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Dataset of Regional Economic Resilience and Industrial Evolution Path in China's Coastal Areas (2002–2017)

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Abstract: China's coastal areas include Liaoning, Hebei, Tianjin, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Taiwan, Guangdong, Hong Kong, Macao, Guangxi and Hainan. Based on export product data and national economic accounting data of China's coastal areas (data on Hong Kong, Macao, and Taiwan are temporarily missing), the author calculated the dataset of regional economic resilience and the industrial evolution path by applying the calculating method of regional economic resilience proposed by Martin *et al*. (2016) and the method of identifying new industrial path dependence and path creation proposed by Coniglio *et al*. (2018). This dataset includes regional economic resilience, new industries of 2-digit Harmonized System (HS) codes, industrial evolution path dependance, industrial evolution path creation, other variables affecting the regional economic resilience in China's coastal areas from 2002 to 2017 and economic resilience and its influencing factors of core cities in the Yangtze River Delta from 2002 to 2016. The dataset is archived in .xlsx format with data size of 124 KB.

Keywords: industrial evolution; path dependence; path creation; economic resilience; China's coastal areas

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Dataset Availability Statement:

The dataset supporting this paper was published and is accessible through the *Digital Journal of Global Change Data Repository* at: https://doi.org/10.3974/geodb.2023.03.09.V1 or https://cstr.escience.org.cn/CSTR:20146.11.2023.03.09.V1.

1 Introduction

The continuous development of economic globalization has brought countries and regions closer together through global production networks. However, regional economic systems

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[2] Qu, Y., Wu, F. Y., Li, B. Dataset of regional economic resilience and industrial evolution path in China's coastal areas (2002–2017) [J/DB/OL]. *Digital Journal of Global Change Data Repository*, 2023. https://doi.org/10.3974/geodb.2023.03.09.V1. https://cstr.escience.org.cn/CSTR:20146.11.2023.03.09.V1.

are simultaneously exposed to increasingly uncertain shocks and disturbances[1–3]. Especially since the 2007–2008 global financial crisis, the different characteristics of regional economic systems in response to various shocks and the analysis of the reasons have gradually attracted scholars' attention. As a result, regional economic resilience has become a hot topic in regional research[4–6].

The development of a regional economy is a process of new industries emerging and old industries withdrawing[7]. New industries in a region reflect the direction and characteristics of the evolution path of the regional industrial structure. The evolution path of a regional industry can be divided into two main types: path dependence and path creation, which are classified according to the proximity between the new industry and the original industries. Path dependence means that the new industry is closely related to the original industries in terms of technology and knowledge, while path creation denotes that there is less connection between the new industry and the original industries, thus enabling innovation in production and technology.

China's coastal areas have a good industrial foundation and are characterized by rapid economic development[8]. It is worthwhile analyzing the characteristics of economic resilience and industrial evolution and study the influence of the industrial evolution path on economic resilience[9,10]. However, how to measure the evolutionary path and calculate the degree of path dependence and break creation by quantitative means has long puzzled scholars. The model constructed by Coniglio and related studies carried out by Li compensate for the above deficiencies[11,12]. We use national economic accounting and export product data to obtain the regional economic resilience and industrial evolution path dataset of China's coastal areas from 2002 to 2017.

2 Metadata of the Dataset

Table 1 summarizes the metadata of the Dataset of regional economic resilience and industrial evolution path in China's coastal areas (2002–2017)[13]. It includes the dataset full and short names, authors, year, data format, data size, data files, data publisher, and data sharing policy, etc.

Table 1 Metadata summary of the Dataset of regional economic resilience and industrial evolution path in China's coastal areas (2002–2017)

Items	Description
Dataset full name	Dataset of regional economic resilience and industrial evolution path in China's coastal areas (2002–2017)
Dataset short name	Res_EvolPath_CoastalChina
Authors	Qu, Y. HOH-8736-2023, Zhanjiang University of Science and Technology, Key Research Base of Humanities and Social Sciences of the Ministry Education, Center for Studies of Marine Economy and Sustainable Development, Liaoning Normal University, University Collaborative Innovation Center of Marine Economy High-Quality Development of Liaoning Province, quyi1412@163.com Wu, F. Y. HOH-8937-2023, Key Research Base of Humanities and Social Sciences of the Ministry Education, Center for Studies of Marine Economy and Sustainable Development, Liaoning Normal University, University Collaborative Innovation Center of Marine Economy High-Quality Development of Liaoning Province, 531583887@qq.com Li, B. HPD-0607-2023, Key Research Base of Humanities and Social Sciences of the Ministry Education, Center for Studies of Marine Economy and Sustainable Development, Liaoning Normal University, University Collaborative Innovation Center of Marine Economy High-Quality Development of Liaoning Province, libo_ok@126.com
Geographical region	Coastal areas of China (except Hong Kong, Macao and Taiwan)
Year	2002–2017
Data format	.xlsx
Data size	124 KB

(*To be continued on the next page*)

(*Continued*)

Items	Description
Data files	(1) Regional economic resilience in China's coastal areas from 2002 to 2017 (2) New industries of 2-digit HS codes in China's coastal areas from 2002 to 2017 (3) Industrial evolution path dependance in China's coastal areas from 2002 to 2017 (4) Industrial evolution path creation in China's coastal areas from 2002 to 2017 (5) Other variables affecting the regional economic resilience in China's coastal areas from 2002 to 2017 (6) Economic resilience and influencing factors of core cities in Yangtze River Delta from 2002 to 2016
Foundations	National Natural Science Foundation of China (41976207, 42076222)
Data publisher	Global Change Research Data Publishing & Repository, http://www.geodoi.ac.cn
Address	No. 11A, Datun Road, Chaoyang District, Beijing 100101, China
Data sharing policy	***Data*** from the Global Change Research Data Publishing & Repository includes metadata, datasets (in the *Digital Journal of Global Change Data Repository*), and publications (in the *Journal of Global Change Data & Discovery*). ***Data*** sharing policy includes: (1) ***Data*** are openly available and can be free downloaded via the Internet; (2) End users are encouraged to use ***Data*** subject to citation; (3) Users, who are by definition also value-added service providers, are welcome to redistribute ***Data*** subject to written permission from the GCdataPR Editorial Office and the issuance of a ***Data*** redistribution license; and (4) If ***Data*** are used to compile new datasets, the 'ten per cent principal' should be followed such that ***Data*** records utilized should not surpass 10% of the new dataset contents, while sources should be clearly noted in suitable places in the new dataset [14]
Communication and searchable system	DOI, CSTR, Crossref, DCI, CSCD, CNKI, SciEngine, WDS/ISC, GEOSS

3 Methods

3.1 Data Sources

China's coastal areas include Liaoning, Hebei, Tianjin, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Taiwan, Guangdong, Hong Kong, Macao, Guangxi, and Hainan, but data on Hong Kong, Macao, and Taiwan are temporarily missing. The dataset is developes based on the export data and national account data from 2002 to 2017[15–17]. The export data include countries' and regions' data in the UN Comtrade Database and China's coastal areas' data in the DRCNet. The national account data include gross domestic product (GDP) data for China's coastal areas. Figure 1 shows the building process of this dataset.

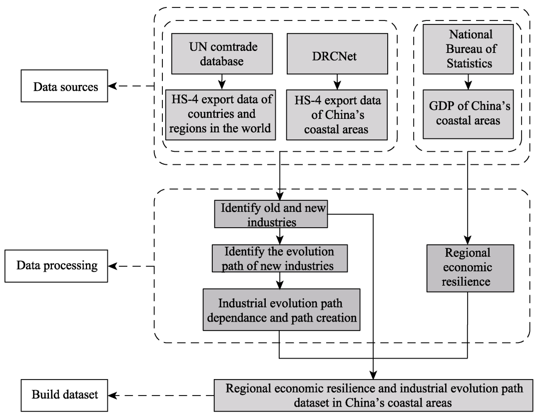

Figure 1 Flowchart of dataset deveplopment

3.2 Data Collection or Processing

3.2.1 Regional Economic Resilience

There are two main methods for quantifying regional economic resilience. The first is to use a traditional indicator system. This method considers the availability and representativeness of relevant indicators and constructs an indicator system to calculate the value of economic resilience through subjective or objective weighting methods.

The second, proposed by Martin[18], compares the actual change in a region within a specific economic cycle with the expected change under the national average level to reflect the economic resilience of each region within a specific economic cycle. This method can avoid subjective consciousness of indicator selection, unreasonable and imperfect indicator system construction, and other problems. Moreover, it is a results-oriented measurement method. Therefore, we selected the second method to measure the regional economic resilience of China's coastal areas:

$$Res_{k,t} = \frac{\Delta E_{k,t} - g_N^{t+T}\left(E_k^t\right)}{\left|g_N^{t+T}\left(E_k^t\right)\right|} \tag{1}$$

where, $Res_{k,t}$ is the economic resilience of region *k* from *t* to *t+T*; $\Delta E_{k,t}$ is the change in annual GDP of region *k* from *t* to *t+T*; E_k^t is the GDP of the region in year t and g_N^{t+T} is the national rate of change in GDP from *t* to *t+T* year. In this paper, T=4.

3.2.2 New Industries

This study identifies new and old industries based on the Revealed Comparative Advantage Index (RCA) of regional export products according to Coniglio's criteria for the division of old and new industries[11]. For the export industry of region *k* in year t,

$$p_{k,t} = \begin{cases} new\ industry\ (if\ \ RCA_{i,t} < 0.5 \text{ and } RCA_{i,t+T} > 1) \\ old\ industry\left(RCA_{i,t} \geq 1\right) \end{cases} \tag{2}$$

where $RCA_{i,t}$ is the RCA of product *i* in year *t*.

3.2.3 Evolution Path of New Industries

According to Hidalgo's concept of industrial proximity[19], Coniglio proposed a method for identifying the evolutionary path of new industries based on proximity[11]. The process is as follows:

First, we construct a correlation matrix and compute its proximity. For industry *i* in country *c*,

$$x_{it} = \begin{cases} 0\ (RCA_{i,t} < 1) \\ 1\ (RCA_{i,t} \geq 1) \end{cases} \tag{3}$$

The proximity of industry *i* and industry *j*:

$$\varphi_{ij} = \min\left\{P\left(x_{i,t} \mid x_{j,t}\right), P\left(x_{j,t} \mid x_i, t\right)\right\} \tag{4}$$

Second, we compute maximum proximities between new and old industries; the equation is as follows:

$$D_{i,k,t} = \begin{cases} d_{i,k,t}\left(\varphi_{ij}\right) = \max\left(\varphi_{ij}\right)\left(i \in N_{k,t}, j \in B_{k,t}\right) \\ no\ value \end{cases} \tag{5}$$

where $D_{i,k,t}$ is the matrix of maximum proximities between new industry and old industry in region *k* from *t* to *t+T*. We use $N_{k,t}$ and $B_{k,t}$ to denote old industries at *t* and new industries at *t+T*, respectively.

Finally, we identify the evolutionary path of the new industries. We use the Monte Carlo method to randomly select industries with RCA less than 1 in regions *k* and *t* with the same number of $N_{k,t}$. Then we calculated the average of their maximum proximities. We repeat this process 2,000 times to obtain the counterfactual distribution of average proximities. A new industry is considered path-dependent if its maximum proximity is more than the 95% confidence interval of the counterfactual distribution. Alternatively, a new industry is considered path-creative if its maximum proximity is less than the 5% confidence interval.

3.2.4 Path Dependence and Path Creation

According to the method proposed by Li and He[12], the industrial evolution path dependence in a certain region and specific period of time refers to the ratio of the number of path-dependent new industries to the number of all new industries. The same is true for industrial evolution path creation.

4 Data Results and Validation

4.1 Data Composition

The dataset includes regional economic resilience, new product distribution, industrial evolution path dependence, path creation, and other variables affecting regional economic resilience in China's coastal areas from 2002 to 2017 and its influencing factors of core cities in the Yangtze River Delta from 2002 to 2016. The data size is 124 KB.

4.2 Data Products

(1) The regional economic resilience curve of China's coastal areas shows a trend of opening–closing–opening (Figure 2). At the initial stage of the study period, the resilience of some regions had obvious differences. Over time, the inter-regional differences gradually weakened and reached a minimum in 2005–2009. However, the resilience curves of different regions then entered a state of scattered change. We divide them into five types according to the change characteristics of the curve. 1) The resilience curves of Shanghai and Guangdong are U-shaped, reaching the lowest values of –0.324 and –0.195 in 2009–2013 and 2008–2012, respectively. 2) Fujian, Guangxi, and Hainan belong to the rising fluctuation category. 3) The economic resilience of Jiangsu and Zhejiang has a W-shape. 4) Liaoning and Shandong also had a similar trend of change, experiencing the process of first rising, then falling, then rising and falling again. 5) For Hebei and Tianjin, the resilience curves showed a downward trend, followed by an upward trend and finally a downward trend.

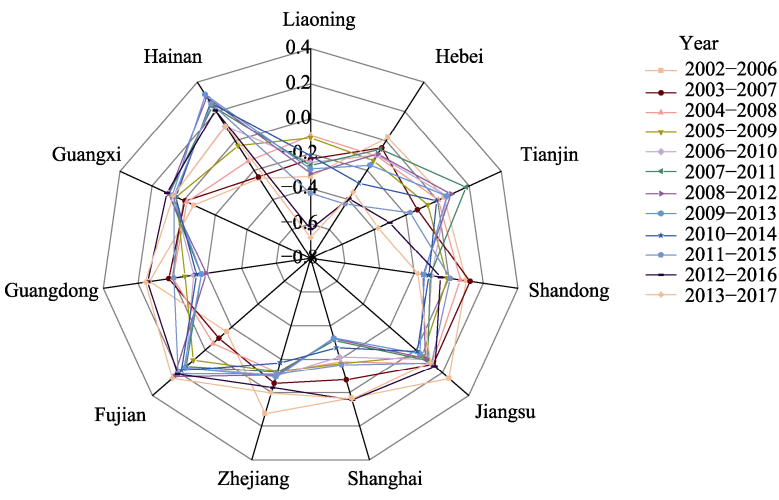

Figure 2 Map of regional economic resilience in China's coastal areas from 2002 to 2017

(2) Table 2 shows the number of new industries in China's coastal areas from 2002 to 2017. We find that the number of new industries presents a declining trend followed by a rising trend. Most regions had the lowest number of new industries around 2011–2015, after which

the numbers increased. However, for the majority of regions, the pace of new industry development has still not recovered to pre-crisis levels, and there are fewer new industries now than there were before the 2007–2008 global financial crisis. We obtain the number of new industries from the 2-digit HS and draw the heat maps of new industries of each region in the periods of 2002–2006, 2007–2011, 2008–2012, and 2013–2017 (Figure 3). There were a large number of new products in the period 2002—2006, which are mainly distributed in Chapters 72, 73, 76, 84, and 85. Shandong and Shanghai have more new industries in Chapters 28 and 29, respectively. The number of new products in almost all regions decreased to varying degrees during 2007–2011 and 2008–2012. The number of new products increased in more than half of the regions in 2013–2017, with Guangxi experiencing the most obvious growth.

Table 2 The number of new industries in China's coastal areas from 2002 to 2017

Year	Liaoning	Hebei	Tianjin	Shandong	Jiangsu	Shanghai	Zhejiang	Fujian	Guangdong	Guangxi	Hainan
2002—2006	52	59	42	70	25	51	42	27	13	55	49
2003—2007	54	55	45	61	43	45	39	36	14	47	33
2004—2008	47	57	59	53	50	37	34	45	17	52	41
2005—2009	46	62	48	44	39	28	31	35	14	74	21
2006—2010	29	42	49	30	30	21	27	33	20	61	20
2007—2011	26	35	33	31	27	20	16	26	13	59	23
2008—2012	46	38	23	22	21	15	14	30	13	43	17
2009—2013	49	30	23	27	23	19	13	18	17	39	19
2010—2014	20	30	25	21	18	16	12	23	26	38	18
2011—2015	19	25	21	30	14	11	14	20	18	50	12
2012—2016	19	24	27	23	12	20	14	17	26	51	15
2013—2017	21	31	47	37	15	47	22	31	25	141	28

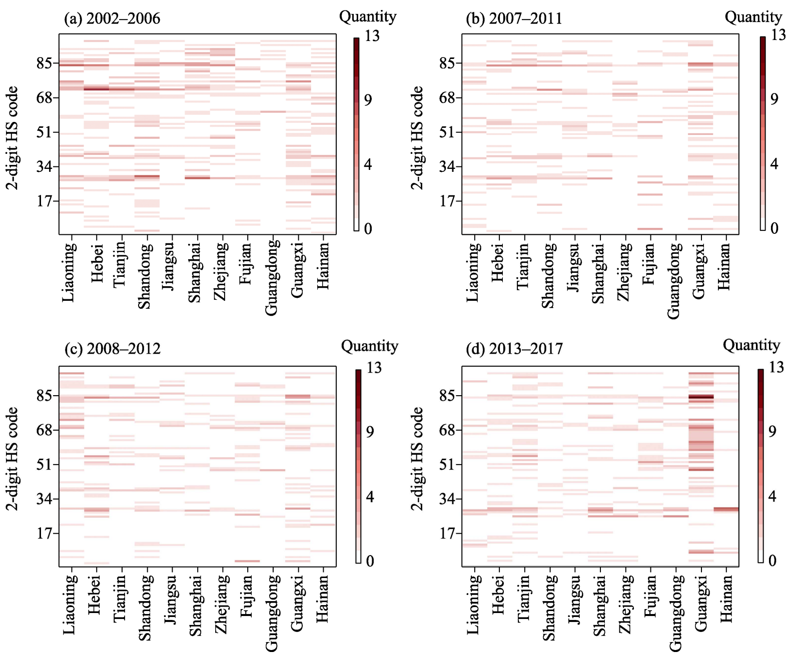

Figure 3 Heat maps of new industries in China's coastal areas from 2002 to 2017

(3) Tables 3 and 4 represent the path dependence and path creation in China's coastal are-

as, respectively. We find that the path dependence and path creation of each region always fluctuate, and the overall dependence is higher than the creation in the same period. After dividing Chinas coastal areas into three large regional ranges, we find no similar characteristics within the Bohai Rim, Yangtze River Delta, and pan-Pearl River Delta coastal areas.

Table 3 The path dependence in China's coastal areas from 2002 to 2017

Year	Liaoning	Hebei	Tianjin	Shandong	Jiangsu	Shanghai	Zhejiang	Fujian	Guangdong	Guangxi	Hainan
2002–2006	0.596	0.593	0.500	0.543	0.720	0.608	0.643	0.704	0.615	0.600	0.531
2003–2007	0.556	0.655	0.733	0.557	0.744	0.689	0.615	0.583	0.714	0.447	0.515
2004–2008	0.468	0.561	0.542	0.623	0.620	0.649	0.676	0.667	0.647	0.462	0.537
2005–2009	0.500	0.645	0.646	0.455	0.744	0.679	0.710	0.686	0.429	0.473	0.429
2006–2010	0.655	0.571	0.551	0.533	0.600	0.476	0.741	0.667	0.600	0.492	0.750
2007–2011	0.538	0.600	0.545	0.581	0.704	0.500	0.375	0.654	0.615	0.559	0.652
2008–2012	0.500	0.658	0.652	0.545	0.667	0.467	0.571	0.633	0.846	0.651	0.824
2009–2013	0.633	0.633	0.696	0.519	0.652	0.737	0.462	0.444	0.588	0.538	0.632
2010–2014	0.750	0.600	0.680	0.524	0.556	0.625	0.750	0.348	0.538	0.342	0.667
2011–2015	0.632	0.680	0.571	0.633	0.214	0.727	0.714	0.750	0.444	0.660	0.583
2012–2016	0.632	0.542	0.593	0.652	0.500	0.350	0.500	0.706	0.654	0.686	0.733
2013–2017	0.238	0.581	0.638	0.324	0.467	0.638	0.545	0.613	0.360	0.667	0.464

Table 4 The path creation in China's coastal areas from 2002 to 2017

Year	Liaoning	Hebei	Tianjin	Shandong	Jiangsu	Shanghai	Zhejiang	Fujian	Guangdong	Guangxi	Hainan
2002–2006	0.404	0.390	0.500	0.443	0.280	0.392	0.357	0.296	0.385	0.400	0.469
2003–2007	0.444	0.345	0.267	0.443	0.256	0.311	0.333	0.389	0.286	0.553	0.455
2004–2008	0.532	0.439	0.458	0.377	0.380	0.351	0.324	0.333	0.353	0.538	0.463
2005–2009	0.500	0.355	0.354	0.523	0.256	0.321	0.290	0.314	0.571	0.527	0.524
2006–2010	0.345	0.429	0.449	0.467	0.400	0.476	0.259	0.303	0.350	0.508	0.250
2007–2011	0.462	0.371	0.455	0.419	0.296	0.500	0.625	0.346	0.385	0.441	0.348
2008–2012	0.500	0.342	0.348	0.409	0.333	0.533	0.429	0.367	0.154	0.349	0.118
2009–2013	0.367	0.367	0.304	0.407	0.304	0.263	0.538	0.556	0.412	0.462	0.368
2010–2014	0.250	0.400	0.320	0.429	0.389	0.375	0.250	0.652	0.462	0.658	0.333
2011–2015	0.368	0.320	0.429	0.367	0.786	0.273	0.286	0.250	0.556	0.340	0.417
2012–2016	0.368	0.458	0.370	0.348	0.500	0.650	0.500	0.294	0.308	0.314	0.267
2013–2017	0.762	0.419	0.362	0.649	0.533	0.362	0.455	0.387	0.640	0.333	0.536

5 Discussion and Conclusion

From the perspective of evolutionary economic geography, path dependence and path creation are considered important factors affecting the performance and response of regional economies when facing shocks.

Compared with previous studies that analyzed the structure of all incumbent industries, discussing the characteristics of the industrial evolution path from the perspective of new industries enables us to grasp the characteristics of dynamic evolution and its development trend more accurately. However, few studies have qualitatively measured the degree of path dependence and path creation of industrial evolution. In this study, we take China's coastal areas as an example and compute the proximity between industries by using export product data from around the world, which eliminates the limitation of the traditional calculation method using the input–output method. We obtain the dataset of regional economic resilience and industrial evolution path of China's coastal areas based on export product data and GDP data. The conclusions are as follows. (1) The regional economic resilience of China's coastal areas showed obvious differences in some areas at the initial stage. The inter-regional differences gradually weaken in a short period of time but then enter a longer period of scattered change. (2) The number of new industries first declined and then increased. (3) Path dependence was higher than path creation in the same period. This dataset provides data to support the study of economic resilience and industrial evolution in China's coastal areas.

Author Contributions
Li, B. designed the algorithms of dataset. Qu, Y. and Wu, F. Y. contributed to the data processing and analysis. All authors wrote the data paper.

Conflicts of Interest
The authors declare no conflicts of interest.

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