Nexus between privatization and marketization during transition process: an experimental analysis based on China’s provincial panel data

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\textbf{ABSTRACT}

This paper explores the nexus between privatization and marketization in pursuit of insightful implications about effective privatization/marketization policies, particularly in institutionally underdeveloped countries like China. Our hypothesis is that, given a certain level of institutional development, we can identify causal and dynamic relationships between privatization and marketization. If market expansion facilitates private ownership more easily and rapidly than privatization promotes marketization, transition policy should emphasize market expansion even if the ultimate objective is to privatize the entire economy as extensively as possible. We test this hypothesis with panel data from Chinese provinces to draw implications about a dynamic nexus between privatization and marketization vis-à-vis institutional background. We then develop an illustrative analysis comparing privatization-first versus marketization-first policies to examine their cumulative effects on development of private enterprises and markets in subsequent periods.

\textbf{KEYWORDS}

Privatization; marketization; institutionalization; economic transition; China

\section{1 Introduction}

It is a quarter century ago when a radical system transformation started in the former Eastern Europe and the Soviet Union. Meanwhile, heated debate has been repeated surrounding effective transition strategies. China’s gradualism versus Central and Eastern Europe (CEE) and former Soviet Union’s shock therapy is one of the central issues focused on in such a debate. Fundamental differences between these two strategies may be ultimately concerned with the following two questions: (1) whether economic transition should be associated with political democratization and (2) whether ownership transformation, or more specifically massive extension of private property rights (hereafter, privatization), should be performed concomitantly more or less with market development (hereafter, marketization) including price liberalization.

As far as the first question is concerned, China has experienced relatively successful economic transition, at least so far, in terms of its long-run high growth rate, without...
any kind of substantial political reforms. Yet it may be still uncertain whether it will be able to perform fundamental reforms of its economic system, state-owned enterprises (SOEs) in particular, without political reforms.¹ As for the second question, China has definitely employed a gradualist approach of extending markets first without formal as well as large-scale privatization of public enterprises, particularly in key industries, although it has implemented de facto privatization.² This Chinese style of privatization policy seems to have been relatively successful, at least at the present moment, if only for the sake of stimulating market activities, thereby accelerating economic growth. Without formal institutions to carry out privatization, it has certainly allowed a tremendous number and many different kinds of private enterprises to be mushrooming in every corner of the Chinese terrain.³

This paper aims at exploring a nexus between privatization and marketization to obtain an insightful implication about effective privatization/marketization policies, especially in institutionally less developed countries like China.⁴ Our hypothesis is that, given the Chinese experience of privatization and marketization over past 30 years, there must be not only a certain interrelationship but also causal relationship between privatization and marketization. If market can trigger private ownership more easily and effectively than privatization works on marketization, market should be developed first even for the sake of privatizing the entire economy more easily and rapidly. Institutions must be playing a critical role during this process, and how they work is an important issue that deserves to be discussed from many aspects.

The paper is organized as follows. In section 1, we make a brief review of related literature to present our hypotheses about relationships between privatization and marketization vis-à-vis institutional development (hereafter institutionalization) during transition process. In section 2, we set up a framework to examine those hypotheses, focusing on a causal relationship between privatization and marketization. In this section, we define the above three key variables, i.e., privatization, marketization, and institutionalization, then formulate such indices to be used for our statistical tests based on China’s panel data at provincial level, to derive several testable hypotheses. In section 3, we present the results of the statistical analysis and discuss whether those hypotheses can be proved by the real data, followed by several robustness checks on these results in section 4. In section 5, we derive some theoretical and policy implications about a nexus or inter-linkage between privatization and marketization from our findings in the previous section. We compare dynamic effectiveness of privatization-

¹SOEs in China are well known as organizations with powerful vested interests, in which high-ranking government officials, party cadres, or even ordinary workers are deeply involved. They are often criticized as one of the big “nests” of aggravating corruptions.
²By “de facto privatization,” we mean a type of privatization by which, first, the government allows it without formally established rules and institutions as in the case of economic transition in Central and Eastern European countries; second, the state overlooks public enterprises to be run by private hands, at first informally and in secret. Xu (2011) says, “de-facto privatization was tried quietly without official permission from the central government... due to political and ideological constraints, privatization has occurred in a camouflaged form (in China).”
³Most of the TVEs were originally publicly (collectively, in the official terminology) owned, at least nominally, but they have actually been privatized by the end of the twentieth century as an aftermath of the systemic transition (改制) campaigns. Even some of the SOEs were found to be privately owned in reality (see Dollar and Wei 2007).
⁴Our main interest here lies in transition process, since privatization, marketization, and institutionalization are typical structural changes characterizing this process, and China is a unique case for such changes. However, our argument can be relevant even for the development process, since it is, more or less, associated with the same or similar structural transformations.
first policy (let us call it the “shock-therapy-like strategy” here) with marketization-first policy (let us call it the Chinese-style strategy in this paper) to look at their effects on development of private enterprises and markets in subsequent periods. In the final section, we conclude and discuss several limitations inherent in these analyses that should be overcome in further studies.

2 Literature review and hypotheses

As far as we know, there is no author in the economics literature who has discussed directly a nexus between privatization and marketization, but there are many authors who have taken up individual relationships between these forces and certain aspects of economic performances, particularly growth and/or efficiency. Let us look at a major trend of economics literature on effects of privatization and marketization on such performances, first from the world-wide perspectives and then strictly in an area of China economic studies. As these forces are closely related to institutions and institutional development, we finally discuss the effects of institutionalization on privatization and marketization.

2.1 Effects of privatization

There are many authors who have discussed an issue of how privatization promotes economic/managerial performances comparing private and public ownership. The related literature is various and numerous, but as a typical paper surveying a long list of empirical studies on this issue, we have, for example, Shirley and Walsh (2000) who collected as many as 52 case studies on the effects of ownership on managerial efficiency of the world over. They concluded that 32 cases demonstrated the superiority of private firms over their counterparts with public ownership, while only 5 cases showed the contrary and remaining 15 cases provided neither positive nor negative answer to this question.

The other type of literature is one that discusses effects of privatization of public enterprises as a result of economic transition from planned to market economies. The authors surveyed the effects of privatization in the 1980s and 1990s in the world with the result that privatized firms are more efficient and more profitable than their former SOEs, although non-privatizing measures such as market liberalization can improve their efficiency, but such reforms would be more effective when coupled with privatization. Summarizing the effects of privatization in transition economies, Estrin et al. (2009) found that such effects differed between CEE and Commonwealth of Independent States (CIS) countries, and pointed out that privatization in the former was more effective than in the latter. Their finding seems to imply that the quality of institutions is one of the keys determining effects of privatization, as the CEE is more institutionally well organized than the CIS in terms of privatization measures. Djankov and Murrell (2002) reached nearly the same conclusion as theirs.

Studies on the effects of privatization in the case of China are also many, and most of them discover basically positive effects of privatization in productivity as well as profitability. Based on their sample survey of 12,400 firms, Dollar and Wei (2007), for example, found that Chinese SOEs had significantly lower returns to capital, on average, than private firms, whether domestic or foreign-owned. Constructing a panel data set of 25,970 SOEs, Bai et al. (2009) made it clear that privatization of China’s SOEs was effective for increasing sales and improving labor productivity with significant gains in
profitability. Moreover, calculating the profit rate of manufacturing firms, Lu and Liu (2005) discovered that privatized firms were able to increase ROA compared to SOEs. Jefferson and Su (2006), too, supported these findings on the basis of their surveyed data of large- and medium-size manufacturing enterprises in China.

### 2.2 Effects of marketization

On the other hand, it goes without saying that marketization stimulates economic growth, since markets themselves have an inherent dynamic force to boost the growth. As economic history tells us unequivocally, markets expand in association with economic growth, which in turn promotes further marketization. The modern economic growth can be said to be a path with and toward market development (Hicks (1969)). This has already become a popular common sense without any need to testify. Even though we have found no fixed causality between these two factors, it must be natural to assume that marketization proceeds concomitantly with economic growth.

Therefore, all transition countries began to abolish their socialist price controls as a first step to establish the market mechanism, whichever transition strategy they adopted. How such a marketization policy affects their economic growth after transition seems to have no definite consensus yet. Balecky and Campos (2011) collected 46 studies with more than 500 estimates related to the effects of transition reforms including marketization on growth. They applied a meta-regression analysis to conclude that the result would change depending on the specification models, the time horizon of growth, and transition paths. Other authors insisted that the result could change in relation to the transition starting period and initial conditions (e.g., Falcetti, Raiser, Sanfey, 2002). But the long-run trend for transition countries, other things being equal, generally indicates a positive relationship between marketization as well as privatization and economic growth.

In the case of post-reform China, many studies confirmed a strong effect of marketization on economic growth. Wang et al. (2009) revealed a fact that market reforms had a substantial impact on growth, and Fan et al. (2011) estimated the contribution of marketization to China’s growth, based on provincial panel data for the period of 1997 to 2007, utilizing such a composite index of market development as we also refer to below. Zhao and Yu (2014) likewise calculated total factor productivity of each province as well as its degree of marketization effect on economic growth, obtaining essentially the same result as Fan et al. (2011) did. The problem is that they did not distinguish privatization from marketization, the index of which includes some sub-indices closely connected with not only trends of privatization but also even institutionalization. We will utilize the same data as theirs but from a different angle than theirs.

### 2.3 Effects of institutionalization on privatization and marketization

Obviously, those effects of privatization and marketization are generally all coupled with good institutions as well as steady institutionalization. Without reliable institutions, whether formal or informal, clear or vague, neither private ownership nor markets could normally function well to bring about economic growth.

Acemoglu et al. (2004) argued that “institutions matter.” In a seminal essay on the economic history, North (1990) emphasized that institutions affected economic performance
positively. According to Rodrik, the question is no longer “do institutions matter?” but “which institutions matter?” (Rodrik, 2000). Legal institutions, for example, are essential for modern economic growth as Beck (2010) revealed. By the same token, Beck and Levine (2004) pointed out that legal tradition was important in shaping financial development in each country. Other institutions, e.g., the government, banks, corporations and firms, property rights, etc., are all associated with the development of legal institutions in the modern history. Thus, institutionalization in the sense of institutional development matters for the better result of economic growth.5

What is to be asked here is rather how to evaluate the level and quality of institutions in a society as a whole, since the society is an extremely complex structure with a huge variety of institutions, each of which still consists of complicated various elements. There seems to be no definite way of directly measuring the general level of institutional effectiveness and quality in economic transition, let alone arguing about contributions by some specific institutions, e.g., legal institutions as noted above. It appears extremely difficult to make precise measurement of overall level of institutions, which are too various in kind and too heterogeneous to measure. Some authors have tried to evaluate the general quality of institutions by using the Fraser Institute index of economic freedom, Freedom House freedom index, and Heritage Foundation freedom index, which are all composite indices calculated by several indicators, but these indices should be treated as ones to measure the level of economic liberalization or marketization, rather than institutional quality per se. Kaufmann et al. (2010) formulated worldwide governance indicators, but their indices cannot necessarily capture the overall features of general institutional level, although they are comprehensive in character.6

The overall level and quality of institutions in a society, however, probably could be captured indirectly but very simply in the following way. Provided that corruptions can be presumed to occur only due to the overall institutional backwardness in the society, the degree of corruption can be a (negative) proxy of general level of institutional development as well as quality. Then, provided that corruptions can be demonstrated as being anti-growth, as against the well-known Leff–Huntington’s hypothesis (i.e., corruption to “grease the wheel” or growth), institutionalization can be said to be pro-growth. As a great many of statistical studies have demonstrated so far, this hypothesis has been almost denied (see, to cite a few, e.g., Mauro (1995), Tanzi and Davoodi (2000), Kaufmann and Wei (1999), Abed and Davoodi (2000), Vinod et al. (2000), etc.). They have arrived at a single conclusion that corruptions can neither enhance the total amount of investment nor increase the output of corrupt firms. Ugur (2014) surveyed these studies and applied a meta-analysis to find that corruption has a negative effect on growth, but the magnitude of the effect is small in full-country sample, while it is more adverse when the reported estimates are confined to the low income country data.

His analysis seems to suggest that there cannot be a simple linear relationship between corruption and growth. Relying on international comparison and regression analysis, Mendez

5Efendic et al. (2011) investigated the effects of institutional quality on economic performance, by applying meta-regression analysis to many related studies they sought to find out a positive relationship between institutions and growth.

6Their world-wide governance indicators comprised of a wide range of institution indices, such as accountability, rule of law, control of corruption, etc. These indicators are, no doubt, very comprehensive but cannot tell us about an important aspect of institutionalization, for example, about how people respect their institutions and how they really obey the established rules and laws.
and Sepulveda (2006) found a non-linear relationship between them for free countries. Their finding demonstrated, then, that the hypothesis in question could be valid to a certain extent if political character of countries is taken into account in the analysis.\(^7\)

In the case of China, most of the studies are negative to this hypothesis. In other words, corruptions are generally found to be harmful to economic development. However, some studies revealed an inverse U-shaped relation between corruption and growth or other economic performance (e.g., Wu and Rui (2010), Yang (2011)). This implies that the above hypothesis is adaptable to the Chinese case, at least at the early stage of economic development.

At any rate, it seems so reasonable to look at China’s institutionalization from several different perspectives in light of the complexity and variety of institutions themselves, moreover possible complicated relationships between institutions and growth, that we should construct several alternative institutionalization indices, including one reflecting corruption level.

To sum up, to the best of our knowledge, there has been no work which deals directly with a nexus between privatization and marketization either in economic development or in transition, much less ones discussing causal and dynamic relationships between these two forces. No author has ever tried to investigate deeply how marketization promotes privatization and vice versa. But markets and private ownership are so tightly correlated with economic performance like growth that these two variables must be closely interrelated.\(^8\) As institutions are the basis for the interrelationships between private ownership and markets, institutionalization must be acting as a background for such a privatization/marketization nexus (see Figure 1). Then, it seems logically reasonable to assume that:

(a) Privatization is strongly associated with marketization, whether the former promotes the latter or the former is promoted by the latter, which is an issue to be tested by empirical work.

(b) Institutionalization must be also linked with both privatization and marketization during the process of economic transition.

(c) If, however, institutions act positively on the other variables, they can be interpreted as playing a role of something like glue or catalyst connecting markets (marketization) with private ownership (privatization) as shown in Figure 1. Moreover, against the background of China’s experience of rapid economic growth, e.g., high speed of marketization, official reluctance to pursue official and large-scale privatization, and relatively underdeveloped or vague institutions, we can derive some testable hypotheses for our analysis as follows.

H(1): the more privatized a transition economy, the more easily and rapidly it can be marketized.

H(2): the more marketized a transition economy, the more easily and rapidly it can be privatized.

\(^7\)Assiotis and Sylwester (2014) re-estimated the effects of corruption on growth using different methodology and data, to obtain the evidence that Mendez and Sepulveda’s conclusion must be revised.

\(^8\)Theoretically, they could be independent from each other, but such an assumption seems to be extremely lacking reality.
H(3): then, the relationship between privatization and marketization is reciprocal in nature, but their effects are asymmetrical in that marketization affects privatization more strongly than the contrary.

H(4): the more institutionalized a transition economy, the more easily it should be privatized and marketized in theory, but the institutionalization’s effect must be asymmetrical in reality in the sense that its effect on privatization is comparatively stronger than on marketization, because privatization as spread of private capital ownership is much more complicated in procedure than extensive transfer of ordinary commodities in markets.

3 Methodology, definitions, and data

What methodology should be employed to test these hypotheses, then? Popular causality tests such as Granger’s are not appropriate in this case, because the period covered is too short to apply these conventional tests; moreover, they basically focus on an aspect of causal relations between those key variables, rather than on a relative strength of the effects that they have on each other. Our hypotheses above are not only related to causal relationships between privatization and marketization, but also point to relative influential powers of each variable. In this sense, the model used by Chinn and Ito (2006) may be quite appropriate for our objectives, although it is very simple. They examined financial development (with 5-year lag) in association with capital openness as well as institutional characteristics utilizing panel data of 108 countries in the world, while they tested also the reverse causality of change in capital openness to financial development. We replaced financial development in their model by privatization and capital openness by marketization. The other structure of our model is essentially the same as theirs.
Our estimation model to clarify the nexus between privatization and marketization assumes, as a first step, that institutions, once established, generally do not alter so easily; therefore, the institutionalization level does not change as rapidly as marketization and privatization do during the period in our consideration. Then we can focus on the effects of average level of institutionalization, rather than on the change in institutions. This assumption, however, will be relaxed later when we try robustness checks to the results. The model assumes further that institutions have not only a direct effect on the other variables, but also an indirect effect on them through acting on one of them; then it seems reasonable to incorporate interaction terms of institutionalization level with both privatization and marketization variables in the model.

We try to examine marketization’s development (with 3-year lag) in association with privatization’s trend as well as institutional characteristics utilizing Chinese panel data encompassing 30 regions at provincial level, while we also test the reverse causality of the changes in privatization to the development of marketization. The model is specified as follows:

\[
M_{it} - M_{it-3} = \alpha_{m0} + \beta_{m1} M_{it-3} + \beta_{m2} P_{it-3} + \beta_{m3} I + \beta_{m4} I \times P_{it-3} \\
+ \beta_{m5} GDP\text{per capita}_{it-3} + \beta_{m6} GDP\text{Growth}_{it-1/t-3} \\
+ \beta_{m7} \text{Openness}_{it-3} + u_{it},
\]

and

\[
P_{it} - P_{it-3} = \alpha_{p0} + \beta_{p1} P_{it-3} + \beta_{p2} M_{it-3} + \beta_{p3} I + \beta_{p4} I \times M_{it-3} \\
+ \beta_{p5} GDP\text{per capita}_{it-3} + \beta_{p6} GDP\text{Growth}_{it-1/t-3} \\
+ \beta_{p7} \text{Openness}_{it-3} + u_{it}.
\]

where \(M\) denotes a marketization index at provincial level, \(P\) represents a provincial privatization index, and \(I^*\) refers to institutionalization level, respectively, while \(i\) shows administrative unit of provincial level, \(t\) is time, and \(u\) is an error term. GDP per capita, GDP growth, and Openness in region \(i\) are all included as control variables in the above equations. “GDP” is, of course, not the gross domestic product at national level, but the regional GDP. GDP growth is calculated as growth rate of per capita regional GDP. Openness is measured as the ratio of the region’s total exports and imports to the regional GDP.

Equation (1) investigates a change in marketization levels during 3 years which can be explained by initial levels of \(M\) and \(P\), average level of \(I\), and an interaction of \(I\) and \(P\), controlling for regional per capita GDP, growth rate, and openness in the region. Equation (2), on the other hand, investigates a change in privatization levels during 3 years which can be explained by initial levels of \(M\) and \(P\), average level of \(I\), and an interaction of \(I\) and \(M\), controlling for regional per capita GDP, growth rate, and Openness.

If the above hypotheses are all valid and if the three key indices could be all measured in a comparable way, we could translate the above testable hypotheses into:

\(H(1): \beta_{m2} \text{ is significantly positive.}\)
H(2): $\beta_{p2}$ is also significantly positive.

H(3): $\beta_{p2}$ is larger than $\beta_{m2}$.

H(4): $\beta_{p3}$ is significantly positive and larger than $\beta_{m3}$, while $\beta_{p4}$ is significantly positive and larger than $\beta_{m4}$.

Let us now define the concept of the three key variables used in this paper. First, “privatization” generally means the transfer of capital ownership from public to private hands at the microlevel such as privatization of SOEs, e.g., selling them to outside investors or to their management and employees. However, we use this concept here more broadly as a process of expanding private capital in a macro-economy, such as emergence and rising share of private firms compared to public enterprises. Let us call for brevity the former case of privatization as “micro-privatization,” the latter one as “macro-privatization.” Micro-privatization is not necessarily coupled with macro-privatization. Such a situation of privatization could take place in theory that SOEs are not privatized at all while their share of national income or industrial production is declining over years. Macro-privatization proceeds irrespective of lacking micro-privatization. Yet, the macro-privatization could involve, needless to say, the micro-privatization as long as the share of private ownership is rising within an economy. Normally, these two types of privatization are expected to proceed side by side.

Second, the definition of “marketization” is relatively simple. Here, we refer to any tendency of market development as marketization. Markets may be called “developed” at least in the following two senses: (a) the more and more items and volume of goods and services as well as production factors enter the markets; (b) the more and more freely they are priced and transacted without non-market, particularly governmental interventions than before. Thus, if the government abolishes or loosens price controls as well as restrictions on market entry, the markets can be called “more developed,” namely marketization develops in the economy.

Finally, the term “institutionalization” is more complicated and difficult to define than the above two concepts, since institutions are extremely broad in scope, characterized by outstanding diversity, as we have noted above. Institutionalization is a process/tendency in which such institutions are generated, developing, and intensifying themselves. We use this term in this paper as a process in which various institutions regularizing economic activities are increasingly created, for example, enactment of new laws and establishment of new regulations, and/or as a tendency where these institutions are certainly implemented in the real affairs. Institutions can be classified into two kinds, formal and informal, but naturally formal institutions should be ranked higher than informal ones in terms of institutionalization level. Informal institutions, such as customs and human relationships, are often characterized by their vagueness in nature.

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9When we look at privatization in China, it seems useful to separate these two types of privatization. The Chinese leadership has been reluctant to privatizing major SOEs particularly in strategically important industries.

10Even in China, these two types of privatization have been concomitants. The majority of state SMEs have left the state ownership by the end of the 1990s (Xu, 2011).
The data for our statistical analysis in this paper are in the major part drawn from the following three Chinese sources: (a) Fan, Wang, and Zhu (various years) hereafter NIM), (b) Wang, Fan, and Li (Wang, Fan, Li, 2012) (hereafter BEI), and (c) China Statistical Yearbook (hereafter CSY). Both NIM and BEI provide us with quite detailed and useful panel data for all provinces, including four municipalities and autonomous regions except for Tibet.

We constructed and formulated indices to describe the three key variables in the ways as follows. Both privatization index and marketization index are calculated from NIM data. Since institutions are very complex in nature, we tried to formulate four types of institutionalization index: Case 1 is calculated utilizing NIM data alone, and the other three cases (Cases 2–4) are constructed from NIM data as well as BEI data and transparency (or negative corruption) index. Control variables used in our estimates are basically derived from the CSY. The period covered by NIM is from 1997 to 2009, while BEI data are only for three years, 2006, 2008, and 2010. What is to be noticed is that the NIM indices for 1997–2000 are constructed on a partially different basis from those for 2001–2009, so that we constructed two series of panel data, i.e., series I for 2001–2009 on the basis of NIM 2001, and series II for 1997–2009 on the basis of NIM 2000 (see Appendix for more details of how to formulate these indices).

The NIM data are composed by various quantitative and mostly objective data, while the BEI data are composed by several subjective indicators alone. But all of the basic data included in these sources are measured by comparable units, e.g., point one to ten. Thus, it is convenient to calculate relative weights of contributions by those indicators to the effects on dependent variables. The descriptive statistics of our panel data for the period of 2001–2009 (series I) are summarized in Table 1.

4 Results and discussion

We estimated the above equations at first utilizing series I panel data for 2001–2009, based on a fixed-effect model to exclude time-invariant effects like regional characteristics after examining the statistical results by Hausmann test and F test as well as Breush and Pagan test. As equations (1) and (2) indicate, our models include 3-year time lags and the number of observations is only 180, i.e., 30 provinces for 6 years, since the coverage of years in the panel is limited to 2001–2009.

A summary of the results of our regression analysis is recorded in Tables 2 and 3. Corresponding to the four different sets of institutionalization index, we estimated four models, from Case 1 to Case 4. The results lead us to several important findings.

(1) Both $\beta_p^2$ (e.g., 0.93 for Case 1) and $\beta_m^2$ (e.g., 0.11 for the same case) are positive and significant, no matter which institutionalization case is selected; therefore, both H (1) and H(2) hold definitely. In other words, other things being equal, privatization expands markets, while marketization in turn stimulates privatization.

**Note:** The BEI data are only used for the institutionalization index, which is assumed to be fixed during the middle range of period. Accordingly, the difference of coverage of time between privatization/marketization index and institutionalization index does not matter in our estimation in the case of series I. Variable institutionalization index is employed for series I data (see section 4).
β_p^2 is much larger than β_m^2, no matter which institutionalization case is selected; therefore, H(3) holds certainly. In other words, marketization affects privatization much more strongly than privatization works on marketization.

(3) Institutionalization positively affects both marketization and privatization, but its effect is not necessarily significant. It is strongly significant for all cases of marketization, but only weakly significant in Cases 1 and 3 of privatization. Therefore, H(4) cannot be said to hold well regarding institutionalization effects on privatization, although it is valid for the effects on marketization.

(4) Moreover, institutionalization tends to affect marketization indirectly and significantly through privatization (see coefficients on Average I^*P(t−3) in Table 2).

Table 1. Descriptive statistics (series I).

|                | Mean  | Std. dev. | Min  | Max  |
|----------------|-------|-----------|------|------|
| M(t)−M(t−3)   | 0.64  | 0.70      | −1.36| 2.70 |
| P(t)−P(t−3)   | 1.81  | 1.12      | −1.31| 5.22 |
| M(t−3)        | 6.16  | 1.49      | 2.73 | 9.46 |
| P(t−3)        | 6.01  | 2.76      | 0.68 | 12.77|
| Institutionalization Index: I(1) | 5.12  | 2.74      | 1.34 | 15.98|
| I(2)          | 4.55  | 1.42      | 2.27 | 10.10|
| I(3)          | 5.31  | 1.49      | 3.27 | 11.02|
| I(4)          | 4.87  | 1.02      | 3.22 | 8.75 |
| Per capita GDP(t−3) | 12,475.04 | 8914.29 | 2983.07 | 51,463.43|
| GDP growth(t−1−t−3) | 25.96 | 5.66 | 13.34 | 49.27|
| Openness(t−3) | 0.33  | 0.39      | 0.05 | 1.67 |

Notes: I(1): index calculated only based on NIM-related data; I(2): index calculated as an average of I(1) and (negative) corruption index; I(3): index calculated as an average of I(1) and BEI-related index; I(4): an average of index I(2) plus BEI-related index. See Appendix for more details.

Source: Authors’ own elaboration.

Table 2. Estimation results of equation (1) (series I).

|                | Model 1     | Model 2     | Model 3     | Model 4     |
|----------------|-------------|-------------|-------------|-------------|
| M(t−3)        | −1.01***    | −1.00***    | −1.01***    | −1.00***    |
| P(t−3)        | [−18.53]    | [−18.76]    | [−18.59]    | [−18.81]    |
| Average I *   | 0.20***     | 0.43***     | 0.39***     | 0.62***     |
| Average I * P(t−3) | [3.03]     | [3.86]     | [3.91]     | [4.26]     |
| Per capita GDP(t−3) | 0.00**     | 0.00**     | 0.00***     | 0.00**     |
| GDP growth(t−1−t−3) | 0.01     | 0.01     | 0.01     | 0.01     |
| Openness(t−3) | −0.78*     | −0.66     | −0.81*     | −0.69*     |
| Constant      | 5.42***     | 4.52***     | 4.39***     | 3.47***     |
| Adjusted R^2  | 0.83        | 0.83        | 0.83        | 0.83        |

Notes: *** shows significance level at 1%, ** at 5%, and * at 10% respectively; Model 1 to Model 4 correspond to Institutionalization index I(1) to I(4), respectively, definitions and formulations of which are explained in the Appendix. Figures in parenthesis are t-values.

Source: Authors’ own elaboration.
and privatization through marketization but insignificantly (see coefficients on Average $I^*M(t−3)$ in Table 3). The coefficients are all negative against our expectation regardless of any institutionalization cases. In particular, this indirect negative effect is strongly significant for marketization, while it is insignificant for privatization. How this fact should be interpreted deserves our consideration, so we will return to this issue later.

(5) When marketization or privatization stands on the higher level at $t−3$, it increases less rapidly at $t$ (see significantly negative signs of the coefficients on $M(t−3)$ or $P(t−3)$), but by rearranging the variables in equations (1) and (2) we can find that the direct effect of this year’s marketization level on that of 3 years later is approximately null. This suggests that marketization has no its own self-generating power by itself. It seems to expand through the other route, privatization in particularly. On the other hand, privatization has a force to regenerate itself in addition to its function to generate new markets. This fact implies the existence of close dynamic inter-linkage between privatization and marketization (see section 5 for more discussion).

(6) GDP per capita has a significant effect on the trend of marketization, but its effect is almost negligible. On the other hand, the effect of GDP growth on marketization is not only negligible, but insignificant. In contrast to the case of marketization, the effect of economic growth on privatization is positive but small, while per capita GDP’s effect is nearly null and insignificant. The region’s openness has positive impact on privatization albeit insignificantly, while its effect on marketization is negative, but can be insignificant depending on which case of institutionalization index is used for analysis.

Table 3. Estimation results of equation (2) (series I).

| Dependent variable: $P(t−3)$ | Model 1 | Model 2 | Model 3 | Model 4 |
|-----------------------------|---------|---------|---------|---------|
| $P(t−3)$                    | $-0.80^{***}$ | $-0.80^{***}$ | $-0.80^{***}$ | $-0.80^{***}$ |
| $M(t−3)$                    | $[−11.01]$ | $[−11.00]$ | $[−11.02]$ | $[−11.01]$ |
| $Average I^*$               | $0.93^{***}$ | $1.07^{***}$ | $1.16^{***}$ | $1.28^{***}$ |
| $Average I^* M(t−3)$        | $[4.96]$ | $[3.64]$ | $[3.55]$ | $[2.90]$ |
| $Per capita GDP(t−3)$       | $0.47^*$ | $0.89$ | $0.90^*$ | $1.29$ |
| $GDP growth(t−1− t−3)$      | $[−0.05]$ | $[−0.08]$ | $[−0.09]$ | $[−0.12]$ |
| $Openness(t−3)$             | $0.00$ | $0.00$ | $0.00$ | $0.00$ |
| $Constant$                  | $1.65$ | $1.59$ | $1.63$ | $1.59$ |
| $Adjusted R^2$              | $0.53$ | $0.53$ | $0.53$ | $0.53$ |

Notes: *** shows significance level at 1%, ** at 5%, and * at 10%, respectively. As for Model 1 to Model 4, see the Note of Table 2. Figures in parenthesis are t-values.

Source: Authors’ own elaboration.

\[ M_{t−3} = α_m + β_m M_{t−3} \ldots \text{in equation (1) can be rearranged as } M_t = α_m + (1 + β_m) M_{t−3} \ldots \text{ The same rearrangement can be applied to } P_t \text{ in equation (2).} \]
The above findings demonstrate the importance of institutions in relation to the privatization/marketization nexus. What does the negative sign of interaction terms between institutionalization index and privatization or marketization index in our model imply? The interactions of \( I^* \) with \( P \) and \( M \) are all negative, whether in equation (1) or (2), or irrespective of which case of institutionalization index is used. Does this prove anything characteristic of China’s privatization/marketization nexus during its transition process? Let us take the interaction of \( I^* \times P(t–3) \) in equation (1) as an example. The coefficient on that interaction under Case 1 is significantly negative \((-0.02)\) (see Table 2). This indicates unequivocally that the higher the institutional level is, the less rapidly marketization proceeds in China, given the past level of privatization and other things being constant. This fact seems to imply that in the Chinese context institutionalization does not necessarily stimulate marketization. Vague institutions, as we refer to later, may be one of the keys in determining China’s rapid marketization, with a result leading to its high growth rate in the long run.

The similar situation takes place as for privatization, too, but in a less positive way. Namely, the higher the institutional level is, the less rapidly privatization proceeds in China, given the past level of marketization, as the coefficient on \( I^* \times M(t–3) \) is negative for all institutionalization cases (between \(-0.05\) and \(-0.12\)), but the estimated coefficients are all statistically insignificant (see Table 3). Nevertheless, this finding does not testify uselessness of institutions for the sake of expanding markets and accelerating privatization in transition economies. It only suggests that China’s relative backwardness in institutionalization has never been a serious obstacle for marketization, privatization, as well as economic growth.

In our view, the above finding may be interpreted in the following way. China may have something strange as to the roles that institutions play in the course of economic growth. It is often suggested that institutionalization in the common sense may not necessarily guarantee economic development in the Chinese history of economic growth. Weitzman and Xu (1994) insisted that human relationships and trust (in place of formalized proprietorship) worked quite effectively behind the development of township and village enterprises (TVEs) in China in which a great many of ordinary peasants and local cadres were involved spontaneously. Allen et al. (2005), too, revealed that “(in place of legal and financial systems) the system of alternative mechanisms and institutions plays (in China) an important role in supporting the growth in the private sector – relationship and reputation.” It is Kato (2013) who stressed the importance of institutional vagueness in the process of China’s economic development. Thus, it may be safe to say that the rapid growth in China might have been realized to a certain extent not by such highly institutionalized mechanisms as has been argued, but rather by informal, human relational factors and/or vague, namely low-key institutions.

### 5 Robustness checks

We were able to obtain almost expected results as to our hypotheses, but several checks should be made in order to confirm their robustness, by changing methodology and/or data and/or relaxing some assumptions for the above estimations.

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13TVEs were originally public enterprises called collectively owned but a substantial portion of them were called “red hat enterprises (红帽子企业)”. Their ownership was nominally “red,” namely socialist, but actually private. The “red hat” they wore was effective to run their enterprises, since banks were all state owned; even rural financial cooperatives were publicly owned, giving favor to public enterprises.
5.1 Robustness check

As far as these results from such a panel data analysis are concerned, we may not be able to be free from “endogeneity” problems, which can be involved in the model specified as in equations (1) and (2). In order to avoid possible problems of such endogeneity as serial correlations between explanatory variables and error terms, and at the same time even for the sake of making a robustness check on the above results, we tried to apply different methodologies to the analysis, i.e., first difference and feasible GLS approaches. More specifically, in order to remove fixed effects from the model we applied first difference approach to equation (1) because we found no serial correlation in the equation.

We added year dummies to equation (1) in order to control for time effects common to all regions, to obtain the following equation:

\[
\delta M_{it} = M_{it} - M_{it-1} = \alpha_{m0} + \beta_{m1} M_{it-3} + \beta_{m2} P_{it-3} + \beta_{m3} I * + \beta_{m4} I * P_{it-3} + \beta_{m5} \text{GDP per capita}_{it-3} + \beta_{m6} \text{GDP Growth}_{it-1/t-3} + \beta_{m7} \text{Openness}_{it-3} + \gamma_{m8} d_{2005} + \gamma_{m9} d_{2006} + \gamma_{m10} d_{2007} + \gamma_{m11} d_{2008} + \gamma_{m12} d_{2009} + u_{it}
\]

Therefore,

\[
\delta M_{it} = \delta M_{it-1} - \beta_{m1} \Delta M_{it-3} + \beta_{m2} \Delta P_{it-3} + \beta_{m3} \Delta I * + \beta_{m4} \Delta I * P_{it-3} + \beta_{m5} \Delta \text{GDP per capita}_{it-3} + \beta_{m6} \Delta \text{GDP Growth}_{it-1/t-3} + \beta_{m7} \Delta \text{Openness}_{it-3} + \beta_{m8} \Delta d_{2006} + \beta_{m9} \Delta d_{2007} + \beta_{m10} \Delta d_{2008} + \beta_{m11} \Delta d_{2009} + \Delta u_{it}
\]

where \(d_{2004}, d_{2005}, \ldots\), are year dummies, and \(\Delta\) denotes the difference between \(t\) and \(t-1\).

We estimated equation (4) by the first-difference approach to obtain the results which are recorded in Table 4.

Then, we applied the same approach to equation (2), to derive the following equation:

\[
\delta P_{it} = \delta P_{it-1} = \beta_{p1} \Delta P_{it-3} + \beta_{p2} \Delta M_{it-3} + \beta_{p3} \Delta I * + \beta_{p4} \Delta I * M_{it-3} + \beta_{p5} \Delta \text{GDP per capita}_{it-3} + \beta_{p6} \Delta \text{GDP Growth}_{it-1/t-3} + \beta_{p7} \Delta \text{Openness}_{it-3} + \beta_{p8} \Delta d_{2006} + \beta_{p9} \Delta d_{2007} + \beta_{p10} \Delta d_{2008} + \beta_{p11} \Delta d_{2009} + \Delta u_{it}
\]

However, since we found significant serial correlations in the first-difference model of the equation, we tried feasible GLS approach to the above equation in order to control for the effects from these correlations. The results thus we obtained are recorded in Table 5.

Let us compare the results of Table 4 with those of Table 2, and the results of Table 5 with those of Table 3. Obviously, the results by the new estimators basically confirm our previous findings and conclusions derived from equations (1) and (2), although coefficients on average I* are all insignificant. Thus, hypothesis H(4) cannot be supported, implying that institutions do not matter in the development of privatization and marketization in China.

The point is the validity of our hypothesis H(3). As the model specification is different between these two approaches, we cannot compare \(\beta_{m2}\) in Table 2 with \(\beta_{m2}\) in Table 4, and \(\beta_{p2}\) in Table 2 with \(\beta_{p2}\) in Table 5 in a strictly comparable manner. Nevertheless, the results of Tables 4 and 5 seem to suggest that the hypotheses are essentially supported, or at least are not denied, by the different approaches of
estimation. Put it in another way, the results and findings by previous estimators (1) and (2) can be said to be basically robust.

5.2 Robustness check 2

Another robustness check on the above results recorded in Tables 1 and 2 is to estimate equations (1) and (2), utilizing different panel data (series II) by extending our analysis to cover a longer period, from 1997 to 2009, with a different set of marketization and institutionalization indices. The number of observations increased from 180 to 300. The results thus obtained are essentially the same as those in Tables 1 and 2 (see Tables 6 and 7).

5.3 Robustness check 3

Our third robustness check on the above results is made by changing an assumption of institutionalization index. We have presumed so far that institutions do not change so easily as markets and properties do, so we have assumed the constancy of regional institutional quality (I). But if this assumption is dropped and this index can change every year like the other two key indices, can our hypotheses H(1) through H(4) still remain valid? We applied estimation models of equation (1-a) and equation (2-a) with variable institutionalization index in place of equation (1) and equation (2), respectively. We tested our estimation only for Case 1 and only

| Table 4. Results of first difference estimation (series I). |  |
|---|---|---|---|---|
| Model 1 | Model 2 | Model 3 | Model 4 |
| M(t–3) | −1.12*** | −1.11*** | −1.12*** | −1.11*** |
| [−16.36] | [−16.30] | [−16.37] | [−16.32] |
| ρ(t–3) | 0.09* | 0.12** | 0.14** | 0.16** |
| [1.95] | [1.99] | [2.14] | [2.05] |
| Average I | 0.07 | 0.14 | 0.14 | 0.20 |
| [0.79] | [0.73] | [0.76] | [0.71] |
| Average I * ρ(t–3) | −0.01* | −0.02 | −0.02* | −0.02* |
| [−1.76] | [−1.64] | [−1.81] | [−1.70] |
| Per capita GDP(t–3) | 0.00 | 0.00 | 0.00 | 0.00 |
| [0.90] | [0.82] | [0.93] | [0.85] |
| GDP growth(t–1– t–3) | 0.01 | 0.01 | 0.01 | 0.01 |
| [1.20] | [1.29] | [1.19] | [1.29] |
| Openness(t–3) | −0.13 | −0.10 | −0.15 | −0.11 |
| [−0.23] | [−0.17] | [−0.25] | [−0.19] |
| Δd2006 | 0.10** | 0.11** | 0.10* | 0.10** |
| [1.98] | [2.00] | [1.96] | [1.98] |
| Δd2007 | 0.07 | 0.07 | 0.07 | 0.07 |
| [1.01] | [1.04] | [0.99] | [1.02] |
| Δd2008 | −0.01 | −0.01 | −0.01 | −0.01 |
| [−0.14] | [−0.08] | [−0.17] | [−0.10] |
| Δd2009 | −0.12* | −0.12* | −0.12* | −0.12* |
| [−1.76] | [−1.71] | [−1.78] | [−1.73] |
| F value | 39.71*** | 39.56*** | 39.78*** | 39.64*** |

Notes: Figures in parenthesis indicate t-values. *** means significance level at 1%, ** at 5%, and * at 10%, respectively. Source: Authors’ own elaboration.
Table 5. Results of feasible GLS estimation (series I).

|                | Model 1       | Model 2       | Model 3       | Model 4       |
|----------------|---------------|---------------|---------------|---------------|
| \( P(t-3) \)  | -0.70***      | -0.70***      | -0.70***      | -0.70***      |
|                | [-10.94]      | [-10.81]      | [-10.91]      | [-10.80]      |
| \( M(t-3) \)  | 0.52***       | 0.54*         | 0.78**        | 0.70*         |
|                | [3.00]        | [1.96]        | [2.47]        | [1.69]        |
| Average \( I \) | 0.41*         | 0.53          | 0.74          | 0.77          |
|                | [1.71]        | [1.09]        | [1.65]        | [1.10]        |
| Average \( I \) * \( M(t-3) \)   | -0.06*        | -0.06         | -0.10*        | -0.09         |
|                | [-1.70]       | [-1.02]       | [-1.67]       | [-1.04]       |
| Per capita GDP(\( t-3 \)) | 0.00          | 0.00          | 0.00          | 0.00          |
|                | [0.44]        | [0.17]        | [0.43]        | [0.18]        |
| GDP growth(\( t-1 - t-3 \)) | 0.03**        | 0.03**        | 0.03**        | 0.03**        |
|                | [2.40]        | [2.56]        | [2.41]        | [2.55]        |
| Openness(\( t-3 \)) | 2.05*         | 1.65          | 2.01*         | 1.66          |
|                | [1.85]        | [1.46]        | [1.82]        | [1.48]        |
| \( \Delta d_{2006} \)    | 0.93***       | 0.93***       | 0.93***       | 0.93***       |
|                | [12.10]       | [11.92]       | [12.07]       | [11.89]       |
| \( \Delta d_{2007} \)   | -0.21*        | -0.21*        | -0.21**       | -0.21*        |
|                | [-1.96]       | [-1.94]       | [-1.99]       | [-1.96]       |
| \( \Delta d_{2008} \)   | -0.23**       | -0.23**       | -0.24**       | -0.24**       |
|                | [-2.09]       | [-2.04]       | [-2.12]       | [-2.05]       |
| \( \Delta d_{2009} \)   | -0.53***      | -0.54***      | -0.53***      | -0.54***      |
|                | [-5.07]       | [-5.10]       | [-5.11]       | [-5.13]       |
| Wald chi^2       | 1031.36***    | 1009.68***    | 1028.32***    | 1007.82***    |
| Number of observations | 150          |              |              |              |

Notes: Figures in parenthesis indicate z-values. *** means significance level at 1%, ** at 5%, and * at 10%, respectively. Source: Authors’ own elaboration.

Table 6. Estimation results of equation (1) (series II).

|                | Model 1       | Model 2       | Model 3       | Model 4       |
|----------------|---------------|---------------|---------------|---------------|
| \( M(t-3) \)  | -0.84***      | -0.83***      | -0.84***      | -0.84***      |
|                | [-13.59]      | [-13.54]      | [-13.60]      | [-13.58]      |
| \( P(t-3) \)  | 0.06          | 0.15***       | 0.14**        | 0.23***       |
|                | [1.44]        | [2.74]        | [2.54]        | [3.23]        |
| Average \( I \) | 0.20***       | 0.42***       | 0.40***       | 0.62***       |
|                | [2.88]        | [3.06]        | [2.81]        | [3.02]        |
| Average \( I \) * \( P(t-3) \)   | -0.02***      | -0.05***      | -0.04***      | -0.07***      |
|                | [-3.88]       | [-4.14]       | [-3.80]       | [-4.08]       |
| Per capita GDP(\( t-3 \)) | 0.00***       | 0.00***       | 0.00***       | 0.00***       |
|                | [5.46]        | [5.02]        | [5.48]        | [5.06]        |
| GDP growth(\( t-1 - t-3 \)) | 0.05***       | 0.05***       | 0.05***       | 0.05***       |
|                | [7.38]        | [7.69]        | [7.39]        | [7.67]        |
| Openness(\( t-3 \)) | -1.28***      | -1.14**       | -1.33***      | -1.19**       |
|                | [-2.73]       | [-2.42]       | [-2.84]       | [-2.54]       |
| Constant       | 2.73***       | 1.86***       | 1.99***       | 1.09          |
| Adjusted \( R^2 \) | 0.48          | 0.49          | 0.48          | 0.49          |
| Number of observations | 300          |              |              |              |

Notes: Figures in parenthesis indicate t-values. *** shows significance level at 1%, ** at 5%, and * at 10%, respectively. Source: Authors’ own elaboration.

for series I panel data. The results are shown in Table 8, which indicate the relatively high level of robustness of our previous estimations.\(^\text{14}\)

\(^\text{14}\)Estimation for Cases 2–4 is not possible due to lack of relevant panel data to construct I(2) and I(3) (see Appendix).
6 Theoretical and policy implications

From the above findings and results, we can draw interesting implications as to the privatization policies during transition process. Let us now simplify our model of equations (1) and (2) into the following form (5), since this is just an attempt to explore some theoretical as well as policy implications:

\[ X(t) = AX(t - 1) + C \]  

where vector \( X = (P, M) \), \( t \) denotes period, and vector \( C = (C1, C2) \), which represents \( \alpha + \beta_3P + \beta_4M \), \( \beta_{p1}P_{it-3} \) (or \( \beta_{p1}P_{it-3} \)) + \( \beta_{p2}M_{it-3} \) + \( \beta_{p3}I_{it-3} \) + \( \beta_{p4}I_{it-3} \) in the above equations, for simplicity.

Matrix \( A = \{\beta_{p1}, \beta_{p2}, \beta_{m1}, \beta_{m2}\} \), which is to be called “nexus matrix” hereafter in this paper.

The nexus matrix specifies a dynamic inter-linkage between privatization and marketization in an economy. Therefore, it must reflect institutional character inherent in these forces, although it is not directly linked with the institutionalization index used in the model.
It may be convenient to pick up two nexus matrices for illustrative examples, utilizing the estimated coefficients on $P$ and $M$ in Tables 2 and 3 (see Table 9). Here, we assume that the nexus matrix of an initial period $X^*$ does not change for a certain range of time, say 5–6 years; hence, we can extend the equation as below (equations 6–8). These equations indicate how such an initial impact produces subsequent streams of privatization and marketization effects in a cumulative way.

(1) If $X(t-1) = X^*$, then the cumulative effects for two periods are

$$X(t) + X(t-1) = AX^* + X^* + C = (I + A)X^* + C$$

(6)

(2) If $X(t-2) = X^*$, then $X(t-1) = AX^* + C$,

$$X(t) = AX(t-1) + C = A(AX^* + C) + C = A^2X^* + (I + A)C$$

Therefore, the cumulative effects for three periods are

$$X(t) + X(t-1) + X(t-2) = AX^* + X^* + C + A^2X^* + (I + A)C$$

$$= (I + A + A^2)X^* + C + (I + A)C$$

(7)

### Table 8. Estimation results of equations (1) and (2) in the case of variable institutionalization index (series I).

|                          | Dependent variable: $M(t)-M(t-3)$ | Dependent variable: $P(t)-P(t-3)$ |
|--------------------------|-----------------------------------|-----------------------------------|
| $M(t-3)$                 | $-1.02^{***}$                     | $-0.78^{***}$                     |
|                          | [−18.45]                          | [−10.97]                          |
| $P(t-3)$                 | $0.12^{***}$                      | $0.86^{***}$                      |
|                          | [3.33]                            | [4.50]                            |
| $I(t-3)$                 | $0.20^{***}$                      | $0.38$                            |
|                          | [3.06]                            | [1.35]                            |
| $I(t-3) * P(t-3)$        | $-0.03^{***}$                     | $-0.04$                           |
|                          | [−4.46]                           | [−1.00]                           |
| Per capita GDP($t-3$)    | $0.00^{***}$                      | $0.00$                            |
|                          | [3.18]                            | [−0.17]                           |
| GDP growth($t-1$–$t-3$)  | $0.01$                            | $0.05^{***}$                      |
|                          | [1.06]                            | [3.17]                            |
| Constant                 | $0.41^{***}$                      | $1.54$                            |
|                          | [−1.89]                           | [1.30]                            |
| $I(t-3) * P(t-3)$        | $0.03^{***}$                      | $0.04$                            |
|                          | [−4.46]                           | [−1.00]                           |
| Adjusted $R^2$           | $0.83$                            | $0.52$                            |
| Number of observations   | 180                               | 180                               |

Notes: Figures in parenthesis indicate t-values. *** shows significance level at 1%, ** at 5%, ad * at 10%, respectively. Source: Authors’ own elaboration.

It may be convenient to pick up two nexus matrices for illustrative examples, utilizing the estimated coefficients on $P$ and $M$ in Tables 2 and 3 (see Table 9). Here, we assume that the nexus matrix of an initial period $X^*$ does not change for a certain range of time, say 5–6 years; hence, we can extend the equation as below (equations 6–8). These equations indicate how such an initial impact produces subsequent streams of privatization and marketization effects in a cumulative way.

(1) If $X(t-1) = X^*$, then the cumulative effects for two periods are

$$X(t) + X(t-1) = AX^* + X^* + C = (I + A)X^* + C$$

(6)

(2) If $X(t-2) = X^*$, then $X(t-1) = AX^* + C$,

$$X(t) = AX(t-1) + C = A(AX^* + C) + C = A^2X^* + (I + A)C$$

Therefore, the cumulative effects for three periods are

$$X(t) + X(t-1) + X(t-2) = AX^* + X^* + C + A^2X^* + (I + A)C$$

$$= (I + A + A^2)X^* + C + (I + A)C$$

(7)

### Table 9. Nexus matrix A (series I).

|                      | Case 1 | Case 4 |
|----------------------|--------|--------|
|                      | $P$    | $M$    | $P$    | $M$    |
| $P$                  | 0.20   | 0.93   | 0.20   | 1.28   |
| $M$                  | 0.11   | -0.01  | 0.29   | 0.00   |

Source: Authors’ own elaboration based on figures in Tables 2 and 3.

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15 Of course, we can relax this assumption and treat I (institutionalization) as a variable component in the matrix. In this case, the nexus matrix is extended into a three-dimensional one.
(3) Likewise, if $X(t-3) = X^*$, then the cumulative effects for four periods are

$$X(t) + X(t-1) + X(t-2) + X(t-3) = (I + A + A^2 + A^3)X^* + C$$

$$+ (I + A)C + (I + A + A^2)C$$

Thus, the total and cumulative effects of initial efforts made by the government for economic transition can be divided into the following two parts:

- direct effect: $(I + A + A^2 + A^3 + \cdots)X^*$
- indirect effect: $C + (I + A)C + (I + A + A^2)C + \cdots$

The direct effect can be said to be policy ($X^*$) determined, while the indirect effect is initial conditions ($C$) related. As these two effects are linearly related, then it is enough for us just to look at the direct effect alone when we compare different transition strategies in terms of the total cumulative effects they have in subsequent periods.

Third, on the basis of these equations and assumptions, it is possible to extend our illustrative analysis to see how China’s privatization policy derived from its gradualist transition strategy can perform better than its counterpart, the shock-therapy-like strategy. We define those strategies by the initial level of efforts which the government takes to implement both privatization and marketization policies. If its total efforts can be assumed to be constant, say 200 unit, the shock-therapy-like policy can be described as $X^*(S) = (180, 20)$, compared to Chinese style policy as $X^*(C) = (20, 180)$ and neutral type policy as $X^*(N) = (100, 100)$. In other words, the shock-therapy-like style of transition strategy puts more emphasis on privatization first, at least relatively speaking, in contrast to the Chinese style one which emphasizes more on marketization rather than privatization, as the Chinese experience of economic transition has demonstrated. The neutral type one lies in between.

What different outcomes will these privatization/marketization policies lead to in subsequent periods? Direct effects of these policies on outcomes of subsequent periods are calculated according to equations (6)–(8), with the results obtained in Table 10. The effects differ to a large extent depending on which type of strategies is adopted and which nexus matrix is applied to calculation. The table records only two cases for illustration, i.e., Cases 1 and 4.

We can draw several insightful implications from such simply illustrative calculations as below.

1. Given Case 1 of institutionalization index, privatization proceeds widely under the shock-therapy-like policy as expected, but except for the second period it proceeds most rapidly under the Chinese style policy as time elapses.

2. Given Case 4, although private economies are expected to be developed most rapidly under the shock-therapy-like strategy at first, they develop to a greater

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16 If we can assume that the nexus matrix is kept constant eternally, in other words, the initial state of privatization/marketization inter-linkage could last forever, then since $I + A + A^2 + A^3 + \cdots A^n = (I-A)^{-1}$, the ultimate direct effects of the initial state can be described as $= (I-A)^{-1}X^*$. This kind of extremely hypothetical situation, needless to say, is lacking reality.
extent even under the neutral or the Chinese style strategy after the second period, narrowing the gap with the former strategy. This implies that the former strategy is not necessarily the only and the best choice even for the sake of expanding private economies (privatization in our sense) from a long-run perspective.

(3) Markets can expand much further under the Chinese style strategy, as naturally expected, than under the neutral or shock-therapy-like strategy, whether under institutionalization index Case 1 or Case 4.

(4) If the effects on privatization and marketization could be equally valued, the Chinese style strategy is superior to the other strategies from a point of view of overall effects, whichever case of institutionalization index is chosen.

The above implications seem to indicate that the Chinese style of transition is superior to the shock-therapy-like strategy at least from a perspective of developing private enterprises and extending market activities. However, we do not intend here to insist that the Chinese way of transition is universally effective, as we will refer to in the final section.

7 Concluding remarks with several reservations

We have focused on an issue of nexus constituted by privatization, marketization, and institutionalization during economic transition, utilizing the panel data at the provincial level in China. Our special interest lies in a nexus between privatization and marketization, so that we tested some hypotheses regarding this linkage. We found that they were not only interconnected closely, but also mutually stimulat-
marketization in China. Finally, we suggested that institutions had important effects, both direct and indirect, on this nexus. These findings lead us to a new hypothesis concerning a dynamic inter-linkage between privatization and marketization. There must be such a linkage during China’s transition process, whereby it has succeeded in constructing so far. In our view, institutional underdevelopment, or more correctly flexibility, seems to have played an important role behind this success.

However, the conclusions thus obtained are subject to several reservations and/or limitations. First, institutionalization is a notion quite hard to define as we have stressed above. We tried to formulate four alternative types of institutionalization index in this paper, but none of these indices, as well as the other types of indices (e.g., Fraser Institute index), is capable enough to capture the real level of institutional development of a society.

Second, “privatization” in our analysis does not directly describe micro-privatization, or transfer of ownership of SOEs and other public firms to the private hands, but depicts the overall development of private sectors (macro-privatization). One may naturally ask, then, “Can the similar results be derived from the transition process in other transition countries which are characterized by large-scale micro-privatization? If the nexus matrix based on the experiences of these countries were used, the conclusion must be different.” The conclusions derived from this analysis may not be directly or totally applied to other transition countries which are colored by different transition strategies as well as different cultural background and historical paths, although our tentative analysis seems to imply that the Chinese type of privatization policy could still be effective to a certain extent to stimulate further marketization even in other transition countries.

The Chinese way of privatization, however, cannot be a panacea which can be universally appropriate in any country. In addition, it seems that the Chinese model has been facing a fundamental turning point since around 2010, when the political leadership began to stress the importance of “rule of law (法治).” In other words, China

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An estimator to test causality $P$ to $M$ is

$$\Delta M_{it} = \Delta P_{it-2} + X_{it-3} + u_{it} \quad (X - 1)$$

where $\Delta P_{it-2} = P_{it-2} - P_{it-3}, \Delta M_{it} = M_{it} - M_{it-1}, u_{it}$ is an error term while $X$ denotes the three control variables which were used in our above analysis.

Likewise, an estimator to test causality $M$ to $P$ is

$$\Delta P_{it} = \Delta M_{it-2} + X_{it-3} + u_{it} \quad (X - 2),$$

where $\Delta M_{it-2} = M_{it-2} - M_{it-3}, \Delta P = P - P_{it-1}$.

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17 As we noted above, the Granger causality test in the true sense is (and can) not to be applied to our analysis, but we tried a simplified causality test by the pooled OLS, the results of which also enforces our argument. The estimators we employed are as follows.

18 Imagine why China has not accepted the mass privatization policy. Such a policy is said to be effective for rapid de-nationalization as well as successful de-politicization. The socialist system was not their own original choice for most of CEEs unlike China and the Soviet Union, which succeeded in building socialist system by themselves.

19 We tried experimentally to extend our analysis to look at whether the same kind of nexus for non-China transition economies exists. We made a similar analysis about the nexus between privatization and marketization on the basis of EBRD’s Transition Report data. The result is affirmative. The above conclusions were certainly revised, but just slightly, although further pieces of research with more comparable data are required to obtain more persuasive results.
has been undergoing economic transition without rule of law in the strict sense, which must be one of the essential aspects of institutional development in the modern society. They have realized that “institutions matter” in order to make their economy sustainable, by continuing to reform the economic system as a whole (World Bank and the PRC Development Research Center, 2012).

Third, the period covered in our analysis is short. If it could be extended much longer, say more than 30 years, the usual causality tests such as a Granger causality test could have been employed to obtain some useful implications about the fundamental structural changes in the Chinese economy after its gradualist transition started. However, the necessary data available at present are so weak and scare for the years before 2000 that we had to give up an idea to extrapolate the indices, e.g., back to the early 1980s. We are now trying to extend the period for analysis up to 2014 on the basis of recently published NIM and BEI indices to find certain structural shocks that must have occurred in China’s economic situation around 2009.

Last but not least, our panel data are limited to provincial level, probably useful enough to construct the overall structure of the nexus in question, thereby obtaining specific implications as to the dynamic transition process. But we believe that this study can be a first step toward exploring a complicated and entangled nexus between privatization and marketization during transition. The analysis should be complemented by in-depth studies built on microscopic surveys and data, hopefully with the much longer period covered. This paper is nothing but an experimental introduction to such studies in the near future.

8 Appendix: formulation and data sources of the three key indices and control variables

The three key indices employed in our analysis, i.e., privatization, marketization, and institutionalization as well as control variables, are calculated and formulated in the following way. The contents of marketization and institutionalization differ according to the data series used in the analysis.

(1) Privatization index: We adopted an index named “development of non-state economies” in NIM for privatization index. This index consists of three sub-indices, i.e., indices of share of non-state economies in the amount of industrial sales, in fixed investment of the entire society, and in urban employment. These three sub-indices are averaged with equal weights. The same privatization index is applied to both series I and series II, although the period covered is different.

20 In the Chinese terminology, "法治" means "rule by law" rather than "rule of law." Rule of law in the true sense cannot be realized under the communist party system, in which the party transcends ultimately any laws.
21 Our work is now in process. Our tentative analysis strongly suggests that a certain structural change has occurred within the Chinese economy since around 2009 as soon as it entered a new stage of development, officially called "new normal."
22 As far as we know, there is no detailed study so far focusing on how privatization, whether of macro- or of micro-nature, has been spreading in China. There is no deep historical study as to how de facto privatization has actually been transformed into de-jure privatization in China.
23 More specific definitions and formulations of each index and sub-indices are given in the original texts of data sources, i.e., NIM and BEI.
(2) Marketization index: We took the following sub-indices from NIM and averaged them with equal weights to obtain this index: indices of “government-market relations,” “degree of development of commodity markets,” and “degree of development of factor markets,” but the construct of this index is different between series I and series II. In the case of series I, the index of government-market relations includes sub-indices of “reduction of non-tax burdens for firms” and “decrease in government size”; moreover, sub-index of “marketization of technological achievements” is included in the index of degree of development of factor markets, while those three sub-indices are excluded from series II.

(3) Institutionalization index: we tried to construct four alternative sets of institutionalization index as described in section 3, taking into account the comprehensiveness as well as vagueness of institutions and institutionalization.

Case 1 of institutionalization (hereafter I) index (1) is derived totally from NIM data about “development of market agencies and environment of legal institutions.” This indicator consists of the following four sub-indices: “development of market agency organizations like lawyers and accountants,” “protection of legal rights of producers,” “protection of intellectual properties,” and “protection of consumers’ rights and interests,” but the construct of this index is different between series I and series II. When we constructed series I, we included a sub-index of “protection of consumers’ rights and interests”, while it is excluded from series II. Moreover, the construct of a sub-index of “protection of intellectual properties” is different between series I and series II. To be more concrete, an index of “acceptances of patent applications per technological and scientific personnel” is calculated in the case of series I instead of “acceptances of patent applications per GDP” in the case of series II, while an index of “approvals of patent applications per technological and scientific personnel” is calculated in the case of series I instead of “approvals of patent applications per GDP in the case of series II.

Case 2 of I index (2) is calculated by averaging institutionalization index (1) and (negative) corruption index, which is derived from the data provided by Professor Lian Zhou at Peking University, who estimated the degree of corruptions within Chinese provinces by counting the number of people arrested for corruptions. His estimates do not cover the cases in Peking, so we assumed its corruption level as equivalent to the average of the levels of Shanghai and Tianjin.

Case 3 of I index (3) is made from the average of index (1) and BEI-based index, which reflects subjective assessment in each province. Namely, this index is a complex of both objective and subjective indices.

Case 4 of I index (4) is the most comprehensive indicator, which combines the above three institutionalization indices. More correctly and specifically, this index is derived by making simple average of I index (1), I index (2), and I index (3).

We constructed a variable institutionalization index (5), which was used for robustness check on the results of our analysis (Tables 2 and 3).

(4) Control variables: per capita GDP and GDP growth are drawn from the data of regional GDP in CSY. Openness is calculated as a ratio of each province’s external trade (export plus import) to its nominal regional GDP.
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