The pattern of economies’ green growth: The role of path dependency in Green Economy expansion

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ABSTRACT

Existing research argues that countries increase their production baskets based on the available capabilities, adding products which require similar capabilities to those already produced, a process referred to as path dependency. Expansions to include goods that use divergent capabilities from those currently in the economy requires a structural change in available capabilities. Structural changes in existing capabilities contributes to countries’ economic growth and development. Economic development increases environmental risks from higher consumption of energy and natural resources. Managing that risk is critical and a transition to a green economy can help. The main objective of this research is to determine if structural changes or path dependency drives the expansion in production of green economy products. We consider a dataset with 138 countries over the period of 2008 to 2017, with a focus on specific case study examples, including all countries in the world and China. The results of this research show countries increased
their green production baskets based on their available capabilities following path dependency as well as by expanding to products that path dependency does not predict. This suggests that, while path dependency may explain some expansion in green economies, additional theories are needed to fully explain observed green economic expansion.

**Keywords**: product space, path-dependence, non-path dependence, green economy

**1. Introduction**

Countries are faced with the paired challenges of both growing their economics and mitigating environmental risks (Knight and Schor, 2014). In most public debate, these two goals are posed as being in competition with each other. A growing call for green economic development and a green economy, including recent efforts around the Green New Deal, proposed in the United States Congress, show how countries can pursue both goals simultaneously and in a mutually supportive manner (Andersen, 2018; He et al., 2019; Fraccascia et al., 2018; Han, 2018). Expansion of countries’ green production basket enables them to grow and develop their economy while meeting their environmental needs (McAfee, 2016; D’Amato et al., 2017; Weber and Cabras, 2017). According to the path dependency hypothesis (Hidalgo et al., 2007), an economy that is not prepared to make this expansion will require a more difficult transition to expand capacity. Examining growth patterns in those countries and that are building and expanding a green economic sector will show whether expansion into and within the green economy adheres to the path dependency hypothesis.

Path dependency is driven by product similarities. Hausmann and Klinger (2007) and Hidalgo et al. (2007) established the concept of a Product Space (PS) that provides a measure of similarity between any two products in an economy. This measure is based on the idea that if two products share similar production inputs such as resources, technology, or infrastructure, then they
have greater similarity to products that do not share any of these inputs. Hidalgo et al (2007) showed that it is also more likely that an economy will produce both products and that expansion is more likely to add products similar to what the economy already produces, establishing the path dependency hypothesis. Mealy and Teytelboym (2018) proposed the concept of a Green Product Space (GPS) by constructing a comprehensive list of green products and linking all green products as a network by defining a measure of green products’ similarities based on Hausmann and Klinger (2007) and Hidalgo et al. (2007)’s definitions. The green product space allows the application of concepts that Hidalgo et al examined in the full product space to a country’s green economy.

Diversifying production according to path dependency tends to generate faster economic growth (Hausmann and Klinger, 2007; Hidalgo et al., 2007; Mealy and Teytelboym, 2018; Coniglio et al., 2018). Path-defying diversification is rare, especially for poorer countries (Hidalgo et al., 2007; Coniglio et al., 2018). It is harder and riskier for the economy to jump in their PS and GPS networks but the required structural change can be expected to generate greater economic development over a longer time horizon than the faster GDP growth that path dependent diversification. (Coniglio et al., 2018) have demonstrated that product diversification across all goods tends to follow path dependency. However, this has not been examined for the expansion of green production and the diversification of the economies basked of green products.

This research asks if empirically observed patterns of green product diversification follow the path dependency hypothesis as suggested by applying Hidalgo et al (2007) work in the PS framework to the GPS framework (Coniglio et al.2018; Mealy and Teytelboym, 2018). This analysis allows us to answer the following question:

1. Do countries diversification to produce green products followed path-dependent, non-path dependent process?
The answers to the above questions will help us understand how quickly economies can diversify into the green product space, and so limit the future costs and risks both to the environment and to future green product diversification (Bassi, 2016; Loiseau et al., 2016).

2. Literature

Economic growth is not a sufficient indicator of the level of economic development in a country (Moyo, 2009; Acemoglu et al. 2002). Economic growth is simply the value of annual increase in countries’ production baskets along with the growth rate of Gross Domestic Product (GDP) (Zhang and Zeng, 2008). Economic development does not only happen through changing on existing production materials, but rather through several changes in a countries’ production structure (Schumpeter, 1961). Structural changes in countries’ production materials enable them to enhance their production baskets and will lead them to achieve the desired economic development (Yang, 1990). This development causes countries to face with several problems such as environmental risks (Gu et al., 2018; Lederer et al., 2018; Knight and Schor, 2014) and high consumption of energy and natural resources (OECD, 2013).

According to Knight and Schor (2014), climate change is the most serious environmental risk that the world is facing today. Studies show the strong positive relation between the countries’ economic development and carbon dioxide emissions (Knights and Schor, 2014; Jorgenson and Clark; 2012; York et al., 2003; Dietz and Rosa; 1997), therefore, it is important to control the global climate change in a way that it stands “…below the critical threshold of 2 C” (Lorek and Spangenberg, 2014, p. 2). The green growth and transition to green economy enables the countries to reduce their environmental risks, and address some of their economic, social and environmental challenges (Hoffmann, 2011).
2.1 Path Dependency in Product Diversification

The concept of path dependency in product diversification was proposed by Hidalgo et al. (2007). They argued that a country’s economy grows by producing more products and it is easy for the country to produce the products that apply similar capabilities, such as capital, technology, infrastructure, and labor, with the country’s existing export basket. According to Coniglio et al. (2018) “current production capabilities are the key link between what a country produces today and what it will produce tomorrow, in other words the essence of the mechanism of path-dependence…” (p. 10). Hausmann and Klinger (2010) and Hidalgo (2012) analyzed the export baskets of Ecuador and some African countries - Kenya, Mozambique, Rwanda, Tanzania and Zambia – and showed that they inhabit a peripheral position in the product space. Coniglio et al (2018) added that this peripheral position was persistent over time. Coniglio et al. (2018) discussed that, Minondo (2011) studied export baskets of 91 countries to show how they are diversified in their production baskets by calculating the degree of centrality in the PS. The results of their research showed that degree of centrality in the PS “…is a strong predictor of diversification level” (p. 10). Coniglio et al. (2018) mentioned another study that investigates the path-dependency in countries’ products diversification and is proposed by Boschma and Capone (2016) where they “…analyzed the process of trade diversification for EU-27 and European Neighbourhood Policy (ENP) countries between 1995 and 2010. The authors find evidence of path-dependence as countries develop their revealed comparative advantage in products related to those in which they were already specialized” (p. 10).

Mealy and Teytelboym (2018) in their recent study showed that countries’ green growth and green development also follow path-dependence process. The authors showed that the countries can expand their green production baskets based on their existing green production
capabilities and used this finding as a fundamental point on how countries can re-orient their current industrial capabilities in order to have a better green growth. Their work remains one of only a small few works that examine the dynamics described above to the green product space.

2.2 Green Economy and Green Growth

According to Knight and Schor (2014) and the United Nations Environment Programme (UNEP) green economy can be defined as “one that results in improved human well-being and social equality, while significantly reducing environmental risks and ecological scarcities” (p. 3723). On the other hand, green growth is defined as “growth achieved by saving and using energy and resources efficiently to reduce climate change and damage to the environment, securing new growth engines through research and development of green technology, creating new job opportunities, and achieving harmony between the economy and environment” (Kasztelan, 2017, p. 489). Green Growth and Green Economy are both suggested as solutions to financial and economic crises (Kasztelan, 2017; Lane, 2010). They both encourage improving global economy by investing in the environmentally friendly products, markets, and services and in the development of natural infrastructure (Kasztelan, 2017; Lane, 2010). Although green economy and green growth have different origins, they are often used interchangeably (Kasztelan, 2017).

Moving towards a more comprehensive approach to incorporate the environment in the economy is the main reason behind the development of the concepts of green economy and green growth. Mainly through technological innovations, green economy and green growth try to identify feasible approaches to improve the results of economic activity, while considering the climatic problems and deficiency in natural resources (Kasztelan, 2017). The goal of green economy is two-fold. It aims at transforming economy in such a way that it reduces environmental and ecological deficiencies, while at the same time improving justice and social welfare. Such
change will be achieved by investment, creating new “green” jobs, creation of markets for new products and reinforcing international trade. The main goal of Green Growth is to maintain the economic growth, while taking into account the importance of natural capital and recognizing its role as a production (Kasztelan, 2017).

2.3 Product Space

The concept of Product Space (PS) is defined by Hausmann and Klinger (2007) and Hidalgo et al. (2007). The PS is a network between 774 products that are produced and traded between all countries in the world. Products are related when they use similar inputs of capital, recourses, and labor and the PS network connects these products according to their relatedness. The relatedness between any two products $i$ and $j$ in the PS is calculated as “…the minimum of the pairwise conditional probability of being co-exported…” (Coniglio et al., 2018, p. 10) with revealed comparative advantage ($\text{RCA} \geq 1$):

$$\varphi_{i,j} = \min\{P(x_i / x_j), P(x_j / x_i)\}$$

where $\varphi_{i,j}$ is the measure of relatedness between any two products $i$ and $j$ that has been traded between countries, respectively, and $P(x_i / x_j), P(x_j / x_i)$ “…is the conditional probability of exporting good $i$ given that you export good $j$” (Hidalgo et al., 2007, p. 2). According to Hidalgo et al. (2007), a new product $j$ will be added to the countries’ export basket is the one that has the highest relatedness with the products that are already produced and exported. The main hypothesis of the PS is that “the evolution of countries comparative advantage can be represented over the PS as gradual ‘jumps’ from one node that represents a product already in the export basket to the closest nodes not in the production basket, that is products in which countries have a latent comparative advantage from sharing the use of similar production capabilities” (Coniglio et al., 2018, p. 6). More explicitly, the path
dependency hypothesis claims that countries tend to grow their economy by adding products that are similar to those for which the country already produces with high RCA.

### 2.4 Green Product Space

Mealy and Teytelboym (2018) used the concept of PS and developed a network of relatedness between 293 green products - Green Product Space (GPS) - that are traded between 1995 and 2014. The main hypothesis of GPS is that countries tend to develop their green economy according to their existing green production capabilities. Similar to Hidalgo et al. (2007), Mealy and Teytelboym (2018) argued that a new green product that is to be added to a country’s green production basket, is the one that has the high relatedness value with the green products that are already produced and exported in the green production baskets of that country. In addition, Mealy and Teytelboym (2018) ranked countries according to their Green Complexity Index (GCI) and showed countries with high GCI, “…have higher environmental patenting rates, lower CO2 emissions, and more stringent environmental policies” (Mealy and Teytelboym, 2018, p. 1).

They further constructed the Green Adjacent Possible (GAP) measure that “…represents the set of technologically proximate green products that a country could potentially become competitive in” (Mealy and Teytelboym, 2018, p. 1). Finally, the authors constructed a measure – Green Complexity Potential (GCP) – to predict “…countries’ future competitiveness in green products” (Mealy and Teytelboym, 2018, p. 1), and show the relation between GCP and GCI will “…suggests the path-dependence in the accumulation of green production capabilities” (Mealy and Teytelboym, 2018, p. 1).

### 2.5 Revealed Comparative Advantage (RCA)

The Revealed Comparative Advantage (RCA) index can be defined as “a measure of the relative ability of a country to produce a good vis-à-vis its trading partners” (French, 2017, p. 83) and is
defined by Balassa (1965). Hausmann et al. (2014) mentioned Balassa (1965)’s definition of RCA as: a country has RCA on a product if it produces and exports the product more than “…a fair share, that is, a share that is equal to the share of total world trade that the product represent” (Hausmann et al., 2014, p. 25). The RCA of a country c, for product i, can be calculated by equation 1 (Hausmann et al., 2014):

\[ \text{RCA}_{ci} = \frac{x_{ci}}{\sum_c x_{ci}} / \frac{\sum_i x_{ci}}{\sum_c \sum_i x_{ci}} \]

where \( x_{ci} \) is the export value of product i for country c, \( \sum_c x_{ci} \) is the total export value of product i that is exported by all countries, c, \( \sum_i x_{ci} \) is the total export value of all products i that is exported by country c, and \( \sum_{ci} x_{ci} \) is the total value of all products that has been traded between all countries in the world. (Hausmann et al., 2014) then used this measure to develop “…a matrix that connects each country to the products that it makes” (Hausmann et al., 2014, p. 25). The matrix values can be calculated as (Hausmann et al., 2014):

\[ M_{ci} = \begin{cases} 1 & \text{if } \text{RCA}_{ci} \geq 1; \\ 0 & \text{otherwise}. \end{cases} \]

where \( M_{ci} \) is the entries in the matrix and it is 1 if country c exports product i, with Revealed Comparative Advantage larger than 1, and 0 otherwise.

3. Data

Recent classification of green products by Organization for Economic Cooperation and Development (OECD, 2019) is used to construct a comprehensive list of 309 green products that was traded between 174 countries from 2008 to 2017. The green products are classified by the OECD (2019), based on the 6-digit Harmonized System (HS). The data for 309 green products are obtained from United Nation Comtrade (UN Comtrade, 2019) database according to 6-digit HS. The data includes:
1. Information on the year that each green product was exported
2. The countries that exported and imported the green products
3. All green products’ codes according to HS classification.
4. Countries’ code
5. Trade values of each green product for all countries that was traded in each year (2008 to 2017).

The trade value of each green product shows how much a specific green product was exported by each country. The trade value is based on US Dollars and for all 309 green products the export values are considered. Trade value is used as the main information in database to calculate the RCA and relatedness for each country and each year.

4. Methods

This analysis uses seven steps to answer the research questions listed above:

1. In order to begin the analysis, two years should be defined to understand the countries’ pattern of green growth. In this research initial year is 2008, \( t_0 = 2008 \) and final year is 2017, \( t_1 = 2017 \).
2. Define the new green products.
3. Calculate the relatedness between any pair of products \( i \) and \( j \) that was traded in \( t_0 = 2008 \) to construct an \( M \times M \) matrix of relatedness between all products \( i \) and \( j \).
4. Construct the set of products with \( RCA > 1 \) at \( t_0 = 2008 \) for each country.
5. Calculate the relatedness between new green products and all products with \( RCA > 1 \) at \( t_0 = 2008 \).
6. Construct the matrix of relatedness, \( M \times G \), between new green products and all products with \( RCA > 1 \) at \( t_0 = 2008 \).
7. Provide statistical analysis on the obtained data at step 6 to understand whether or not countries followed path-dependence process to grow their green economy.

We base our approach in the PS framework (Hidalgo et al., 2007) and dart-board approach that Coniglo et al. (2018) proposed for exploring whether a country’s transition to green economy followed path-dependency or not. We used the definition of new products that Coniglio et al. (2018) proposed to define new green products. In addition, the definition of RCA that is proposed by Balassa (1965) is used to define the green products in the countries’ export baskets as those with RCA above 1 (Coniglio et al., 2018; Hidalgo et al., 2007). New green products can be defined as the products that was not in the green production baskets of a country at time \( t_0 = 2008 \) and enter to the green production baskets of a country at time \( t_1 = 2017 \), therefore, the new green product in this research are those with RCA lower that 0.2 at time \( t_0 = 2008 \) and above 1 at time \( t_1 = 2017 \).

Similar to Coniglio et al. (2018) and Hidalgo et al. (2007) the relatedness between any pair of products \( i \) and \( j \) that was exported in the world at time \( t_0 = 2008 \) is calculated in an MxM matrix where the products \( i \) are in the rows and products \( j \) are in the columns of the matrix and the values in the matrix shows the relatedness between the products \( i \) and \( j \). The values of the matrix (relatedness between products \( i \) and \( j \)) are obtained as follow:

1. The RCA values for all products that is exported by each country, \( c \), in the world and for time \( t \) is calculated to “…measure whether a country, \( c \), exports more of good \( i \), as a share of its total exports…” (Hidalgo et al., 2007, p. 484) as follow:

\[
RCA_{ci} = \frac{x_{ci}}{\sum_c x_{ci}} / \frac{\sum_i x_{ci}}{\sum_c x_{ci}}
\]  

(1)

2. After calculating the RCA values for each country, \( c \), in the world in year \( t \), if RCA of product \( i \) for country, \( c \), is above 1 it means the country is a major exporter of the product
and it has RCA above 1 for product i at time t otherwise the RCA is 0 (Hidalgo et al., 2007; Coniglio et al., 2018):

\[ x_{ci} = \begin{cases} 1 & \text{if } RCA_{ci} > 1 \\ 0 & \text{otherwise} \end{cases} \] (2)

“where \( RCA_{ci} \) is the standard Balassa (1965) index employed as a measure of export specialization.” (Coniglio et al., 2018, p. 11). Then, after constructing the RCA values for each country, c, Hausmann and Klinger’s (2007) method is used to calculate the relatedness between any pair of products i and j as the minimum of the pair-wise conditional probability of being co-exported (Hidalgo et al., 2007; Coniglio et al, 2018):

\[ \varphi_{i,j} = \min\{P(x_i / x_j), P(x_j / x_i)\} \] (3)

where \( \varphi_{i,j} \) is the relatedness values in the MxM matrix.

According to Coniglio et al. (2018), in the third step of the analysis products that is exported with RCA above 1 for each country, c, at time \( t_0 \) should be listed. After implementing the first two steps, we proposed \( G_{ct_0} \) as the set of green products that is exported by each country, c, at time \( t_0=2008 \). Next, an MxC matrix, \( D_{ic} \), of relatedness between the new green products at the time \( t_0=2008 \) and the initial green products of the countries at time \( t_1=2017 \) is developed as follows:

\[ D_{ic} = \begin{cases} d_{ic}(\varphi_{i,j}) = \max(\varphi_{i,j}) \text{ when } j \in G_{ct_0}, i \in N_c \\ \text{no value} \quad \text{if } j \not\in G_{ct_0} \end{cases} \] (4)

where \( d_{ic}(\varphi_{i,j}) = \max(\varphi_{i,j}) \) shows the relatedness of new green products at time \( t_1=2017 \) with the most related (highest relatedness) green products at time \( t_0=2008 \) (Coniglio et al., 2018). The relatedness values are between 0 to 1, that is the more closer the relentless value to 1 the more similar capabilities that two products i and j share for production, but when the relatedness value
is close to 0 the less similar capabilities that two products $i$ and $j$ share less similarities for production.

The final step is to provide statistical analysis to explore whether the new green products that entered to the countries’ export baskets followed path dependence or non-path dependence. Similar to Coniglio et al. (2018), a counterfactual distribution of relatedness for each country, $c$, was constructed by implementing Monte Carlo simulation with “…1,000 random draws of size equal to the actual number of new…” (p. 12) green products to test Hidalgo et al.’s (2007) path-dependence hypothesis for developing countries’ production basket and, at the same time, observe if there are any new green products that did not follow a path-dependent process. In other words, the aim of this step is to compare the distribution of new green products relatedness that is obtained from equations (4) with the counterfactual distribution to explore three possible scenarios (Coniglio et al., 2018):

1. If the distribution of new green products relatedness stands to the right side of counterfactual distribution the hypothesis of random relatedness for any level of proximities can be rejected for actual data (full path-dependence).

2. If the distribution of new green products relatedness stands below the counterfactual distribution the hypothesis of random relatedness for any level of proximities cannot be rejected for actual data (no path-dependence).

3. If the distribution of new green products relatedness stands partially to the right side of counterfactual distribution the hypothesis of random relatedness can be rejected for new green products that their distribution stands above counterfactual distribution (path-dependence and non-path dependence process).
In accordance with Duranton and Overman’s (2005) and Coniglio et al.’s (2018) methods, this analysis is implemented using kernel smoothed density estimation as:

\[
\bar{K}(d) = \frac{1}{(\sum_{i=1}^{M} \sum_{t=2008}^{2017} l_{it})h} \sum_{i=1}^{M} \sum_{t=2008}^{2017} l_{it} f \left( \frac{d - d_{it}}{h} \right) \text{ for all countries, } c
\]

(5)

where “…densities calculated non-parametrically using a Gaussian Kernel function with bandwidth h set according to Silverman’s optimal rule of thumb.” (Coniglio et al., 2018, p. 13). In equation (5), \(d_{it}\) is obtained using equation (4) and \(\sum_{i=1}^{M} \sum_{t=2008}^{2017} l_{it}\) equals to the total number of green products.

5. Results

Figure 1 shows the kernel distribution of relatedness, as defined in equation 4, between new green products at time \(t_1=2017\) and the products with RCA>1 at \(t_0=2008\) for all countries.

![Figure 1. Kernel distribution of relatedness between new green products at time \(t_1=2017\) and time \(t_0=2008\): actual new green products data versus random data](image)

The horizontal axis in Figure 1 shows the relatedness values – 0 to 1 - between new green products at \(t_1=2017\) and the products with RCA>1 at \(t_0=2008\) for all countries. The blue kernel distribution
shows the relatedness between new green products at $t_0=2008$ and the products with $\text{RCA}>1$ at $t_0=2008$ while orange kernel distribution shows the randomly generated relatedness values that were obtained as a result of the counterfactual analysis.

The comparison between the blue kernel distribution and orange kernel distribution is a test that shows whether the countries green growth followed path-dependence process or not. The comparisons show countries’ diversification to green economy followed path-dependence process when the relatedness values are above 0.75 and for some relatedness values between 0.4 to 0.68. The relatedness values above 0.75 argue for the path-dependency process when the products have high degree of relatedness that is aligned with Hidalgo et al. (2007) hypothesis of path-dependence. This shows that countries enhanced their green production baskets based the products for which they already had an RCA > 1.

The comparison also shows that countries’ diversification to green growth followed non-path dependence process for considerable number of green products (the orange area that is above blue area). This result can proof the general path-dependence process in developing countries’ green production baskets as proposed by Hidalgo et al. (2007) and, at the same time countries did jump in their PS and produced the green products that does not share similar capabilities with existing countries’ green production baskets.

According to Mealy and Teytelboym (2018), China ranked first in terms of green growth and the authors argued that China followed path-dependence – as proposed by Hidalgo et al. (2007) - process to develop their green production baskets.
Figure 2. China’s Kernel distribution of relatedness between new green products at time $t_1=2017$ and time $t_0=2008$: actual new green products data versus random data

Similar to Figure 1, the horizontal axis in Figure 2 shows the relatedness values – 0 to 1- between new green products at $t_1=2017$ and the products with $RCA>1$ at $t_0=2008$ for China. By comparing the kernel distribution of relatedness between new green products at $t_1=2017$ and the products with $RCA>1$ at $t_0=2008$, the blue kernel distribution, with the kernel distribution of randomly generated relatedness for China’s green product relatedness values, the orange kernel distribution, China followed a non-path dependence process (the orange area stands above blue area) and, at the same time, China followed path-dependence process (the blue area that are above green area) for producing most of the new green products. That is, China exhibits patterns both adherence to and deviation from the path dependency hypothesis. This shows China’s structural change in their production capabilities enabled them to produce more green products and grow their economy while reducing their environmental risks (Haibo et al., 2019; Li et al., 2019; Pan et al., 2019).
6. Discussion

The results of this research showed that all countries did grow their economy following both path dependent and non-path dependent processes (Sonnenschein and Mundaca, 2016; Oh, 2019; Sujit and Tanurima, 2019). We considered China as a case study since it had the largest green growth compared to other countries in the world (Mealy and Teytelboym, 2018) and found that China did jump - followed non-path dependence process for considerable number of their green products - in its product space and could manage to produce more green products compared to all other countries. This shows China had successful structural change reforms in order to have a growth while reducing its environmental risks, especially climate change (Haibo et al., 2019; Li et al., 2019; Pan et al., 2019; Shen et al., 2018; Li et al., 2018).

As “…governments around the globe are more and more seduced by the PS idea of ‘latent comparative advantage’, which suggests that policy effort should be ‘smartly’ targeted to those products that are not yet in countries’ export baskets but are related to it (i.e. small jumps over the Product Space are those that are likely to be effective)” (Coniglio et al., 2008, p. 28), the results of this paper shows that countries diversified their green production baskets not merely based on path dependent process – small jump in their PS- but also based on large jumps in their PS as a result of following non-path dependence process. This shows countries can plan to jump in their PS to produce more green products by having “…better endowment of human…” (Coniglio et al., 2017, p. 28) and natural “…capital to develop their comparative advantage in new areas of the product space” (Coniglio et al., 2018, p. 28), and better intervention from governments (Mealy and Teytelboym, 2018) in order to support industries and make such a jump in green production basket of countries.
7. Conclusion

An economy grows by upgrading the products they produce and export (Hidalgo et al, 2007). Countries follow path-dependence (Hidalgo et al., 2007) or non-path dependence process (Coniglio et al., 2018) to grow their economy. That is, if a country uses existing capabilities to grow its economy it shows country followed path-dependence process and if a country produce a product that use divergent capabilities from its existing production baskets it shows a country followed non-path dependence process to grow its’ economy. Following non-path dependence process requires the country to do structural changes in its production basket (Coniglio et al., 2018). Countries economic growth will increase their environmental risks, climate change, therefore, it is crucial for them to grow their economy while reduce their environmental risks (Knight and Schor, 2014).

Economic growth and economic development causes countries face with several problems such as environmental risks, and high energy and natural resources consumption. Climate change is the most considerable problem that emerge when countries try to grow their economy. On the other hand, a transition to green economy enable the countries to growth their economy while reduce this environmental risk. Transition to green economy needs the countries to start a structural change in their industries and implement a policy for this change is a challenge for all countries, especially poor countries. The results of this research showed that China as a country that has a largest growth in its green economy could jump in its green production baskets and successfully did a major structural change in its industry. In addition, the results of this research can provide a better understanding on how countries enhanced their green growth and how other countries to do similar actions in order to have a better growth in their green economy development plan while reducing their environmental risks, especially climate change.
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