Empirical Study on the Impact of Rural Labor Force Flow on the Price of Agricultural Products

——A Method Based on VEC Model

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Abstract Based on the research introduction of domestic and foreign scholars, dynamic equilibrium between the rural labor force flow and the price of agricultural product is analyzed by VEC model, according to the data of the rural labor force flow and the price of agricultural products in the years 1990 -2007. Chow's breakpoint test is used to measure the stage characteristics of the impact of rural labor force flow on the price of agricultural product. Result shows that there is a long-term and stationary relationship between the flow quantity of rural labor force and the price of agricultural product. Rural labor force flow, as an exogenous force, affects the agricultural production, and further influences the price fluctuation of agricultural products. Impact of rural labor force flow on the price of agricultural product is from weak to strong, then grows gradually weaker, and reaches its peak value at the year 1998. With the development of rural society and economy and the market process, rural labor force flow endogenously affects the price of agricultural product, which has periodic characteristics. In order to achieve a dual stabilization of the rural labor force flow and the price of agricultural products, the following countermeasures are put forward: vigorously developing vocational education, increasing the support for agricultural production, and making active employment measures.

Key words Rural labor force flow, Price of agricultural products, VEC model, Vocational education, China

Since the reform and opening up in the 1980s, China, a developing country, has emerged a large scale of rural labor force flow. Floating population is 120 million in the year 2004 in China and reaches 147 million in 2005. The huge number of floating labor forces has become one of the characteristics of the construction of market economy and the all-round development of society in China, which is also a spontaneous behavior of seeking economic opportunities. Rural labor force flow is a rational choice to promote urban-rural integration and to pursue economic equality and social recognition. Labor force flow in rural China has provided a wealth of labor support for the construction of industrialization and urbanization. However, a labor flow of such scale also influences the development of agriculture. Rural labor force flow might affect the supply of agricultural products and finally influence the price. Based on this, VEC model and Chow's breakpoint test is used to measure the relationship between the rural labor force flow and the price of agricultural products.

1 Review of literatures

Rural labor force transfer is a major subject for a country in the course of industrialization, especially a country having a large number of surplus labor forces. Developing countries usually have a dual economic structure between urban modern department and rural traditional department. The differences in economic structure and income of the two departments lead to the transfer of surplus labor forces from rural areas to urban areas. Based on the Dual Labor Flow Theory by Lewis, Rains points out that the transfer of agricultural labor force is determined by the progress in agricultural technology, the population growth, the growth of industrial capital stock and other factors[1-2]. Jorgenson discusses the relationships among population growth, industrial expansion, and rural surplus labor force transfer from the angle of agricultural department and population growth[3]. Harris *et al.* studies on the mass unemployment in urban industrial departments and points out that the transfer of labor force is due to the expected income[4]. These classical models mainly research on the order of spatial transfer of rural labor force, but neglects the rural labor force transfer between different industries and its impacts on the agricultural production and the price of agricultural products.

An important characteristic of rural economic development in China is the transfer of rural labor force. Cai Fang *et al.* point out the three institutional causes for the pendulum-like flow mode of rural labor force, such as the attractiveness of land to farmers, the separation function of household registration system, and the duality of urban labor market[5]. But the impact of institutional causes on the transfer of labor force is gradually reducing over time. Lu Xianghu *et al.* argue that with the development of economy and the deepening of reform, institutions hindering the urbanization of rural population is disappearing, or the hindering effects of some institutions are reducing[6]. This indicates that only eliminating institutional causes can not change the transfer status of labor force at present.

Brauw *et al.* argue that migration has become the most common form for rural labor force working in non-agricultural companies. More than 100 million people live outside of their native land. And most of them work in cities far away from their hometowns. Different from the past, most young labor forces now specialize in non-agricultural jobs[7]. Chen Weiping be-

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lieves that rural labor force transfer is affected by rural land rights reform to a certain extent; and the impact of further reform of land rights on labor force transfer is determined by the living environments of labor forces. Households with relatively low productivity effect will reduce or maintain the transfer of labor forces, those with relatively high productivity effect will also not change their behaviors; and those between the two will increase the transfer of labor forces[8]. " Du Ying *et al*. take Anhui and Sichuan Provinces, which have relatively more migrant workers, as the research objects, and verifies that the phenomenon of rural labor forces working outside does not necessarily lead to the reduction or enhancement of agricultural production level by comparing the migrant households with the households stay at hometown. However, the large amount of migrant labor forces have significant negative impact on family animal husbandry[9]. Brauw *et al*. point out that the rural labor force flow has direct and significant negative impact on the output of crops. On the one hand, when a family member works in cities, the output reduces greatly. On the other hand, flow reduces the labor forces engaged in agriculture; but the migrant labor force sends money to his family, which increases the money of a family. In other words, flow has dual impacts on the agricultural production of a family[10]. Although flow has direct negative impact on agricultural output, money sent from migrant workers may offset this negative impact to a certain extent. Wang Xiwei finds out that rural labor force flow can integrate the agricultural benefits of land into few agricultural people. During the wealth accumulation, land is concentrated, which can improve the production technology, mechanization level, and the output of agricultural production[11].

Zhang Sijun argues that, on the one hand, rural labor force flow helps to promote the status transformation of farmers, to form the scale management of land, to achieve scale operation effect, to increase agricultural input, to enhance agricultural labor productivity, and to optimize the structure of agricultural industry. On the other hand, labor force flow may reduce the quality of the regenerated labor forces, the utilization rate of agricultural resources, and the current agricultural income[12]. Zhou Pinghua believes that rural labor force transfer has reduced the total cost of agricultural production, promoted the large-scale operation of agricultural land, and enhanced the agricultural productivity[13]. Sheng Laiyun argues that rural labor force flow into cities has promoted the transformation of traditional agriculture and the development of modern agriculture. This is because the labor force flow has promoted the application of new agricultural technology and agricultural mechanization, has enhanced human capital, and has promoted the reform of land system and agricultural production modes[14]. Based on empirical research, Cui Chuangbin *et al*. find out the rapid development of tertiary industry and secondary industry, the accelerated process of urbanization, the reduction of agricultural comparative effectiveness, and the enlargement of urban-rural income gap. All these factors will inevitably lead to the large-scale flow of rural labor force and the insufficient supply of labor forces in some rural areas. But, scale operation of agriculture can effectively improve the land use efficiency, labour productivity, and agricultural specialization level[15].

There is no doubt that labor force flow from rural areas to urban areas will continue for a long time. Labor force will flow more smoothly in the future with the elimination of various institutions affecting labor force flow. Impact of rural labor force flow on rural economy will undoubtedly continue and will be more far-reaching. Research on the price of agricultural products can not be divorced from agricultural production under the background of rural labor force flow. Rural labor force transfer can promote the capital flow from cities to rural areas and into rural land circulation. Capital aggregation leads to the concentration of land, which improves the production technology, mechanization level, and agricultural production output. Thus, the price of agricultural products is affected. On the contrary, excessive transfer of high-quality labor force has adverse effect on agricultural production, especially the grain production, and also affects the price of agricultural products. Based on this, effects of rural labor force flow on the endogenous change of agricultural production is researched from the aspects of rural labor force and the price of agricultural products, which aims to provide theoretical foundation for the relevant researches.

2 Data source and research method

2.1 Data source Flow quantity of rural labor force and price of agricultural products are taken as samples. Data of rural flow labor force in the years 1990 – 1993 are from the *Rural Labor Force Flow and China Economic Growth—Based on the Empirical Study on Human Capital* written by Tan Yongsheng[16]; data in the year 1994 are from the *Economic Situation Scanning and Forecast at the* 15*th National Congress of the CPC*[17]; data in 1995 are from the *Hot Issues in the Rural Reform and Development at Present*[18]; data in 1996 are from the *Main Variables of Labor Employment in the Next Ten Years*[19]; data in 1997 are from the *Rural Surplus Labor Force Transfer and Small Town Development in China*[20]; data in 1998 are from the *Rural Labor Force Differentiation and Social Structure in China*[21]; data in 2001 – 2002 are from the *Guidance to Policy*[22]; data in the years 1999 – 2000 are based on the difference; data in 2003 are from the *Problems and Countermeasures for the Rural Labor Force Transfer at Current China*[23]; data in 2004 are from the *Relationship and Consideration of Socialist New Countryside Construction and Urbanization*[24]; data in 2005 are from the *Three Agricultural Problems in Current China*[25]; data in 2006 – 2007 are from the *Macroeconomics of Rural-Urban Migration in China*[26]. Data of agricultural products prices are based on the production price index of agricultural products and are from the 2007 *China Agricultural Development Report* and the 2008 *China Statistical Yearbook*.

2.2 Research method VEC model can be applied in the non-stationary time series modeling with cointegration relationship, which has a relatively high simulation precision. Thus, VEC model is used to analyze the dynamic equilibrium between the rural labor force flow and the price of agricultural products.

Table 1 Data of rural labor force flow and agricultural products flow in the years 1990 –2007

Year	Rural labor force $\times 10^4$	Migrant rural labor force $\times 10^4$	Price index of agricultural products
1990	42 009.50	3 000	97.4
1991	43 092.50	3 200	98.0
1992	43 801.60	3 350	103.4
1993	44 255.70	3 500	113.4
1994	44 654.00	3 800	139.9
1995	45 041.80	4 100	119.9
1996	45 288.00	4 321	104.2
1997	45 961.70	4 423	95.5
1998	46 432.20	4 611	92.0
1999	46 896.50	4 903	87.8
2000	47 962.10	5 205	96.4
2001	48 228.90	8 961	103.1
2002	48 527.00	9 400	99.7
2003	48 971.00	9 820	104.4
2004	49 695.00	10 260	113.1
2005	50 387.26	14 735	101.4
2006	51 000.00	15 000	101.2
2007	–	13 750	118.49

3 Result and analysis

Regression method is directly used to study on the relationship between the rural labor force flow and the price of agricultural products. Even if there are high fitting degree and significant time *t* statistics, it is difficult to obtain an accurate inference. This is because that the traditional econometric method directly uses the level value of variables to study on the equilibrium relationship among economic phenomena, which easily leads to a false conclusion; and the regression after differential transformation of data may miss the long-term information. Co-integration, which is developed in recent years to process the stable data, can test the long-term equilibrium relationship among the variable level data in economic time series. Granger Causality Test determines the causal relationship among variables in economic time series. Both co-integration and Granger Causality Test require the stationary characteristics of variables in economic time series[27]. Therefore, before empirical test and modeling, stationarity of variable in economic time series should be tested.

3.1 Unit root test Stationarity of variable should be tested before co-integration analysis. *ADF* test method by Dickey-Fuller is adopted to carry out stationary test on the flow quantity of rural labor forces (*Ncl*), the price of agricultural products (*Ncj*), and their first order differences $\triangle Ncl$ and $\triangle Ncj$.

Table 2 shows that although time series variables of the flow quantity of rural labor forces and the price of agricultural products are non-stationary, their first order differences $\triangle Ncl$ and $\triangle Ncj$ are stationary sequences under 1% and 5% significant level. Hence, the unit root of original sequence is the prerequisite for co-integration test.

Table 2 Unit root test on the rural labor force flow and the price of agricultural products

Variable	*ADF* value	Test type (c,t,l)	Critical value			Stationary or not
			1%	5%	10%	
Ncl	0.017 949	(0,0,1)	−3.886 751	−3.052 169	−2.666 593	Non-stationary
Ncj	−2.034 872	(0,0,1)	−3.920 350	−3.065 585	−2.673 459	Non-stationary
$\triangle Ncl$	−6.844 771	(0,0,2)	−4.057 910	−3.119 910	−2.701 103	Stationary
$\triangle Ncj$	−3.043 629	(0,0,1)	−4.057 910	−3.119 910	−2.701 103	Stationary

Note: *c*, *t* and *l* are the constant term, time trend term, and lag order of unit root test equation. 0 means not including *c* and *t*. And Δ means difference operator.

3.2 Co-integration test Johansen co-integration test is used to test the co-integration relationship between the flow quantity of rural labor force and the prices of agricultural products in the years 1990 –2007.

Table 3 Co-integration test on the rural labor force flow and the prices of agricultural products

Null hypothesis	Eigenvalue	Likelihood ratio statistics	Critical value	
			1%	5%
No co-integration relationship	0.696 143	28.93 441	31.153 85	25.872 11
At least one co-integration relationship	0.460 549	9.875 244	16.553 86	12.517 98

Table 3 reports that the likelihood ratio statistics is 28.934 41, but the 5% critical value is 25.872 11. 28.934 41 > 25.872 11 indicates that the null hypothesis, that is no co-integration relationship, is not tenable. In other words, co-integration relationship exists. The likelihood ratio statistics is 9.875 244, and the 5% critical value is 12.517 98. 9.875 244 <12.517 98 indicates that the null hypothesis, that is at least one co-integration relationship, is tenable. Therefore, under 5% significant level, there is at least one co-integration relationship between the flow quantity of rural labor force and the price of agricultural products. And it can be concluded that there are long-term stable relationship between the flow quantity of rural labor force and the price of agricultural products.

3.3 Vector error correction model (VEC) According to the co-integration test mentioned above, there is long-term co-integration relationship between the flow quantity of rural labor force and the price of agricultural products in the years 1990 – 2007. Therefore, VEC model can be established. Engle and Granger combine the co-integration and error correction model together to establish the VEC model. Since there is VAR model with co-integration constraint, VEC model should be applied in the non-stationary time series modeling with co-integration relationship. Hence, the VEC model is

$$\Delta y_t = \alpha\beta' y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \varepsilon_t, \quad (1)$$

where $y_t = (Ncl \quad Ncj)^T$, Δ is the first order difference of variable, p is the lagging order, and $ecm_{t-1} = \beta' y_{t-1}$ is the error correction term, reflecting the long-term equilibrium relationship among variables. Coefficient vector α reflects that when deviating from the long-term equilibrium, equilibrium relationship among variables will adjust to the adjustment speed of equilibrium status. All the coefficients of difference as explanatory variables reflect the impact of short-term fluctuation of variables on the short-term change of the explained variable. Γ_i reflects the effects of short-term change of variable on the short-term change of the explained variable.

Eviews6.0 is used to estimate the VEC model. Hence, we have:

$$\Delta Ncj = -0.403\,921\ ecm_t + 0.651\,360\ \Delta Ncj(-1) + 0.027\,229\ \Delta Ncj(-2) - 0.005\,692\ \Delta Ncl - 1.60E-05\ \Delta Ncl(-2). \quad (2)$$

According to the coefficients of error correction term, when short-term fluctuation deviates from the long-term equilibrium, the non-balanced state will be back to equilibrium at an adjustment of 0.403 921. That is to say, when the price of agricultural products at period $(t-1)$ shows an upward deviation from equilibrium, adjustment coefficient will reduce the price of agricultural products at period t at a speed of 0.403 921. Thus, the price of agricultural products at period t is adjusted to the long-term equilibrium, and *vice versa*. Based on the VEC model estimated, Wald statistics is used to carry out constraint test on regression coefficient (Table 4). This also indicates that the rural labor force flow has long-term impact on the price of agricultural products.

Result of causality test in Table 4 shows that rural labor force flow can bring along the price change of agricultural products, and its P value is 0.098 0. On the contrary, price change of agricultural products will not lead to the flow of agricultural labor force, and its P value is 0.540 6, which can be taken as exogenous variable. The Granger Causality Test basically verifies that the rural labor force flow will lead to the price change of agricultural products, indicating that rural labor force flow, as an exogenous force, affects the agricultural production, that is the supply of agricultural products, and further influences the price fluctuation of agricultural products.

Table 4 Granger Causality Test under VEC model

Variable	Chi-square test	Variable	Probability value
D(*Ncj*)	1.230 045	2	0.540 6
D(*Ncl*)	4.646 139	2	0.098 0

3.4 Chow's breakpoint test Chow's breakpoint test is carried out in order to find out whether the impact of agricultural labor force flow on the price of agricultural products has a change node, or whether national policy or economic cycles affects the impact.

Table 5 shows that among all the breakpoint tests, Chow's breakpoint test in the year 1998 is most significant, with 18.887 67 trace statistics and 0.000 1 P value, which is smaller than 0.01 and meets the 1% significance hypothesis. This indicates that the influence function of rural labor force flow on the price of agricultural products has changed at two periods, which starts from the year 1994 and becomes insignificant gradually after the year 2002. Impact of rural labor force flow on the price of agricultural product is from weak to strong, then grows gradually weaker, and reaches its peak value at the year 1998, which has inevitable relations with the reform of the household registration system and the establishment of socialist market economy system in the year 1994 in China. Moreover, a nationwide natural disaster in the year 1998 further induces the peak value. Chow's breakpoint test shows that with the development of rural society and economy and the market process, rural labor force flow endogenously affects the price of agricultural product, which has periodic characteristics.

Table 5 Result of Chow's breakpoint test

Year	*F* statistical value	Likelihood ratio	Wald statistical value
1994	12.989 86	18.887 67	25.979 72
	(0.000 6)	(0.000 1)	(0.000 0)
1996	12.612 88	18.544 97	25.225 76
	(0.000 7)	(0.000 1)	(0.000 0)
1997	18.085 27	22.974 68	36.170 55
	(0.000 0)	(0.000 0)	(0.000 1)
1998	24.535 38	27.093 60	49.070 75
	(0.000 0)	(0.000 0)	(0.000 0)
1999	20.574 08	24.677 39	41.148 16
	(0.000 0)	(0.000 0)	(0.000 1)
2000	8.679 801	14.516 34	17.359 60
	(0.003 5)	(0.000 7)	(0.000 2)

4 Countermeasures

In order to achieve a dual stabilization of the rural labor force flow and the price of agricultural products, the following countermeasures are put forward:

4.1 Vigorously developing vocational education; increasing the support for agricultural production Developing vocational education is an important way to solve the "Three Agricultural Problems" and to promote the social employment. Under the background of diversified education qualities, agricultural vocational education should change its direction of running school, improve the awareness of service for the rural economy, and cultivate skilled, creative, and application-based workers. At the same time, vocational education should serve the farmer, countryside, and agriculture, and cultivate professional and technical personnel and management talent for agriculture, as well as the new-type farmers with good management and creative skills. Besides, we should combine the agricultural technology extension, science and technology development, poverty relief, and education training together, popularize advanced agricultural technology, improve the scientific and cultural quality of farmers for socialist new countryside construction, integrate vocational education and agricultural technology training, pay attention to the agricultural production and technical education, and maintain high-quality labor force resources under the circumstance of labor force transfer.

4.2 Making active employment measures We should establish rural social security system as soon as possible, make farmers working outside give up their economic links with agriculture and finally transfer in to cities[28], stabilize the land con-

tract relation in rural areas, implement land systems conducive to the rational flow of rural labor, and remove the worries of farmers transferred. At the same time, we should carry out experimental work of national overall planning of urban and rural employment, speed up the construction of urban and rural labor force market, improve resource information bank of labor force, offer unified services and service standards, make employment plan for urban-rural integration, establish both employment and unemployment registration, and solve the problems in employment and social security of rural labor forces and landless farmers.

References

[1] RANIS G, FEI JCH. Theory of economic development[J]. The American Economic Review, 1961, 51(4):533-558.

[2] LEWIS WA. Economic development with unlimited supplies of labour [C]. Beijing: The Commercial Press, 1984. (in Chinese).

[3] JORGENSON DW. The development of a dual economy[J]. The Economy Journal, 1961, 71(283):309-334.

[4] HARRIS JR, TODARO MP. Migration, unemployment and development:a two-sector analysis[J]. The Economy Journal, 1970, 60 (1): 126-142.

[5] CAI F. The political economy of labor migration[M]. Shanghai: Shanghai People's Publishing House, 2003. (in Chinese).

[6] LU XH, ZHU SF, ZHANG ZH. A positive study on the magnitude of rural-urban migration in China[J]. Chinese Rural Economy, 2006 (11):35-41. (in Chinese).

[7] DE BRAUW A, HUANG JK, ROZELLE S, *et al*. The evolution of China's rural labor markets during the reforms[J]. Journal of Comparative Economics, 2002, 30(2): 329-353.

[8] CHEN WP. The implications of privatizing rural propert rights on labor migration in China[J]. China Economic Quarterly, 2004(10): 163-190. (in Chinese).

[9] DU Y, BAI NS. Out of the villages: an empirical study of rural labor flow in China[M]. Beijing: Economic Science Press, 1997. (in Chinese).

[10] DE BRAUW A, ROZELLE S. Migration and household investment in rural China[C]//China labor economics. Beijing: China Labor and Social Security Publishing House, 2005. (in Chinese).

[11] WANG XW. Migration of rural labor and equilibrium analysis on agricultural production[J]. Seeker, 2007(8):31-32, 181. (in Chinese).

[12] ZHANG SJ, WU RM. Influence of flow of rural labour on agricultural development[J]. Social Sciences in Yunnan, 2002(1):36-39. (in Chinese).

[13] ZHOU PH. Discussing the impact of labor force transferring on development of China's rural economy[J]. Technology Economics, 2007(3):71-75. (in Chinese).

[14] SHENG LY. The economic impact of rural labor flow[J]. Statistical Research, 2007(10):15-19. (in Chinese).

[15] CUI CB, WANG KS. Migration of rural labor and scale operation of agriculture[J]. Issues in Agricultural Economy, 2008(4):48-51. (in Chinese).

[16] TAN RS. Village labor-force flow and chinese economy growth——the substantial evidence study according to the angle of manpower capital[J]. Inquiry into Economic Issues, 2007(4):80-84. (in Chinese).

[17] WU X. Economic situation scanning and forecast at the 15th National Congress of the CPC[J]. China Non-Governmental Science Technology and Economy, 1997(S2):58-75. (in Chinese).

[18] LIU J. The hot issues in the rural reform and development at present[J]. Chinese Cadres Tribune, 1995(9): 6-9. (in Chinese).

[19] LU L, ZHAO CX. Main variables of labor employment in next ten years[J]. Dong Yue Trbune, 1998(4):33-38. (in Chinese).

[20] LI BK. Rural surplus labor force transfer and small town development in China[J]. Urban Problems, 1997(3):11-14. (in Chinese).

[21] GUO ST. Rural labor force differentiation and social structure in China[J]. Contemporary China History Studies, 1998(6):79-88. (in Chinese).

[22] WEI YD. Guidance to policy[J]. Newsletter About Work in Rural Areas, 2004(2):1-4. (in Chinese).

[23] HOU L. Problems in transformation of rural labor force in China and the countermeasures[J]. Population Journal, 2004(6):30-34. (in Chinese).

[24] BAI ZW. Relationship and consideration of socialist new countryside construction and urbanization[J]. Money China, 2006(9):18-21. (in Chinese).

[25] CHEN XW. The problems about agriculture, rural areas and farmers in modern China[J]. Productivity Research, 2005(10):185-191. (in Chinese).

[26] HU JB. Macroeconomics of rural-urban migration in China[J]. Social Science Journal, 2009(9):5-46. (in Chinese).

[27] HE SY. Applied time series analysis[M]. Beijing: Beijing University Press, 2003:55-100. (in Chinese).

[28] ZHANG L. The experience and inspire of foreign surplus labor transfer[J]. Economic Review, 2007(2):56-58. (in Chinese).

[29] WANG DP, PENG JQ, YAN Z. Employment and transfer status of female labor force in rural China[J]. Asian Agricultural Research, 2009, 1(6):4-9.

[30] ZHU WW. Economic analysis on transfer of rural labor force[J]. Journal of Anhui Agricultural Sciences, 2007, 35(25):279-280. (in Chinese).

[31] GUO XH, GE DQ. Characteristics of price fluctuation of agricultural products in China[J]. Asian Agricultural Research, 2009, 1(3): 45-48, 52.

[32] WANG Y. Some advice of prompting the development of agriculture product circulation[J]. China Forestry Economy, 2005(4):50-51. (in Chinese).

[33] LIN YF. New Thoughts in need: A Comment on World Bank's "reaching the rural poor: strategy for rural development"[J]. Journal of Peking University: Philosophy and Social Sciences, 2002, 39 (5):5-8. (in Chinese).

(From page 24)

[5] ZHAO YR. On the feasible matching-cooperation model alternatives of the farmer cooperative economic organizations between Fujian and Taiwan[J]. Taiwan Research Quarterly, 2009(4):34-43. (in Chinese).

[6] QI RH, YANG XH. Study on status and countermeasures of aquatic product export of Zhoushan City[J]. Fisheries Economy Research, 2005(3): 13-18. (in Chinese).

[7] HU QG, HUO XX. Structural analysis of aquatic products trade: based on the comparative advantages[J]. Issues in Agricultural Economy, 2007(12):20-26. (in Chinese).

[8] National Bureau of Statistics of China. China statistical yearbook [M]. Beijing:China Statistics Press, 1988-2007. (in Chinese).

[9] ZHU Y. The effect of ecological barrier on the export of Zhoushan's fishery products and its countermeasures[J]. Economic Tribune, 2006(10): 21-22. (in Chinese).

[10] YU CD, SHANG H. The discussion about development of Zhoushan's recreational fishery[J]. Journal of Zhejiang Ocean University: Nature Science, 2002(1): 9-12. (in Chinese).