contamination in the regions where the recycling process of e-waste takes place (e.g. see: Han et al., 2018). As a response, China banned the export of foreign waste in 2017 and wants to substitute this with the resource efficiency of the circular production process (Qu et al., 2019).

3.2. Japan

Japan is a resource poor country (very limited mineral and energy sources) despite its being one of the leading producer countries in the world. In addition to this fact, the Japanese (business) culture historically evolves in a collaborative way. Therefore, it could be argued that these structural traits significantly affected Japan's CE policy. Firstly, the lack of national resources forced Japan to take systemic measures to adapt to this scarcity, and the circularity of resources within the economic system is being gradually institutionalized since the 1990s. The Law for Promotion of Effective Utilisation of Resources was enacted in 2001 and provides a legal framework for the Japanese producers (requirement to use recycled materials in the production process, designing easily recyclable products, and getting responsibility for recycling of their used products). It also covers a wide range of products from plastics to electronics (Cheng, 2018). This legal framework became highly effective in Japan's transition process to the circular economy. For instance, the industrial waste from 32 different industries was 74.8 % lower than the number in 2000 and 92.2 % lower than the number in 1990 (Yagai, 2015). As a more specific example, the rate of recycling of appliances are significantly high in the country after the enactment of the mentioned law in 2001, and the recycled materials are used in the production of new appliances to close the loop in the circulation of materials in this specific sector (a true circular system covering several

economic actions from production to consumption). This is especially a strategic measure for Japan to revitalize local stagnating industries (Geng et al., 2013).

Secondly, the collaboration between different actors in the Japanese economy from production to consumption makes the implementation of the CE related regulations more possible (Benton and Hazell, 2015). When the collaborative approach of Japan in the implementation of the CE is analysed deeper, some unique parameters emerge. Initially, the Japanese government implements an active and effective policy to drive the Japanese actors from different segments of the society towards the circular economy. For example, the Ministry of the Environment and the Ministry of Economy, Trade and Industry not only monitor the implementations of the private sectors in line with the CE goals but also launch incentives to encourage them. The programmes: e-Mark and Eco Town are good examples to these initiations (Zhelyazkova, 2018). In line with this, the Development Bank of Japan provides necessary funds for the CE oriented projects, and the Law on the Promotion of Green Purchases entered in force concomitantly with the Law for Promotion of Effective Utilisation of Resources (Ministry of Environment, 2022). Therefore, the effective institutional support and diffusion of the idea of CE across different segments of the Japanese society strengthened the public-private sector collaboration containing numerous institutes and organizations (Herrador et al., 2022). The similar collaboration also exists between the Japanese producers and consumers as a vital necessity to achieve the circularity of economic actions within a society (Ogunmakinde, 2019). Moreover, Japan's advanced technology helped in the construction of the necessary infrastructures for the complex circular actions. As an example, from 1995 to 2005, Japan became the leading country producing renewable energy related patents in the world (Welfens, 2017). Related to this point, the circular way of thinking/behaving has been relatively embedded within Japanese society through the government's campaigns (Ji et al., 2012). However, Rovanto and Finne (2022) argues that the collectivistic nature of the Japanese society might produce some masked attitudes (without truly internalization of the idea of circular economy), and this might stall gradual institutionalization of the circular economy. For example, they found that some Japanese entrepreneurs do business in the CE related sectors without enough knowledge of the CE.

3.3. The EU

The European Union (the EU) is a sui generis polity which was gradually institutionalized in a functionalist path since the 1950s. This functionalist path also highly affects the EU's current structure. For example, the EU has a multi-level governance system which works in a functionalist logic (see: Hooghe and Marks, 2001). Within this general structure, the EU follows a functionalist bottom-up approach and tries to encourage stakeholders in the private sector to initiate CE oriented economic actions. According to this logic, when stakeholders start to take CE oriented actions, this will have a spill-over effect in the existing economic system from the bottom, and the institutionalization of the CE system will gradually be

achieved. In other words, this strategy prioritises the direct economic gains in transition to a CE system to encourage the stakeholders in the private sectors (Friant et al., 2021). For example, the EU launched three action plans in 2014, 2015, and 2020, and all of them point out economic gains and market dynamics as the main catalysts for a CE oriented change (see: EC, 2014, 2015, 2020).

The EU's historical experiences also affect the implementation of this approach. The EU immediately responded to the early scientific warnings about climate change in the 1970s, and took idealistic environmental measures formulated in a top-down way (Hey, 2005). However, the inefficiency of these policies was realized in the 1990s (European Environment Agency, 1999). The implementation gap between the EU rules and their national implications was the main reason behind this inefficiency (Jordan, 1999). In the same vein, the EU developed the main principles of its CE policy at the supranational level, and asked the member states to adapt them. However, there is still a significant implementation gap between the member states (Marino and Pariso, 2020; Ūsas et al., 2021). As a result, a bottom-up approach directly targeting stakeholders in the private sector in the EU single market raised as a rational option in formulating the EU's CE policy.

Moreover, resource scarcity is another structural factor affecting the EU's CE strategy. Historically, the EU single market has difficulty in obtaining raw materials and energy sources in a sustainable way (Domenech and Bahn-Walkowiak, 2019). For instance, the recent Ukrainian war showed the overdependence of the EU on Russian gas. As a response to this, the EU tries to develop eco-innovative ways to increase the sustainability of its resources (Bleischwitz et al., 2009). In this regard, the EU countries made a heavy investment in the recycling of generated wastes after the 1980s. In line with this historical development, the EU's CE policy gives priority to recycling (Dodick and Kauffman, 2020; Friant et al., 2021). However, Ranta et al. (2018) warn that too much dependence on recycling might prevent the EU from the implementation of the CE's more advanced principles: reduce and reuse. In line with this warning, for example, Eurostat (2021) shows that most of the EU's recycled materials are exported rather than channelled into the production process as the CE advises.

3.4. The USA

The United States does not have a holistic approach for a systemic change towards the circular economy mostly because of its federal governmental structure (Ghisellini et al., 2016). It has mainly focused on the recycling principle of the circular economy, and zero waste is given as the main goal without referencing other perspectives of the CE (Lin, 2022). For example, the US's Environmental Protection Agency (EPA, 2021), as the leading federal agency for a circular economy-oriented change, conceptualizes the circular economy within its National Recycling Strategy. Moreover, the federal governance structure also heterogenizes

the circular economy policies across different states in the United States. Regarding this point, for example, the US's supreme court restricted the EPA's regulative power in June 2022 (Totenberg, 2022). As another example, despite the zero-waste goal of the US, it does not have a well-prepared federal regulation on e-waste management (Xavier et al., 2021). Therefore, the lack of comprehensive federal policies is also a reason for confusion among stakeholders in terms of the implementation of the CE in different sectors (Ryen and Babbitt, 2022). To illustrate, Saidani et al. (2019) argue that the US lags behind the EU in terms of the circularity of the automobile/vehicle industry due to the lack of federal regulations and inconsistent state regulations on the issue. As a more specific example, while the EU recovered 92% of its used tires, this percentage is 75.6 in the US (the valorization of end-of-life tires) (Martínez, 2021).

On the other hand, the US is the world's leading market economy and the market dynamics are the main transition/change power of the country. In line with this structural fact, the US has a bottom-up approach and the market dynamics have the pivotal role in the US's CE policy. For example, Esposito et al. (2017) point out that the CE is generally conceived as a new market opportunity to invest in the USA. Moreover, the US companies also started to positively react to the new circularity ideas in their businesses. For example, ING (2019) carried out a survey with 300 executives from different companies with different scales in the US, and found that 62% of the participant companies had business strategies to move toward circularity, and 16% of them already adopted a circular economy framework in their businesses in 2019. Moreover, as the US consumers are sensitive to the environmental problems and open to buy reconstructed products, the US companies increasingly engage in product reconstruction (Gaur et al., 2018). More noticeably, the U.S Chamber of Commerce (USCC) (2022), which is historically against any environmental measures at the expense of business, advises/helps companies to "incorporate circularity into their core principles and business practices". However, the full value of the CE is not embedded in the US market yet as the cost-saving calculations are the main driving force behind the US companies' circularity-oriented actions (Sillanpää and Ncibi, 2019); thus, most of the circularity-oriented initiatives take place within the existing economic and production models and they hesitate to make radical changes which might be necessary for a truly circular transition (Circular CoLab, 2018). As a result, it could be argued that a gradual adaptive change towards the circular economy takes place in the US as companies in different sectors try to adapt themselves into a new environment without taking too much risk.

4. Conclusion and further discussion

The climate crisis forces the global actors to change their unsustainable linear system with a more sustainable circular system. Despite this exogenous pressure, the global actors tend to implement an adaptive change from the linear economy to a circular one. For example, this study convincingly shows that China, Japan, the

EU, and the USA follow an adaptive change strategy in their CE policies. As noted above, China has a top-down approach (piecemeal social engineering strategy), Japan has a collaborative strategy (a close working between all segment of the society), the USA has a market-oriented strategy, and the EU implements a functionalist bottom-up strategy to achieve an adaptive change towards the CE. In this regard, the findings of the study suggest that these actors' institutional rationality could be the main reason behind their adaptive change tendencies towards the CE. The institutional rationality contains both instrumental and historical components, and both of these components are naturally in favour of an adaptive change over a transformative change. First of all, instrumental rationality does not favour a radical/abrupt change due to the high cost of the uncertainty. With regard to this point, the CE is an attractive idea promising a more sustainable system compared to the linear economy; however, it does not have any guiding model. The lack of a guiding model increases uncertainty in a change process, and the instrumental rationality of the global actors might drive them towards a more adaptive path in which the actors tend to integrate new ideas into their existing structure incrementally. Furthermore, this piecemeal adaptation process could be a strategic learning process for actors to smoothly govern the change process (Parker, 2010). Secondly, the global actors' path-dependence on their existing structure might consciously or unconsciously favours an adaptive change over a transformative one. Particularly, historically developed institutional thinking/habits and cognitive limitations on a new idea might significantly increase the isomorphic effect of the existing structure in a policy-making process (Pierson, 2004), and adaptive changes emerge as a possible outcome of this structural effect. As a result, it could be argued that structure matters in the global actors' reaction to the climate crisis, and the institutional structures of the global actors could be given as one of the main reasons behind their adaptive change strategies to gradually replace their unsustainable linear system with a more sustainable circular one (see also: Hysing and Olsson, 2018).

These structural analyses on the global actors' adaptive change tendencies towards the CE also provide an implicit answer to the question of the extent to which adaptive changes could achieve a paradigm shift from the linear system to a circular system. Kuhn points out the accumulation of anomalies disturbing the continuity/normality of a paradigm as an important parameter which triggers a paradigm shift (Kuhn, 1962). From this point of view, the climate crisis produces numerous anomalies in the daily life of the linear system, and increasingly forces the global actors to change their linear systems. However, unlike the Kuhnian understanding, the climate crisis has not produced a paradigm shift in a revolutionary way. Contrary to this understanding, as mentioned above, this research has found that the global actors favour an adaptive change (in an evolutionary way) from the linear system to a circular one due to the structural reasons, and a transformative/revolutionary change does not seem feasible (see

also: Termeer et al., 2017). Moreover, this finding suggests that an earlier paradigm (the linear system) and subsequent paradigm (the circular system) do not necessarily have to be contradictory and they may "coexist for long periods" (Mayr, 2004, in: Wray, 2011, p. 23). To illustrate, the CE might be seen as a better version of the linear economic system because it does not refuse the economic growth to protect the environment but offers to make the economic growth more sustainable by protecting the environment (Kaplan, 2022). Thus, the small changes belonging to the CE paradigm could be initiated and accepted within the linear paradigm. This means that the adaptive changes of the global actors might result in a gradual paradigm shift from the linear system to a circular one (see also: Frankish, 2013). However, this study also found that the adaptive changes were chosen by the actors (China, Japan, the EU, and the USA) to strengthen the functionality of their existing system at an initial stage. Despite this fact, a gradual paradigm shift needs progressive adaptive changes rather than adaptations aiming to strengthen the functionality of the existing system as it will only produce unsustainable practices. Therefore, a progressive adaptive change approach should have a systemic vision and prioritize social learning over the functional persistence of the existing system to achieve a gradual paradigm shift (see: Few et al., 2017; Pelling, 2010). In this way, the calibration of contiguous piecemeal changes towards a new system (e.g. the CE) might produce the necessary in-depth and large-scale systemic changes in time (a gradual paradigm shift) (e.g. see: Park et al., 2012; Termeer et al., 2017).

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