Relationship between International Trade and Circular Economy: Literature Review

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Abstract:
In the last few years, the circular economy has received considerable attention worldwide because it offers an opportunity to optimise and promote sustainable production and consumption through new models based on continuous growth and limitless resources. This concept has been adopted in some countries such as Denmark, Netherlands, Scotland, Sweden, Japan, China, and Germany while it is being considered by others including England, Austria, and Finland. Although applications of a circular economy have been identified in many developed countries, a few of studies exist that investigate practices in developing countries. However, the implementation of each country may vary, with specific priorities. This paper aims at analyzing the concept of circular economy (CE) and some international experience of implementing CE.

Keywords: I*nternational trade, circular economy.*

1. Introduction

The fundamental need for an alternative to the traditional linear model of growth has led to the emerging debate about circular economy (CE), described as an economy with closed material loops. The circular economy is a new way of creating value, and ultimately prosperity. It works by extending product lifespan through improved design and servicing, and relocating waste from the end of the supply chain to the beginning—in effect, using resources more efficiently by using them over and over, not only once. It has received considerable attention worldwide because it offers an opportunity to optimise and promote sustainable production and consumption through new models based on continuous growth and limitless resources. Scholars have produced rich studies in regard with the CE from its fundamental concept to its practical implementation.

At the country and regional level, in 2008 China was among the first to adopt a circular economy law promoting the recovery of resources from waste. In that same year, the G8 environment ministers agreed on an action plan for the 3Rs: reduce, reuse and recycle. Following on that, the 2015 G7 Summit Leaders' Declaration underscored the need for "sustainable supply chains" that protect workers and the environment.

Then, in late 2015, the European Union adopted an ambitious Circular Economy Package, including goals for food, water and plastics reuse. "The message is that while you are protecting the environment you can boost your economic development and provide new growth and new jobs," said the then European Commissioner for Environment Janez Potočnik in support of the EU Circular Economy Package in 2014.

Indeed, there is a strong business case to be made for a circular economy. Nike, Google, and H&M are already implementing aspects of the circular economy in their global business. Dutch technology company Philips refurbishes medical quipment such as MRI systems. Chilean pump technology company Neptuno Pumps remanufactures energy-efficient pumps from reused and recycled pump material, and its common practice for automotive manufacturers is to use recycled plastics in components under the hood and for vehicles' internal parts. Mexican brewer Cuauhtémoc Moctezuma Heineken México and American computer company Dell, as well as smaller companies such as Serbian rolling-element bearing manufacturer FKL Temerin are also leaders in adopting circular economy principles. By designing products with resource recovery in mind, they can protect themselves from price changes in the raw-materials market by creating a more reliable source of raw materials, as well as maintain longer-lasting relationships with consumers by ensuring contact throughout a product's life cycle.

2. Literature Review

The selection of published studies was performed according to several integrated criteria: (1) chronological order (from 1990 to 2019), (2) topics of interest (circular economy origins, principles, implementation at different scales (micro, e.g. company or consumer level; intermediate, e.g. eco-industrial parks level; macro, e.g. city, province, region, nation), (3) comparison to present economic growth and alternative patterns (steady state economy), (4) problems and challenges. The literature search was performed in all web of science databases and Science direct, by means of keywords such as "circular economy", "circular economy an cleaner production", "circular economy and eco-industrial park", "circular economy and zero waste", "circular economy and international trade", "circular economy and sustainability". In a like manner, only a small number of published studies designer discuss CE indicators, therefore calling for additional research. Until now, discussions on the CE have paid minimal attention to developing economies other than China. Very few other developing countries are included in existing macroeconomic models of the effects of shifting to a CE. This section shall make a general assessment on several typical and prominent researches.

Firstly, in term of circular economy concept, there are some useful research. ''The circular economy: historical ground'' (José LuÍs Cardoso, 2019) shows historical origins of the concept of the circular economy and affirms the vitality of the concept of the circular economy increasingly involve the business sector. In addition, ''The Circular Economy: A review of definitions, processes and impacts '' (Vasileios Rizos, 2017) reviews the growing literature on the circular economy with the aim of improving our understanding of the concept as well as its various dimensions and expected impacts. On the basis of this review, it attempts to map the processes involved and their application in different sectors. The paper suggests that research on the circular economy is currently fragmented across various disciplines and there are often different perspectives and interpretations of the concept and the related aspects that need to be assessed. This fragmentation is also evident in the available studies that adopt different approaches in calculating the impacts, which makes efforts at comparing the results from different sources very challenging. This paper also suggests that there is limited information on the indirect effects on the economy (e.g. impacts on the value chain and/or changes in consumption spending patterns) as well as the social impacts of the circular economy transition.

Secondly, ''EU circular economy and trade Improving policy coherence for sustainable development'' (Kettunen, M., Gionfra, S. and Monteville, M. 2019) examines the interface between the EU circular economy, trade and sustainable development. It identifies the expected global impacts associated with the EU's shift to circularity and investigates the role of trade in either incentivising or hindering this process. Finally, the paper highlights the links between the circular economy, trade and sustainable development, emphasising the need for better policy coherence among these areas in the EU.

Thirdly, ''A review on circular economy: the expected transition to a balanced interplay of environmental and economic system'' (Patrizia Ghisellini, 2015) evidenced features and progresses of CE patterns in some countries and geographical areas. Because of different development stages and country specific constraints, European Union Japan and USA (post-industrialization stage) and China (midindustrialization stage), the main areas and countries of CE development, evidence unique features in circular economy patterns. In the former, CE policies and actions are mainly identified within waste area as they emerged in response to the increasing problem of waste management.

Forthly, to have more details on Chinese case, ''Efforts for a Circular Economy in China'' (Zunming Zhu 2018) is a research reviewing all policies beyond law that contribute to the development of China 's CE.

The research that must mentioned is ''A Review of Circular Economy Development Models in China, Germany and Japan'' (Olabode Emmanuel Ogunmakinde, 2019). This paper specifically identifies such policies and laws that were used by the pioneer countries. It made several contributions to the literature and policy and served as a guide for countries planning to introduce the concept.

Besides these above mentioned books focusing on CE, there have been some papers specialized in CE in Vietnam, for example, ''Implementing Circular Economy: International Experience and Policy Implications for

Vietnam'' (Nguyen Hoang Nam, Nguyen Trong Hanh, 2019) focusing on internatonal experiences on implementing CE such as Denmark, China, Japan, Canada, EU. The study also discusses some policy implications for Vietnam in term of CE.

''An Assessment of Vietnamese Firms' Readiness to Adopt a Circular Economy''by Thao Hoa Dinh and Hong Long Nguyen (2018) is carried out by the results of the PEST analysis and the survey on the factors proving the potential of applying circular economy in Viet Nam show that Viet Nam is ready for circular economy. Some findings of this research shows that the implementation of existing plans and actions towards developing circular economy is still inefficient and slow.

Other paper can be mentioned is ''Circular Economy in Vietnam '' (Nguyen Duc Quang, Nguyen Hoang Nam, 2019). The study focuses on the situation of waste generation and waste management in Vietnam and find out that Vietnam has not any specific terms on CE, however, the necessary of the circle the natural resources have been emphasized in legistration documents and in may sub-models of recycle and reuse of waste.The authors also suggested that Vietnam should be focused on 3R policy to build a proper infrastructure before applying the circular economy concept and frame for substainable development of the country.

3. Implementation of CE at different scales

3.1. CE at micro level

CE implementation in production sectors: the emergence of ecodesign and cleaner production

The adoption of a circular economy program calls for activities that a company carries out different strategies to improve the circularity of its production system and also cooperates with other companies over the supply chain for the achievement of a more effective circular model.

Within company's production processing, eco-design or green design and design for environment (DFE) as well as cleaner production (CP) are the main strategies, to be considered as preparation towards CE. Design for environment and cleaner production are strictly in relation among each other. Actually, cleaner production includes three related practices as pollution prevention (PP), toxic use reduction (TUR) and design for environment (DFE). Both DFE and eco design "blend environmental aspects into product design and development at product conception to enhance environmental performance throughout its lifecycle". The design stage is relevant in which the relative sustainability of the product mainly depends on the choices made in the early design stage, in order to avoid that the reduction of some impacts could translate into an increase of other types of impacts (e.g. the reduction of toxic substances might increase energy use which could in turn cause a negative impact on environment). Moreover issues regarding "disassembly, disposability without negative environmental impacts, ease of distribution and return, durability, reliability and customer success" should also be included as relevant to CE. Finally, eco-design bring outs more environmentally friendly products and processes while at the same time keeps high quality standards and effective product's performances.

CE in the consumption sector: consumers' responsibility and green public procurement

Functional instruments for green consumers are specific information and labelling systems covering food, non food products as well as services. The labelling systems are sharply developing across all continents in Europe, Asia; Northern and Southern Americas and Australia. Governmental involvement in labelling schemes is an important factor for increasing confidence of consumers towards these instruments. In European Union, the EU Eco-label, from its launch in 1992, has awarded 1300 licenses on non - food products and services and today it can be found on about 17,000 products (OECD 2016). Products identified by an Eco-label should satisfy strict environmental criteria established by a panel of experts, consumer organizations and industry on the basis of the environmental impacts of the product in the whole life cycle. Green consumption in public sector is another important policy tool, stimulating the interest of more environmentally friendly products and services. It can be introduced by setting and including "green" requirements before awarding public contracts. This tool is as much

as important for its contribution if we think that e.g. in EU27 public procurement accounted for about 19.9% of EU Gross Domestic Product in 2009. In China the public procurement expenditure is also relevant. GPP schemes are also implemented in Japan, Taiwan, Korea, Malaysia and USA. A recent survey in EU27 on ten product/service groups showed that the development of green public procurement, GPP, is encouraging even if not yet satisfactory. Different institutional hurdles, some of which country specific and more commonly across countries, prevent further development of GPP worldwide. The latter would require a coherent international framework of agreed and recognized principles and assessment systems of GPP's sustainability including a set of indicators to monitor and evaluate GPP activities by policy makers, purchasers and suppliers.

CE in waste management: recovery of resources and environmental impact prevention

Waste management has been considered in the past simply away to get rid of the waste materials by landfilling or incinerating. This is still the dominant disposal pattern worldwide, in generating a huge loss of valuable resources and very heavy environmental impacts. Recently, a new way to look at waste is being highlighted that recognizes waste management as a recovery of resources and environmental impact prevention. To that end, waste management becomes an important sub- sector of circular economy, with the emergence of new typologies of operators and processes, among which the so-called “scavengers” and “de-composers”, referring to companies capable to extract resources out of waste by applying innovative recovery technologies. It is worth noting that in the natural world “scavengers” and “de-composers” are fundamental organisms in each ecosystem and its food chain. They contribute to keep the community clean by processing dead organic matter and nurture plants with essential substances. Scavengers collect the waste resources on site within companies or in other points of the disposal chain and redistribute them into the system to companies that can reuse or recycle such materials making their work easier. After the collection of waste materials, some of the scavengers perform dismantling, sorting, and transport to the decomposers in a form that is readily accessible for them to process. The decomposers in turn transform or recycle waste resources into new materials or as fractions of the same input flows for which they were initially designed. Scavengers and decomposers can be further classified as specialist or generalist ones, according to their specialization to deal with only one type or more types of materials. The stability of a company relies on the availability of different materials for its activity and more than one scavenger or decomposer company.

3.2. CE at intermediate level

The CE actions within this level only refer to the production side involving the development of eco-industrial parks, industrial symbiosis districts and networks, as well as other related productive networks denominations. In these industrial systems, industries that traditionally work as separate entities, become engaged in complex interplays of resource exchange (material, water, energy and by-products), so called “industrial symbiosis”, with the purpose of achieving economic and environmental benefits. “The essence of industrial symbiosis is taking full advantage of by-product utilization, while reducing residual products or treating them effectively. The term is usually applied to a network of independent companies that exchange by-products and possibly share other common resources”.

The industrial symbiosis has traditionally been a research field within industrial ecology. While industrial ecology focuses at all levels of analysis (facility level, inter-firm level, regional and global level), the industrial symbiosis refers at inter-firm level because it involves physical exchanges among several organizations that do not necessarily take place within the “strict boundaries of a “park”. As the distance among participant industries increases energy demand, this implies that Eco industrial Parks are planned where a suitable mix of production units is able to minimize the waste and emissions of the whole facility.

3.3. CE at macro level

Circular economy development in cities, provinces or regions involves the integration and the redesign of four systems: the industrial system (e.g. changing the size of companies from small to large or the phase-out of the

heavy polluting enterprises in favor of light economic activities as related to high-tech industries, tourism or culture) the infrastructure system delivering services (transportation and communication systems, water-recycling systems, clean energy and electrical power lines, etc.), the cultural framework and the social system.

Eco cities

The concept of eco-town was born in the eighties in USA within Urban Ecology mission and was aimed to redesign cities according to more ecological concepts (Roseland 1997). The well-known Japanese eco-towns Governmental program developed since 1997 involved urban and industrial centers in symbiosis projects thanks to their geographical proximity (Van Berkel et al. 2009). In that way both zero emissions goals (concept that virtually emphasizes the full use of waste flows in the economic system) and economic benefits have been achieved given the challenges of shortage of landfills and the need of revitalizing local industry texture (Van Berkel et al. 2009). From the adoption of the Eco-town program in 1997, a number of 26 eco-towns were created in Japan, by approving their eco-town plans. Eco-towns also received subsidies to invest in innovative recycling projects. Moreover, the projects granted with subsidies generated further and even higher no subsidized projects and provided public (e.g. environmental quality) and private benefits (e.g. profits of enterprises). The success of such programs is due to legal, social, economic and technological factors, such as the evolving legislative framework towards the adoption of a recycling oriented society, the shared responsibility of society over the need for environmental protection, the reduction of enterprise's risks and capital expenditure by means of subsidies, the diversification of enterprise's activities, and the improvement of technological capacity within particular industrial sector (Van Berkel et al. 2009).

Collaborative consumption models

Collaborative consumption models are recognized as one of the best available options on consumer side to shift from the present business as usual model to CE. Collaborative models (e.g. sharing, bartering, lending, trading, renting, gifting) are based on a shared ownership among multiple consumers. For example, when renting the consumer has no ownership of the product but has only the right to use it by paying a charge. As the ownership is at the core of our present consumption model, the loss of ownership is one of the strongest potential barriers that could limit the development of such systems.

Besides renting, other solutions are lending, bartering and gifting. Because of the various approaches of these activities, their goal can range from profit, non- profit or both. Presently, collaborative consumption is adopted in car-sharing, in website-based networks sharing different products (music, textbooks, fashion, and art, among others). Consumer's lifestyle keeps changing, by reducing the environmental impacts associated to consumption activities (e.g. in North America members of car-sharing reduced by 30% their driving time compared to the period they owned a personal car) and promotes social cohesion. Rather than a marketing trend, it is instead a crucial factor towards sustainable development and circular economy, as also recently recognized by the European Economic and Social Committee (EESC, 2014). However, consumers need to be located within a certain community or location (e.g. big cities) or should be part of a larger network for easy access to such schemes.

These consumption models are the basis for an improved performance of circular economy, as theorized by Stahel (2010). In his study the author evidenced the advantages in terms of higher employment and resource efficiency of a business model mainly based on selling services instead of selling products as the present business model. As a consequence Governments, in western economies should accelerate their taxation policies towards taxing more strongly the use of non- renewable resources instead of taxing renewable resources as labor). Obviously, this fact creates an indirect strong barrier to the development of circular economy as CE is perfectly aligned with the development of the bio-economy and the transition towards bio-based rather than fossil based products.

Innovative waste management and zero-waste program

Waste production and management issues increase when a society further develops. The problem is also worsened by globalization. In urban centers, municipal solid waste are mainly disposed of in landfills, recycled or recovered. Due to increasing environmental problems and landfill constraints the prevention of waste is gaining more attention in particular in crowded cities and countries such as Japan with limited landfill land natural resource capacity. Caprile and Ripa (2014) showed by means of LCA that through prevention, recycling or recovering (separate collection) it is possible to reduce substantially the environmental impacts compared to disposal in landfills. Moreover as shown by the case of Kawasaki (Japan), innovative Municipal Solid Waste Management (MSWM) through urban symbiosis seems to fulfil the need for reducing the amount of waste as well as natural resources procurement.

4. Opportunities and challenges to move towards a more CE

4.1. Opportunities

In a circular economy, the value of products and materials is maintained for as long as possible. Waste and resource use are minimized, and when a product reaches the end of its life, it is used again to create further value. This can bring major economic benefits, contributing to innovation, growth and job creation.

Much of the interest in the CE on its potential to deliver simultaneously on four major political priorities: job creation, balance-of-payments support, supply chain resilience, and climate change mitigation and adaptation. Estimates of the scale of opportunity largely address developed-country settings but have significant bearing for developing countries:

- Job creation. Through capturing the value of materials previously lost to the economy and generating jobs to harness and capitalize on this value, the CE is expected to drive job creation and economic growth. Most macroeconomic models find that such a shift will have a positive economic effect, and that many CE activities will offer opportunities for employment at a range of skill levels and across different geographies. A Waste and Resources Action Programme (WRAP) study in 2015 suggested that shifting to a CE could create up to 3 million extra jobs in Europe by 2030 (WRAP, 2015). In developing countries where large numbers of young people are entering the labour market each year, ensuring adequate employment opportunities will be key to fostering economic growth and political stability.

- Balance-of-payments support. As imports increase to meet rising demand for goods from growing populations, developing-country governments will need to identify opportunities to avoid balance-of-payments deficits. A series of studies estimates the potential scale of savings from shifting to a CE to be in the multi-billions and trillions of dollars in developed countries. A McKinsey analysis for the Ellen MacArthur Foundation (EMF) projected savings in materials costs of up to $630 billion per year by 2025 in EU manufacturing sectors (EMF and McKinsey Center for Business and Environment 2015). Similar benefits potentially apply to developing countries. An Arup study, also for EMF, estimated that a transition to the CE at scale in China could save businesses and households RMB 70 trillion ($10.4 trillion). By 2040, equivalent to 16 per cent of China's projected real GDP. Accenture identified a $4.5 trillion opportunity by 2030 (Arup and EMF, 2018). In India alone, EMF estimates that the CE could create opportunities worth $218 billion per year by 2030 (EMF, 2016). Harnessing new opportunities for value creation will be critical to supporting continued industrial growth in developing countries, particularly in those that currently depend heavily on natural resource rents.

- Supply chain resilience. Fears of resources 'running out' have subsided in line with recent resource price falls, but price volatility continues to provide an important incentive – for resource-importing and -exporting countries alike – to pursue less resource-intensive economic pathways. In recent years, moreover, there have been growing concerns over reliance on critical material inputs for advanced technologies – for example, rare earth elements for smartphones or cobalt for electric vehicles. These resources are concentrated in a handful of producer countries, many of which do not have adequate resource governance frameworks to mitigate the

environmental and social risks from mineral extraction. Circular value chains and models of product sharing and reuse are expected to reduce countries' exposure to resource supply risks, but will at the same time bring structural changes to resource-intensive developing economies. As demand for raw materials lessens in line with the transition to a CE, potentially significant structural changes will be required to ensure these countries' continued participation in high-value international supply chains.

- Climate change mitigation and adaptation. A recent report by Material Economics, a Swedish consultancy, suggests that shifting towards a CE could reduce EU emissions from heavy industry by as much as 56% by 2050 relative to a baseline scenario (Material Economics, 2018). According to the International Resource Panel, more resource-efficient practices could be critical to achieving the commitments in the Paris Agreement. This projects that resource efficiency approaches could reduce greenhouse gas emissions by 60% by 2050 (Ekins, P. and Hughes, N., 2017). Savings on individual resources can be even higher: producing aluminum from scrap results in a 90-95% reduction in energy inputs and greenhouse gas emissions (Gardner, J., 2017). CE practices can also contribute to climate adaptation and resilience, including more efficient use of water and energy resources, improved management of land ecosystems to mitigate climate-induced yield losses, and innovative approaches to disaster-ready building and infrastructure construction. With middle- and lower-income countries expected to experience the worst effects of climate change in the short to medium term, exploiting the synergies between the CE and climate mitigation and adaptation will be key to delivering on global commitments under the Paris Agreement while lowering the costs of building climate-resilient infrastructure and industry.

4.2. Challenges

A transition towards a more circular economy would face a number of barriers and challenges. Potential challenges include:

- Finance: a transition to a circular economy would involve considerable transition costs, such as R&D and asset investments, subsidy payments to promote new business models, and public investment in waste management and digital infrastructure. For businesses, in particular small and medium-sized enterprises (SMEs), the cost of 'green' innovation and business models is considered as one of the major barriers to the adoption of more sustainable practices. The lack of appropriate finance tools for mass market development of radical innovations is also seen as an issue.

- Key economic enablers: a series of key economic enablers are lacking, inter alia, pricing systems encouraging efficient resource reuse and reflecting full environmental costs; incentives for producers and recyclers to work together in order to improve performance within and across specific value chains; and markets for secondary raw materials.

- Skills: a circular economy would require technical skills which are currently not present in the workforce. Skills would for instance enable businesses to design products with circularity in mind, and to engage in reuse, refurbishment and recycling. Missing technical skills could be particularly problematic for SMEs.

- Consumer behavior and business models: a circular economy would require systemic shifts in consumer behavior and business models, with implications for everyday behavior, in terms of waste sorting and food waste for instance. Many industries are currently based on a fast turn-around driven by fashion (typified by fast fashion in clothes and electronic devices, among others). Businesses and consumers have little knowledge about the potential benefits of a circular economy and tend to be reluctant to adopt new business models (e.g. leasing rather than owning).

- Multi-level governance: a transition to a circular economy would require action at many levels (e.g. international, national, local, business, and individual) and in many policy areas (e.g. waste management,

professional training, packaging and product design, research and development, and finance). External trade aspects and existing policies such as the internal market would have to be taken into account.

5. Relationship between international trade and circular economy

The transition towards a more resource efficient and circular economy has broad linkages with international trade through the emergence of global value chains as well as trade in second-hand goods, end-of-life products, secondary materials and waste. The details can be shown in Figure 1 bellows:

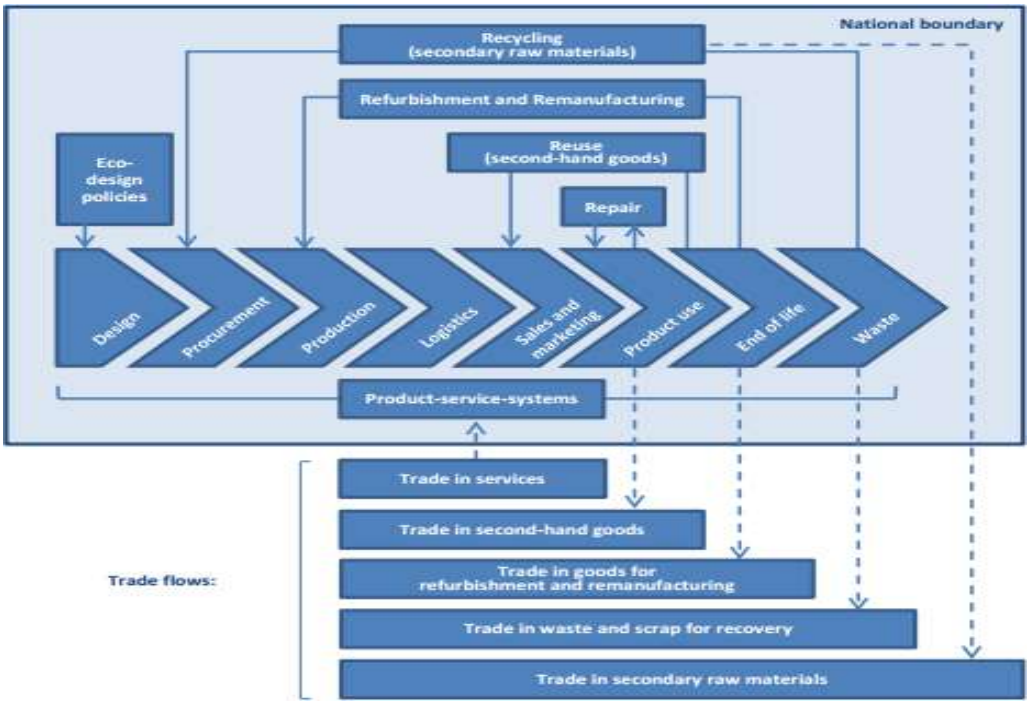

Figure 1. Linkages between international trade and the circular economy

Source: OECD trade and environment working paper, 2018

5.1 Potential impacts of the circular economy transition on trade flows

International trade flows may shift according to the wide-ranging structural changes in production and consumption patterns induced by a transition towards a circular economy. A circular economy transition makes an increase in the circularity of materials and reduces primary resource inputs. Therefore, the transition can undermine the import demand of primary and secondary materials in a given jurisdiction. Similarly, exports of materials and waste may also decrease (Preston and Lehne, 2017).

Typically, the circular economy transition tends to boost service sectors relative to manufacturing sectors. Service-intense sectors such as waste management, recycling, refurbishment and remanufacturing, reuse, and repair are expected to grow as manufactures substitute secondary raw materials for primary raw materials and consumers substitute services for goods (McCarthy et al., 2018a). Many goods can also be replaced by services where the end user buys a service instead of the good itself (Valles, 2016). As an example, some lighting companies are exploring the possibility to provide lighting services instead of selling light bulbs and to retain ownership of its lighting equipment, from installation and maintenance, to end-of-life recovery (McCarthy et al., 2018b).

These product service systems are frequently cited as a part of new business models for the circular economy (McCarthy et al., 2018b) and may provide new opportunities for international trade. For example, circular economy business models may trigger services trade that may not be captured as tangible goods in import-

export statistics, such as software solutions that involve reuse and refurbishment rather than ownership of in-country products. For these reasons, the circular economy transition entails the shift of trade not only of goods, but also of services.

Furthermore, green public procurement that reflects circular economy and resource efficiency objectives may provide additional opportunities for international trade. Indeed, in 2015, 84% of OECD countries incorporated policies aimed at green public procurement (OECD, 2016). In some cases, circular procurement guidelines are made available for public entities as those developed by the European Commission in 2017. While general government procurement accounted for 12% of GDP and around one-third of government expenditures in 2015 (OECD, 2016), circular procurement by subnational and national governments may offer new international trade opportunities to innovative companies

5.2. The importance of import policies toward circular economy

The intention to promote a circular economy at the national level has at times raised concerns of creating unnecessary trade barriers and has led to disputes between trading partners with regards to trade and domestic policies. At the multilateral level, WTO disputes have been recorded in 2013 in two cases raised by the European Union and Japan where it is claimed that the Russian Federation imposed a recycling fee on motor vehicles giving preferable conditions to domestic manufactures over their foreign counterparts. The cases are pending final decisions as of July 2018. At the regional level, several disputes have been raised in the context of investor-state dispute settlement under the North American Free Trade Agreement (NAFTA) in force since 1994. The most relevant case to the circular economy is the "Myers v. Canada" case raised in 1998 where Canadian authorities were challenged by a waste management company based in the United States for imposing export bans on Polychlorinated Biphenyl (PCB) waste.

Similar concerns have been raised in the application of Extended Producer Responsibility (EPR) schemes. Although the extent to which the adoption of these schemes has led to disputes under trade rules is unknown, the earlier OECD guidance document indicates that EPR schemes should be non-discriminatory and avoid the creation of unnecessary trade barriers (OECD, 2004; 2001).

At the same time, it is important to ensure that import policy rules do not hinder the adoption of circular economy and resource efficiency policies as indicated in the OECD (2016) policy guidance on resource efficiency. To facilitate the transition towards a more resource efficient and circular economy, governments commonly consider adopting import policies such as EPR schemes, standards for recycled materials, standards for recyclability and reparability of products, requirements for eco-design, requirements to secure information on chemical and material composition of products, and to phase-out hazardous substances from products. While these domestic initiatives can bring about positive outcomes, they can also face challenges, as products are widely involved in global value chains through international trade and exposed to different regulations and standards based on various levels of environmental stringency across multiple jurisdictions worldwide. For instance, despite upstream efforts along the product lifecycle to phase out hazardous substances from products to increase their potential recycling rates, imported goods from abroad that do not necessarily meet the same standards or requirements may still enter downstream waste recovery processes.

This implies that although import policies are increasingly in place to pursue circular economy objectives, import policies alone may not be enough to facilitate a transition towards a global circular economy. There is a question to whether further efforts are required at the global or regional level, such as revisiting trade disciplines, or considering global or regional recyclability and reparability standards, requirements on ecodesign, requirements to provide information on chemical and material composition of products, mutual recognition of schemes, and possible international co-operation.

Since the transition towards a circular economy requires the application of new and innovative policies, there could be potential additional issues to investigate in the nexus of import policies and the circular economy transition.

5.3. Trade in waste and scrap

There is a long-standing concern that trade flows in waste could be negative for the environment and should largely be avoided. International trade in waste is regulated by multilateral environmental agreements such as the OECD Council Decision and the Basel Convention. These controls are in place to make sure that trade in such materials, especially trade in hazardous waste, do not create negative effects for the environment. At the national and regional level, a proximity principle is commonly applied to ensure that waste is treated as close as possible to the point of generation, as indicated in the Waste Frame work Directive of the European Union (European Commission, 2008).

However, there is growing awareness on the importance of treating waste as a resource and a major trading good. Indeed, waste trade can provide potential opportunities to direct waste to countries with comparative advantage in sorting and processing activities that can help boost global recycling rates (OECD, 2018). Post-consumer materials and waste have intrinsic value for material and energy recovery and therefore there is increasing recognition that non-hazardous waste could be traded for further processing and recovery under proper controls (Associate Parliamentary Sustainable Resource Group, 2013; European Commission, 2015). For instance, in 2014, India accounted for 13% of global secondary steel production despite limited supplies of domestic steel scrap which implies that trade in waste and scrap for material recovery has played an important role (McCarthy et al., 2018a). Further studies emphasize that imposing trade restrictions on waste and scrap can even potentially undermine production efficiency in emerging economies (in particular advanced developing countries) by limiting the supply of feedstock material at low prices (Higashida and Managi, 2014).

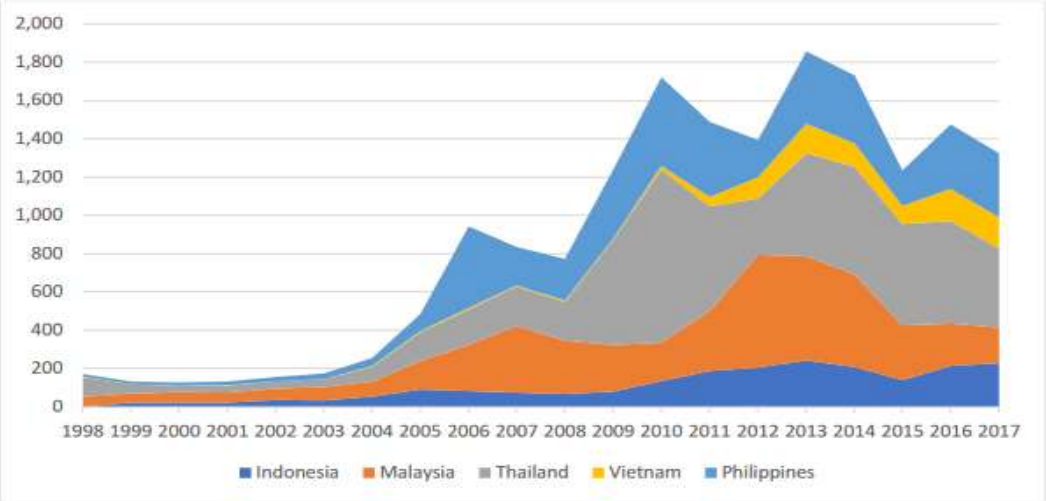

Figure 2. Plastic Waste Import Quantity (in million kilograms)

Source: UN Commodity Trade Database, 2017

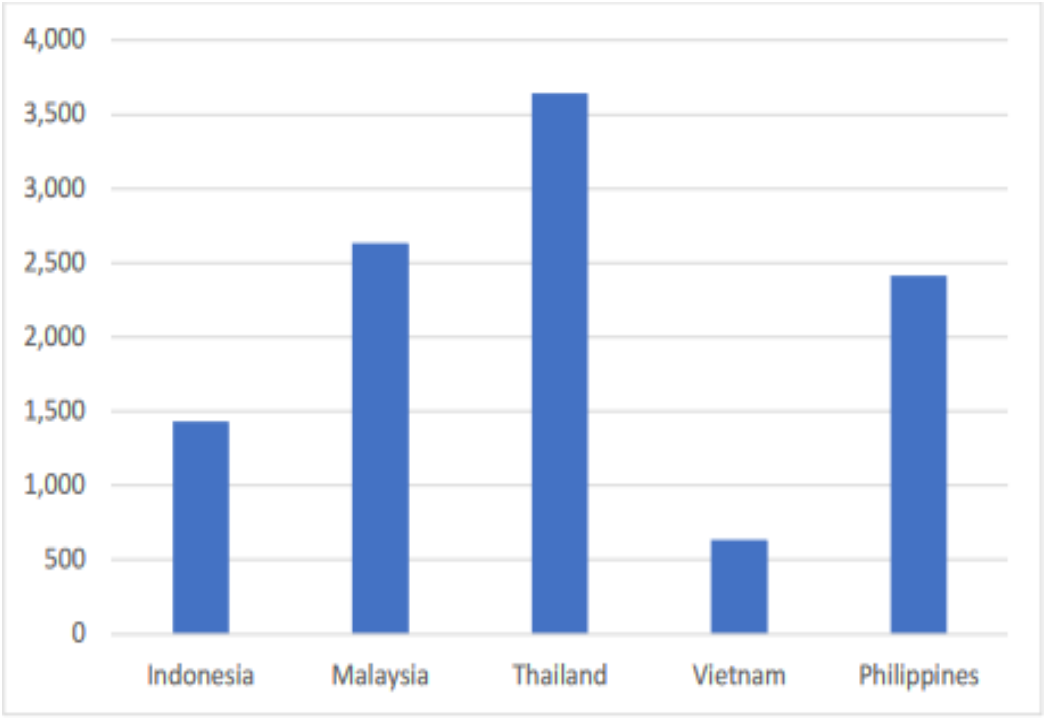

Figure 3.Plastic Waste Import Value (in million US$), cumulative, 1988- 2017

Source: UN Commodity Trade Database, 2017

As recorded in Figure 1.6, world's plastic waste import in 2017 was valued at USD 6.1 billion respectively. In 1993, global plastic waste market began to accelerate with China importing almost half of it in the period between 1988 and 2016.

Southeast Asia experiences similar reality. The quantity of plastic waste imports to Indonesia, Malaysia, Thailand, Vietnam and the Philippines started to expand in 2003 as seen in Figure 1.5. The cumulative value of this upward-trending import stood at USD10.76 billion from 1988 to 2017. Among these five countries, Thailand recorded the highest trade value as seen in Figure 1.6

The UN Commodity Trade database records only the legal transactions. The true value of the global waste market is arguably more than what is shown as the illegal ones remain unaccounted for. Clandestine practices and businesses in the market are well known. In 2012, the European Environmental Agency reported that about 250,000 tons of illegal electronic waste were shipped out of the European Union to West Africa and Asia every year and that the trend of waste smuggling was on the rise (European Environment Agency, 2012),. At this point, it is apparent that the garbage recycling industry, regardless of its 'dirty' outlook, is in fact a very lucrative business. It draws legal and illegal players alike. The simple economic equation, minus the ethical, legal and justice aspects, seems to deliver profitable results.

Overall, it is important to acknowledge that trade in waste and scrap can provide potential opportunities to channel these materials to countries with comparative advantage in sorting and possessing them to advance towards a more global circular economy, while ensuring that these benefits are not at the expense of environmental externalities (Higashida and Managi, 2014). The issue of trade in waste and scrap as a part of the discussion on the transition towards a circular economy is extremely complex and merits further investigation.

5.4 Trade in secondary raw materials

Trade in secondary raw materials constitutes a very important element of the trade and circular economy interface. The substitution of primary raw materials by secondary raw materials would encourage decoupling by decreasing demand for primary materials while sustaining levels of economic growth. Since natural resources are geographically unequally concentrated, trade implications are significant in the worldwide distribution of primary raw materials (WTO, 2010).

However, there is currently no internationally accepted definition of secondary raw materials and tracking such trade flows is therefore difficult. In the OECD (2010) study on non-hazardous recyclable materials, HS codes on metal scrap, scrap paper and plastic scrap are identified and could provide a starting point. This could be complemented by the HS codes of waste compiled by Kellenberg (2012) and the correspondence table made available by the Secretariat of the Basel Convention (2013).

Global trade patterns for Aluminum Scrap are illustrated in Table 1. It shows that trade volumes in Aluminum scrap have been generally growing in the past 10 years and OECD countries largely account for these trade flows.

Table 1. Global Imports of Aluminum Scrap by Country and Year (in metric tons)

Top 20 Importers	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
China	2,090,604	2,154,768	2,626,116	2,854,156	2,685,684	2,592,533	2,504,366	2,305,580	2,086,855	1,917,435	2,171,648
India	237,194	241,180	297,855	456,333	584,740	709,532	724,101	840,540	882,882	919,376	1,045,427
Germany	613,081	543,837	362,582	479,416	534,989	577,092	560,691	656,604	790,138	770,140	791,742
Rep. of Korea	467,491	503,154	443,898	545,692	566,953	641,800	711,174	801,211	745,958	715,173	797,149
Italy	448,689	386,459	273,083	376,486	461,302	445,450	456,370	511,986	520,448	517,954	544,868
USA	462,068	476,462	395,212	480,034	545,913	564,447	538,196	536,994	509,848	513,240	671,946
Austria	166,850	170,815	162,155	268,845	282,707	304,271	280,710	285,563	282,557	308,272	293,369
Belgium	192,072	193,475	203,681	221,425	254,967	247,463	219,054	237,096	248,872	275,997	295,093
France	188,814	193,826	215,537	259,420	291,690	266,280	245,937	231,714	215,905	260,759	273,212
Poland	59,519	66,968	66,793	84,850	106,438	107,598	176,509	205,230	238,950	235,391	224,331
Spain	124,093	109,861	67,321	111,942	125,190	155,371	176,445	200,411	205,856	203,673	204,002
Netherlands	204,117	210,203	88,053	184,066	241,081	265,741	220,965	233,610	202,103	185,978	217,455
Luxembourg	196,584	136,806	98,962	128,607	151,237	162,001	165,014	154,961	150,110	142,363	177,081
Malaysia	45,225	56,249	61,754	64,318	79,515	74,988	70,492	88,132	93,747	136,665	159,677
Czechia	63,606	58,686	50,279	61,714	88,951	105,390	83,294	78,491	83,103	125,211	118,893
Pakistan	80,236	59,118	84,872	88,661	90,483	102,437	76,094	105,850	130,775	125,163	165,557
United Kingdom	158,724	149,900	117,673	126,773	110,275	103,224	113,461	168,300	123,124	123,246	149,127
Canada	166,687	163,312	118,266	117,870	121,575	92,098	90,898	102,034	117,890	117,266	115,319
Mexico	112,489	100,475	69,488	126,783	105,363	102,328	89,255	118,549	151,924	113,830	123,734
Slovenia	52,126	51,194	37,315	51,792	52,844	61,462	69,014	77,942	84,186	91,076	91,595
Rest of the World	955,666	1,020,837	668,410	956,239	995,670	882,814	915,381	965,009	992,748	965,013	1,029,985
Grand Total	7,085,935	7,047,583	6,509,306	8,045,420	8,477,565	8,564,322	8,487,420	8,905,809	8,857,977	8,763,220	9,661,208

Source: UN Comtrade Database, 2017

5.5 Trade in second-hand goods

International trade is not only about new products. A wide variety of used consumer and capital goods are also sold on international markets, from old cars and turbines to spare parts, mobile phones and airplanes. From a global circular economy perspective, promoting the re-use of products through exports of second- hand goods would likely provide economic and environmental benefits to the global economy such as in used cars and second-hand textiles (Coffin et al., 2016; Valles, 2016; Shinkuma and Managi, 2011). In support of this argument, the OECD (2016) policy guidance on resource efficiency makes recommendations for removing trade barriers to secondary goods and used products.

However, such benefits may be accompanied by potential concerns. From a domestic policy perspective of an exporting country, these exports could be considered as "leakage" from the official system such as in extended producer responsibility schemes (OECD, 2014b). Alternatively, second-hand good imports in some economies may hinder the transition towards energy efficient and low carbon economies due to slower market transformation or place additional pressures on the management of end-of-life products. As a consequence, countries importing second- hand goods may impose import restrictions on such products in order to increase oversight and control over these flows (Czaga and Fliess, 2005). Indeed, a number of developing countries mention the imposition of stricter controls or import restrictions on old and inefficient second-hand vehicles to meet their nationally determined contributions under the Paris climate accord (Brandi, 2017).

5.6. Trade in goods for refurbishment and remanufacturing

There are increasing concerns related to international trade in refurbishment and remanufacturing of end-of-life products. A workshop by the European Union identified that industries have been facing issues of recovering their end-of-life products across borders for refurbishment and remanufacturing of such products since they are often legally classified as waste. In addition, cases were reported for remanufactured products that could be re-sold within a given jurisdiction however face transboundary issues when shipping across borders since they do not meet newly introduced standards and requirements at the time of exporting the remanufactured product (European Union, 2017)

5.7. International co-operation on circular economy value chain

A transition towards a global circular economy is gradually gaining political attention. The aim is to promote the circular economy not only in a given jurisdiction but also by exploring synergies in working with other countries to achieve material circularity and ultimately decoupling of resource use from economic growth at the macro level. Such initiatives could also consider joint efforts to avoid environmentally harmful activities such as non-compliant, poorly regulated, and informal recovery operations. These concepts could be encouraged through multilateral frameworks and international trade negotiations (EASAC, 2015; Shinkuma and Managi, 2011; 2010).

REFERENCES

i. *Associate Parliamentary Sustainable Resource Group, Exporting Opportunity? Putting UK waste to work at home and abroad, 2013*
ii. *Brandi, C., Trade elements in countries' contributions under the Paris Agreement, Climate and Energy Issue Paper, March 2017, International Centre for Trade and Sustainable Development (ICTSD), Geneva , 2017*
iii. *Caprile, D., Ripa, M. A life cycle assessment of Landfilled Municipal Solid Waste in Argentina: The influence of waste composition on greenhouse gases emissions and other impacts. Journal of Environmental Accounting and Management , 2014*
iv. *Chertow, M.R. Industrial Symbiosis: Literature and Taxonomy. Annual Review of Energy and the Environment, 2000*
v. *Coffin, D. et al., Examining Barriers to Trade in Used Vehicles, Office of Industries and Office of Economics U.S. International Trade Commission (USITC), 2016*
vi. *Czaga, P and B. Fliess, Used goods trade - a growth opportunity, OECD Observer, 2005*
vii. *EASAC, Circular economy: a commentary from the perspectives of the natural and social sciences, European Academies Science Advisory Council, 2015*
viii. *EESC, European Economic and Social Committee, Collaborative consumption: new opportunities for consumers and businesses on the EU market, 2014*
ix. *Ellen MacArthur Foundation, Circular Economy report, 2015*
x. *European Commission, Waste Framework Directive, European Commission Circular Economy Fact Sheet, 2008*

xi. *European Commission, Trade - Waste Shipment, Circular Economy Fact Sheet, 2015*

xii. *European Commission, Circular Economy - Closing the loop – From Waste to Resources, Circular Economy Fact Sheet, 2015b*

xiii. *European Union, Promoting Remanufacturing, Refurbishment, Repair, and Direct Reuse, As a contribution to the G7 Alliance on Resource Efficiency, Workshop Report, Brussels, Belgium, 2017*

xiv. *Geng, Y., T. Fujita and X.D. Chen. Evaluation of innovative municipal solid waste management through urban symbiosis: a case study of Kawasaki. Journal of Cleaner Production, 2010*

xv. *Geng, Y. and B. Doberstein. Developing the circular economy in China: challenges and opportunities for achieving "leapfrog development". International Journal of Sustainable Development and World Ecology, 2008*

xvi. *Hicks, C. and R. Dietmar. Improving cleaner production through the application of environmental management tool in China. Journal of Cleaner Production, 2007*

xvii. *Higashida, K. and S. Managi, "Determinants of trade in recyclable wastes: evidence from commodity-based trade of waste and scrap", Environment and Development Economics, Vol. 19, 2014*

xviii. *Kettunen, M., Gionfra, S. and Monteville, M. EU circular economy and trade: Improving policy coherence for sustainable development, IEEP Brussels / London, 2019*

xix. *Kirchherr, Julian; Reike, Denise; Hekkert, Marko, Resources, Conservation and Recycling,2017*

xx. *Korhonen, J., C. Nuur, A. Feldmann, and S. E. Birkie. Circular Economy as an Essentially Contested Concept., 2018*

xxi. *McCarthy, A. and P. Börkey, Mapping Support for primary and secondary metal production, OECD Environment Working Papers, No. 135, OECD Publishing, Paris, 2018*

xxii. *McCarthy, A., R. Dellink and R. Bibas, The Macroeconomics of the Circular Economy Transition: A Critical Review of Modelling Approaches, OECD Environment Working Papers, No. 130, OECD Publishing, Paris, 2018*

xxiii. *Nguyen Hoang Nam, Nguyen Trong Hanh, Implementing Circular Economy: International Experience and Policy Implications for Vietnam, 2019*

xxiv. *Nguyen Duc Quang, Nguyen Hoang Nam, Circular Economy in Vietnam, 2019*

xxv. *OECD, Policy Guidance on Resource Efficiency, OECD Publishing, Paris, 2016*

xxvi. *OECD, Export Restrictions in Raw Materials Trade: Facts, Fallacies and Better Practices, OECD Publishing, Paris, 2014*

xxvii. *OECD, Improving Markets for Recycled Plastics: Trends, Prospects and Policy Responses, OECD Publishing, Paris, 2018*

xxviii. *OECD, Reducing barriers to international trade in non-hazardous recyclable materials: exploring the environmental and economic benefits, Part 1: A synthesis report, 2010*

xxix. *OECD, Economic Aspects of Extended Producer Responsibility, OECD Publishing, Paris., 2004*

xxx. *OECD, Extended Producer Responsibility: A Guidance Manual for Governments, OECD Publishing, Paris, 2001*

xxxi. *Olabode Emmanuel Ogunmakinde, A Review of Circular Economy Development Models in China, Germany and Japan, 2019*

xxxii. *Preston, F. and J. Lehne , A Wider Circle? The Circular Economy in Developing Countries, Briefing, Energy, Environment and Resources Department, Chatham House, 2017*

xxxiii. *Roseland, M., Dimensions of the eco-city. Cities 14 (4), 1997*

xxxiv. *Su, B., A. Heshmati, Y. Geng and X. Yu. A review of the circular economy in China: moving from rhetoric to implementation. Journal of Cleaner Production , 2013*

xxxv. *Shinkuma, T. and S. Managi ,Waste and Recycling: Theory and Empirics, Routledge, New York, 2011*

xxxvi. *Shunta YamaguchiShunta, International Trade and the Transition to a More Resource Efficient and Circular Economy: A Concept Paper Yamaguchi, 2018*

xxxvii. *Stahel, WR. Policy for material efficiency – sustainable taxation as a departure from a throwaway society. Phylosophical Transaction of The Royal Society , 2010*

xxxviii. *Thao Hoa Dinh and Hong Long Nguyen. An Assessment of Vietnamese Firms' Readiness to Adopt a Circular Economy.2018*

xxxix. *The World Bank, World Bank technical assistance program "China: promoting a circular economy" policy note, 2009*

xl. *Valles, G. The Circular Economy in International Trade, United Nations Conference on Trade and Development (UNCTAD), Geneva 2016*

xli. *Van Berkel, R., Fujita, T., Hashimoto, S., Geng, Y.,. Industrial and urban symbiosis in Japan: Analysis of the Eco-Town program 1997–2006. Journal of Environmental Management 90, 2009*

xlii. *Velis C.A. Global recycling markets - plastic waste: A story for one player – China. Report prepared by FUELogy and formatted by D-waste on behalf of International Solid Waste Association - Globalisation and Waste Manage- ment Task Force. ISWA, Vienna,2014.*

xliii. *Walker, T.R., Xanthos, D., 2018. A call for Canada to move toward zero plastic waste by reducing and recycling single-use plastics. Resour. Conserv. Recycl. WTO, World Trade Report 2010: Trade in natural resources, WTO Secretariat, World Trade Organization, Geneva, 2010*

xliv. *Yuan, Z.W., B. Jun and Y.C. Moriguichi (2006). The circular ecology: a new development strategy in China. Journal of Industrial Ecology, 2006*

xlv. *Zhu, D. Circular economy: new economy for 21 century. Empirical Reference , 2005*