Desalination and Water Treatment
www.deswater.com
doi: 10.5004/dwt.2020.25300

188 (2020) 303–308
June

Relations between factor-market distortion and environmental pollution–analysis of intermediate effect based on technological innovation

Fang Liu, Shu Bing Qiu*

School of Management Engineering, Anhui Polytechnic University, Wuhu, 241000, China, email: bill.hiton@foxmail.com (S.B. Qiu)

Received 18 July 2019; Accepted 20 December 2019

ABSTRACT

Factor-market distortion could cause misallocation of capital and talent resources, which in turn has profound influences on environmental pollution. In this essay, the panel data of 30 provinces and cities China from 2008 to 2017 are adopted to study the influences of factor-market distortion on industrial wastewater discharge as well as the intermediate effect of technological innovation with the analytical method of intermediate effect. The results show that factor-market distortion has both direct and indirect effects on industrial wastewater discharge and that technological innovation functions as a partial intermediary in the process of factor-market distortion influencing industrial wastewater discharge, with the intermediate effect value of 18.8%. With the improvement of technological innovation level, an inverted *U*-shaped curve law of "intensifying first and then improving" appears between factor-market distortion and industrial wastewater discharge. Based on these countermeasures are raised in this essay with the aim to provide data support for improving regional environmental quality.

Keywords: Non-linear relation; Intermediate effect; Industrial wastewater discharge; Factor market distortion; Technological innovation

1. Introduction

Within over 40 y of Chinese economic reform, great achievements have been made and the economy has developed quickly. Meanwhile, great prices are also paid. The development pattern with high pollution, high consumption, high investment and low efficiency has destroyed greatly the ecological environment. In 2018, China ranked 120 in the global environmental performance index, with a score of only 50.74. Especially, it ranked the fourth from the bottom in air quality.

Reform of factor resource allocation is a lengthy process. As early as in 1992, the Chinese government brought forward that the market should play fundamental roles in resource allocation. However, in actual implementation, to realize gross domestic product (GDP) growth, increase employment and other indexes of achievement assessment, some local governments intervene prices of land and other factors by administrative measures instead of market behavior, hinder the free circulation of capital and labors and encourage investment expansion and deteriorate the distribution structure, which leads to finally further factor-market distortion. Against such background, it is of great theoretical and practical significance to study the relations between factor-market distortion and environmental pollution.

2. Literature review

A study on the influences of factor-market distortion on environmental pollution started late. Based on provincial panel data from 1997 to 2014, Zheng et al. [1] selected "shortest distance from the threatened place" and "number of old industrial bases" as the tool variables of factor-market distortion to check the endogenous problems of

* Corresponding author.

factor-market distortion influencing environmental pollution. The results show that: (1) after endogenous treatment, the empirical results of factor-market distortion with SO_2, chemical oxygen demand, and soot as the indicators of environmental pollution are significantly positive, indicating that factor-market distortion accelerates environmental pollution. (2) If endogenous problems are not considered, the environmental pollution effects caused by factor-market distortions can be underestimated. (3) The results of the sub-sample period show that as the degree of factor-market distortion in China decreases gradually, its environmental pollution effect decreases also. Based on the provincial panel data from 2005 to 2015, starting from the institutional level, and taking factor-market distortion as a breakthrough point, Xu et al. [2], used the spatial panel data model, the threshold regression model and the structural equation model to analyze empirically the influences of factor-market distortion on haze pollution as well as its effect path. Results of the study show that factor-market distortion aggravates smog pollution, and there is a significant double threshold effect between the two; factor-market distortion could affect smog pollution by influencing energy efficiency, technological progress, industrial structure and other factors. According to Lu [3], factor-market distortion has delayed the arrival of the critical point for the economic scale and the industrial structure forming an inverted U-shape relation with environmental pollution, which goes against the improvement of environmental quality. With fertilizer as an example, Zhang et al. [4] analyzed whether factor-market distortion could stimulate emission of farmland surface pollutants and the research found that fertilizer market distortion existing wide in China had significant stimulating roles on the emission of farmland surface pollutants. Liu [5] thought that in the area of factor-market distortion, the complexity of export techniques of the manufacturing industry had decreasing accelerating effects on regional pollutants discharge reduction.

In terms of study on influences of technological innovation on environmental logistics, Zhang [6] conducted an empirical test on the threshold effect of technological innovation on environmental pollution in the process of China's industrialization and it is found that different levels of technological innovation have inverted *U*-shaped relation with environmental pollution. Ma et al. [7] tested empirically the influences of regional innovation on the changes of carbon pressure levels with a panel threshold model. Chen et al. [8] discussed the relations between technological innovation and environmental pollution and found that when technological innovation was at a lower level, environmental pollution cannot be reduced; however, in case it surpassed the threshold value, it was conducive to reducing environmental pollution through energy-saving effect, industrial upgrading effect and population agglomerating effect. Yuan et al. [9] considered that industrial agglomeration had inverted *U*-shaped relations with environmental pollution while technological innovation play key roles in deciding the "turning point".

The existing literature has studied profoundly the relations between factor-market distortion and environmental pollution as well as the relations between technological innovation and environmental pollution with fruitful achievements. However, it remains unknown whether factor-market distortion could affect regional environmental pollution by affecting technological innovation. Therefore, this essay studies the influences of factor-market distortion on environmental pollution as well as the intermediate effect of regional technological innovation in the process.

3. Research design

3.1. Model specification and variable declaration

It is possible that the influences of factor-market distortion on industrial wastewater discharge relate to the innovation effect of factor-market distortion. Therefore, the intermediate variable model, which takes the innovation that could occur in the process of factor-market distortion affecting industrial wastewater discharge as the intermediate variable, is adopted to study the correlations between factor-market distortion, technological innovation and industrial wastewater discharge.

By referring to the study conducted by Wen et al. [10] on intermediate effects, three steps are constructed in this essay.

Step one: calculate the direct effect of factor-market distortion on industrial wastewater discharge. Eq. (1) is shown as follows:

$$\text{H1}: \ln \text{pol}_{i,t} = \alpha_0 + \alpha_1 \text{fmd}_{i,t} + \alpha_2 \text{fin}_{i,t} + \alpha_3 \text{open}_{i,t} + \alpha_4 \ln \text{pgdp}_{i,t} + \alpha_5 \ln \text{pop}_{i,t} + \varepsilon_{i,t} \quad (1)$$

Step two: calculate the influences of factor-market distortion on technological innovation as well as the influences of factor-market distortion and technological innovation on industrial wastewater discharge respectively. Eqs. (2) and (3) is shown as follows:

$$\text{H2}: \ln \text{inno}_{i,t} = \beta_0 + \beta_1 \text{fmd}_{i,t} + \beta_2 \text{fin}_{i,t} + \beta_3 \text{open}_{i,t} + \beta_4 \ln \text{pgdp}_{i,t} + \beta_5 \ln \text{pop}_{i,t} + \delta_{i,t} \quad (2)$$

$$\text{H3}: \ln \text{pol}_{i,t} = \varphi_0 + \varphi_1 \ln \text{inno}_{i,t} + \varphi_2 \text{fmd}_{i,t} + \varphi_3 \text{fin}_{i,t} + \varphi_4 \text{open}_{i,t} + \varphi_5 \ln \text{pgdp}_{i,t} + \varphi_6 \ln \text{pop}_{i,t} + \zeta_{i,t} \quad (3)$$

The coefficient β_1 in Eq. (2) and coefficient φ_1 in Eq. (3) are approved by the significance test, indicating the intermediate effect passes the test. If only one of them is approved by the test, the Sobel test should be conducted. If it passes the test, the intermediate effect model could be applied; otherwise, it cannot.

Step three: if the coefficient is significant, calculate the intermediate effect.

In Eqs. (1)–(3), α, β, φ are the regression coefficients, ε, δ and ζ are random error terms independent from one another. In case α_1 is significantly positive, it shows increasing factor-market distortion could promote industrial wastewater discharge; in the case β_1 is significantly positive, it shows factor-market distortion is conducive to the improvement of technological innovation; in the case φ_1 is significantly positive, it shows the higher the level of technological innovation is, the more serious the industrial wastewater discharge is.

3.2. Variable declaration

- *Explained variable*: industrial wastewater discharge.
- *Core explanatory variable*: factor-market distortion. According to Tang [11], factor-market distortion is the non-optimal allocation of resources of production factors in the national economy caused by government intervention, market imperfection and other factors. At present, measuring methods of factor-market distortion include absolute distortion and relative distortion. Referring to the method put forward by Zhang et al. [12], the absolute value of factor-market distortion indexes (marketization index of product market – development index of factor market)/marketization index of product market) is constructed to evaluate factor-market distortion.
- *Intermediate variable*: technological innovation. This essay adopts the number of patents granted for 10,000 people to assess technological innovation. Calculation of the number of granted patents refers to the method put forward by Bai et al. [13], that is, a patent for inventions, utility model and appearance design are given weights of 0.5, 0.3 and 0.2, respectively and the weighted average is taken as the final index to evaluate patent authorization.
- *Controlled variable*: opening degree: the proportion of the total value of import and export to GDP is adopted to represent the opening degree. The population is evaluated by the logarithm of regional population density. Financial development is represented by the loan balance/deposit balance of financial institutions. Government size is represented by the proportion of the size of government finance to GDP.

3.3. Data sources

According to the principle of data availability, objects of the research include 30 provinces and cities of China, not including Hong Kong, Macao, Taiwan and Tibet. The data come from China statistical yearbook (2009–2018), China financial statistical yearbook (2009–2018), China environmental statistical yearbook (2009–2018) and report on marketization indexes in China of fan Gang et al. Some missing data are supplemented by interpolation method. Descriptive statistics are shown in Table 1. It could be seen from the data that the maximum value of industrial wastewater discharge is 47.631, the minimum value is 3.252 and the mean value is 14.832. The maximum value of market distortion is 0.961 and the minimum value is 0. Therefore, the variables have high dispersion degrees and there are some differences between the regions.

4. Test of intermediate effect and result analysis

4.1. Unit root test

To avoid spurious regression, unit root test is required for the panel data. According to the characteristics chosen by the data, this essay adopts Levin-Lin-Chu (LLC), Im-Pesaran-Shin (IPS) and HADRI to test the sample data of all the variables. The test results are shown in Table 2. According to the rule, the results obtained by two or more methods are approved by the test, which indicates the variable has certain stability.

4.2. Intermediate effect analysis

By calculating Hausman statistics, the *P* value is less than 0.001. A fixed-effect model is adopted. According to models (1)–(3), Stata 15.0 software is used for regression analysis. Detailed results are shown in Table 3. *Model* (1) tested direct influences of factor-market distortion on industrial wastewater discharge and it is found that factor-market distortion and industrial wastewater discharge show a significant positive correlation at the level of 1%. The regression coefficient is 0.262, indicating industrial wastewater discharge in areas with a higher degree of factor-market distortion is more serious. Influences of financial development, government size, opening and population on industrial wastewater discharge are all significantly negative, indicating they could alleviate industrial wastewater discharge to some degree.

Table 1
Descriptive statistics

Variable	Obs	Mean	Std. dev.	Min.	Max.
pol	300	14.832	8.096	3.252	47.631
inno	300	2.265	2.96	0.113	18.343
fin	300	0.718	0.197	0.132	2.319
open	300	0.341	0.524	0.012	5.188
pop	300	454.335	675.426	7.684	3,825.692
gov	300	0.233	0.098	0.087	0.627
fmd	300	0.516	0.189	0.000	0.961

Table 2
Stability tests for variables

Variable	LLC (*P*-value)	IPS (*P*-value)	HADRI (*P*-value)	Stationarity judgment
lnpol	–5.6441 (0.0000)	–1.0398 (0.1492)	7.5588 (0.0000)	stable
fmd	–2.3612 (0.0091)	–2.1e+02 (0.0000)	9.1478 (0.0000)	stable
lninno	–16.2486 (0.0000)	–3.3027 (0.0005)	7.4315 (0.0000)	stable
fin	–2.7822 (0.0027)	–2.3782 (0.0087)	5.8401(0.0000)	stable
open	–6.7141 (0.0000)	–0.2950 (0.3840)	6.6289 (0.0000)	stable
lnpop	–11.5613 (0.0000)	–11.2523 (0.0000)	9.4777 (0.0000)	stable
gov	–15.4292 (0.0000)	–2.5507 (0.0054)	6.8876 (0.0000)	stable

Table 3
Mediation effect test results

Variable	lnpol	lninno	lnpol
lninno	/	/	–0.154***[–4.69]
fmd	0.262***[4.17]	–0.321***[–2.84]	0.213***[3.46]
fin	–0.302***[–3.35]	0.742***[4.58]	–0.188**[–2.09]
gov	–1.455***[–2.67]	12.70***[12.98]	0.503[0.75]
open	–0.0637[–1.36]	–0.0337[–0.40]	–0.0689[–1.52]
lnpop	–1.160***[–5.01]	0.673[1.61]	–1.056***[–4.71]
_cons	9.343***[7.64]	–6.854***[–3.12]	8.286***[6.92]
N	300	300	300
adj. R^2	0.1985	0.5123	0.2573
Hausman test	58.82 (0.0000)	72.58 (0.0000)	67.23 (0.0000)
F^2	21.61 (0.0000)	69.63 (0.0000)	23.09 (0.0000)

t statistics in brackets,* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Model (2) tests the influences of factor-market distortion on technological innovation. It could be seen that factor-market distortion and technological innovation are in significant negative correlation at the level of 1%. The regression coefficient is –0.321, indicating high factor-market distortion goes against the development of regional technological innovation. Financial development and government size could promote technological innovation.

Model (3) tests the influences of factor-market distortion and technological innovation on industrial wastewater discharge. The results show that factor market distortions have a positive impact on industrial wastewater discharge, and the elastic coefficient of regional technological innovation to industrial wastewater discharge is –0.154, which indicates that the intermediary variables play a part of the intermediary role, that is, the independent variable factor market distortions have a part of the impact on industrial wastewater discharge through technological innovation. Financial development, opening up, population and technological innovation have significantly curbed regional industrial wastewater discharge.

The mediating effect has been further calculated. According to the test method of mediating effect, factor market distortions have partial mediating effects in the process of industrial wastewater discharge. The size of the intermediary variable of technological innovation can be measured by the formula, the value is 0.188, that is, 18.8% of the industrial wastewater discharge is promoted by the distortion of factor market, which verifies that technological innovation plays an important intermediary role in the process of industrial wastewater discharge caused by the distortion of the factor market.

4.3. Robustness test

To further confirm the reliability of the above results, in this paper, we use the method of substituting core variables for robustness test, that is, we use the method of Lin et al. [14] for reference, and use the relative gap between the development degree of factor market in each region and the highest development degree of factor market in the sample as the proxy index to test robustness, and the results are shown in Table 4. The results show that the positive and negative signs and significance of the core explanatory variable factor market distortions and the intermediary variable technical innovation coefficient estimates are consistent with Table 3, and the positive and negative signs and significance of the control variable estimates are basically consistent with Table 3. The main conclusion of this paper has not changed substantially, that is, the conclusion has robustness.

5. Test of a nonlinear relationship between factor market distortion and industrial wastewater discharge

As previously demonstrate, distortions in factor markets have a direct and indirect impact on industrial wastewater discharge. There is a promoting effect between the two, and it has been proved that technological innovation plays an important intermediary role, then further prove whether the factor market distortions and industrial wastewater discharge are non-linear relationships, learn from Jiang et al. [15], this paper will test through the panel threshold model, take single threshold as an example, double and triple threshold model can be extended, single threshold model is described as follows:

$$\begin{aligned} \text{Lnpol}_{i,t} &= \mu_0 + \mu_1 \text{nq20}_{i,t} \cdot I\left(\exp \le \theta\right) + +\mu_2 \text{nq20}_{i,t} \cdot I\left(\exp > \theta\right) \\ &+ \mu_3 \ln \text{cx}_{i,t} + \mu_4 \text{jrxl}_{i,t} + \mu_5 \text{zfgm}_{i,t} + \mu_6 \text{Open}_{i,t} \\ &+ \mu_7 \ln \text{rkmd}_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{4}$$

In Eq. (4), θ is the threshold to be assessed, $I(\cdot)$ is an indicative function, if the expression inside (·) is true, then I take 1, otherwise I take 0.

In this paper, we take factor market distortion intensity as a threshold variable, so that it can be convenient to divide factor market distortion intensity into different intervals, to calculate the impact of factor market distortion intensity on industrial wastewater discharge under different thresholds. Before making the model estimate, we should check to see if there is a threshold value, as shown in Table 5.

Table 4
Robustness test

Variable	lnpol	lninno	lnpol
lninno	/	/	–0.162***[–4.88]
fmd	0.540***[2.78]	–0.930***[–2.71]	0.389**[2.06]
fin	–0.333***[–3.64]	0.779***[4.82]	–0.206**[–2.25]
gov	–1.643***[–2.98]	12.91***[13.24]	0.453[0.67]
open	–0.0970**[–2.03]	0.0142[0.17]	–0.0947**[–2.06]
lnpop	–1.049***[–4.44]	0.510[1.22]	–0.966***[–4.25]
_cons	8.648***[6.86]	–5.716**[–2.56]	7.720***[6.30]
N	300	300	300
adj. R^2	0.1702	0.5111	0.2359
Hausman test	53.40 (0.0000)	70.73 (0.0000)	64.55 (0.0000)
F^2	19.07 (0.0000)	69.31 (0.0000)	21.22 (0.0000)

t statistics in brackets,* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5
Threshold checklist

Threshold type	F statistics	P–value	Threshold value
Single threshold	33.367***	0.000	–0.945
Double threshold	10.003**	0.020	–0.206
Three threshold	16.227***	0.010	0.515

Table 6
Panel threshold model estimation results

Variable	Coefficient [P-value]
fin	–0.329***[–4.06]
gov	–1.433**[–2.59]
open	–0.137***[–3.35]
lnpop	–0.960***[–4.74]
lninno < –0.945	0.370***[3.73]
–0.945 ≤ lninno < –0.206	0.576***[6.54]
–0.206 ≤ lninno < 0.515	0.533***[6.39]
0.515 ≤ lninno	–0.138**[–2.06]
_cons	8.278***[7.72]
N	300
adj. R^2	0.3723

t statistics in brackets,* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The threshold model estimates are shown in Table 6. According to the results of the parameters in Table 6, the variable of factor market distortion has an inverted *U*-shaped curve relationship with industrial wastewater discharge, that is, with the continuous improvement of technological innovation level, the impact of factor market distortion on industrial wastewater discharge has changed from aggravation to mitigation. When the level of technological innovation is low, distortions in factor markets result in misallocation of resources. So that the factor distribution is uneven, more factors flow to productivity, higher pollution industries, and factor distribution will reduce the willingness and motivation of enterprises to innovate, resulting in more environmental side effects than the pollution reduction effect of technological innovation [16]. Therefore, factor market distortion will worsen the environment, which partially validates Zhang et al. [4].

When the level of technological innovation is high, technology innovation, especially the green technology innovation, reduces the damage of ecological environment pollution, and the pollution reduction effect is greater than the pollution caused by the distortion of the factor market, which slows down the industrial wastewater discharge.

6. Conclusions and recommendations

Resource mismatch caused by distorted factor markets is one of the main culprits of worsening industrial wastewater discharge problems in China. Clarifying the relationship between factor market and industrial wastewater discharge is not only of great academic value but also conducive to the establishment of an environment-friendly society. Based on the panel data of 30 provinces and cities in China except for Hong Kong, Macao and Tibet from 2008 to 2017, this paper investigates the relationship among factor market distortions, technological innovation and industrial wastewater discharge by using the mediating effect test and panel threshold model. The study found that:

- Factor market distortions can directly promote industrial wastewater discharge, while factor market distortions can also indirectly affect industrial wastewater discharge through technological innovation, which is confirmed by the robustness test.
- Technological innovation has an important mediating effect, which plays a partial mediating effect in the process of factor market distortion affecting industrial wastewater discharge, and the mediating level is 18.8%;
- The panel threshold model test shows that in the region with a low level of technological innovation if the market distortion will aggravate the industrial wastewater discharge, while in the region with a high level of

technological innovation, the factor market distortion will slow down the industrial wastewater discharge, showing an "inverted *U*-shaped" curve.

- Based on the above research, factor market distortions do not aggravate industrial wastewater discharge in all cases, so relevant departments need to consider the level of technological innovation when accelerating factor market reform. For the reduction of industrial wastewater discharge, in the long run, it is an inevitable trend to reduce the distortion intensity of factor market, and also an inevitable choice to enhance the level of technological innovation. Specifically, the policy implications of this study are: the distorted factor market is the product of China's planned economy from the commodity era to a fully market-oriented economy. Inevitably, the efficiency of factor resources allocation is low, and the reform process of factor market and product market is inconsistent, that is, factor resources and economic subjects do not match, which easily leads to economic imbalance, and hinders the investment of innovation resources and the improvement of environmental quality to a certain extent. Therefore, firstly, it is necessary to reduce the distorted intensity of market factors, improve the unfavorable phenomena caused by factor market, such as mismatch of resources, imbalance of demand structure and weakening of innovation, to provide effective market incentives for green technology. Secondly, strengthen the regional technological innovation, replace the existing factor-driven with innovation-driven, cultivate and develop the innovation factor market; thirdly, we should focus on the market-oriented allocation of factors, and strengthen the free circulation of factor resources, especially the innovation factor and the ecological environment factor in the market. Therefore, to improve the environmental quality, we should pay attention to the distortion of the factor market, reduce the distortion of the factor market, pay attention to technological innovation, adhere to the innovation-driven, give play to the "wild goose effect" of innovation, reform the factor market in all aspects, and gradually improve the environmental quality.

Acknowledgments

The study was supported by the Planning Project of Philosophy and Social Science of Anhui Province (Grant No. AHSKQ2019D014 & 0437). The authors also gratefully acknowledge the helpful comments and suggestions of the reviewers which have improved the presentation.

References

[1] J. Zheng, C. Fu, R. Zhang, The impact of factor market distortion on environmental pollution: an empirical study based on tool variable method, Soft Sci., 32 (2018) 103–106.
[2] Y. Xu, H. Cai, C. Yan, Factor market distortion and haze pollution control in China, J. China Univ. Geosci., 19 (2019) 22–33.
[3] L. Lu, Does the distortion of factor market aggravate environmental pollution?, Based on the analysis of provincial industrial spatial dynamic panel data, Finance Trade Economy, 5 (2016) 146–159.
[4] Y. Zhang, Y. Li, P. Jin, Spatial effects of factor market distortions on urban environmental quality in China, Financial Theor. Ser., 7 (2016) 3–10.
[5] S. Liu, Factor market distortion, export technology complexity and regional environmental pollution: an empirical study based on China's provincial panel data, Explor. Econ. Issues, 9 (2015) 24–31.
[6] J. Zhang, Threshold effect of technological innovation on environmental pollution in the process of industrialization: an empirical analysis based on 283 cities in China, J. Yunnan Univ. Finance Econ., 35 (2019) 34–42.
[7] X. Ma, T. Xue, A. Waoas, Study on the impact of regional innovation on carbon pressure level under the constraint of environmental regulations, J. Manage., 16 (2019) 85–95.
[8] Y. Chen, Y.P. Quijin, Has technological innovation reduced environmental pollution?, Empirical evidence from 285 cities in China, J. Xi'an Jiaotong Univ., 39 (2019) 73–84.
[9] Y. Yuan, R. Xie, Internal relationship between industrial agglomeration, Technological innovation and environmental pollution, Sci. Res., 9 (2015) 1340–1347.
[10] Z. Wen, L. Zhang, J. Hou, Mediation effect test procedure and its application, J. Psychol., 05 (2004) 614–620.
[11] J. Tang, The impact of factor price distortion on export: an empirical analysis from China's manufacturing industry, World Econ. Res., 6 (2015) 92–101.
[12] J. Zhang, X. Zhou, Y. Li, Factor market distortions inhibit R & D?, Econ. Res., 46 (2011) 78–91.
[13] J. Bai, F. Jiang, Study on regional innovation efficiency considering environmental factors based on three-stage DEA method, Finance Trade Economy, 10 (2011) 104–112.
[14] B. Lin, R. Duke, The impact of factor market distortion on energy efficiency, Econ. Res., 48 (2013) 125–136.
[15] H. Jiang, C. Li, Research on financial development and consumption demand under dual economic conditions, Financial Econ. Issues, 9 (2018) 83–89.
[16] Y. Huang, Z. Lu, Z. Li, Upgrading of industrial structure, distortion of factor market and environmental pollution - based on panel data of 283 prefecture-level cities from 2003 to 2015, Bus. Res., 7 (2018) 113–118.