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Provincial Growth in China

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Abstract

The last decades have seen increasing empirical support for the argument that institutional quality has a significant impact on economic growth. However, in these cross-national studies China often seems to be an exception.

Despite weak institutions, encroachments on property rights and the rule of law, China has achieved growth rates surpassing all other developing economies. This study asks whether or not China is an exception to the rule, or alternatively, if institutional development at province level has been a driving force behind economic growth.

Ordinary least squares is used to test the relationship between institutional development and real growth rates, while controlling for fixed capital, human capital, international integration and geographic location.

The results show that institutions are not statistically significant in explaining economic growth among the provinces of China. Growth instead seems to primarily have been driven by investment in fixed capital.

Key words: China, Provinces, Growth, Institutions

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1 Introduction

Since the beginning of the reform era in late 1978 the People's Republic of China has gradually, but steadily, moved towards an open market economy. While doing so, it has outperformed all other major economies in terms of economic growth. As the Chinese economy has continued to grow, so have the efforts of economists to explain this growth miracle.

Opening up to foreign capital and innovations is a widely cited explanation, as is the role played by internal investment in fixed and human capital. The geographic proximity to the developed East Asian economies is yet another.

However, not all aspects of the Chinese transition have been as rapid as economic growth. Political and legal reform has continuously lagged behind social and economic change. Given this development, institutional quality does not seem as a given candidate in explaining China's economic performance.

And, while the last decades of empirical studies have produced findings in support of New institutional economic theory, arguing that institutional quality has a significant impact on economic growth, China often seems to stand out as an exception. Despite comparatively weak institutions, encroachments on property rights and inconsistencies towards the rule of law, mainland China has achieved growth rates surpassing all other developing economies and managed to largely sustain these rates over more than three decades.

This study asks whether or not China indeed is an exception to the empirical findings that institutional quality has a positive impact on economic performance. The potential alternative explanation would be that, although overall national institutional development has been comparatively slow, improvement in institutional quality at a province level has promoted regional growth, in turn driving national development.

Furthermore, the current debate on the impact of institutions among the provinces of China is embryonic, and the few existing studies point in various directions. This makes China an interesting case for revisiting the question of whether or not institutions have had an impact on economic growth.

1.1 Aim

Given the strong support for the importance of institutional quality in cross-national studies the questions arise: Is China simply an exception to these findings? Are factors other than institutions more important in the case of China?

There may be another explanation to the conundrum, that the Chinese growth experience has been driven by improvements in institutional quality at a sub-national level. Economic growth in China has been unevenly distributed among its provinces, some have been forging ahead while others have lagged behind.

The aim of this study is to test whether or not institutions have had an impact on the provincial growth rates in China, while controlling for other potential explanatory variables. The research question of this study is:

Does institutional quality impact economic growth among the provinces of the People's Republic of China?

If this should prove to be the case, it would be reasonable to conclude that improvement in institutional quality has driven growth among the provinces of China, in turn constituting a driving force behind the growth of the entire nation.

1.2 Method and limitation

This study uses panel data from the 31 provinces and administrative regions within the People's Republic of China, comprising data from 1997 to 2009. The dependent variable, real GDP growth rates, is collected from various issues of the China Statistical Yearbook (1998-2010). The yearbooks also serve as the source of data on control variables such as gross capital formation, human capital and international trade. The independent variable of interest in this study, institutional quality, is represented by data from the NERI Index of Marketization (2008). All data will be discussed more extensively in Chapter 3.

The method used to test the economic models is ordinary least squares. After initial testing and analysis, robustness is checked by including lags, changing the

sample size and modifying independent and control variables. If the initial findings still hold, they can be said to be robust.

The most obvious limitation of this study is the time frame. The available data on institutional development stretches from 1997-2009, while the actual reform process began in late 1978. If the early stages of reform are expected to be crucial for subsequent economic development, then this may severely impact the relevance of the findings in this study.

However, as institutional development is a constant process, especially with the gradual approach to reform adopted by China, even this later period should be of great interest. And while the country began its economic reforms in late 1978, vital legislation supporting property rights, private ownership and contract enforceability came during the 1980s and 1990s. These include, among other, the Company Law in 1993 and the Securities Law in 1998, during this period there was also several revisions of the General Principles of Civil Law and the Economic Contract Law (Pitman 1999).

1.3 Structure

In this chapter the aim and main research question has been presented. In order to get a better overview of the subsequent structure of this study a brief outline follows below.

In Chapter 2 the assumptions of New institutional economics (NIE), constituting the theoretical framework of this study, is presented. This is followed by a presentation of previous empirical studies on the economic impact of institutions. The chapter continues with a description of the Chinese economic transition from a command style economy towards a market economy, albeit still politicised and heavily influenced by the state. Chapter 2 concludes with the presentation of a testable hypothesis, based on the results from the previous empirical studies and the Chinese transition narrative.

In Chapter 3 methodology and choice of data will be discussed and motivated, with references to differences and similarities with previous studies. Once these factors are taken into account they can begin to be formalised into economic models. These models as well as the testing process will be outlined in detail at

the end of this chapter. In Chapter 4 the regression results from the models are presented and analysed. The robustness of these regression results is tested, after which further analysis is conducted. Chapter 5 features the concluding remarks of this study.

2 Theory and previous studies

This chapter begins with an outline of New institutional economics, the perspective that forms the theoretical framework of this study. This outline is followed by a presentation of cross-national studies supporting this perspective, as well as studies supporting other prominent perspectives within economics.

Previous studies on growth among the provinces of China are then discussed, followed by an outline of the Chinese transition process. In the last section of this chapter the hypothesis that will form the core of the testing process is formulated.

2.1 New institutional economics

New institutional economics (NIE) aims to explain variations in economic performance with differences in institutional development. Within this perspective institutions are defined as the rules and norms that shape incentive structures and thereby economic actions and outcomes. NIE covers almost every aspect and level of the contemporary world economy, for instance the effect of management structure on firm performance, the effect of ownership structure on a certain industry and the effect of property rights and rule of law on economic growth in and among nations.

The basic idea that legal protection and secure rights to one's property were essential for incentives to invest and innovate was not unfamiliar to 18th century economist Adam Smith. However, the origin of NIE as a school of thought dates back to the 1930's. It was pioneered by Robert Coase, and subsequently developed by among others Douglass North, Oliver Williamson and Elinor Ostrom.

Coase (1937) aims to explain the emergence of the firm as an organisation. He criticises the notion by neoclassic economists that price mechanisms determine all action within an economy, without any elements of planning. Coase contends that even within a firm of any economy, management always engages in planning that is not determined by pricing. Coase explains the emergence of the firm as an organisation by the concepts of uncertainty and risk.

If every actor was certain of the future price determined by the price mechanisms, each actor could theoretically become an entrepreneur. But in an economy with uncertainty, risk is assumed by a few entrepreneurs who offer employment contracts with secure wages in exchange for control. Uncertainty provides incentives for contracts that benefit both the employer and the employee and reduces the transaction costs associated with uncertainty, giving the firm an important role in the economy.

In a later study, addressing the problem of social costs, i.e. externalities brought on by private actions, Coase (1960) expands his critique against neoclassic economics. Specifically he criticises the notion that externalities, such as environmental degradation, are best removed by making producers completely liable to damage that their activities may cause.

Coase demonstrates that, in the absence of transaction costs, production remains the same regardless of liability. With liability for damage the producer would compensate the affected and adjust production, until compensation cost exceeds profit. Without liability the affected will instead compensate the producer for abstaining from production, until the cost of persuasion exceeds the value of remaining unaffected (Coase 1960: 2-7).

However, in real life this price mechanism does not work perfectly. There are always transaction costs, e.g. costs of entering, monitoring and enforcing contracts. These can even be high enough as to discourage contracts altogether. With a simple calculation exercise Coase goes on to explain that in some cases shifting liability may produce outcomes where total social costs become higher. The producer would in some cases give up production altogether while the affected did not gain proportionally from being unaffected. He argues that both parties must be liable to some extent as to minimise social costs, otherwise none of them would be encouraged to act responsibly (ibid: 15, 20).

One method of limiting transaction costs is establishing a firm, but there are many instances when firms are suboptimal. Another method of reducing transaction costs is by government regulation. However, also regulation may increase costs in some circumstances (ibid: 7-11). Of importance to Coase was that focus be shifted from liability towards to what extent a producer should have the right to pollute or make noise, and how to limit such rights through regulation without disabling production, that would otherwise contribute to society.

The ideas of these early studies by Coase were broadened and developed during the subsequent decades by, among others, prominent economist such as Williamson and Ostrom. Management of uncertainty and incentive structures that determine behaviour of economic actors became key features of NIE.

Economic historians expanded this logic in time and space. North (1994) extended the critique against neoclassic economics to be unsuitable for explaining how markets develop in the first place. The focus how market strives towards economic equilibrium makes neoclassical economic theory uninterested in, and unable to grasp, the importance of incentive structures that determine investment in physical and human capital. The assumption that markets works perfectly efficient only applies when there are no transaction costs, i.e. when information is perfect, risk is minimal. But such conditions rarely exist. North therefore argues that the assumption of perfect rationality must be dismantled (ibid: 362), since actors lack the information on which to base perfectly rational decisions.

Instead, rationality is always bounded by different formal rules and informal norms, be it within a firm or a civilisation. Furthermore, even if the formal rules are changed, the informal norms often linger (ibid: 366). These rules and norms help to explain why technology and knowledge are either encouraged or discouraged and markets do not simply developed by themselves.

From the research within NIE, of which some examples have been given above, emerged the hypothesis that institutions such as secure property rights and rule of law decrease transaction costs, causing factor markets to function more efficiently and thereby having a positive impact on economic growth. Following these theory developing studies, measurements and data on institutional quality were constructed and improved as to enable the inclusion of measurements on institutions in economic models.

In recent decades there has been a rich flora of empirical studies testing the hypotheses forwarded by NIE. Some of the most relevant for the purpose of this study are cited below. These mostly consist of quantitative cross-national studies and conclude that there does exist a significant correlation between institutional quality and economic performance.

2.2 Cross-national studies

An early empirical study on the relationship between institutional quality and economic performance was written by Gerald W. Scully (1988). This article contains a series of measures on institutions, aimed at capturing degrees of political openness, individual rights and free market and modelled to explain economic growth and economic efficiency. Scully found that higher degrees of these factors had a positive and statistical significance effect on economic growth and efficiency. This whereas political closed state dominated and command economies were generally under performers. Scully concluded that the individual innovators and entrepreneurs have to be given the right to capitalise on his or her own investment and effort in order for an economy to prosper.

Similarly, Keefer and Knack (1997) adds an institutional dimension to the debate on economic convergence, or rather lack thereof. They hypothesise that weak legal frameworks reduce investment in developing countries preventing them from benefiting from the “advantage of relative backwardness”, i.e. lower factor costs, thus preventing them from catching up. Employing two indices, on e.g. risk of government expropriation, rule of law and contract enforceability, the authors find that growth is higher and economic convergence faster for countries with good institutional quality and the ability of countries to take advantage of cheaper inputs is low where institutions are poor.

However, the role of institutions in explaining economic growth is far from uncontested. Several other factors have also been forwarded by researchers as determinants of economic growth. Most prominent of which are integration into international trade and beneficial geographic location.

The importance of trade has been at the heart of classical economy, pioneered by Adam Smith in the mid-18th century. He hypothesised that trade would lead to

specialisation, promoting productivity and economic growth. In a modern context, several studies have shown that integration into international economy is positively associated with economic growth. Sachs and Warner (1995) divide their total cross-national sample into open and closed economies, based on tariff and non-tariff trade obstacles, state involvement or control. They show that the lack of overall global economic convergence can largely be attributed to the effect of the closed economies, while open economies converge unconditionally. They also find that political and legal rights promote economic growth. Furthermore, they refute the argument that international trade locks countries in production of primary industry products.

The notion that beneficial or adverse geographic location impacts economic performance is neither new by any means. However, the argument has gained renewed momentum by the works of geographer Jared Diamond. He argues that global economic disparities visible today have arisen from the geographic endowments, i.e. flora and fauna, emerging with the end of the last ice age (Diamond 1997). The availability of animals fit for domestication in combination gave Eurasia a defining edge. The majority of the vast continent is located in the temperate climate zone, and the West-East extent gave rise to long distance trade.

Also Pomeranz (2000) stresses the importance of the transatlantic trade and colonialism for the rise of Western Europe. And just as important, he attributes the British industrial revolution to the ready availability of coal in the British manufacturing heartland. Pomeranz argues that this geographic coincidence is at the core of modern economic divergence, and that before the industrial revolution living standards were quite similar, when comparing Europe and Imperial China. There also exists a series of empirical studies that support this perspective. In relation to China, Sylvie Demurger et al. (2002) show that geographic proximity to the coast encouraged both economic growth and foreign investment.

Rodrik et al. (2004) tackle the issue of the importance of institutions relative to other factors that may influence economic growth, i.e. integration into the world market through trade and benefits from geographic location. And by using the two-stage least squares method the authors show that integration and geography become statistically insignificant in explaining economic performance when controlling for institutions in three different cross-national samples.

The authors also aim to address the issue of reverse causality. Higher levels of economic development may very well give greater incentives to protecting property rights and enable better law enforcement. By their instrumental variables on institutional development, e.g. settler mortality rates in colonial times, Rodrik et al. claim to exclude this possibility. They also find that although geography in itself cannot explain economic variation, it has a significant indirect impact through influencing variations in institutional quality.

In response to papers claiming that geographic factors only have an indirect effect (e.g. the draft version of Rodrik et al. 2004) Sachs (2003) uses the risk of malaria infection and lethality to demonstrate that geographic factors do have a direct impact. Sachs finds that both have an economic and statistically significant effect on GDP among the cross-national samples used. Rodrik et al. (2004: 150-151) responds with demonstrating that though malaria lethality does have an direct effect, that effect disappears when controlling for regional properties by adding dummies.

The studies on institutions mentioned above only account for a small fraction of the vast and expanding empirical literature on the subject, but they serve the purpose of providing an overview of the empirical research. Studying sub-national institutions have different implications, as each state or province must abide by the same formal rules and national regulations. The scope for variation instead becomes the enforcement of national legislation and local regulation. Previous studies on economic growth among the provinces of China will be discussed in the section below.

2.3 Sub-national studies

The literature on the impact of institutional development in China is by no means extensive. Examples of studies using firm level data are Cull and Xu (2005), and Allen et al. (2005). There exists a rich literature on the causes of differences in growth rates among the provinces of China. However, the list of empirical studies testing for the effect of institutional variation at a provincial level is extremely thin. However two such studies, by Yu (2008) and by Hasan et al. (2009) are presented later in this section.

In their firm level study Cull and Xu (2005) test for the effects of property rights and financial provisions on profit reinvestment, using survey data from the World Bank on the perceptions of managers and accountants among Chinese firms. They test for property rights by the risk of expropriation and the reliability of contract enforcement. The former is measured by the perceptions of government assistance and by estimation of informal payments, while the latter is measured by confidence in the legal system, the existence of contracts and the perceived ability of courts. Cull and Xu find that the risk of expropriation is negatively associated with reinvestment and reliability of contract enforcement correlates positively with the same. They also find that access to external finance such as bank and trade credits are positively associated with profit reinvestment.

By contrast, Allen et al. (2005) argue that China is an exception to the international pattern that legal and financial environment are keys to economic growth, using a combination of survey data and data on firm performance. They first compare China's legal system to other legal traditions, e.g. the English and French, noting that despite China's often inferior legal performance growth has been far more impressive. Dividing their sample on Chinese firms into ownership, i.e. state, listed and private sector they find that, although the first two have far superior legal protection and financial access, their performance is inferior to the rapidly expanding private sector.

For the purpose of this study, the applicability of results from firm level studies is limited. The scope naturally differs, but there are also differences in methodology and research question. The comparative sector analysis of Allen et al. (2005) does not use testable economic models, instead relying on descriptive data to demonstrate relationships between sector performance and legal protection. Profit reinvestment (Cull and Xu 2005) is certainly important for long term firm performance and in extension the local economy. But when broken down to city level it is insufficiently correlated with local GDP levels (ibid: 124). Of greater importance to this study are the two cross-provincial studies by Yu (2008) and Hasan et al. (2009), which are discussed below.

Using generalised method of moments (GMM) on panel data from the Chinese provinces, Yu (2008) argues that neither institutions nor integration into the global economy are significantly associated with growth. However, when introducing an interaction variable between institutions and integration, not only is the interaction

variable positive and significant, but its inclusion makes institutions and integration significant and positively associated with growth. The author concludes that the gap between the two theoretical stances of institutions or global integration not only can, but must be, bridged for any of the factors to be relevant.

Meanwhile Hasan et al. (2009), who in addition to institutional quality also tests for the role of financial deepening, find that both these factors are significant in explaining provincial performance in China. They test for business environment by the private share of fixed investment. They also test for rule of law, measured by legal professionals as share of total population, and the awareness of property rights, measured by domestic trademark applications to number of firms. Using the GMM method on panel data they find that the institutional variables are significant in explaining real GDP growth rates among the Chinese provinces. And while bank loans are not significant in explaining growth, financial deepening as measured by equity to debt does have a significant and positive impact on growth.

That the results by Hasan et al. (2009) and Yu (2008) are contradictory can largely be attributed to their difference in research objectives and use of different measurements.

The role of geography in the case of China as an explanation of economic performance has been explored by among others Demurger et al. (2002). They also test for the role of preferential policies. As measures used in cross-national studies, such as distance from equator and occurrence of malaria is not applicable to China. The authors instead test for adjacency to the coast. Using panel data, they also employ a more refined geographic measure, the share of population living within 100 kilometres from the coastline or navigable river (ibid: 451). The policy measure used is constructed by point system by province and year depending on the occurrence of preferential treatments, such as Special Economic Zones or similar arrangements (ibid: 453).

Demurger et al. (2002) find that economic growth has a positive correlation with the coastal dummy, while the results of the refined measure are mixed. Preferential policy is significant and a positive correlation with economic growth. Exploring mechanisms whereby growth affected, the authors also tests whether these variables may have had an impact on FDI. They find that both the share of

population within 100 kilometres and preferential policy has had a positive impact on the attraction of FDI among the Chinese provinces.

Before presenting the methodology and data used in this study, it is necessary to look at the transition process of the People's Republic of China, from a planned command style economy towards a market economy, albeit still highly politicised and with large influx of state intervention.

2.4 Economic growth in China

China's economic history from the founding of the People's Republic of China in October 1949 to the beginning of the reform period in late 1978 is one of turbulence. From the revolution, the focus on heavy industry put severe pressure on the agricultural sector, as it was largely financed by cheap agricultural inputs. The Great Leap Forward and the Cultural Revolution added to the hardships and by the death of Mao in 1976, the command economic system was crumbling (Naughton 2007).

After the death of Mao, the radical so called “Gang of Four” was ousted and economic reforms were initiated, under the leadership of Deng Xiaoping. However, the initial idea of financing purchase of Western technology through oil ended in failure. Instead the Communist leadership, at the “Third Plenum” in December 1978, was forced to liberalise the economy, something that would have been unthinkable a year before (ibid: 79).

The reforms that started in late 1978 were not part of some overarching master plan. In fact, while the Chinese leadership under Deng wanted reform, they had little idea on how to carry this out. Ultimately, in order to encourage growth in output, the leadership had to turn to existing practices that were not even officially sanctioned at the time. In Anhui province farmers began to lease collective land and divided the production and procurement quota to individual households within the collective. This created incentives whereby these collectives soon became far more productive than others (Lin 1988).

At first this was only tolerated at local level and from the reform period at the central level, with the condition that the practice be limited to poorer areas. But as this condition was ignored the practice spread, output increased across the board,

and finally became the policy of the central government (Lin et al. 1996: 213). In 1983 leasing contracts covered 98 per cent of the collectives. This system was to become known as the Household Responsibility System. Growth in agricultural output was remarkable, 42.2 per cent during the period 1978-1984, with half the growth attributable to reform. Rural areas flourished after decades of neglect under the heavy industry policy of the pre-reform era.

The next step in the Chinese transition was the acceptance of collective and private ownership in local small and medium enterprises. During the 1980s, price controls were relaxed and credit rationing had been decentralised. This contributed to the rapid growth of non-state enterprises, especially rural businesses called Township and Village Enterprises (TVEs). These became driving in the transformation of the Chinese economy as the non-state sector grew from 22 per cent in 1978 to 56.9 per cent in 1993. TVEs consisted mainly of light and labour intensive industry, correcting the misallocation of resources towards heavy industry during the era of planned economy (ibid: 215).

This development had several side effects, one of the most important was increasing productivity in the overall economy. As the TVEs catered to the market, poor management and performance meant going out of businesses, as they were not as protected as the State Owned Enterprises (SOEs). This meant that TVEs had to be efficient to survive, and as a consequence they soon outperformed the SOEs. This in turn prompted reform of SOE management and privatisation in order to improve their competitiveness (ibid: 216).

While the leasing contracts and TVEs led to growth in agricultural and industrial output, generated productive employment and corrected serious errors from the planned era, the dismantling of state sector had drawbacks for some. The SOEs did not only provide employment, but were also hubs of social security for their employees, who became the first real losers of reform. Like nearly all other aspects of the Chinese transition, the Communist leadership did not embrace all out privatisation, but only partly and gradually allowed private buy-outs of TVEs and SOEs (Naughton 2007: 106).

The internal reforms were coupled with what has been referred to as the Leap Outwards, the engagement in global trade and attraction of foreign direct investment (FDI). There was a realisation from the beginning of the reform period that foreign capital and know-how was vital for economic growth in China. But

just as with privatisation, globalisation and foreign investment was not accepted as a wholesale solution. In fact, it was only during the 1990's that FDI inflows really gathered momentum.

The introduction of Special Economic Zones (SEZs) was as much a commitment to gradualism as to economic liberalisation. Within these zones, located in the Southern and Eastern coastal areas, generous taxation and tariff incentives were offered to foreign businesses. This, coupled with provision of infrastructure and the availability of cheap labour, attracted the investments sought after while simultaneously shielding the rest of the economy from excessive competition. One SEZ became six, and these were complemented by over a hundred investment zones by 2003 (ibid: 410), but by then the zones had since long played their part as FDI beachheads. When China joined the World Trade Organisation (WTO) in 2001, trade tariffs had been drastically cut.

The gradual approach to reform has been a hallmark of the Chinese transition process, this in sharp contrast to other transition economies, e.g. Eastern Europe and Russia who went with fully embracing market economy as a wholesale solution (Qian et al. 1999). Much of the explanation to this difference can be found in the fact that, while Eastern Europeans wanted to shed every aspect of economic and social life that smelled of Communism, the Chinese Communist Party only wanted to distance itself from the worst stench of command economy. Just as importantly, the gradual approach was a result of the constant struggle between reformers and conservatives within the Chinese Communist ranks. Even today, many parts of the Chinese economy, especially the interest rate policy and the banking sector, still lag behind other segments of the economy when it comes to private ownership and marketisation.

Even more gradual and careful progress has characterised legal reform in China. While rights to personal property was formally recognised in the 1978 and 1982 post-Mao Constitutions, first by 1990 was regulation enacted that permitted businesses to make long term invest in land. And property rights in corporate assets were strengthened with the Company Law in 1993 and Securities Law 1998. Only in 1999 were private property rights formally recognised, though the state retained the primacy in determining the conditions of these rights (Potter 1999: 678-679). A series of contract laws were enacted during the 1980s. These were harmonised in the 1993 Economic Contract Law revision. Though this

revision emphasised fairness, good faith and protection of rights, state control also lingered here (ibid: 679-680).

Economic reform in China brought with it a dramatic increase in income inequality. In the 1980's the country was among the most egalitarian in the world, although far poorer than today, with a Gini coefficient of 0.28, comparable to Germany and Sweden. By 2001 that measure had increased to nearly 0.45, making China far more unequal than other Asian countries, even surpassing the United States (Naughton 2007: 217-218).

Reform and growth in China has been uneven and characterised by volatility, it has also been unevenly distributed across the vast country. Gross Regional Product per capita in 2008 was 73,124 Yuan in Shanghai and only 8,824 Yuan in Guizhou, an eightfold difference (China Statistical Yearbook 2009). And while the richest five provinces contributed to 22.1 per cent and the six poorest to 19.8 per cent of China's total output in the beginning of the 1980s, that relationship has changed to 27.3 and 8.7 per cent respectively (Quan 2007).

While both rural and urban inequality has risen during the last decades, it is the rising urban-rural income inequality that is the main driver of this trend (ADB 2007). This can partly be attributed to the patterns of foreign investors and exporters, as all SEZs and most of FDI was concentrated to China's urbanised coastline. But the trend has also been exacerbated by the social and political limitations on migration known as the *hukou* system. Despite efforts by the government to curtail regional inequality, e.g. by promoting investment in the inland regions, there is little evidence of a trend break thus far.

But, as seen from the debate covered in Section 2.3, it remains unresolved what factor has driven this unequal growth process among the different provinces. As it is the aim of this study to address that very problem a testable hypothesis is developed in the following section.

2.5 Hypothesis

The research question of this study asks whether or not institutional quality has had a positive effect on economic growth among the provinces of China. Given

the results of previous empirical studies and the nature of the Chinese transition process a testable hypothesis can be formulated.

Hypothesis: *Institutional quality is positively associated with GDP growth among the provinces of the People's Republic of China.*

Drawing on previous cross-national and sub-national studies, several factors also needs to be controlled for. These include factors that are standard practice to control for in growth models, such as initial capital. But also factors that are offered as explanations by classic or growth economics, such as capital accumulation, human capital or, as discussed above, geography and trade.

Consequently, this study controls for the effects of initial GDP level, capital intensity, human capital, international trade integration and geographic location, when testing for the relationship between institutional quality and economic growth.

3 Data and methodology

The testing procedure of this study is divided into five stages. First, economic models are constructed on the basis of the theoretical assumptions and empirical findings discussed above. Second, data is collected to capture the variables which constitute these models. Third, the models are subject to parametric testing through the least square method and regression results are then analysed. Fourth, the robustness of the results will be tested. Lastly, conclusions are drawn based on the findings. Before presenting the models however, the data used will be discussed and compared to that of previous studies.

3.1 Data

A discussion on each measure is presented below. Choice of measurements will be motivated and comparisons will be made to data in previous studies.

3.1.1 Dependent variable

Economic growth is measured by real GDP growth rates, from 1997 to 2009, data is obtained from various editions of China Statistical Yearbook (1998-2010), available online. The measure of real GDP growth rates is commonly used when testing economic performance (e.g. Scully 1988, Keefer and Knack 1997, Hasan et al. 2008). The choice of GDP rather than income measures is a consequence of the focus on economic output rather than living standards.

3.1.2 Independent variable

Institutional quality is the independent variable of interest in this study. Measures on institutional development are often subjective (e.g. Scully 1988, Keefer and Knack 1997, Rodrik et al. 2004), i.e. they measure perceptions of institutional quality by different stakeholders, such as managers or investors. In some studies objective measures are used (Yu 2008, Hasan et al. 2009), these are often directly measurable indications, such as number of legal professionals or the share of private ownership.

The main advantage with objective measures is that they are not subject to personal opinion, while the subjective perceptions of business-people are subject to sentiments and personal experience. On the other hand, it is on their perceptions that investors and entrepreneurs base their business decisions. Ideally this type of data would have been used, but as no such measures currently exist on a provincial level, an index of mostly objective measures will be used in this study. This index may still avoid some problems inherit with the objectives measures that have been used previously.

For instance, Yu (2008) uses the objective measurement, share of urban employment outside state owned enterprises (SOEs), as a proxy for private sector development and market friendly environment. While such factors are indeed associated with institutional quality, the scope of institutions risks becoming skewed by such a definition. Not only is it a very narrow definition of institutional development, but in fact privatisation may or may not impact growth without reflecting the underlying institutional quality at all. Private firms face harder budget constraints than SOEs, and as a consequence their performance can be

expected to be superior. Yu suggests that institutions are significant only through the interaction with international trade, but his findings may show that interaction between privatisation and integration is significant, rather than between institutional quality and integration as he himself argues.

Hasan et al. (2009) use objective measurements that better captures institutional quality, but there are some problems also with these. The number of legal professionals also gives a very narrow scope of institutional development and can have many other determinants than the rule of law. And domestic trademark applications may be an indication on factors of provincial development other than the awareness of property rights.

Some of these problems may be avoided by using an index on several aspects of institutions. Data on institutional development used in this study was obtained from the NERI Marketization Index (2008). This index actually contains several indices, the one used here is called the “Development of intermediary and legal institutions”, spanning from 1997 to 2007. This index in turn comprises four sub-indices. A) “Development of intermediary institutions” measures the service available to producers from lawyers and accountants. B) “Protection of legal rights of producers” measures frequency of economic cases and the fairness and efficiency of courts. C) “Protection of Intellectual Rights” measures patents and employment in the research and development sector, and D) “Protection of consumers’ rights” measures the occurrence of consumer lawsuits. Together these indices capture a broad range of aspects on institutional quality and are far more multidimensional than previously used measures on institutions in China. This data however shows some inconsistencies.

In respect to the subjective and objective discussion, sub-index A) uses the objective measures of numbers of lawyers and accountants as share of population are up to 2005, when the measure instead measures the subjective perceptions of service quality by local business. Similarly sub-index B) indicates economic court cases controlling for GDP, while from 2003 it measures the perception of efficiency and fairness of courts.

These factors need to be accounted for in the parametric testing stage of this study, e.g. by adjusting the sample size in time. Additionally, some measures risk being too broad in measuring institutions, e.g. patent registration in C) may reflect provincial innovative capabilities as much as confidence in the enforcement of

property rights. By themselves the objective measures of the Marketization Index suffers the same limitations as those used in previous studies.

However, the main advantage in using such an index is the coverage of several aspects relevant to institutional development. The risk of the individual measures in the index being excessively narrow is thereby reduced, even though some may still be a bit broad. Given the theoretical assumptions of NIE and the results from cross-national studies improvements in institutional quality is expected to be positively associated with economic growth.

Note that the measure refers to a year-on-year change in institutional quality, as opposed to a level effect. Expecting that growth would be higher as the level of institutional quality increases would implicate that we expect the provinces with superior institutions to grow faster in infinity, which is not reasonable.

3.1.3 Control variables

Economic growth theory has a long tradition of highlighting the importance of capital accumulation for economic growth (Jones 2002). Empirically, investment in capital has been proven to be a driving force in China (Naughton 2007: 143-148) and a major factor for the growth miracle of East Asian tiger economies, such as South Korea and Taiwan (Rodrik 1994). Yu (2008) uses investment as share of GDP for this purpose, but following the recommendations and evidence of Alexander (1994) capital stock to GDP rather than investment ratio will be used in this study to control for capital intensity. Ideally this should have included some adjustment to actual utilisation of capital resources, but such measures were not available. An increase in capital intensity is expected to be positively associated with economic growth.

The importance of human capital for economic growth has been underlined by, among others, Paul Romer (Jones 2002). Accumulation of human capital should encourage the adoption of new technology, especially for developing countries attempting to catch up. Hasan et al. use secondary schooling enlistment as share of primary school graduation as a quality measure. But this measures primary school efficiency rather than overall higher education, which should be more important as production in China becomes more advanced. Human capital in this study is controlled for by the share of the population with non-mandatory

education, as estimated in the China Statistical Yearbook (1998-2010). In China education is mandatory up to junior high school and voluntary afterwards. An increase in the population share with non-mandatory education is expected to be positively associated with economic growth.

Trade as an explanation to economic growth is associated with Adam Smith, the father of classic economics. Trade encourages specialisation, which promotes productivity. Romer offers an additional argument for international trade as a contributing factor to growth, technology transfer (Jones 2001). Hasan et al. use exports as share of GDP to measure global integration. However, Lawrence and Weinstein (2001) argue that imports rather than exports were driving in the East Asian economic development, as imports contain technology that can be incorporated into the domestic economy. But as a large part of Chinese exports is generated by foreign multinationals, which brings technology and management practices which can generate spill-off effects, it seems reasonable to include both exports and imports. In this study exports and imports as a share of GDP, from the China Statistical Yearbook (1998-2010), is used to control for trade intensity and thereby integration into the international economy. An increase in trade intensity is expected to be positively associated with economic growth.

Geography has been stressed by Jared Diamond (1997) and Jeffrey Sachs (2003) as explaining economic growth in the very long run and through direct effects. In cross-national studies the distance to the equator is often used as a dummy of geographic location. However, this is not applicable in explaining regional differences in China, where prosperous and poor regions can be found in both the North and the South. Instead development has been most pronounced in the coastal East and weakest in the Western inland.

Demurger et al. (2002) use a variable on the distance from coast. They also add a measure on share of provincial population within 100 kilometres from coast or navigable rivers. As advanced measurements such as the latter were not readily available for the purpose of this study, a dummy was constructed reflecting the adjacency to the coast and navigable rivers. But the question immediately arises what rivers should be included in such a measurement.

The Pearl River, the Heilongjiang, the Huaihe, the Qiantang, the Minjiang and the Huangpu rivers are all navigable, but none of these carry freight volumes comparable to that of the Yangtze river (Chinatourguide.com). As a result of

being the only river where freight volumes may be sizeable enough to impact economic growth, only provinces adjacent to the Yangtze were included in the dummy. The second largest inland water transport system in China is the Grand Canal (Chinaculture.org). However, this will not be included as it is man-made, and its exclusion does have an impact as the canal runs through the coastal provinces. Adjacency to the coast or the Yangtze river is expected to be positively associated with economic growth.

3.2 Models

This study utilises the ordinary least square (OLS) method to regress real growth rates on the independent variable and control variables. Rodrik et al. (2004) and Sachs (2003) use the two-stage least squares (TSLS) method when testing for cross-national economic performance.

But the quality of results using TSLS depends on the quality of the instruments used in the first stage. Rodrik et al. (2004) utilise well established instruments on institutional development, e.g. settler mortality rates, developed by Acemoglu et al. (2001). And Sachs (2003) uses the prevalence and lethality of malaria as an instrument for malign geographic location. As no such recognised instruments are available in the case of China TSLS was not appropriate for the purpose of this study. Both Yu (2008) and Hasan et al. (2009) use generalised method of moments (GMM), but for this study OLS fits the purpose well.

The testing process starts with three fixed effects models, for both cross-sections and periods, for province i and year t . The first model (1) tests for capital intensity (Cap_{it}) and non-mandatory education ratio (Hum_{it}) only. Model (2) includes the independent variable of interest, institutional quality ($Inst_{it}$), to test the hypothesis of this study and whether the independent variable improves the model. Model (3) includes trade intensity as a measurement of integration into the global economy ($Inte_{it}$). α indicates the constant term, β_j indicates the parameter for variable j , and ε indicates the error term.

$$\Delta Y_{it} = \alpha + \beta_1 Cap_{it} + \beta_2 Hum_{it} + \varepsilon \quad (1)$$

$$\Delta Y_{it} = \alpha + \beta_1 Cap_{it} + \beta_2 Hum_{it} + \beta_3 Inst_{it} + \varepsilon \quad (2)$$

$$\Delta Y_{it} = \alpha + \beta_1 \text{Cap}_{it} + \beta_2 \text{Hum}_{it} + \beta_3 \text{Inst}_{it} + \beta_4 \text{Inte}_{it} + \varepsilon \quad (3)$$

Note that when cross-section fixed effects are included the variable initial GDP and the geography dummy have to be excluded, as the regression otherwise becomes a near singular matrix.

Both fixed effects were significant in a redundant effects test, but nonetheless it is still of interest to isolate the effect of initial GDP ($\ln(Y_{\text{initial}})_i$) and especially geography (Geo_i). The basic models were adjusted to include period fixed effects only, thus enabling the dummy for geography.

$$\Delta Y_{it} = \alpha + \beta_1 \ln(Y_{\text{initial}})_i + \beta_2 \text{Cap}_{it} + \beta_3 \text{Hum}_{it} + \varepsilon \quad (1')$$

$$\Delta Y_{it} = \alpha + \beta_1 \ln(Y_{\text{initial}})_i + \beta_2 \text{Cap}_{it} + \beta_3 \text{Hum}_{it} + \beta_4 \text{Inst}_{it} + \varepsilon \quad (2')$$

$$\Delta Y_{it} = \alpha + \beta_1 \ln(Y_{\text{initial}})_i + \beta_2 \text{Cap}_{it} + \beta_3 \text{Hum}_{it} + \beta_4 \text{Inst}_{it} + \beta_5 \text{Inte}_{it} + \beta_6 \text{Geo}_i + \varepsilon \quad (3')$$

It is possible that institutional quality may only affect growth with time. It is therefore necessary to test the possible effects displayed by time lags. In Model (4) lags are included for province i and year t , where r is the number of lags.

$$\Delta Y_{it} = \alpha + \beta_1 \text{Cap}_{it-r} + \beta_2 \text{Hum}_{it-r} + \beta_3 \text{Inst}_{it-r} + \beta_4 \text{Inte}_{it-r} + \varepsilon \quad (4)$$

Once parametric testing has been conducted the robustness of the results are tested, e.g. by adjusting cross-sections and time periods, or alternate definitions of the independent variable or control variables.

4 Results and analysis

This chapter presents the regression results from the parametric testing of the models presented in the previous chapter. The results are analysed and robustness is tested and discussed. The tables in the chapter present a summary of the most important findings.

4.1 Results

The results from the testing of the basic models (1), (2), and (3) are presented in Table 1 below.

| Dependent variable: Real Growth | | | |
|---------------------------------|----------------------|----------------------|----------------------|
| Model/ Variable | (1) | (2) | (3) |
| Constant | 11.244*** (0.079) | 11.145*** (0.085) | 11.107*** (0.089) |
| Cap | 0.039** (0.018) | 0.073*** (0.020) | 0.072*** (0.020) |
| Hum | -0.024 (0.042) | -0.040 (0.038) | -0.037 (0.038) |
| Inst | | -0.085 (0.110) | -0.063 (0.111) |
| Inte | | | 0.020 (0.014) |
| Obs | 372 | 307 | 307 |
| Adj-R ² | 0.70 | 0.80 | 0.80 |

Period and cross section fixed effects.
Significance level: *** 1%, ** 5%, * 10%

In Model (1) real growth is regressed on the measures of capital and human capital. Capital intensity is significant at a 5 per cent level and has a positive sign, as expected. The human capital variable, non-mandatory education ratio, has a negative sign, opposite to what is expected, but the estimate is not significant.

In Model (2) institutional quality is added to the equation. The result shows that the institutional variable is insignificant and has the opposite sign than expected. Therefore the hypothesis that institutional quality is positively associated with economic growth among the provinces of China has to be rejected. The control variable for capital however, not only remains significantly positive, it is now significant at a 1 per cent level and increases in economic significance. Human capital remains insignificant.

Model (3) includes integration into the international economy. This control variable is also statistically insignificant in explaining economic growth, contrary

to expectations, even if the sign is positive, as expected. The other variables remain unchanged from the results in Model (2).

Both cross-section and period fixed were shown to be significant in a redundant variable test. However, despite that fact, it is of interest for the purpose of this study to drop the fixed cross-section effects temporarily in order to test for the effects of initial GDP and the geography dummy. The testing process of these models including dummies is identical to that of the basic models. The summary regression results are presented in Table 2 below.

Table 2: Dummy Variable Models

Dependent variable: Real Growth

| Model/ Variable | (1') | (2') | (3') |
|---------------------|---------------------|---------------------|---------------------|
| Constant | 4.745*** (1.536) | 1.692 (1.541) | 2.363 (1.764) |
| ln($Y_{initial}$) | 0.745*** (0.177) | 1.079*** (0.179) | 0.996*** (0.211) |
| Cap | 0.061*** (0.021) | 0.098*** (0.025) | 0.097*** (0.025) |
| Hum | -0.002 (0.052) | -0.019 (0.048) | -0.016 (0.049) |
| Inst | | 0.064 (0.134) | 0.070 (0.135) |
| Inte | | | 0.024 (0.017) |
| Geo | | | 0.015 (0.201) |
| Obs | 372 | 307 | 307 |
| Adj-R ² | 0.54 | 0.65 | 0.65 |

Period fixed effects.

Significance level: *** 1%, ** 5%, * 10%

In Model (1') real GDP growth is regressed on the natural logarithm of the initial provincial GDP, capital intensity and human capital. Initial GDP levels are positively associated with economic growth at a 1 per cent significance level. This may indicate economic divergence among the provinces, but there is also a possibility that these individual GDP levels capture other province specific

effects. Capital intensity is positive and significant even in this model and human capital is still negative and non-significant.

In Model (2') institutional quality has the expected sign, but is still statistically insignificant. In this model both initial GDP and capital intensity increase in economic significance. Including the geographic dummy of coast and navigable river adjacency in Model (3') does not change the overall regression results and the geography variable itself is not statistically significant.

However, as the cross-section fixed effects are significant in the redundant effects test. And the higher Adj-R² seems to indicate that initial GDP and the geography dummy does not fully capture individual characteristics across the provinces. Therefore the basic models will form the core of the analysis.

Institutional quality cannot be shown to have a significant effect on economic growth, neither in Table 1 nor Table 2. This runs contrary to the hypothesised expectations of this study and contradicts the findings of cross-national studies and the China cross-provincial findings by Hasan et al. (2009).

There naturally exists a risk of possible misspecification, of both measurement and models, but not more so than with the measures used by Yu (2008) or Hasan et al. (2009). And as the index offers to capture several relevant aspects of institutional development, the risk is actually reduced that the definition of institutions is missed altogether. There is therefore not unreasonable to assume, at this stage, that the results are in fact correct.

Furthermore these findings are not surprising given the nature of the Chinese growth experience. Political and legal reform has been lagging behind economic reform. And as observed in the description of China's economic transition, pressure for reform has often come from the grass-root level. The government has often consented to, rather than initiated, reform initiatives, such as with the Anhui de-collectivisation experiment. Growth seems to have occurred in spite of inferior legal provisions, not because of superior ones.

But the argument for trade offered by neoclassic economics does not seem to fare any better. Integration into international trade is insignificant in all models, which runs contrary to expectations and conventional theory. This may also be due to variable misspecification or sample misspecification.

It is interesting to note that capital intensity is significant across the board. This confirms the notion that Chinese growth to a large extent has been driven by

investment in fixed capital. That human capital is negatively associated with economic growth does not necessarily suggest that educational attainment has a negative impact on the economy. It could be that the mechanisms through which human capital work are other than the year-on-year change that is used in this study. The effects may lag as it takes time before educational attainments to impact the wider economy or there may simply be no relationship between change in education ratio and GDP growth.

Table 3: Models Including Lags

Dependent variable: Real Growth

| Model/ Variable | (4.a) | (4.b) | (4.c) |
|--------------------|----------------------|----------------------|----------------------|
| Constant | 11.330*** (0.093) | 12.310*** (0.115) | 11.454*** (0.100) |
| Cap | 0.095*** (0.020) | 0.024 (0.021) | |
| Cap(-1) | | | 0.073*** (0.022) |
| Hum | -0.033 (0.041) | -0.001 (0.048) | |
| Hum(-1) | | | -0.026 (0.042) |
| Inst(-1) | -0.106 (0.123) | | -0.171 (0.124) |
| Inst(-4) | | 0.054 (0.140) | |
| Inte | 0.033** (0.014) | 0.057*** (0.014) | |
| Inte(-1) | | | -0.011 (0.016) |
| Obs | 307 | 245 | 307 |
| Adj-R ² | 0.76 | 0.63 | 0.75 |

Period and cross section fixed effects.

Significance level: *** 1%, ** 5%, * 10%

Given that changes in institutional quality, fixed capital, human capital and international trade all have the potential to influence growth in the subsequent years it is necessary to test for lag effects. Several versions of Model (4) were

tested, but the differences from the results of the original regressions were limited. Table 3 presents three selected versions of Model (4), above.

Model 4.a) only includes one single lag for the institutional quality variable, but does not change the significance of the independent variable. However, integration becomes significantly positive at a 5 per cent level. The implications of this change are not self-evident, as the exact mechanisms through which lagged effects of institutional quality may impact the significance of international trade are not theoretically obvious.

Extending the lag of institutions to two and three years does not change the results compared to Model 4.a), but including a four year lag as in Model 4.b), changes the sign of the institutional variable to positive. However the variable is still statistically insignificant. Even a fifth and final lag does not change the significance of institutions.

In Model 4.c) one year lags on all independent variables are included. Only the one year lag effect of capital intensity is statistically significant with the expected sign, all other lagged effects are statistically insignificant.

Several other versions of Model (4) were also tested, however they did not change the results, no variables except capital and integration were significant. The sign of the human capital variable changed to positive in all lags, but none of them were statistically significant. Institutions were not statistically significant with any lagged effect. Therefore lagged effects of institutional quality cannot be said to have a significantly positive affect on economic growth.

4.2 Robustness

The robustness of the above results is tested by the exclusion of outliers and adapting the sample by excluding cross-sections or time periods. Furthermore, the effect of changes to the independent variable and control variables were tested.

By plotting residuals it was indicated that the autonomous region of Inner Mongolia exhibited errors that differed from the rest of the sample. This can probably be attributed to the extremely high growth rates experienced there. The real GDP growth in 2005 was exceptional 23.8 per cent. These rates are largely

driven by the increased extraction of the region's various natural resources, making it reasonable to exclude the autonomous region.

The regression results, when excluding Inner Mongolia from the sample, is presented in Model (3₃₀) in Table 4 below. While institutions are still insignificant and capital intensity remains significant, the results from Model (3₃₀) exhibit some important differences from the basic model. First of all, integration into the international economy has now become statistically significant at a 5 per cent level with the expected positive sign. Secondly, human capital is now significant at a 1 per cent level. However, it does not have the expected sign, but is negatively associated with economic growth rates.

| Table 4: Robustness Models | | | |
|-----------------------------------|----------------------|----------------------|------------------------|
| Dependent variable: Real Growth | | | |
| Model/ Variable | (3 ₃₀) | (3 ₂₇) | (3' _{Coast}) |
| Constant | 10.993*** (0.072) | 10.862*** (0.085) | 5.369** (2.504) |
| ln(Y _{initial}) | | | 0.627** (2.445) |
| Cap | 0.056*** (0.016) | 0.059*** (0.017) | 0.099*** (3.997) |
| Hum | -0.051* (0.031) | -0.055* (0.034) | -0.016 (-0.328) |
| Inst | -0.021 (0.089) | 0.048 (0.131) | 0.053 (0.397) |
| Inte | 0.027** (0.011) | 0.017 (0.015) | 0.024 (1.408) |
| Geo ^{Coast} | | | 0.536** (2.130) |
| Obs | 297 | 267 | 307 |
| Adj-R ² | 0.84 | 0.85 | 0.67 |

Period and cross section fixed effects. Period fixed effects in (3'_{Coast}).
Significance level: *** 1%, ** 5%, * 10%

Another possibility of sample adjustment is to exclude the poorest provinces Guizhou, Tibet, and Gansu, by a logic similar to that of excluding the three richest. However this did not change the results from Model (3₂₇) which remains robust.

The question arises which model, Model (3) or Model (3₃₀), is systematically better. By looking at the Adj-R² it is evident that Model (3₃₀) is superior to its predecessor, the lower AIC and BIC pointed in the same direction. Excluding Inner Mongolia also has a positive effect on the normality of the error distribution. Skewness decreased from 0.96 to -0.02, skewness under normality is 0, and kurtosis decreased from 13.46 to 4.07, kurtosis under normality is 3.

Furthermore, it makes empirical sense to exclude the resource rich region. If natural resources underpin the local economy then factors like institutions or trade has limited changes of explaining growth. Similarly, resource rich countries are often excluded from cross-national studies on economic growth.

There is no evidence of overall economic convergence in the sample, if anything the findings indicate divergence. But given that economic theory claims that initially high levels of GDP should eventually lead to slower growth rates, the question arises when “eventually” actually is. It may therefore be an idea to exclude the three initially wealthiest provinces of Beijing, Tianjin and Shanghai from the sample. This is the same approach used by Demurger et al. (2002), but there with the logic that these are metropolitan areas. Results of this further adjustment is presented in Model (3₂₇), excluding Inner Mongolia, Beijing, Tianjin, and Shanghai.

Institutions remain insignificant and capital remains significant. That human capital is significant and negative continues to defy hypothesised expectations. But most interesting is that the integration variable again becomes insignificant in Model (3₂₇). Integration into the world economy is therefore only significant when excluding Inner Mongolia, but retaining the three richest provinces in the sample.

Even though the basic models with fixed effects are superior to the models including a geography dummy, it may still be of interest to control for the robustness of the findings with alternative definitions of geography. While Demurger et al. (2002) includes a measure of population within 100 kilometres of the coast and rivers, the relationship which the dummy in this study is meant to reflect, the dummy they themselves use only distinguishes between coastal and inland provinces. Redefining the dummy in the lines with Demurger et al. (ibid.) an alternative to Model (3'), Model (3'_{Coast}) was constructed.

In Table 4 above, it is shown that this coastal dummy is positive and statistically significant in explaining economic growth across the provinces of

China. And if the dummy does not capture other fixed effects it confirms that growth has continued to be strongest in the coastal provinces, while the Yangtze river does not offer similar opportunities for growth. High levels of initial GDP and year-on-year changes in capital intensity also continue to be positively associated with real growth rates.

The sample could also be adjusted to exclude certain time periods. Recalling the shortcomings of the institutional index used in this study, that the method of measuring intermediary institutions changes from 2005, it may be fruitful to exclude the years 2005-2009 from the sample. But the results from the basic regression remain robust when testing for these adjustments.

Table 5: Indirect Effects Models

Dependent variable: Capital Intensity, Integration, Institution

| Model/ Variable | (3 _{Cap}) | (3 _{Inte}) | (3 _{Inst}) |
|--------------------|----------------------|----------------------|----------------------|
| Constant | -6.337*** (2.034) | -2.486 (3.007) | 0.656* (0.381) |
| Growth | 0.646*** (0.181) | 0.268 (1.455) | 0.019 (0.034) |
| Cap | | 0.040 (0.090) | (0.009) (0.011) |
| Hum | 0.087 (0.113) | -0.122 (0.164) | -0.020 (0.021) |
| Inst | 0.268 (0.333) | -1.048** (0.480) | |
| Inte | 0.109 (0.424) | | -0.017** (0.008) |
| Obs | 307 | 307 | 307 |
| Adj-R ² | 0.20 | 0.27 | 0.29 |

Period and cross section fixed effects.

Significance level: *** 1%, ** 5%, * 10%

Even though institutional quality does not display any direct effects on growth rates it may still be a possibility that they contribute to growth by impacting other significant variables. Models were constructed to capture any indirect effects of institutions through capital and international integration, presented in Table 5 above. But institutions were not significant in explaining capital intensity, in

Model (3_{Cap}), only real growth is significant in explaining capital intensity. Lags were also tested but were insignificant. In Model (3_{Inte}) it is shown that institutional quality is negatively associated with economic integration, a relationship significant at a 5 per cent level.

Even though institutions do not seem to have either a direct or indirect effect, at least not as expected, another relationship may be possible. That causality is simply reverse, i.e. growth impacts institutional quality. But as seen in Model (3_{Inst}), this was not the case. There is no evidence that growth causes the development of superior institutions, while the negative relationship between institutions and integration is reciprocal.

Before testing the alternative definitions of institutional quality the interaction effect between institutions and integration, found by Yu (2008) should be explored. Yu found that while neither institutions nor integration was significant in themselves the interaction effect between them was not only significant, but made the individual variables significant as well.

The regression results are presented in detail in the Table 6, Model (3_{Interaction}), below. These show that the interaction variable was not significant, furthermore, the institution and integration variable both remained statistically insignificant. The difference in results may originate from the fact that OLS is used in this study, while Yu uses GMM. But if assumed that the methods are equivalent, the result presented here should give more accurate estimates as Yu only measures the effects of institutions through privatisation, which as explained above could affect growth through mechanisms other than institutional quality.

Expecting a year-on-year effect of change in institutions may be a misspecification of the mechanisms through which institutions are expected to work. Even though such a measure has elements of irrationality, an alternative model was constructed to explore the level effects of institutions. Model (3_{Logarithm}) uses the natural logarithm of the independent variable, rather than the year-on-year change as employed in the basic models. The results however demonstrate the robustness of the basic models and that level effects of human capital is not significant in explaining real GDP growth.

Another approach to the same possibility is to test for the initial levels of institutional development, controlling for initial GDP, changes in capital intensity, change in trade intensity and initial human capital levels.

The initial level of human capital was also controlled for as it may display long term rather than year-on-year effects, but this was not proven to be the case. And even in this model the institutional variable remains negative and insignificant. Without controlling for initial GDP levels institutions were statistically significant and had a positive sign, but there is no reason to assume that initial GDP does not belong in this model.

Table 6: Robustness Models

Dependent variable: Real Growth

| Model/ Variable | (3 _{Interaction}) | (3 _{Logarithm}) | (3' _{Initial}) |
|---------------------------|-----------------------------|---------------------------|--------------------------|
| Constant | 11.086*** (0.093) | -2.685 (3.554) | 4.134* (2.327) |
| ln(Y _{initial}) | | | 0.699** (0.339) |
| Cap | 0.071*** (0.020) | 3.681*** (0.631) | 0.065*** (0.022) |
| Hum | -0.036 (0.038) | -0.249 (0.699) | 0.444 (0.436) |
| Inst | -0.030 (0.120) | -0.011 (0.107) | -0.131 (0.094) |
| Inte | 0.029 (0.017) | 0.113 (0.425) | 0.045** (0.015) |
| Inst*Inte | -0.010 (0.010) | | |
| Geo | | | 0.199 (0.232) |
| Obs | 297 | 307 | 360 |
| Adj-R ² | 0.80 | 0.81 | 0.56 |

Period and cross section fixed effects. Period fixed effects in (3'_{Initial}).

Significance level: *** 1%, ** 5%, * 10%

In conclusion, the findings of the basic models remain robust. Institutions remain statistically insignificant, while capital is significantly robust in almost all models. Human capital was continued to be statistically insignificant, in all models but two, where it had a negative effect. Integration is only significant once excluding Inner Mongolia, while retaining the three metropolitan areas, which is interesting, but hardly a robust result.

5 Concluding remarks

The findings central to this study are summarised below. First of all should be noted that the main hypothesis of this study, that improvements in institutional development is positively associated with economic growth, was rejected in all regression results from the testing process.

The only explanatory variable that was significant in almost all regressions was capital intensity, confirming that the Chinese economy is largely led by investment in fixed capital. Human capital was insignificant, with some exceptions, when it was significant but negatively associated with economic growth, contrary to expectations.

Integration into the global economy, measured by exports and imports of GDP, was positively associated with economic growth only when excluding Inner Mongolia, but retaining the richest and most developed provinces in the sample. The support for the hypothesis and popular notion of China as an export-led economy is therefore very limited, conditioned upon highly selective cross-sectional sampling.

Geography is insignificant when defined as adjacency to coast and rivers. But when defined as coastal only, it becomes statistically significant and positively associated with growth. This confirms that the coastal provinces have continued to grow faster than the inland provinces during the last decade, given that the dummy variable does not catch other significant fixed effects.

The finding that institutional quality does not have an impact on economic growth rates does not have to suggest that institutions do not matter in China. It could suggest that relationships other than year-on-year improvements or the natural logarithm of institutional quality may cause growth. The initial institutional values used in this study only dates back to 1997, it could be that the initial reform from 1978, even though modest in scope, has been important for the subsequent provincial growth.

Finally, there is a possibility that the measurement used is inadequate in capturing institutional development. The measures used are inconsistent in the respect that they employ both objective measurements and subjective perceptions.

Assessing the role of institutions in China would benefit tremendously by the construction of subjective perception measurements, similar to those often employed in cross-national studies. Such measures are included in the later years in the NERI Marketization Index. Should this development continue and expand the research community would have far better tools at its disposal in assessing the relationship between institutions and growth.

However, assuming that the measurements are reasonably correct, this study shows that there is no significant relationship between institutions and growth. This may be unexpected given the overall cross-national support for the importance of institutions, but far less so given the Chinese growth experience where legal and political reform has lagged behind economic development.

The conclusion of this study is that growth among the provinces of the People's Republic of China has primarily been driven by investment in fixed capital rather than economic integration, human capital or institutional development.

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