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Measuring Transaction Costs in the Chinese Economy (1978-2007)

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RESUMO

Este artigo objetiva medir os custos de transação do setor comercial da China de 1978-2007 nos três níveis industriais e construir um modelo MIMIC empregando os princípios da Modelagem de Equação Estrutural para indiretamente mensurar os custos de transação não-mercadológicos (NTC) na China no nível macroscópico. Estima-se que tanto o valor absoluto quanto relativo dos custos de transação em relação ao PIB evoluíram substancialmente desde as transformações institucionais da China, mas ainda há um hiato relevante entre este pais e os países desenvolvidos. Os NTCs foram reduzidos com a transformação efetiva do sistema e o aperfeiçoamento da infra-estrutura. No entanto, influências negativas decorrentes da expansão de tentativas desarrazoadas de regulamentação pelo Governo estabilizaram a relação NTC/PIB na China. Consequentemente, urge-se pela implementação da reforma política institucional.

Palavras-chave: Custos de transação, Setores de transação, Custos de transação de não-mercado, Medida.
JEL: O43.

ABSTRACT

This paper aims to measure transaction costs of transaction sectors in China during 1978 and 2007 on the three industries' level, and construct a Multiple Indicators and Multiple Causes model by employing the principle of Structural Equation Modeling to measure non-market transaction costs (NTC) in China on the macroscopic level indirectly. It is found out both the absolute size of transaction costs and its proportion in GDP have achieved remarkable progress since China's institutional transformation, but there is still a big gap between China and developed countries. NTC has been reduced obviously with the effective transformation of system and the perfection of infrastructure. However, the negative influences caused by the unreasonable government regulatory control efforts have been expanded, which led to the stabilization of NTC/GDP in China. Consequently, it is urgent to carry out the political institutional reform.

Key words: Transaction Costs, Transaction Sectors, Non-Market Transaction Costs, Measurement.
R: 21/8/10 **A**:29/11/10 **P**: 26/2/11

1. Introduction

Transaction cost is one of the core concepts in the new institutional economics. Whether to admit transaction costs incurred in making an economic exchange constitutes the fundamental difference between the new institutional economics and the neo-classical economics which is the mainstream school in the western countries. As one of the most important variables in economic activities, transaction costs also serves as one restrictive factor for economic growth just as transformation costs from the historical perspective (Wallis & North, 1986).[1]Therefore, Transaction costs are essential to the understanding and appraisals of the economic performances. To put it in a more detailed way, transaction costs not only influences the arrangements of contract, but also affects the amount and types of commodities and services provided in the market (Wang, 2003). It is even no exaggeration to say that transaction costs fundamentally affect what is produced and what exchanges take place in the market, which organizations and specialties survive, which individuals and groups thrive in particular markets, and which rules of the game persist (Benham & Benham, 2004) .

Under the certain institutional circumstances, without considering the initial cost of establishing system, transaction costs can be divided into the two parts, namely transaction costs of transaction sectors and NTC (North, 1986). Transaction costs of transaction sectors falls into the category of measurable parts, it can reflect the level of transaction services in economy, including the transaction fees incurred in the transaction sectors and those incurred due to the state's efforts of maintaining economic order and the corresponding provision of the public services. NTC, on the other hand, is of non-measurable parts, referring to those fees which cannot be measured through the market trade in reality, such as resources spent in waiting, getting permits to do business, cutting through red tapes, bribing officials, and so on.

Measurement of transaction costs is of great theoretical and realistic significance for the new institutional economics. Douglass North has made a pioneering research of transaction costs measurement in 1986, but his research was limited to transaction costs of transaction sectors, and overlooked NTC. Benham, A. & Benham, L. (1998) used the cost of exchange to measure NTC, but his measurement was on the microcosmic level, blank in the research of total transaction costs of the economy. Now in China, all existing researches of transaction costs are measured by the labor award of transaction staff of transaction and transformation sectors, or directly by the industry's added value. However, the result measured in this way seriously deviated from the actual transaction costs. Especially for the developing and transitional country such as China, due to the imperfect development of official transaction sectors in economic exchanges, there are large amounts of non-measurable NTC. Moreover, the criteria for success or failure of reform and the growth characteristics can be illustrated through the changes of NTC. Therefore, a new method is needed.

This paper uses North's theory to re-measure transaction costs of transaction sectors in China during 1978 and 2007 on the three industries' level, and constructs a Multiple Indicators and Multiple Causes (MIMIC) model on the basis of Structural Equation Modeling (SEM) method to measure NTC on the macroscopic level indirectly. Here, we set NTC/GDP as the latent variable, and set government regulation, communication infrastructure, networking development level,

[1] Transformation costs is a concept firstly put forward by North (1986). North defined transformation costs as the costs involved in the material exchange between the mankind and nature, including the expenditures and fees of labor, land and capital concerned in the implementation of producing transformation process.

effective transformation of system, actual GDP and such measurable variables as the cause variables and index variables of the latent variable, then calculate by the software Amos 7.0 the value of the latent variable and the influence of cause variables upon NTC (i.e. the loading factor). To be brief, the measurement theory stated in this paper on one hand validates whether the variation of China's transaction costs coincides with the historical experience of developed countries, and on the other hand evaluates from the perspective of transaction costs the economic achievements of China in the transition period, and finds out the crux decisive for China's high NTC.

2. Literature Review

In North & Wallis (1986) paper entitled '*Measuring the Transaction Sector in the American Economy: 1870-1970*,' he made a pioneering research into the measurement of transaction costs of transaction sectors. All subsequent foreign researches borrowed his ideas and came to conclusions identical to North & Wallis (1986) (Dollery & Leong, 1998; Ghertman, 1998; Dagnino-Pastore & Farina, 1999; Van Dalen & Van Vuuren, 2005 et al.). In the context of economic growth in the United States, transaction sectors are undergoing a soaring transaction costs (Details may be seen in the summary of Wang (2003), and will not be elaborated in this paper). Chinese economists have also made endeavors to measure China's transaction costs based on North & Wallis (1986) (Mou & Chen, 2002; Jin & Zhang, 2004; Lu & Li, 2008). However leaving a series of defects, which are mainly represented in the following two aspects.

Firstly, the interpretation of transaction sectors' transaction costs is partial and biased. It advocates that transaction costs as the friction of the economic system, will impact on the allocation efficiency of economic resources; and desirable economic growth should gradually impair the proportion of transaction costs in GDP. It is true that the decrease of transaction costs boosts economic growth, and transformation of economic system is to save transaction costs (Williamson, 1985; North, 1986 et al.). However, such saving is not referred to the total transaction costs, but to the waste of resources in the process of economic operation, and to the cost of every specific transaction. Amid the extension and intensification of labor division, as well as the improvement of production efficiency, people are more and more correlated to and dependent on each other, and impersonal exchange becomes more and more frequent. Unavoidably, the total transaction costs of transaction sectors are bound to rise. This theory can be further validated by quantitative research of North (1986): desirable economic growth will definitely enhance the proportion of transaction costs of transaction sectors.

Secondly, the precision of costs measurement is to be improved. In the present measurement studies, there are no set rules for the division of transaction sectors or the measurement ways of transaction costs. These are the direct influential factors for the measurement result. Mou & Chen (2002) have measured transaction costs of transaction sectors in China during 1978 and 2000 on North & Wallis (1986) framework. Their measurement is on the basis of labor division, where all employees are classified into two groups: one is to provide transaction services, and the other is to provide transformation services. Correspondingly, payment to them is classified into transaction costs and transformation costs. Jin & Zhang (2005) take the advantages of existing accounting data to measure the external transaction costs of China during 1991 and 2002 by the added value of

transaction sectors[2]. Lu & Li (2008) have measured transaction costs in Chinese provinces from the perspective of three industries, and directly set the proportion of the added value of transaction activities in the entire economy as the relative value of transaction costs.

Therefore, all existing researches of transaction costs in China are measured by the labor award of transaction staff of transaction and transformation sectors, or directly by the industry's added value. However, the result measured in this way seriously deviated from the actual transaction costs. In North's view, transaction costs are in nature identical to transformation costs. It reflects the consumption of all resources in the course of transaction of economic activities. Measuring simply by the added value of transaction sectors will exaggerate the actual transaction costs. Besides, transaction costs are defined as the value of all input factors consumed by the sector. It is not purposed to measure the contribution made by the sector to economic growth. This is why added value shall not be the criterion. Similarly, measurement simply by labor division only puts the consumption of resources belonging to the transaction staff into consideration, but reckons out the material and financial consumption input in transactions. North & Wallis (1986) have also pointed out that division of transaction sectors shall also be standardized, since they are crucial to the accuracy of measurement results of transaction costs. With these facts, this paper tries to overcome all these defects on the basis of existing literatures, and to improve and develop the measurement studies of transaction costs of transaction sectors in China.

Besides, China is almost blank in the study of NTC measurement. Benham & Benham (1998) offered the concept of the cost of exchange, which means that under the certain institutional environment, the total opportunity cost for an individual to acquire a certain commodity by certain means of exchange can be measured by the money and time cost consumed in fulfilling the transaction. He compared the cost of exchange of different countries in installing commercial telephones, transferring assets ownership and importing cranks of large excavators. The results show that in different countries, the difference of money price of intermediate commodities is far less than the difference of the cost of exchange, and it is flimsy as in traditional studies to use the open price to measure the opportunity cost. That's why Alexandra Benham and Lee Benham's measurement of NTC is microcosmic. In this paper, the author tries to probe into the most rational methodology in measuring the total NTC in China and its trend of fluctuation. However, due to the non-observable nature of NTC and the limitation of the current statistical data, the direct measurement of NTC scale is almost impossible. Hence we can only conduct the measurement through some indirect methods (Cheung, 2000). This paper aims to establish the measurement system of NTC in China in the construction of MIMIC model by using the principle of SEM. The scale of NTC in China during the period from 1978 to 2007 will be estimated to reveal the relationship between transaction costs and the economic growth since China's reform indirectly.

3. Transaction Costs of Transaction Sectors

In accordance with sector division rules of North (1986), we sub-group the 20 sectors classified by the *Industrial Classification for National Economic Activities (GB/T4754-2002)* as in Table 1:

[2] Jin et al. (2005) define the external transaction costs as the cost incurred by sectors which provide transaction services specifically to the economic subject (transformation sectors).

Table 1: Division of China's Transaction Sectors (GB/T4754-2002)

Private Transaction Sectors		Public Transaction Sectors	
Transaction Sectors	Transformation Sectors	Transaction Services	Transformation Services
Finance; Insurance; Real estate trade Wholesale and retail trade; Tenancy and business services	Agriculture, Forestry, Farming of Animals and Fishery; Mining; Manufacturing; Production and Distribution of Electricity, Gas and Water; Construction; Traffic, Transport and Storage; Information Transfer, Computer and Software; Accommodation and Restaurants; Resident Services and Other Services	Post; Public Management and Social Organization; International Organizations	Education; Management of Water Conservancy, Environment and Public Establishment; Scientific Research, Technical Service and Geological Prospecting

Note : The division of transaction sectors for 1978-2002 is based on the *Industrial Classification and Codes for National Economic Activities (GB/T4754-94)*. Details may be referred to *China Labor Statistical Yearbook 2008.*

From Table 1, we can see that from the perspective of the three industries, all sectors in the primary and secondary industries belong to private transformation sectors, while the tertiary industry involve private transaction sectors, public transaction services and public transformation services. By separately measuring transaction costs of the primary, secondary and tertiary industries, we can get the total transaction costs of transaction sectors in China. The detailed measurement results are listed in Table 2 below:

Table 2: Transaction Costs Size and Constituents of Transaction Sectors in China during 1978 and 2007

Year	Transaction Costs of the Primary Industry	Transaction Costs of the Secondary Industry	Transaction Costs of the Tertiary Industry	Total Transaction Costs (Current Price)	The Proportion of Transaction Costs in GDP.	Real Total Transaction Costs
1978	0.117	67.306	675.559	742.981	0.204	742.981
1979	0.129	76.702	670.223	747.054	0.184	733.124
1980	0.147	90.655	743.053	833.855	0.183	761.5116
1981	0.152	95.558	817.046	912.756	0.187	813.508
1982	0.158	101.498	859.763	961.419	0.181	840.402
1983	0.166	106.488	985.696	1092.350	0.183	936.032
1984	0.183	132.494	1348.450	1481.177	0.206	1235.344
1985	0.206	160.812	2035.474	2196.492	0.244	1675.433
1986	0.245	191.959	2376.509	2568.714	0.250	1840.053
1987	0.270	218.938	2872.652	3091.860	0.256	2063.992
1988	0.303	269.309	3737.1451	4006.757	0.266	2252.253
1989	0.327	306.504	4444.773	4751.605	0.280	2263.747

1990	0.361	342.252	4638.916	4981.529	0.267	2302.000
1991	0.384	387.785	5690.157	6078.326	0.279	2715.963
1992	0.419	454.334	7294.962	7749.715	0.288	3254.815
1993	0.429	575.402	9135.168	9710.999	0.275	3555.840
1994	0.575	730.706	12434.964	13166.245	0.273	3883.848
1995	0.690	951.432	15390.720	16342.842	0.269	4117.622
1996	0.739	1022.171	17899.682	18922.592	0.266	4401.626
1997	0.788	1050.783	20473.949	21525.521	0.273	4871.130
1998	0.750	970.818	22831.912	23803.480	0.282	5429.626
1999	0.759	981.233	25033.167	26015.159	0.290	6019.241
2000	0.780	1027.390	28231.891	29260.061	0.295	6741.950
2001	0.805	1082.631	32101.726	33185.161	0.303	7593.859
2002	0.834	1181.269	35868.860	37050.964	0.308	8546.935
2003	0.968	1335.043	39856.055	41192.067	0.303	9389.575
2004	1.006	1537.584	45531.116	47069.706	0.294	10326.833
2005	1.040	1820.105	51623.837	53444.983	0.291	11518.315
2006	1.138	2181.755	60221.611	62404.504	0.295	13249.364
2007	1.293	2613.343	71935.394	74550.030	0.299	15103.329

From Table 2, we can intuitively see that in the climate of economic growth, the absolute amount of the actual transaction costs after the price variation factor is deducted soared from RMB 74.2981Billion in 1978 to RMB 1510.3329 Billion in 2007 – an increase of 20 times. It indicates that from 1978 to 2007, the transaction sectors in China have gradually enlarged the absolute size of transaction costs. From the comparative figures, we see an augmentation of the proportion of transactions costs in GDP. In order to test whether the proportion of transaction costs in GDP has significantly changed during the sample period, i.e. whether the time series is stable, we test the unit root by means of the ADF test and the software Eview6.0 in the form of (c, 0,1), and get the following results:

Table 3: Results of ADF Test

ADF test Statistic	-1.966529	1% Critical Value	-3.689194
		5% Critical Value	-2.971853
		10% Critical Value	-2.625121

The statistical value by the ADF is -1.966529, and the absolute value is below the critical value of significance level. Therefore, the assumption of ADF test shall be adopted, i.e. the relative transaction costs in the sample period are not stable. It shows that since China's institutional transformation, both the absolute size of transaction costs and its proportion in GDP have achieved remarkable progress. This coincides with North (1986). Therefore, we can conclude that with China's economic growth, China's transaction sectors are embracing an ascending transaction costs. And from the descriptive statistics of this series (Table 4), we see that since the reform and opening up, the average proportion of transaction costs in GDP is 25.09%, and the fluctuation range stays 18.06-30.79%, which indicates a big gap between China and developed countries in transaction service level.[3]

[3] North & Wallis (1986) measured that as early as in 1970, the total transaction costs of American transaction sectors accounted for 45% of GNP.

Table 4: The Average Proportion of Transaction Costs in China during 1978 and 2007

Index	Value (%)
Mean	25.90
Median	27.29
Standard Deviation	4.21
Minimum	18.06
Maximum	30.79
Sample Interval	30

Besides the analysis of the fluctuation trend of transaction costs, we can calculate by the figures in Table 2 the relative value of transaction costs of three industries (Figure 1). From up to down, four lines in Figure 1 are the proportion of total, the Tertiary, secondary and primary industrial transaction costs of transaction sectors in GDP. Figure 1 visually displays the structural features of the variation of transaction costs, from which we can see that since the reform and opening up, transaction costs of China's transaction sectors mainly derive from the tertiary industry, and the fluctuation trend of transaction costs of sectors in this industry determines the tendency of transaction costs of all transaction sections. Meanwhile, transaction sectors in the primary and secondary industries occupy a rather low transaction costs proportion in GDP, and such a low proportion is even diminishing year by year.

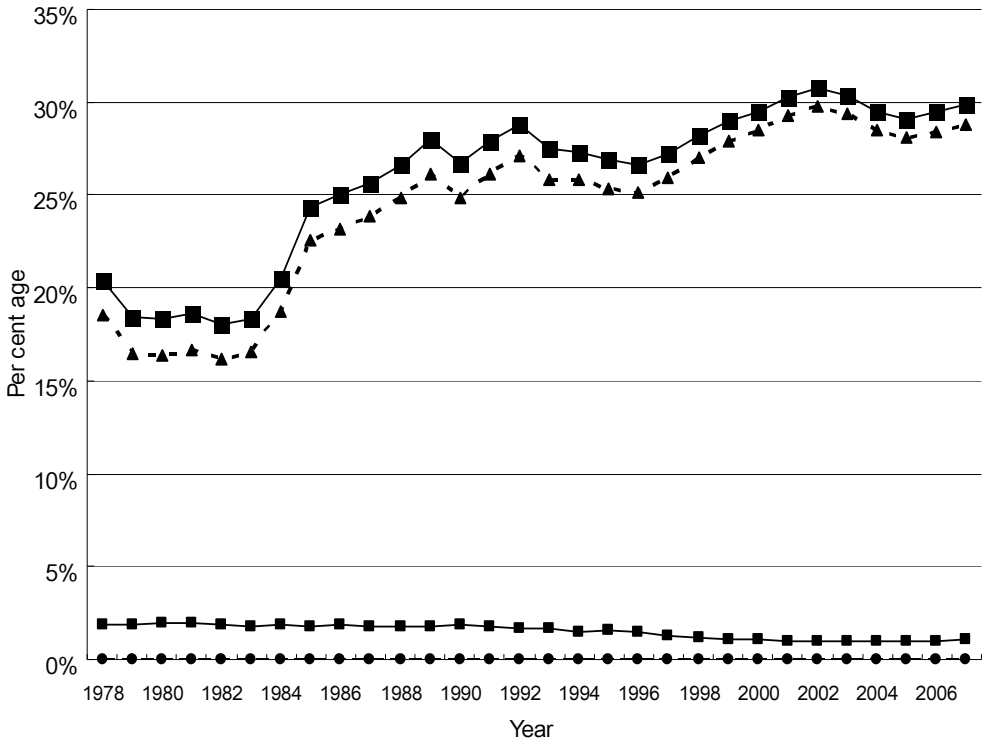

Figure 1: Transaction Costs Size and Constituents of Transaction Sectors in China during 1978 and 2007

4. MIMIC Model

About the reliability of model approach, since the first point out by Jöreskog and Goldberg, it has improved its statistical accurateness. As Colley (1978) writes, this approach allows to establishing the plausibility of a theoretical model and to determine the degree to which the explanatory variables have an effect on the unobservable variable. Giles (1998) find that the strength of MIMIC lies in not only it takes explicit account of both indicators of latent variable, and potential causes, in a rigorous structural model, but also this framework facilitates formal statistical testing of this relationship. According to Schneider and Nest (2000), the MIMIC approach allows wide flexibility in its framework, therefore it is potentially inclusive of all the indirect methods and thus theoretically, superior to others. Cesar (2001) emphasis that, in contrast with other indirect methods, it does not need restrictive or implausible assumption to operate (with exception of the "calibrating value").Below, the identification process of a MIMIC of a single latent variable is described.[4]

The unobserved variable η is linearly determined, subject to a disturbance ζ , by a set of observable exogenous causes χ_1 , χ_2 , ..., χ_q .

$$\eta = \gamma_1\chi_1 + \gamma_2\chi_2 + ... + \gamma_q\chi_q + \zeta \qquad [1]$$

The latent variable η determines, linearly, subject to a disturbance $\varepsilon_1, \varepsilon_2, ..., \varepsilon_m$, a set of observable endogenous indicators y_1 , y_2 ,... y_p .

$$y_1 = \lambda_1\eta + \varepsilon_1,\ y_2 = \lambda_2\eta + \varepsilon_2, ..., y_p = \lambda_p\eta + \varepsilon_p \qquad [2]$$

The structural disturbance ζ ,and measurement errors ε_i are all normal distributed, mutually independent and all variables are taken to have expectation zero.

Considering the vectors:

$x' = (x_1, x_2, ..., x_q)$ Observable exogenous causes
$\gamma' = (\gamma_1, \gamma_2, ..., \gamma_q)$ Structural parameters (Structural Model)
$y' = (y_1, y_2, ..., y_p)$ Observable endogenous indicators
$\lambda' = (\lambda_1, \lambda_2, ..., \lambda_p)$ Structural parameters (Measurement Model)
$\varepsilon' = (\varepsilon_1, \varepsilon_2, ..., \varepsilon_p)$ Measurement errors
$v' = (v_1, v_2, ..., v_p)$ Standard deviations of the ε ' s

The [1] and [2] are wrote as:

$$\eta = \gamma' x + \zeta \qquad [3]$$
$$y = \lambda\eta + \varepsilon \qquad [4]$$

Assuming:

[4] See Jöreskog K.G. and Goldberg A.S. (1975), p. 631-632.

$$E(\zeta) = E(\varepsilon_i) = 0 \quad E(\zeta^2) = \sigma^2 \quad E(\varepsilon\varepsilon') = \Theta^2$$

Where:

$\underset{(p\times p)}{\Theta}$ is diagonal matrix with v, displayed on its diagonal.[5]

The model can be solved for the reduced-form as function of observed variables:

$$y = \lambda(\gamma' x + \zeta) + \varepsilon = \Pi' \chi + v \qquad [5]$$

The reduced-form coefficient matrix is:

$$\Pi = \gamma\lambda' \qquad [6]$$

The reduced-form disturbance vector is:

$$v = \lambda\zeta + \varepsilon \qquad [7]$$

Finally, the covariance matrix (model-implied):

$$\hat{\sum} = E(vv') = E[(\lambda\zeta + \varepsilon)(\lambda\zeta + \varepsilon)'] = \sigma^2\lambda\lambda' + \Theta^2 \text{。} \qquad [8]$$

The basic idea for solution with the MIMIC model is that the covariance matrix for all the observed variables $\Sigma(\theta)$ is a group of functions for the parameters under estimation. If the estimation model is correct, the overall covariance matrix for the observed variable Σ can be repeated accurately.

$$\Sigma = \Sigma(\theta) \qquad [9]$$

Among which, Σ can be replaced by the covariance matrix of (p+q)*1 vector sample composed of all the observed variables, θ is a vector containing the model's parameters under estimation. According to Formula [9], the parameter θ under estimation can be solved, the value of which can be placed into Formula [1] for the value of the potential variable η.

5. Selection of Observable Variables

Previous studies have shown that the appropriate selection of observable variables remains as the prerequisite for establishing MIMIC model .Thomas (1992) states that the only real constraint of this approach is not in its conceptual structure but in the variables chosen. Dell'Anno (2003) points out that SEM is an alternative way to test the consistency of a "structural" theory through data; in this sense it is a largely "Confirmatory", rather than "explanatory" technique. A Researcher

[5] "...In the standard MIMIC model, the measurement is assumed to be independent of each other, but his restriction could be relaxed." Stapleton D.C. (1978), p.53.

should subsequently be more likely to use SEM to determine whether a certain structure is valid, rather than using SEM to "find" a suitable model. The selection principle for the observable variables is the gradual correction of the initial model through the reasonability of the model parameters and the significance test (C.R. Value), based on previous research results.

5.1.Observable exogenous causes

(1) The effective government regulatory control efforts will reduce NTC while the unreasonable government regulating measures will increase NTC. On the one hand, as a powerful third party, the government is capable of restraining the illegal actions such as bribery in an effective style while perfecting the infrastructure construction, offering more educational opportunities, legislating wisely and protecting the property rights etc, all of which will greatly decrease the NTC (Wallis & North, 1986; North, 1987; Hall & Jones, 1999). On the other hand, the unreasonable efforts of the government's interference not only increase the procedures of review and approval, but also engender more corruption to a more severe degree, thus in turn increasing NTC (De Soto, 1989; Sachs & Warner, 1995; Johnson et al., 1997; Campos & Nugent, 1999; Gabre-Madhin, 2001; Hoshi & Balcerowicz, 2002; Djankov et al., 2002; Benham, 1998; 2001; 2004).The index of "government's expenditure/ GDP" is chosen to reflect China's governmental regulatory control for the purpose of this article (Jin, Lu & Chen, 2006).

(2) The improvement of telecommunications infrastructure, informationization and Internetization will reduce NTC to a large degree. The enhancement of telecommunication infrastructure, the development of information industry and Internet technologies will promote the information communication channels, increase the efficiency of production and transaction by reducing the costs of information asymmetry and communications and greatly speeding up the transaction with higher quality, All of the foregoing will lower NTC (Pant & Cheung, 1990; Hendriks, 1999; Zhang, 2002). The two indices, namely "added value of transportation, storage and postal services/ GDP" and "the highway mileage per capita" are chosen to reflect the infomationaization (Jin, Lu & Chen, 2006) and the index of "the proportion of Netizens in the entire population" for the Internet development in China.

(3) The enhancement of the personal qualities will lower NTC. Benham & Benham (1998, 2001, 2004) point out that many factors will affect individuals' cost of exchange, such as skill in negotiation, local knowledge (Hayek, 1945), personal networks and so on. In addition, the more investment in education one country has, the higher productivity and efficiency of transaction is (Schultz, 1961; Walters & Rubinson, 1983). Hongjun (2006) further argues that the improvement of education, literacy and cultural achievements will greatly reduce the transaction utility. Firstly, the education can well improve people's knowledge and skills concerning the production discrimination and transaction handling capacity (such as the literacy, the cognition of property rights and the negotiation skills, etc.) (Schultz, 1961; Becker, 1965; Wright, 1979; Smith, 1990); Secondly, the literacy rate is of essence for an individual to participate in the economic exchange and activities, especially in the trading system based on the property ownerships and written contracts. Consequently, the literacy rate bears more obvious effects in its lowering of transaction costs (Eigen-Zucchi, 2001). The index of "the citizens' average years of being educated" is chosen to reflect the average individual quality level in China.

(4) The effective institutional transformation will lower NTC in China. The economic growth can be made from the reduction of NTC and the change of economic system is for the saving of transaction costs (Williamson, 1985; North, 1986; Cheung, 2000; et al.). Accordingly, the

economization of transaction costs can be regarded as one important criterion for evaluating the performance of economic system transformation. The effective institutional transformation can well reduce the resources waste in the economic operations, save the cost for each transaction and in turn lower NTC. The three indices, namely "the non-nationalization rate", "marketization index" and "opening-up degree" are selected to reflect the degree of institutional transformation in China.

5.2. Observable endogenous indicators

The two indices of "real GDP" and "transaction costs of transaction sectors" are selected as the endogenous variables in the article for the following reasons: first of all, as the operational costs of the economic system (Arrow,1969), the amount of transaction costs will influence the overall economic output; secondly, the more advanced an economic distribution system with more agencies, more non-observable transaction costs will be turned into observable transaction costs with an tendency of increasing the visibility and transparency of the invisible transactions (North, 1986; Miao & Chen, 2002; Zhao, 2006). As a result, NTC will exert the scale of market transaction costs directly. The selection of model variables and the detailed data are listed in Table5.

Table 5: Model Variables and Sources of Data

Var.	Causes	Sources	Annotations
X_1	government's expenditure/ GDP	China Statistical Yearbook	(government's total expenditure -Social cultural and educational expenses- Defense spending)/GDP
X_2	added value of transportation, storage and postal services/ GDP	China Statistical Yearbook	
X_3	the highway mileage per capita		
X_4	the proportion of Netizens in the entire population	China Statistical Survey Report on Internet Development, China Statistical Yearbook	There are missing data from 1978 to 1997
X_5	citizens' average years of being educated	China Education Yearbook, Demographic Yearbook of China China Statistical Yearbook, People's Republic of China Yearbook	A Reference to Changzheng Zhang et al.(2006),"An Empirical Study on Education Equality Based on Education Gini Coefficient in China: 1978-2004"
X_6	non-nationalization rate	China Statistical Yearbook	A Reference to Yuguo Jin(2001), "The Contribution of Macro-system Changes to China's Economic Growth During the Transition Period"
X_7	marketization index		
X_8	opening-up degree		
Var.	Indicators	Sources	Annotations

Y_1	real GDP	China Statistical Yearbook	GDP/deflator of GDP
Y_2	transaction costs of transaction sectors	China Statistical Yearbook Second National Agricultural Census, Third National Industrial Census	A Reference to Xianxiang Lu (2008),"Institutional Transition, Economic Growth, and Transaction Costs, Empirical Analysis on Chinese Provinces and Cities"

6. Model Identification

In order to identificate MIMIC model, one loading factor of the endogenous variables [6]shall be fixed, i.e. to choose one scale variable. The common practice in the previous studies is to fix the loading factor for GDP at 1 or -1, the selection of plus or minus shall depend on whether the model results can fit the theoretical and experiential assumption under the circumstances of different values (Giles D., 1998; Dell'Anno & Schneider, 2003; Wang & Lin et al., 2006). Taking this into account, "real GDP" will be set as the scale variable with a loading factor of 1. The first order difference will be conducted on the time-series before figuring out the maximum likelihood by using the SEM model non-stability data adjustment method put forward by Bollen (1989). The initial model is a MIMIC 8-1-2 model containing all the variables listed in Table 5 (as shown in Figure 2). The model and the corresponding remedy process will be shown in Table 6.

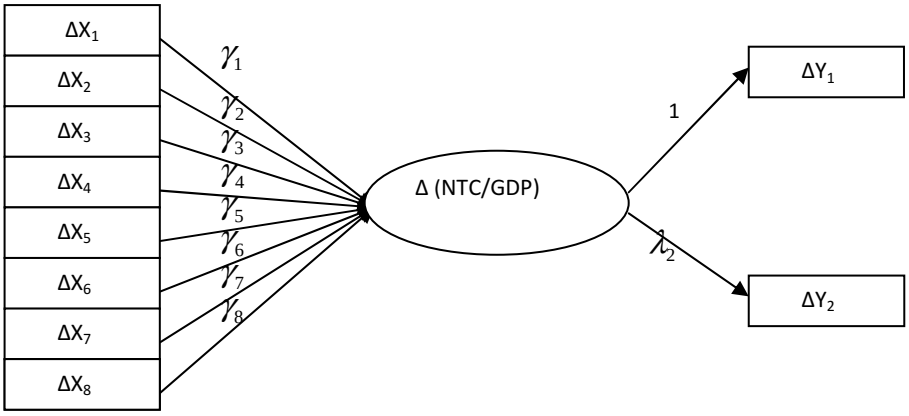

Figure 2 Initial Model: MIMIC8-1-2
Note: the form of differentiation is decided by the fact that all the observable variables are undergone the treatment of first order difference stabilization. Consequently, the potential variable in formula [1] shall be transformed in the same style.

[6] The regression coefficient between the potential variable and the observable variable is called loading factor.

Table 6: Model Remedy Process

Model	ΔX_1	ΔX_2	ΔX_3	ΔX_4	ΔX_5	ΔX_6	ΔX_7	ΔX_8	ΔY_2
MIMIC 8-1-2	0.031 (0.017)	-0.005 (0.230)	-0.001 (0.054)	0.075 (***)	-0.016 (0.852)	-0.017 (0.775)	-0.059 (0.023)	0.089 (0.006)	0.358 (***)
MIMIC 7-1-2	0.031 (0.018)	-0.005 (0.222)	-0.001 (0.056)	0.074 (***)	-0.014 (0.871)		-0.059 (0.023)	0.088 (0.006)	0.356 (***)
MIMIC 6-1-2	0.028 (0.029)	-0.005 (0.187)	0.000 (0.090)	0.067 (***)	0.002 (0.982)		-0.054 (0.031)		0.347 (***)
MIMIC 5-1-2	0.037 (0.009)	-0.003 (0.485)	-0.001 (0.011)		-0.090 (0.338)		-0.058 (0.046)		0.406 (***)
MIMIC 4-1-2	0.037 (0.009)		-0.001 (0.010)		-0.092 (0.328)		-0.057 (0.050)		0.408 (***)
MIMIC 3-1-2	0.037 (0.008)		-0.001 (0.015)				-0.060 (0.043)		0.398 (***)

Note: all those in the parentheses are the corresponding p value of each loading factor, i.e. the probability of the loading factor. Normally p shall be less than 0.05. (***) refers to the significant difference from 0 at the level of 1 percent.

According to Table 6, we can see that the final model is MIMIC3-1-2. The corresponding results concerning the significance test of the model loading factors and the overall Goodness-of-Fit test are illustrated in Table 7 and 8. According to the testing results, all the parameters are significantly different (as the corresponding p value of C.R in the parameters significance test are all less than 0.05) and the model fit index meets the optimal standard, which clearly demonstrates the excellent overall goodness-of-fit.

Table 7: Significance Test of Loading Factors

Var.	Unstandardized loading factors	S.E	C.R.	p	Standardized loading factors
ΔX_1	0.037	0.014	2.658	0.008	0.454
ΔX_3	-0.001	0.000	-2.431	0.015	-0.436
ΔX_7	-0.060	0.030	-2.023	0.043	-0.371
ΔY_1	1				0.968
ΔY_2	0.399	0.034	11.554	***	0.994

Note: C.R. (Critical Ratio) test is similar to the t test in the regression analysis. It is based on the original assumption that the corresponding unstandardized loading factor is zero and the C.R. value is equal to the rate of unstandardized loading factor to the standard error (S.E).

Table 8: Overall Goodness-of-Fit Test

Fit Indices	Indices	Factual Value	Evaluation Criteria
Absolute Fit Indices	Unbiased Goodness-of-Fit Index (GFI)	0.933	>0.9
	Root Mean Square Residual (RMR)	0.000	<0.05, the smaller the better
	Root Mean Square Error of Approximation (RMSEA)	0.032	<0.05, the smaller the better
Relative Fit Indices	Normed Fit Index (NFI)	0.945	>0.9, close to 1 the more the better
	Tucker-Lewis Index(TLI)	0.997	>0.9,close to 1 the more the better
	Comparative Fit Index (CFI)	0.998	>0.9, close to 1 the more the better

Note: the foregoing table is quoted from Page 185 in *Methods and Application of Structural Equation Modeling* composed by Danhui Yi. For the details, please refer to Amos 7.0 User's Guide, Page 489.

7. Results of the Model

Amos7.0 software provides two types of estimation, i.e. the standardized and unstandardized estimation. The loading factor resulted from the unstandardized estimation is the unit of potential variable caused by the change of one unit of each variable, while the standardized estimation is to transform the original fraction of each variable into the Z fraction, among which $Z = (X - \overline{X})/S$, Z measures the standard deviation of the potential variable caused by the standard deviation of each variable. It is to estimate the comparative change of each variable. So the standardized loading factors of each variable can be compared to each other directly. The estimated results of the final model MIMIC3-1-2 are illustrated in Figure 3 and 4.

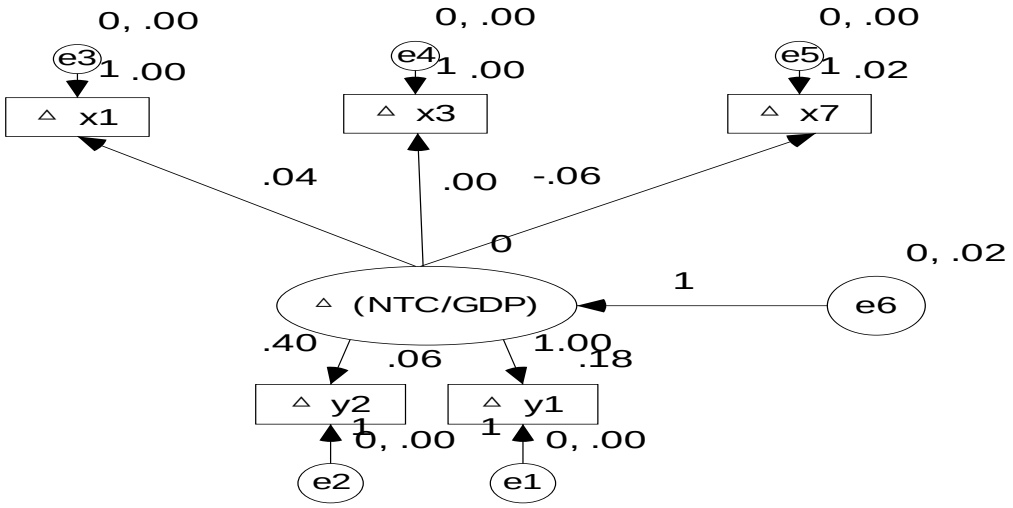

Figure 3 Results of the Unstandardized Estimation.

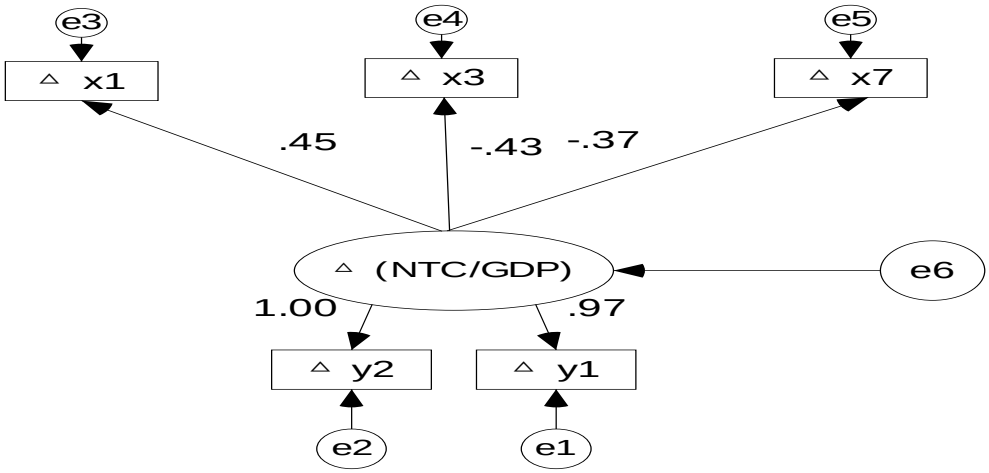

Figure 4 Results of the Standardized Estimation.

Based on the above analysis, we can see that the scale of NTC in China is mainly restrained to the three factors, namely the government's regulatory control, the development of infrastructure and the degree of institutional transformation. The government's regulatory control is positively correlated to the scale of NTC while the development of infrastructure and the degree of institutional transformation are negatively correlated to the scale of NTC. Where the other conditions remain unchanged, the increase of 1 percent in the rate of government expenditure to GDP will bring forth the increase of 3.7 percent in the rate of NTC to GDP; the increase of 1 unit of the highway mileage per capita will lower 0.l percent of the NTC/GDP rate; the increase of 1 unit in marketization index will be accompanied with the decrease of 6 percent in the NTC/GDP rate. In addition to this, given the comparison of standardized loading factor values of the model, the absolute value of the loading factor for government expenditure/ GDP is the largest one. Where the other conditions remain unchanged, the rise of one unit of standard deviation in the rate of government expenditure to GDP will be accompanied by 0.454 unit of standard deviation in the NTC/GDP rate. From the analysis, we can see that the unreasonable government's regulatory control serves as one of the most important reason for the high scale of NTC in our country.

The equation of Model MIMIC3-1-2 is listed as Formula [10] in which the parameter estimated values are entered to form Formula [11]. According to Formula [11], the changing rates of NTC/ GDP during the period from 1978 to 2007 are displayed in Table 9.

$$\Delta \frac{NTC_t}{y_{1t}} = \gamma_1 \Delta X_{1t} + \gamma_3 \Delta X_{3t} + \gamma_7 \Delta X_{7t} \qquad [10]$$

$$\Delta \frac{NTC_t}{y_{1t}} = 0.037 * \Delta X_{1t} - 0.001 * \Delta X_{3t} - 0.060 * \Delta X_{7t} \qquad [11]$$

Table 9: Changing Rates of NTC /GDP in China during 1978 and 2007

Year	Δ (NTC/GDP)	Year	Δ (NTC/GDP)
1978	—	1993	0.000503
1979	-0.002	1994	-0.00115
1980	-0.00557	1995	0.000306
1981	-0.00202	1996	-0.00111
1982	-0.00137	1997	0.000118
1983	-0.00322	1998	-0.00197
1984	-0.00232	1999	0.001359
1985	-0.00525	2000	0.000764
1986	-0.00156	2001	-7.9E-06
1987	-0.00192	2002	0.0006
1988	-0.0025	2003	-0.00054
1989	-0.00068	2004	-0.00092
1990	0.00017	2005	-0.00024
1991	-0.00129	2006	-0.00024
1992	-0.00179	2007	-0.00028

In order to further estimate the concrete values of NTC/GDP rate in China for each of the past years, the NTC/GDP value of a certain year during the testing period from 1978 to 2007 should be picked as the base value. The base value is selected form the *China Sustainable Development Strategy Report 2002*, which was released in March 2002 and showed that "Supposing the comprehensive average cost of development in the world is 1 dollar, the comprehensive average cost of development in China shall be 1.25 dollars." It means that in the normal development of economy in the world, the transaction made at the cost of 1 shall be made at the cost of 1.25 dollars in China. That is also to say that for the same output, transaction costs in China shall be 25 percent higher than that of the global average level. And this part of 25 percent is exactly the loss of low efficiency in the economic development of China that is exceeding the global average speed. It is assumed in the paper that the value of NTC/GDP rate was 0.25 in 2001, based on which the value of NTC/GDP rates from 1978 to 2007 are illustrated in Table 10 and the corresponding continuous changing tendency is displayed in Figure 5.

Table 10: Value of NTC/GDP Rates during 1978 and 2007

Year	NTC/GDP	Year	NTC/GDP
1978	0.2825	1993	0.25169
1979	0.2805	1994	0.25054
1980	0.27493	1995	0.25084
1981	0.27291	1996	0.24974
1982	0.27154	1997	0.24986
1983	0.26832	1998	0.24789
1984	0.26601	1999	0.24924
1985	0.26075	2000	0.25001
1986	0.2592	2001	0.25
1987	0.25727	2002	0.2506

1988	0.25477	2003	0.25006
1989	0.25409	2004	0.24914
1990	0.25426	2005	0.24889
1991	0.25298	2006	0.24865
1992	0.25119	2007	0.24837

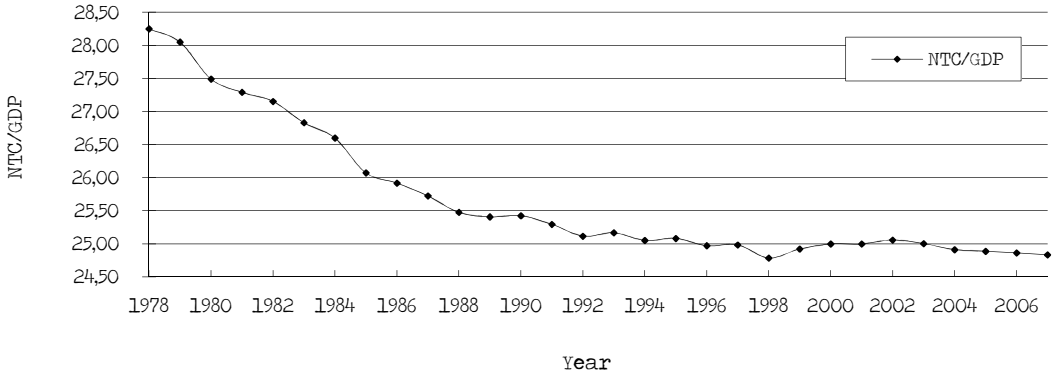

Figure 5: Changing Tendency of NTC/GDP Rates from 1978 to 2007

According to Figure 5, the rate of NTC/ GDP is on the drop since China's reform and opening up with small range of decrease. From 1978 to 2007, China only witnessed a drop of 3.5 percent in the rate of NTC/GDP. Besides, the rate of NTC/GDP has been fluctuating around 25% since 1992, showing a mild characteristic of stabilization.

8. Conclusion

This paper uses North's theory to re-measure transaction costs of transaction sectors in China during 1978 and 2007 on the three industries' level, and constructs a MMIC model on the basis of SEM method to measure NTC on the macroscopic level indirectly, and quantifies the main factors that influence the scale of NTC in China. It can be concluded and revealed that:

Firstly, it shows that since China's institutional transformation, both the absolute size of transaction costs and its proportion in GDP have achieved remarkable progress. This coincides with North (1986). Therefore, we can conclude that with China's economic growth, China's transaction sectors are embracing an ascending transaction costs, but there is still a big gap between China and developed countries in transaction service level. Meanwhile, transaction costs of China's transaction sectors mainly derive from the tertiary industry, transaction sectors in the primary and secondary industries occupy a rather low transaction costs proportion in GDP, and such a low proportion is even diminishing year by year. Studies have shown that since the reform and opening up, the contribution to economic growth made by China's secondary industry maintains above 40%. Such a sharp contrast between the huge industrial added value and the low and even diminishing auxiliary transaction service level on one hand reveals that China's booming economic growth is mainly dependent on the massive influx of productive resources during 1978 and 2007, and on the other hand points out the way to upgrade China's transaction service level, which is to further improve the service industry, to promote the development of agricultural service sectors, and more importantly,

to accelerate the evolution of the auxiliary transaction service of transformation sectors in the secondary industry.

Secondly, it is found out that the scale of NTC in China has been reduced obviously with the effective transformation of system and the perfection of infrastructure since China carries out its reform. However, the negative influences caused by the unreasonable government regulatory control efforts have been expanded. As a result, it has partly counteracted the effect of system transaction and the improving infrastructure, which led to the stabilization of NTC in China. We can get the result that China's economic system reform in transition period is successful as it significantly reduced NTC. However, enhancing the efficiency of government's regulatory control constitutes one of the most severe challenges in the social and economic development.

Last but not the least, despite the fact of continuous rapid growth of 30 years stimulated by the resources utilization and the expanding export demand, the scale of NTC in China is also increasing incessantly, which has not been transferred into transaction costs of transaction sectors obviously (seen from the loading factor listed in Table 7 that of NTC and transaction costs of transaction sectors maintain a positive correlation),[7] this is inconsistent with the historical experience of developed countries. So it can be concluded that the total sum of rents accompanied with the GDP growth is in large amount. The large volume of rents can be taken as the main decisive factor for the increased differentiation between the rich and poor and the high Gini coefficient. To solve this problem, it is urgent to carry out the political institutional reform, just as the late President Deng Xiaoping said, "The economic system reform cannot be conducted successfully in the absence of political institutional reform". Consequently, for a long period in the future, we should not only deepen the economic institutional reform unswervingly and improve the infrastructure construction in the backward region, but correctly distribute the power and authorities between different parties and regulate the government's actions through the legal system construction. In order to reduce NTC, the public's role of control and supervise the government shall be strengthened to prevent that the phenomena of lease contract through nepotism and favoritism might interfere the normal operation of reform, [8]which serves as the key for the realization of long-term sustainable development of economy in China.

9. References

Aiting, X. & Xu, J. L. (2007) The size of non-observed economy in China - a new discovery based on MIMIC model and economics census data. *Statistical Research*, v.9, p.30-36.

Becker, G.. S. (1965). A theory of allocation of time. *The Economics Journal*, v.75, p.493-517.

Benham, A. & Benham, L. (1998) Measuring the costs of exchange. *The Ronald Coase Institute and Washington university in St. Louis*.

Benham, A. & Benham, L. (2001) The cost of exchange. *The Ronald Coase Institute and Washington university in St. Louis*.

[7] According to the experiences of some developed countries, with the economic development and deepening of social division, a state's NTC will gradually turn into transaction costs of transaction sectors (Wallis & North,1986).

[8] The Chinese economist Jinglian Wu argues that the execution of a contract cannot be guaranteed without the legal system established in accordance with the constitutional principles and the independent and just judicature against the background of modern market economy in which impersonal transactions takes up a leading position. Under such circumstances, the participants of economic activities have to seek the shelter from the government to protect their own properties. In order to solve this problem, the political institutional reform can be the only solution (cited from *China Economic Times*).

Benham, A. & Benham, L. (2004). The costs of exchange: an approach to measuring transactions costs. *The Ronald Coase Institute and Washington university in St. Louis,* 2004.

Bollen, K. A. (1989) *Structural Equations with Latent Variables*. New York: John Wiley &Sons.

Campos, N. & Nugent, J. (1999) Development performance and the institutions of governance: evidence from East Asian and Latin America. *World Development*, v.27, p.439-452.

Changzheng, Z., Huan, Z. & Li, H. (2006) An empirical study on education equality based on education Gini coefficient in China: 1978-2004, *Tsinghua Journal of Education*, v.2, p.10-14.

Cooley, W. W. (1978) Explanatory observational studies. *Educational Researcher*, p.9-15.

Dagnino-Pastore, J. M. & Farina, P. E. (1999) Transaction costs in Argentina *Paper presented at ISNIE*.

Yi, D. (2008) *Methods and Application of Structural Equation Modeling*. Beijing: Press of People's University of China.

Dell'Anno, R. (2003) Re-estimating the shadow economy in Italy: a structural equation approach, *university of Aarhus*, Department of Economics, DK, Working paper, 7.

De Soto, H. (1989) *The Other Path*. New York: Harper & Row.

Dollery, , B. & Leong, W. H. (1998). Measuring the transaction sector in the Australian economy, 1911-1991. *Australian Economic History Review*, v.38, p.207-231.

Eigen Zucchi, C. (2001) The Measurement of transaction costs, *unpublished doctoral dissertation*, department of Economics, George Mason University, USA.

Gabre-Madhin, E. Z. (2001) Market institutions, transaction costs and social capital in Ethiopian grain market. *International Food Policy Research Institute*, Washington D. C.

Ghertman, M. (1998, September) Measuring macro-economic transaction costs: a comparative perceptive and possible implications, *second Annual Meeting of the International Society for New Institutional Economics*, Paris.

Giles, D. E. A. (1998) The underground economy: minimizing the size of government. *Working Paper*, department of Economics, University of Victoria, Canada.

Hall, R. & Jones, C. (1999) Why do some countries produce so much more output per worker than others ? *Quarterly Journal of Economics*, v.114, p.83-116.

Hendriks, P. (1999) Why share knowledge, the influence of ICT on motivation for knowledge sharing. *Knowledge and Process Management*, v. 6, p.91-100.

Zhao, H., Yin, B. & Sun, C. (2006). Transaction efficiency, industrialization and urbanization: a model and empirical evidence to understand China's economic development. *China Economic Quarterly*, v.7, p.1041-1063.

Joreskog, K.G. & Goldberger, A. S. (1975) Estimation of a model with multiple indicators and multiple causes of a single latent variable, *journal of American Statistical Association,* v.70, p.631-639.

Cheng, L. (2008) Co-integration analysis on the relationship between educational equity and social equity. *Journal of Zhongnan University of Economics and Law*, v.3, p.21-25.

Renbin, M. & Chen, Z. (2002) Transaction costs and economic growth in China. *Statistical Research*, v.8, p.4-21.

Wang, N. (2003) Measuring transaction costs, an incomplete survey. *The Ronald Coase Institute*, working Paper Series, v.2, p.1-16.

North, D.C. (1990) *Institutions, institutional change and economic performance*. Cambridge University Press.

Pant, S. & Hsu, C. (1996) Business on the web: strategies and economics. *Computer Networks and ISDN System*, v.28, p.1481-1492.

Sachs, J. D., Warner, A. M. (1995) Economic convergence and economic policies. Cambridge, *NBER Working Paper*.

Smith, M. R. (1990) What is new in "new structuralist" analyses of earnings? *American Sociological Review,* v.55, p.827-845.

Schultz, T. W. (1961) Investment in human capital. *The American Economic Review*, v.51, p.1-17.

Schneider, F. & Eneste, D. H. (2000) Shadow economics around the world: size, causes, and consequences. *Journal of Economic Literature*, v.3, p.77-144.

Stapleton, D.C. (1978) Analyzing political participation data with a MIMIC model. *Sociological Methodology*, v.15, p.52-57.

Thomas, J. (1992) *Informal Economic Activity*. LSE Handbooks in Economics, London: Harvester Wheatsheaf.

Van Dallen, H. P., Van Vuuren, A. (2005) Greasing the wheels of trade: A profile of the Dutch transaction sector. *De Economist*, v.153, p.139-165.

Wallis, J. J. & North, D.C. (1986) Measuring the transaction sector in the American economy: 1870-1970.*with a comment by Lance Davis, in long-term factors in American economic growth*, edited by Stanley L. E. and Robert E. G., University of Chicago Press.

Wang, H. M., Lin, Y., & Yu, H. K.A. (2006) MIMIC approach to modeling the underground economy in Taiwan. *Physica A*, v.371, p.536-542.

Williamson, E. (1985). *The Economic Institutions of Capitalism*. New York: The Free Press, 1985.

Wright, E.O. (1979) *Class Structure and Income Determination*. New York: Academic Press, 1979.

Lu, X. & Zhu, Q. (2006). A summarizing of the interrelation of two levels in measuring the transaction cost. *Quantitative and Technical Economics Research*, v.7, p.97-108.

Lu X. & Li, X. (2008). Institutional transition, economic growth and transaction costs - empirical analysis on Chinese provinces and cities. *Economist*, v.3, p.56-64.

Jin, Y. Chen, Z. & Lu, M. (2006). Industry agglomeration in China: economic geography, New Economic Geography and Policy. *Economic Research Journal*, v.4, p.79-89.

Jin, Y. (2001). The contribution of macro-system changes to China's economic growth during the transition period. *Finance and Economics*, v.4, p.24-28.

Jin, Y. & Zhang, W. The statistical measuring of the external transaction cost in China: 1991-2002, and the calculation of system transition performance. *China Soft Science Magazine*, v.1, p.35-40 (2005).