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Research Article

Potential Impact of China's Circular Economy on Jobs Creation in the Tertiary Industrial Sector

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Abstract

The significant implication of a circular economy in China is the creation of an environmentally friendly industry. This circular economy stage is able to create new jobs, especially for people in urban areas. The tertiary industrial sector is one of the largest contributors to increasing China's economic growth. Moreover, most of these industrial activities are spread across major cities in China. Increasing urbanization and the number of people in the city requires greater job opportunities. The application of a circular economy in the tertiary industrial sector will help create new job opportunities for everyone in each segment. However, the application of a circular economy in the tertiary industry must be in line with the Chinese government's regulations regarding the circular economy. Thus, the purpose of this study is to assess how the Chinese government, through the implementation of a circular economy, is able to create new jobs in the tertiary industry. This is achieved by looking at the potential and challenges faced by the government of China. This research found that the circular economy in China, through the tertiary industrial sector, was able to create complex new jobs by bringing together upstream and downstream industries in one area.

Keywords: Circular Economy; Jobs Creation; China; Tertiary Industry

Introduction

The rapid growth of Gross Domestic Product (GDP) has made China the largest producer and exporter of goods and services in the world. Apart from being the largest supplier of finished goods, China is now playing an important role in the digital economy. Increasing economic growth coupled with a fairly high rate of urbanization puts pressure on the environmental and social impacts arising from industrialization and other economic activities.

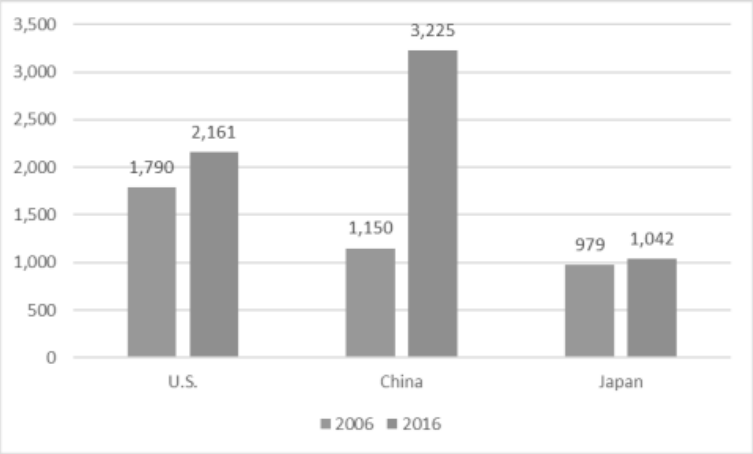

Figure 1. Gross Value Added Manufacturing in China, the United States, and Japan: 2006 and 2016 ($ billions)
Source: Congressional Research Service

High levels of pollution and industrial waste pollution have high consequences for health problems. China is home to 57% of the world's population (projected to increase to 67% by 2030) and is able to produce 82% of its economic activity (Ellen Macarthur Foundation, 2018). Hence, efforts are needed to improve the environment by carrying out environmentally friendly economic activities. Circular Economy (CE) can be responsible for these conditions. In a nutshell, CE is an economic activity that focuses on preserving the environment. Extending the useful life of goods is an emphasized point of CE. A circular economy also has several objectives such as resource efficiency, reducing waste and pollution, and increasing social benefits (Rizos, Vasileios & Tuokko, Katja & Behrens, Arno., 2017).

When associated with the application of a circular economy in China, population growth, urbanization, industrialization and educational background become some of the problems for demographics and the labor market in China (Cao, et. al., 2012, p. 158). This means that China is still facing a number of challenges to provide adequate employment in accordance with the segmentation of its respective population. The circular economy system that the Chinese government has begun to implement is expected to be able to open wider employment opportunities and be able to overcome the various problems mentioned above. It is clear that CE provides a way to ease the tension between economic development and carbon dioxide emission; addresses the urgent pollution and resource scarcity problems; and helps China;s enterprises and industries to improve their competitiveness and remove green barriers in the international trade (Su, Heshmati, Geng, & Yu, 2013, p. 223). Several sectors that are considered capable of providing new job opportunities in China can come from the agricultural sector and the manufacturing industry (Statista, 2021). However, the analysis of job creation from a circular economy system can be focused on three main levels, namely the economic level (economy wide), sectoral and city.

The circular economy model adopted by the Chinese government, which is regulated through the Circular Economy Development Strategy, is believed by Chinese Government to be the key to achieving an environment that is free from pollution and toxic waste. The Chinese Government also believed that the application of a circular economy will assist the Chinese Government in the transition from a linear economy to a more sustainable economic system. The Circular Economy Development Strategy in the 12th Five-Year Plan are outlined as follows. The productivity of key resources must be 15 percent higher than that of the 11th Five-Year Plan. In a circular economy policy, the coal industry must be enhanced in five aspects: green mining, exploitation and comprehensive utilization of coal and related minerals, energy saving, consumption reduction, ecological environmental protection, and industrial chain building. The following targets must be realized by 2015:

power generating capacity is obtained through a comprehensive utilization of coal with low calorific value and a comprehensive level of mining water utilization. China is also targeting the implementation of 10 pilot projects so as to create a circular economy industry that will be implemented in 100 provinces and cities, as well as 1,000 Eco Industrial Parks (Qi, et al. al., 2016, pp. 48-53). This article argues that the 10 pilot projects cover primary, secondary and tertiary industries. The adoption of this circular economy system is felt by Chinese Government to be useful in facilitating close partnerships between the public and private sectors. In addition, the circular economy will create new business opportunities and create new types of jobs for each workforce in the circular economy sector.

Increasing economic growth coupled with very high production and industrialization activities have implications for environmental and social impacts in China. In general, the result of high urbanization and industrialization is projected to cause a traffic jam of 36% in 2030 and water pollution up to the 30% level in 2030 and 39% in 2040 which can affect the health and aquatic environment (Ellen Macarthur Foundation, 2018). Circular economy can be an alternative solution to be used by the Chinese government to help improve the impact on the environmental and social aspects of implementing a linear economic system. The concept of a circular economy has been existing and developing since the 1970s and is considered to be able to help countries in the world move towards a more sustainable development that is environmentally friendly (Grdic, Nizic, Rudan, 2020, p.2). A circular economy has several objectives such as resource efficiency, reducing waste and pollution, and being able to increase social benefits from various economic activities (OECD, 2020). This system also offers many opportunities to take advantage of the sustainable use of natural resources by implementing a recycling management system for the recovery and regeneration of products or finished goods. The approach used in applying the circular economy concept also departs from different problems, for example, environmental problems. Thus, a circular economy is implemented to promote clean technology and green industry, and control the adverse effects of environmental change. This concept also enables increase in new job opportunities, encourage community participation, and create a new, more environmentally-friendly lifestyle (OECD, 2017).

In implementing circular economic policies in China, in addition to improving the industrial structure, creating jobs in the tertiary industrial sector can also be seen as an opportunity or a positive impact from the application of CE. The value added of China's tertiary industry contributed 53.9% of the country's GDP, up 0.6 percentage point year over year (Xinhua, 2020). The service industry contributed 59.4% to the national economic growth in China. GDP From Services in China is expected to be 270950.00 CNY HML by the end of this quarter, according to Trading Economics global macro models and analysts expectations. In the long-term, the China GDP from Tertiary Industries is projected to trend around 619514.00 CNY HML in 2022 and 652968.00 CNY HML in 2023, according to econometric models. The Tertiary sector accounts for around 44% of total output in China and consist of Wholesale and Retail Trades; Transport, Storage, and Post; Financial Intermediation; Real Estate; Hotel and Catering Services and Others (Trading Economics, 2021).

Based on these data, we see that the tertiary industry sector has played a major role in China's economic development. Economic development makes it possible to create the jobs needed by society and reduce unemployment. Economic development also demands an increase in the quality of human resources, so that in this case, it is possible that science and technology will develop rapidly. Thus, it will further improve the welfare of the community. However, can the implementation of CE in China specifically create jobs in the industrial sector? What is the potential impact of CE on new job creations in the tertiary industrial sector?

Literature Review

Circular Economy (CE) is an effort to change the production model from linear to cyclical/circular. The concept was first recognized from Stahel and Reday's writing titled, “Potential for Substituting Manpower for Energy” in

1976. In current years, the concept has surfaced again after China made a legislation regarding circular economy. Meanwhile in Europe, circular economy has also been discussed by many scholars after the Ellen MacArthur Foundation released its research report in 2013. These two factors have made the concept become discussed and researched, both in Europe and Asia (Masi, Day, & Godsell, 2017, p. 5).

The implementation of circular economy is carried out in different ways. These differences are based on various drivers. In Germany, circular economy is motivated by environmental issues due to economic diversification, while in Japan, circular economy is motivated by the crisis of landfills, where the contour of Japan is dominated by rocky hills. In China, circular economy is motivated by environmental issues due to industrialization and infrastructure development .

The various drivers explained above boosted circular economy to be implemented in different forms. At the state level, circular economy is applied to create an Eco-industrial Park, while at the company level, some industries have tried to make durable products, a scheme practiced by Canon printers and copier . The differences between circular economy practices indicates a change in how industries work. Literature shows that circular economy changes the resource management systems - in terms of human resources, circular economy tries to focus on local job creation, but in the context of natural resources, circular economy encourages industries to re-manufacture material waste. These efforts will later provide new jobs and reduce the need for new material goods.

In Stahel's writing, the change in how the industry works lies in the shift from manufacturing industry to knowledge-based industry, such as services and the functional economy. Therefore, a sustainable economy will rely on research and development capabilities. One example is a change in washing machine manufacturing. Previously, washing machine manufacturers only produced machines, but in the era of circular economy they will try to take back the used washing machine to be repaired or reproduced and re-marketed again. This scheme explains that the circular economy provides new jobs related to repairing, reproducing, and re-marketing.

This change is basically a shift in the industrial structure from a centralized model to a decentralized one, where direct services are provided by management to customers. For example, Chinese exporters of investment goods will need to provide repair, re-manufacturing and technological upgrading to extend the life of goods. These services can be performed by companies or in collaboration with third parties. In principle, circular economy seeks to reuse what is not broken, repair minor defects, re-manufacture what is broken, and recycle what cannot be re-manufactured.

In the previous article, Stahel (2005) explained that circular economy is similar to a functional economy, which seeks to combine the three pillars of sustainability, namely the environmental pillar, the social pillar and the economic pillar. The merger of the three will cause a change in the character of the industry, which was originally linear, into a service industry that focuses on reusing waste components. Functional economy that relies on Economic Service will later encourage the creation of cycles where there is no beginning and no end.

Several multinational companies have started implementing the cycle, such as Schindler and Xerox. Both of them have provided all the services needed by customers, including the provision of a 24-hour customer service. This customer service will connect the customer's needs with decentralized maintenance crews (close to the costumers). Nowadays, Xerox no longer focuses on photocopying equipment production, but they have shifted to providing services. Thus, Xerox has succeeded in reducing the volume of production and replacing it with reproduction of goods and extending the life of the goods. The modification of this scheme can also be applied at the industrial level, namely by forming a symbiosis mechanism in transfer waste materials. Economy-based rent systems classify as a tertiary industry.

In the end, Stahel's argument explains that the functional service economy focuses on resource efficiency and extending the life of goods. According to Stahel, the circular economy will create new jobs, especially in the service sector. Circular economy will encourage the industry not to be oriented towards selling products but towards selling services. From this change, the circular economy is estimated to create 500,000 new jobs and will reduce 102,000 unemployed persons. Meanwhile, without a circular economy mechanism, the current production model can only create 200,000 jobs and reduce 54,000 unemployed persons. Among the European countries, the impact of a circular economy on employment is quite mixed. However, practices in European countries show that increasing recycling rates is an important factor in creating additional new jobs. It was estimated that an increase in recycling rates will create 332,000 jobs, plus 160,900 indirect jobs and 80,400 induced jobs. Specifically in the UK, with the improvement of waste management, there will be around 19,000-36,000 new direct jobs, and 25,000-48,000 indirect jobs. Meanwhile, the organic waste processing sector will create 35,000 new jobs if the full potential is utilized.

Overall, there are several strategic sectors in the circular economy that have an impact on the creation of new jobs, such as recycling, waste management, reuse packaging, reuse textile waste (clothing), remanufacturing furniture, repairing and remanufacturing vehicles, bio-refineries, automotive, construction and take-back and resale. However, many types of new jobs will only work if the government provides training. The training that can be provided includes repairing electronic devices, funding, designing to make longer products, and recycling waste. This training is expected to provide new jobs belonging to the tertiary industry.

Methods

This article is aimed at looking at the impact of a circular economy on employment, which is rarely studied. China was chosen as the object of study because it has a large enough population, thus China needs significant new job creations. In addition, China is considered to represent the southern countries and cannot yet be considered advanced. Thus, this study can be relevant in seeing the potential for implementing a circular economy in many countries in Asia, a continent with the largest population in the world. In conducting research, the author traces the implementation of circular economy in previous journals. In addition, the author also predicts circular economy impacts from international institutions coupled with the experiences of countries that have already implemented a circular economy model. These data are then combined with the Chinese workforce pattern available in the China Statistical Yearbook. From these three sources, the data was analyzed.

Implementation of Circular Economy in China

Nowadays, China plays an important role in the global economy, as the key player in the Asian Economy. As the second most populous country in the world after the United States, China's economic growth has developed very rapidly, from owning 2% shares of global GDP in 1980 to 12.5% shares of global GDP in 2009. Since the industrial revolution in China 35 years ago, industrial development has made it a country with a fairly high level of production of goods and services in the world. In 2016, China produced nearly 50% of global major industrial goods. There are two factors that have consistently become important drivers for the rise of the global industry in China, namely, domestic market liberalization and openness to the international economy This openness is deemed important to increase access to new technology and knowledge. In addition, through economic liberalization, China can provide access to new investments through Foreign Direct Investment (FDI).

China is now at a pivotal moment in its economic development. Since the establishment of the Opening and Reform Policy in 1978, China gain an average GDP growth 9% annually until the end of 20th century and transformed itself to emerging market economy. This condition is able to lead China to improve the lives of hundreds of millions of people out of poverty. China GDP quadrupled in period 1978-1996. China Government also claimed that in the same periode the growth has succeeded in bringing more than 200 million people out of

poverty. The relatively high level of urbanization has also contributed to the process of reforming the Chinese economy. The rapid development and increasing GDP in China are also driven by large numbers of people moving from rural areas to cities. In 2016, the rate of urbanization in China reached 57% and cities are projected to provide economic opportunities for people who move to cities so that they can improve their standard of living to become middle-class citizens.

The development of industrialization and urbanization has provided an opportunity for China to achieve its economic growth. After the reform in 1978, China had the largest economic growth, which was 15 percent. However, China's industrial-based development model has raised concerns about environmental threats and resource scarcity. Starting in 1990s China has sought to harmonize economic growth, environmental sustainabilibity, and social issues in order to reduce economic inequality. In this era, China began to formulate policy in saving raw materials. Then, entering 2000-2004, China intensively implemented a cleaner production policy, including the introduction of Eco-Industrial Park (EIP) in 2003. This policy is known as a circular economy. The circular economy concept itself has been applied in advance by countries in the European region as a system to maintain the value of products and the useful life of resources for as long as possible, explore the maximum value usage of goods and be able to regenerate products with innovation and recycling. The development of the circular economy is expected to provide an answer for China to environmental and ecological degradation caused by the rapid rate of urbanization and industrialization.

The concept of circular economy then began to be planned by policymakers in China in the early 1990s, where this concept was inspired by industrial ecology adopted by Japan and Germany. The Chinese government quickly adopted the circular economy concept and incorporated it into the national strategy, which developed into the 11th, 12th, and 13th China Five-Year Plans. Once every five years, the Chinese government promotes a five-year plan as part of a sustainable initiative aimed at sustaining economic growth. The first milestone in the incorporation of the circular economy concept into a policy was marked by the passing of the Circular Economy Promotion Law in 2008 by the National People's Congress. This policy is focused on solutions to environmental damage caused by high levels of urbanization and industrialization. Some of its applications refer to the 3R concept (reuse, reduce and recycle), the city waste management process, further use of communities and reduction of emissions from the production process.

Circular economic policies, economic development agendas and economic reforms are combined into a system that goes hand in hand. Through the 2017 Circular Economy Development Leading Action Plan, the Chinese government has begun to emphasize opportunities in digital solutions related to the application of a circular economy. This opportunity is projected to be able to integrate the circular economy concept with the initial stages of production, which can be used to develop new circular economy businesses. Coordination between various sectors and integration of policies are the main concerns for the Chinese government to implement circular economy practices. Collaboration between policymakers, players in the business sector and civil society will be very useful for realizing a potential circular economy system.

In implementing circular economic policies, through China's Five Year Plans, the level of comprehensive resource utilization is mainly improved in three aspects: (i) the level of resource mining and comprehensive recovery in mineral resource mining, (ii) the utilization rate of three wastes, and (iii) recycling waste material (Li & Lin, 2016, p. 104) The total amount of recycled renewable resources increased from 52.38 million tonnes in 2001 to 148.899 million tonnes in 2010. At the same time, recycling renewable resources brings ecological benefits to China. From 2001 to 2009, recycling of renewable resources was equivalent to 915,708,500 tonnes of accumulated savings on standard coal; 51,222,440 tons of reduced waste water emissions; 13,454,990,000 tonnes of reduced solid waste; 20,646,500 tonnes of sulfur dioxide - reduced emissions; and 2,866,380,300 tonnes of reduced carbon dioxide emissions (Li, and Lin, 2016, p. 104).

The initial practice of implementing a circular economy in China begins by looking at the impact caused by industrialization that is solely directed at pursuing rapid growth. Cities, for China, have a big role in increasing economic growth through industrialization. China has become the world's largest urban nation, with over 600 million urban citizens today. Projections indicate that this level may reach 900 million in 2030. Urban cities in China are also very potential places to develop a circular economy business model. In supporting all of the potentials of an urban city, it is important for the central and regional governments to form an urban plan to develop local businesses, taxation, and the labor market. Such planning is an important component to help incorporate circular economy practices into urban functions and policies.

The adoption of a circular economy in China starts at the micro, meso and macro levels. The circular economy initiative refers to various production activities that are environmentally friendly and capable of overcoming social problems arising from the production and consumption of society. At the micro level, the application of a circular economy in China starts from the scope of small scale businesses that are able to continue the production process to be more environmentally friendly. The methods taken are designing a waste recycling process, developing environmentally friendly production process, and creating efforts to reduce emissions from the production process in manufacturing industry. Environmentally-friendly production strategies include the activity of eliminating toxic products from the remainder of the production process, reducing pollutants that arise from the life cycle of a commodity, and including sustainability issues when designing or delivering finished products (International Institute for Sustainable Development, 2017). Circular economic initiatives applied to industries in China have been implemented in 24 provinces covering various industrial sectors such as pharmaceuticals, metallurgy, chemical transportation, manufacturing and textiles (Geng & Doberstain, 2008, p. 233).

The strategy at the meso level refers towards initiatives between companies that are members of the Eco Industrial Park (EIP) scheme. Eco-friendly Industrial Park is a manufacturing and services business community. Its members mutually strive for improved environmental, economic, and social performance through collaboration in managing environmental and resource issues. This collaborative strategy undertaken by the business community can take the form of waste water flow, shared logistics and delivery & receiving facilities, shared parking, greening of technology blocks, retrofitting of multi-partner green buildings, district energy systems, and upgrading of local education and resource centers. This is an industrial area that is able to connect society and industry to work together to reduce waste and pollution with the aim of achieving sustainable development that is environmentally friendly and economically profitable. This strategy at the meso level can be achieved by managing supply chains that are environmentally friendly through recycling designs for product packaging (Geng & Doberstain, 2008, p. 233).

At the macro level, a circular economy is implemented by developing eco-cities and eco-provinces. The concept aims to manage environmentally friendly settlements. As previously stated, until now, there are 27 cities and provinces that have implemented a circular economy. One of them is Liaoning Province, which is known as the largest heavy industrial province in China (Geng & Doberstein, 2008, p. 237).

Circular economy provides new jobs through manufacturing waste-processing industries. China began providing training and capital assistance to several waste treatment companies. Some companies that are able to create new jobs in waste treatment are Dongtai, which is engaged in hazardous waste treatment., and, Hengji, which is engaged in the treatment of household wastewater. Meanwhile, at the tertiary level, the circular economy provides employment through the provision of environmentally-friendly buildingsor factory design services (Geng, Zhu, Doberstein, & Fujita, 2009, p. 999) On the other hand, circular economy also creates new jobs through an audit mechanism for the implementation of green production. Until 2007 there were 724 national auditors of cleaner production in Liaoning (Geng, Xinbei, Qinghua, & Hengxin, 2010, p. 1505).

Circular economy also plays a role in changing business patterns, which will also create jobs. Through the loop mechanism, China is developing industrial processing of used goods into raw materials for production. This process is initiating in the steel industry. China is currently working hard to recycle steel, so that the used steel that is mostly collected in China can be turned into raw materials. If this process goes well, China's demand for steel imports will decrease. The highest decline in import figures is estimated to come from Australia (-75 million tonnes), followed by India (-27 million tonnes), Russia (-27 million tonnes), and Brazil (-21 million tonnes) (Nechifor, et al., 2020).

Overall, a circular economy has the potential to generate new jobs in three industrial sectors - primary, secondary and tertiary. Each of them has different characteristics in creating employment opportunities. Primary and secondary industries will provide new jobs in waste processing ranging from agricultural waste, livestock, to manufacturing waste, whereas in the tertiary industry, the application of a circular economy will provide employment in eco-friendly business research and development services (R&D). In addition, in the tertiary sector, the circular economy enables sharing of industry ownership, such as Airbnb. Outside the industrial sector, the circular economy can also create jobs because its implementation also requires an audit.

In fact, China's circular economy has created new jobs, specifically in the recycling industry. In 2013, the circular economy implementation reached 137.6% since it was first implemented. The implementation has encouraged the growth of the recycling industry, which generated profit amounting to CNY 1.5 trilion and generated 20 million new jobs. Moreover, China's circular economy also has the potential to create new jobs in terms of bringing together upstream and downstream industries in one area (regional jobs creation) (Geissdoerfer, Savaget, Bocken, & Hultink, 2017, p. 759). This can be done because China is targeting the implementation of 10 pilot projects to create a circular economy industry that will be implemented in 100 provinces and cities, as well as 1,000 Eco Industrial Parks (Qi, et al. al., 2016, pp. 48-53).

The 10 pilot projects cover primary, secondary and tertiary industries. However, this paper will focus in the tertiary industry. In tertiary industries, circular economy pilot projects are being developed in many ways, for instance, recycling and bio-safe disposal of kitchen waste, processing kitchen waste and canteens so the materials do not endanger health, making the accommodation and tourism industries environmentally friendly, and resource-recycling technologies such as strengthening research for energy savings (Qi, et al., 2016, pp. 50-51). Overall, there are three pilot projects that are classified at the tertiary industry, so the next new jobs will be concentrated in that sector.

Labor Concentration in China's Tertiary Industries

After the circular economy implementation, China experienced a growth in the service sector, specifically in the recycling industry. Since 2010, there have been many recycling industries that collect Waste Electrical and Electronic Equipment (WEEE). In those years, China recycled 3.3 million tons of WEEE, while in 2012, China became the largest WEEE recipient country in the world. China receives and recycles WEEE from developed countries (Wei & Liu, 2012).

In recent years, the recycling industry in China has grown massively. In several cities, there are many companies that work in collecting waste material. One of them is Lanzhou city, which has 250 waste material collection stations managed by the Lanzhou Renewable Resources Recycling Company. The company collects materials including paper, glass bottles, plastic bottles, metal, and pop cans. They are able to recycle 80% of the existing renewable items in Lanzhou and generate more than 1,000 workers (Chengcheng, 2018)

The rapid growth of the recycling industry in China has influence in changing the concentration of labor from primary industries to tertiary industries. Previous literature explained that the circular economy will bring new trends in the fields of recycle, reuse, remanufacture, and also rental systems that are classified into the tertiary

sector. The following table shows data related to changes in the concentration of labor in China since 2005, before the circular economy law was passed, until 2019, after more than 10 years the law was passed.

Table 1. Number of Workers in China by Sector of Industry
Source: China Statistical Yearbook 2020

Years	Employed Person (10.000)	Primary Industry (10.000)	Secondary Industry (10.000)	Tertiary Industry (10.000)
2005	74647	33442 (44.8 %)	17766 (23.8%)	23439 (31.4%)
2010	76106	27931 (36.7%)	21842 (28.7%)	26332 (34.6%)
2015	77451	21919 (28.3%)	22639 (29.3%)	32839 (42.4%)
2019	77471	19445 (25.1%)	21305 (27.5%)	36721 (47.4%)

The table above informs that workers in China were concentrated in the primary sector before the circular economy law was enacted in 2005. There were at least 334 million workers (44.8%) in the primary sector, 177 million workers (23.8%) in the secondary sector, and 234 million workers (31.4%) in the tertiary sector. However, entering 2010, after the circular economy law was enacted, the number of workers in primary industries only had a 2% difference with tertiary industries. Furthermore, starting from 2015, workers in China began to be concentrated in tertiary industries and in 2019, almost half of Chinese workers were concentrated in tertiary industries (47.4%), followed by secondary industries (27.5%), and primary industries actually had the lowest proportion (25.1%).

The Impact of China's Circular Economy on Jobs Creation in Tertiary Industry

It seems that caution is needed to analyze how circular economy can have an impact on the creation of new jobs in the tertiary industrial sector. This is based on the assumption that circular economy is a new economic system that aims for resource efficiency across the economic model. Although this efficiency is good for all aspects, it seems necessary to look at the consequences or challenges in the social domain, in this context, the creation of new jobs. It is important to study the implications for the availability of new jobs in the tertiary industrial sector that arise during the transition from a linear to a circular economy. Economic activities in the tertiary sector include retail and wholesale trade, logistics, restaurants, administrative services, media, tourism, insurance, banking, health care, and also law. In most developed countries, most of the workforce work in tertiary industries, and China is a country that should be considered.

First, from an economic point of view, the application of the circular economy concept basically emphasizes the repeated use of resources, which aims to reduce waste and emissions in each production process. Apart from focusing on the environmental benefits of a circular economic system, this system is also able to increase opportunities for local people in China to find new jobs. For Example in Europe, the circular economy is predisted to provide 187,000 jobs in 2030. Thus, the implementation of circular economy in China also has the same potential. This is in accordance with the loop mechanism applied by several tertiary industrial sectors such as restaurants, wholesale trade, and logistics in China. So, the production and consumption model will involve more processes of recycling, product repair, reuse, and manufacture of product recycling. This will increase opportunities for large-scale industries to create new jobs at the local level. But above all, it is important for the Chinese government to be able to reassure the making of policies that regulate and ensure the transition from workers in the linear economic sector to a circular economy system. The change in policy from a linear economy towards a circular economy will greatly affect how this new pattern of employment is created. First, from changes in production modes, second, from market demand patterns, third, from aggregate income and macroeconomic conditions and fourth, from international trade and competitiveness (OECD, 2020). The patterns created in the circular economy concept are capable of realizing job creation, job substitution, and job redefinition.

The second impact is related to the sectoral context. Through an audit of the implementation of green production that has been carried out in 724 national audits in the Liaoning region, it seems that China is able to see opportunities in creating new jobs that are environmentally friendly based on each sector. This means that there is a priority for economic activity to shift to a more efficient direction. Unfortunately, this is not necessarily a good impact. The application of this efficiency is also able to break the primary production model because through circular economy, production will focus more on secondary production. However, the implementation of circular economy is able to increase activities in other sectors, such as reusing commodities and remanufacturing. In the case of remanufacturing, China was created list of remanufacturing companies in 2016, which 56 are pilot companies. The largest remanufacturing companies is Weichai Remanufacturing Group (WRG), who has produced around 100 thousand remanufactured machines in 2020. This figure has increased significantly comparing to 2010 which WRG was only able to produce 3,000s remanufactured machines in a year. This tren tend to increase every year because China subsidizes about $300 for each remanufactured machine through tax reducation. Indeed, some circular economy processes can be minimized and automated, but parts of production will be smaller and more heterogeneous than in the primary production sector (Stahel, 1986; van Beukering and Bouman, 2001; Stahel and Clift, 2016). Third, in the urban sector. China is a country that has started to implement its circular economy in urban areas. The tertiary industrial sector in China is generally located in urban cities. Many Chinese citizens migrate from rural areas to cities to start new jobs in some of the tertiary industrial sectors in urban areas. Recent developments also demonstrate China's seriousness in supporting the adoption of a circular economy, including strong investment in the switch towards new and renewable energy, the rapid development of digital technology and a boom in asset sharing platforms (Ellen Macarthur Foundation, 2018) that are centralized from the industrial sector in urban areas. On this basis, economic activities that develop in urban areas have the potential to create new jobs.

Out of the 10 pilot projects made by China, 6 were dominated by secondary industries. It seems that this is a breath of fresh air for China because it is in the secondary industry that reuse of construction waste, waste management, and re-manufacturing is conducted. From all these components there are at least some new types of jobs that can be created from the application of a circular economy in urban areas in China. The first is the product life cycle manager. The duties and functions of this role are very much needed to ensure that the circle of the circular economy process runs well. In the circular economy concept, finished goods are believed to have a longer expiration period than before. So here, the product life cycle manager is in charge of ensuring how to create new products from previous products, how to make them find gaps for these items to be marketed and distributed. The second is the product designer. The application of circular economy in China basically aims to reduce the residual waste of production so that it can contribute to saving the environment. The application of circular economy is also able to change the lifestyle of people in urban areas to an eco-green lifestyle. For every item that is produced, it is necessary to design environmentally friendly packaging, for example by reducing the use of single-use plastics. This is the simplest way to make the useful life of an item last longer. To support this process, it is important for the government, business actors, and organizations to ensure that there are policies that specifically regulate environmentally-friendly commodity packaging design. Moreover, China is one of the largest exporters of products in the world. This issue then becomes the main task of product designers to design the packaging of a product to make it more environmentally-friendly and bio-degradable. The latter is a circular economy investment specialist. It is acknowledged that the process of implementing circular economy is high-cost in order to be able to present innovative new solutions. So, a country or even the manufacturing industry requires specialists in the investment sector, to ensure investors' interest to invest in producers who apply the circular economy concept. These specialists need to plan promotional strategies for potential investors and ensure that this circular economy concept fits with company values. In the end, we can see together that a circular economy is capable of creating new jobs as long as it gets support from the government through the implementation of its policies and from players in the industrial and other business sectors. The concept of

sustainability that exists in a circular economy is also able to leave many opportunities for people to start new jobs, especially if applied in China, which has a very large population in the productive age.

Conclusion

The circular economy has a broad impact on the economy, from the process of taking raw materials, cleaner production processes, to changing patterns of labor absorption. However, the impact of the circular economy in the workforce has not been given much attention by researchers. Typically, research tends to look at recycling, as well as how clean production is done. In fact, the impact of a circular economy on labor can be related to many things, starting from the quality of the work environment, working wages in a circular economy, to the labor market. As previously explained, this paper seeks to see the impact of a circular economy on the labor market in China. Circular economy has the potential to change the labor market according to priority sectors. China has various forms of circular economy. China has also implemented a circular economy in several regions. However, the circular economy in China is more focused on being developed for urban areas. Of these two characteristics, the application of a circular economy in China has the potential to change the labor market. If originally the labor market was centered on tertiary industries, in the future, after the implementation of a circular economy, China's labor will be centered on secondary industries. Perhaps further research on the impact of the circular economy in the workforce can be carried out in the discussion of changes in worker skills from a linear industry to a circular industry, and how the government and private sector work together in preparing for these skill changes. In addition, research can also be carried out to trace changes in work patterns from a linear industry to a circular industry, whether the circular economy provides a safe work environment and provides a decent wage for workers.

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References

Brandt, L., Ma, D., & Rawski, T. (2016, July). Industrialization in China. IZA Discussion Paper No. 10096.

Cambridge Econometrics. (2018). Impacts of Circular Economy Policies on the Labour Market - Annexes to the Main Final Report. DG Environment - European Commission.

Cao, J., Chen, X., Zhang, X., Gao, Y., Zhang, X., & Kumar, S. (2020). Overview of Remanufacturing Industry in China: Government Policies, Enterprise and Public Awareness. Journal of Cleaner Production, 242, 1-17.

Chengcheng. (2018, December 1). Xinhua Net. Retrieved April 25, 2021, from China Focus: From trash to treasure: China's recycling industry booms: http://www.xinhuanet.com/english/2018-12/01/c_137644567.htm

Trading Economics. (2021) 'China Tertiary Industry,'
<https://tradingeconomics.com/china/gdp-from-services>, accesses on 10 April 2021.

CRS Report. (2019). China's Economic Rise: History, Trends, Challenges, and Implications for the United States. Congressional Research Service, p. 2-42.

Cui, T., & Zhang, J. (2018). Bibliometric and Review of the Research on Circular Economy through the Evolution of Chinese Public Policy. Scientometrics, 1013–1037.

Dahlman, C. J. (2012). The Rise of China, Implications for Global Stability and Sustainability. In X. Fu, China's Role in Global Economic Recovery (pp. 107-126). Oxford: Routledge.

Ellen MacArthur Foundation. (2018). The Circular Economy Opportunity for Urban & Industrial Innovation in China. Cowes: Ellen MacArthur Foundation.

Fan, Y., & Fang, C. (2020). Circular economy development in China-current situation, evaluation and policy implications. Environmental Impact Assessment Review, 84, 1-10.

Geisendorf, S., & Pietrulla, F. (2017). The circular economy and circular economic concepts - a literature analysis and redefinition. Thunderbird International Business Review, 1-12.

Geissdoerfer, M., Savaget, P., Bocken, N. M., & Hultink, E. J. (2017). The Circular Economy - A new sustainability paradigm? Journal of Cleaner Production, 143, 757-768.

Geng, Y., & Doberstein, B. (2008). Developing the Circular Economy in China: Challenges and Opportunities for Achieving 'Leapfrog Development'. International Journal of Sustainable Development & World Ecology, 15, 231–239.

Geng, Y., Xinbei, W., Qinghua, Z., & Hengxin, Z. (2010). Regional initiatives on promoting cleaner production in China: a case of Liaoning. Journal of Cleaner Production, 18, 1502-1508.

Geng, Y., Zhu, Q., Doberstein, B., & Fujita, T. (2009). Implementing China's CIrcular Economy Concept at the Regional Level: A Review of Progress in Dalian, China. Waste Management, 29, 996–1002.

International Institute for Sustainable Development. (2018). Estimating Employment Effects of the Circular Economy. Manitoba: IISD.

Kamal-Chaoui, L., Leman, E., & Rufei, Z. (2009). Urban Trends and Policy in China. Paris: OECD.

Kumar, V., Sezersan, I., Garza-Reyes, J. A., Gonzalez, E. D., & Shbou, M. A. (2019). Circular economy in the manufacturing sector: benefits, opportunities and. Management Decision, 57(4), 1067-1086.

Li, W. and W. Lin (2016), 'Circular Economy Policies in China', in Anbumozhi, V. and J. Kim (eds.), Towards a Circular Economy: Corporate Management and Policy Pathways. ERIA Research Project Report 2014-44, Jakarta: ERIA, pp.95-111.

Masi, D., Day, S., & Godsell, J. (2017, July 31). Supply Chain Configurations in the Circular Economy: A Systematic Literature Review. Sustainability, 9, 1-22.

McDowall, W., Geng, Y., Huang, B., Bartekova, E., Bleischwitz, R., Turkeli, S., . . . Domenech, T. (2017). Circular Economy Policies in China and Europe. Journal of Industrial Ecology, 21(3), 651-661.

National Bureau of Statistics of China. (2020). China Statistical Yearbook 2020. Beijing: China Statistical Press.

Naustdalslid, J. (2014). Circular economy in China – the environmental dimension of the harmonious society. International Journal of Sustainable Development & World Ecology, 303-313.

Nechifor, V., Calzadilla, A., Bleischwitz, R., Winning, M., Tian, X., & Usubiaga, A. (2020). Steel in a circular economy: Global implications of a green shift in China. World Development, 127, 1-12.

OECD, "Environment at a Glance: Circular economy, waste and materials", Environment at a Glance: Indicators, http://www.oecd.org/environment-at-a-glance.

OECD. (2017). Employment Implications of Green Growth: Linking Jobs, Growth, and Green Policies, p. 1-24.

OECD iLibrary. (2020). The Circular Economy in Cities and Regions: Synthesis Report [electronic version]. OECD.

Ogunmakinde, O. E. (2019). A Review of Circular Economy Development Models in China, Germany and Japan. Recycling, 4, 1-14.

Peng, S., Yang, Y., Li, T., Smith, T. M., Tan, G. Z., & Zhang, H.-C. (2019). Environmental Benefits of Engine Remanufacture in China's Circular Economy Development. Environmental Science Technology, 53, 11294–11301.

Pesce, M., Tamai, I., Guo, D., Critto, A., Brombal, D., Wang, X., . . . Marcomini, A. (2020). Circular Economy in China: Translating Principles into Practice. Sustainability, 12(3), 1-31.

Qian, Y. (2002, June). How Reform Worked in China. Berkeley: William Davidson Working Paper Number 473.

Qi, J., Zhao, J., Li, W., Peng, X., Wu, B., & Wang, H. (2016). Development of Circular Economy in China. Singapore: Springer.

Rizos, Vasileios & Tuokko, Katja & Behrens, Arno. (2017). The Circular Economy: A review of definitions, processes and impacts.

Stahel, W. R. (1986). Hidden Innovation: R&D in Sustainable Society. Science and Public Policy, 13(4), 196-203.

Stahel, W. R. (2005). The Functional Economy: Cultural and Organizational Change. International Journal of Performability Engineering, 1(2), 121-130.

Stahel, W. R. (2007). Sustainable Development and Strategic Thinking. Chinese Journal of Population Resources and Environment, 5(4), 3-19.

Stahel, W & Clift, R. (2016). Stocks and Flows in the Performance Economy.
Statista (2021). Distribution of the Workforce Sector in China from 2009 -2019 [electronic version]. Statista.
Su, B., Heshmati, A., Geng, Y., & Yu, X. (2013). A Review of the Circular Economy in China: Moving from Rhetoric to Implementation. Journal of Cleaner Production, 42, 215-227.
Grdic, Z., Nizic, M., Rudan, E. (2020). Circular Economy Concept in the Context of Economic Development in EU Countries, MDPI.
Van Beukering, P. J. H. & Bouman M. N. (2001). Empirical Evidence on Recycling and Trade of Paper and Lead in Developed and Developing Countries. World Development, 29(10), 1717-1737.
Wei, L., & Liu, Y. (2012). Present status of e-waste disposal and recycling in China. Procedia Environmental Sciences, 16, 506-514.
Wen, Y. (2016, April St. Louis). China's Rapid Rise. The Regional Economist, pp. 8-14.
Xinhua. (2020). China's tertiary industry accounts for 53,9% of the total GDP [electronic version]. China Daily.
Yao, S. (1999). Economic Growth, Income Inequality and Poverty in China under Economic Reforms. Journal of Development Studies, 35(6), 104-130.
Zheng, J., Hu, A., & Bigsten, A. (2012). China's Growth Potential. In X. Fu, China's Role in Global Economic Recovery (pp. 203-232). New York: Routledge.
Zhu, J., Fan, C., Shi, H., & Shi, L. (2018). Efforts for a Circular Economy in China, a Comprehensive Review Policy. Journal of Industrial Ecology, 110-118.

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