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Governance Infrastructure and Location of Foreign Direct Investment in the People's Republic of China

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Abstract

Standard neoclassical theory predicts that capital should flow from rich to poor countries. However, Lucas (1990) points out that these capital flows are actually very modest, and nowhere near the levels predicted by theory. The People's Republic of China (PRC) now receives more foreign capital in the form of foreign direct investment (FDI) than any other country, but statistics indicate that this inward FDI flows unequally to different regions. In this study, using hand-collected data on FDI for more than 200 cities, we examine whether the Lucas paradox of capital exists within the PRC. We adopt the dynamic panel data generalized method of moments (GMM) framework to avoid the potential endogeneity issue. Using both provincial- and city-level data, the empirical results show that FDI flows to the PRC, as proxied by total gross domestic product (GDP) and per capita GDP, favor rich regions over poor regions. We also find that regional economic growth has no significant impact on FDI. These findings support the existence of the Lucas paradox in the PRC. We demonstrate that this paradox is not driven by government policy and explore possible explanations for its existence.

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Contents

1. INTRODUCTION

In standard neoclassical economic theory, the law of diminishing returns implies a higher marginal product of capital in a less productive or poorer economy, which tends to direct capital flows from rich economies to poor economies. In a free and competitive capital market, this trend will continue until the difference between the two economies disappears. However, Lucas (1990) argues that, whereas this theory predicts that capital goods will flow rapidly from the United States (US) and other wealthy countries to such poor countries as India—because the marginal product of capital in the latter is far higher than that in the former—capital flows from rich to poor countries are in fact very modest, and nowhere near the levels predicted by theory. This is called the Lucas paradox. In a recent study, Prasad, Rajan, and Subramanian (2007) proposed a deeper version of the Lucas paradox and documented the fact that foreign capital did not follow growth across countries during the 2000–2004 period.[1]

In this study, we investigate the Lucas paradox within the PRC. Foreign direct investment (FDI) inflows have risen dramatically since the "open-door" policy was implemented in the PRC, and the country now receives more foreign capital in the form of FDI than any other.[2] However, these FDI flows are unevenly distributed across different regions of the PRC. Historically, the eastern coastal regions have attracted more foreign capital than have the western inland regions. Moreover, by considering this issue in the context of one specific country, we can eliminate alternative explanations for the paradox, given that all provinces and cities in the PRC share the same (or a similar) legal system, policy risks, cultural structures, and other institutional factors, all of which have commonly been used to explain varying levels of FDI across countries. The PRC is a very large country—economically, geographically, and in terms of population. Statistics indicate that inward FDI flows unequally to the country's different provinces. Prior studies have examined the Lucas paradox using cross-country data, which are likely to suffer from data compatibility problems, as official data collection, definition, and measurement may be inconsistent across countries. Using cross-regional data within a single country makes these problems less severe. In this study, using hand-collected data on FDI in 30 provinces and more than 200 cities, we examine whether the Lucas paradox of capital is prevalent in the PRC. This exercise helps us to understand whether FDI flows to rich regions more than to poor regions, and to high-growth regions more than to low-growth regions.

When examining the relationship between regional economies and FDI inflows, we have to acknowledge the potential endogeneity issue, namely that the Lucas paradox could be caused by reverse causality. Previous studies argued that FDI enhances regional economic development. To control for the endogeneity that may arise from the dynamic specification of the equation and from reverse causation, we adopt the dynamic panel data generalized method of moments (GMM) framework, following the studies of Arellano and Bond (1991); Arellano and Bover (1995); and Blundell and Bond (1998).

Our empirical results demonstrate that foreign capital favors rich regions over poor regions within the PRC, which is consistent with the findings of cross-country studies. Our generalized method of moments (GMM) estimations show that more FDI inflows are attracted to provinces and cities with higher total gross domestic product (GDP) and higher per capita GDP. Prasad, Rajan, and Subramanian (2007) demonstrate that FDI flows to high-growth regions, although we find no significant association between regional economic growth and FDI inflows. Our results imply that foreign capital does not target high-growth

[1] Please refer to Prasad, Rajan, and Subramanian (2007, p. 5).

[2] The open-door policy promotes market forces and commits the PRC to adopting policies that enhance foreign trade and economic investment.

regions in the PRC, which is partially consistent with the deeper version of the Lucas paradox. The Chinese government provides many incentives to encourage FDI, and the focus of government policy has gradually shifted from coastal regions (the richer regions) to inland regions (the poorer regions). To rule out the possibility that the Lucas paradox is driven by this policy factor, we partition our sample into pre and post-2000 groups, because the PRC government implemented a large number of incentive polices to attract FDI to the western part of the PRC (the poorer regions) in 2000. However, we find that wealthier regions attracted more foreign capital in both periods. Overall, our findings indicate that foreign capital flows to rich regions rather than to poorer regions in the PRC.

In our empirical analysis, we also address the concern that "round-tripping" FDI may be the driving force behind the Lucas paradox in the PRC, as previous studies have indicated that such FDI accounts for a fair portion of the total in the PRC and that most of it comes from the country's wealthier areas.[3] We argue, however, that round-tripping FDI does not necessarily cause this paradox, as the round-tripping advantage is not concentrated in certain regions of the PRC, and capital from richer regions does not flow back to its origin. To make our argument more convincing, we treat 35% of the total FDI into regions with annual above-median FDI inflows as round-tripping FDI and subtract it from the original data. However, we find no significant change with respect to our empirical results when we use these adjusted FDI figures, which implies that the round-tripping issue is not a significant factor in the Lucas paradox in the PRC.

After demonstrating that this paradox exists, we attempt to resolve it. There are two strands of the literature on the role of institutional factors in FDI, although many of these studies do not take the perspective of the Lucas paradox. One school focuses on institutional factors, such as the legal system, an independent judiciary, the enforcement of property rights, and institutions that ensure equal rights and protect civil liberties; whereas another school emphasizes capital market imperfections (Alfaro and Kalemli-Ozcan 2005). Most of the studies in both schools explored the role of institutional factors on FDI at the country level. However, different provinces and cities in the PRC share the same or a similar legal system, policy risks, cultural structures, and other institutional factors. We thus propose the following two potential explanatory factors for the regional differences: The first is the level of corruption, proxied by the number of economic crimes prosecuted in each PRC province, and the second is the level of market infrastructure development, proxied by a measure developed in previous research on the PRC's "marketization" situation.[4] The results are generally in line with our expectations. After considering these two variables, we find that the Lucas paradox is mitigated to a certain extent, but by no means eliminated, which implies that a well-developed market infrastructure and less corruption could attract a greater foreign capital flow to less developed and poorer regions.

This remainder of the paper is organized as follows: We briefly describe the characteristics of FDI in the PRC in Section 2. In Section 3, we review the relevant literature, focusing on studies of the Lucas paradox and the determinants of FDI. To avoid the problem of endogeneity, we employ the dynamic panel data GMM framework, which is discussed in detail in Section 4. Section 5 outlines our sample selection and provides a description of the data. We discuss our empirical results in Section 6 and then explain the Lucas paradox using specific proxies for the corruption and market infrastructure development levels in Section 7. Section 8 concludes the paper.

[3] A part of the FDI inflows to the PRC belong to the return of PRC capital that has gone abroad to escape foreign exchange controls.

[4] Marketization is the process that enables state-owned enterprises to act like market-oriented firms.

2. FOREIGN DIRECT INVESTMENT IN THE PRC

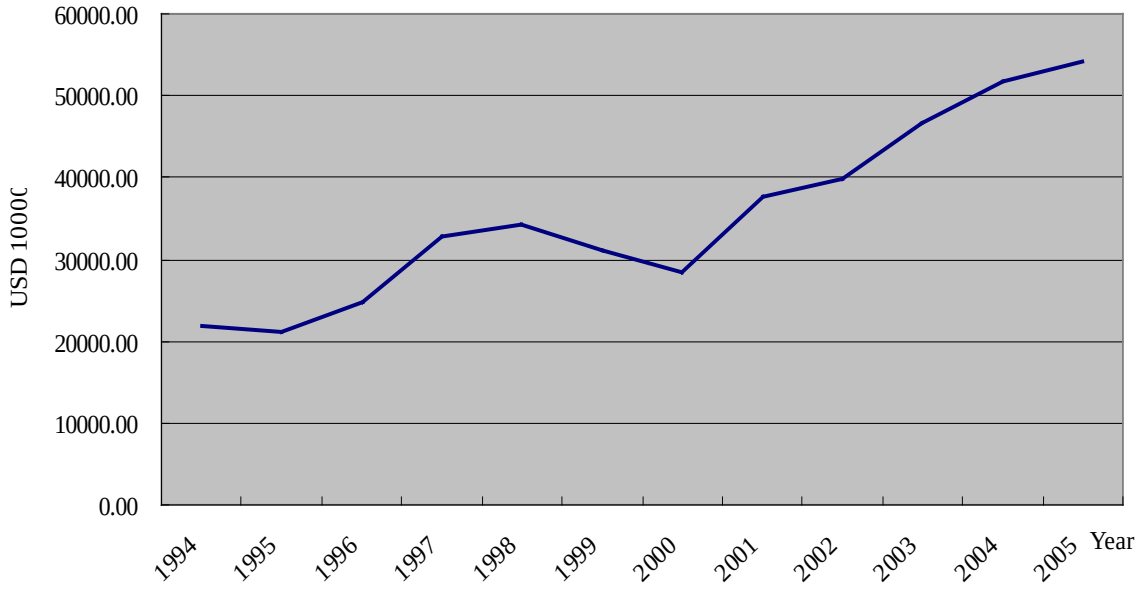
The PRC government launched an "open-door" policy in 1979, and, subsequently, one of the main features of the country's economic landscape has been an upsurge in foreign capital inflows. According to Poncet (2007), annual capital inflows have exceeded US$40 billion since 1996, gradually increasing to around US$70 billion in 2005 and 2006. In spite of the Asian financial crisis in the late 1990s, the PRC still attracts about one-third of all developing country FDI inflows. In 2003, these inflows surpassed those of the US for the first time and the PRC became the world's largest recipient of FDI.

The PRC's FDI growth is characterized by certain unique features (Naughton 2007). First, much of it is concentrated in export-oriented production. Second, Hong Kong, China; Taipei,China; and Southeast Asia contribute a major proportion of the FDI inflows into the PRC. Third, most foreign capital flows into manufacturing industries, rather than service industries, although this is gradually changing, with an increasing amount being injected into the country's financial services industry since 2006. Fourth, and finally, FDI allocation across regions is very imbalanced, with the eastern coastal regions receiving the majority. In this study we focus on this last feature of PRC FDI. In terms of economic development, the eastern coastal regions are the wealthiest areas in the country, and it appears that FDI also favors them. This casual observation suggests that the Lucas paradox exists in the PRC, and thus we investigate the issue empirically in the following sections.

Figure 1 shows average annual FDI at the city level from 1994 to 2005. The general trend has been rapid growth. In the early 1990s, average annual FDI inflows across all cities remained at slightly more than US$200 million. Then, in the mid-1990s, when the PRC deepened its economic reforms and engaged in more infrastructure development, these inflows increased to more than US$300 million. Despite a small drop following the 1998 Asian financial crisis, this figure has increased even more rapidly in the new millennium, rising to more than US$500 million in 2005. Average annual FDI inflows at the provincial level between 1995 and 2005, which are shown in Figure 2, exhibit a similar pattern to the city-level pattern shown in Figure 1.

Figure 1: Average annual FDI at the city level over time

This figure shows average annual city FDI in the PRC from 1994 to 2005.

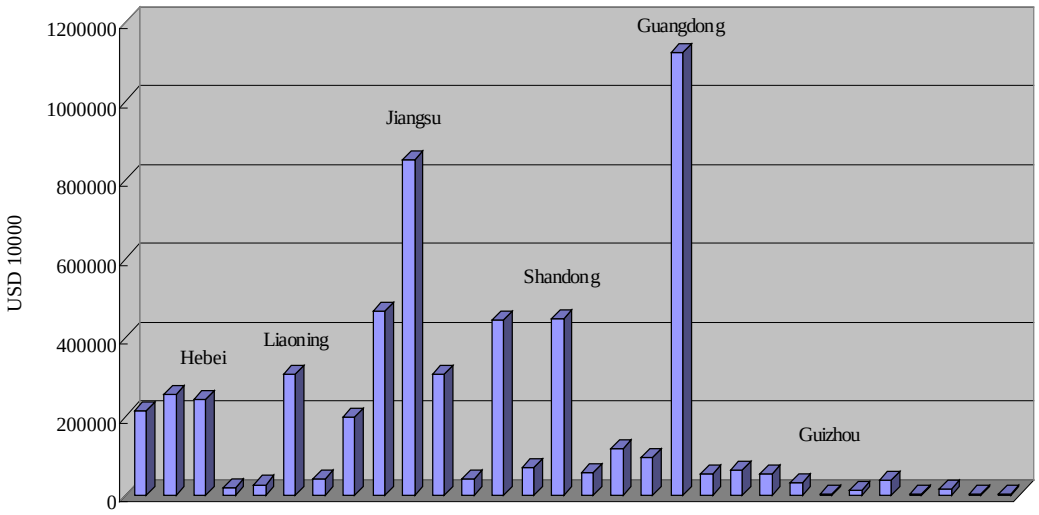


Source: Annual issues of the China Statistical Yearbook published by the National Bureau of Statistics.

It can also be seen that FDI is allocated unevenly across provinces. Guangdong leads the others, attracting an average of nearly US$11 billion per year over the period. This is largely due to the province's three Special Economic Zones, as the central government offers special incentive policies to attract FDI to these zones. Guangdong is also advantaged by its geographical location. It is adjacent to Hong Kong, China; and Macau, which are the major sources of FDI in the mainland. Jiangsu Province is the second largest recipient of FDI inflows, attracting an annual average of more than US$8 billion. The second tier of provinces in terms of FDI inflows, which includes Hebei, Liaoning, and Shandong, attracts only half the amount of FDI received by the two leading provinces. Many western inland provinces, such as Guizhou, Yunnan, and Shaanxi, receive very little FDI.

Figure 2: Average FDI across provinces

This figure shows average FDI from 1995 to 2005 in different PRC provinces. For clarity, we do not include all of the names of the provinces.



Source: Annual issues of the China Statistical Yearbook published by the National Bureau of Statistics.

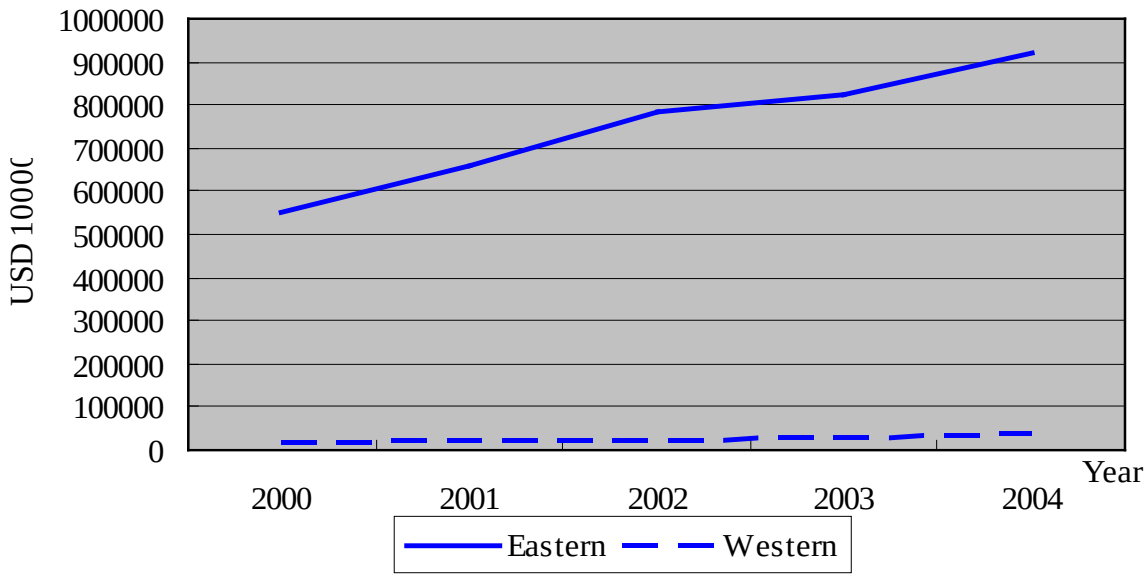
Prior research argued that the PRC government plays a pivotal role in FDI policy. The government has gradually extended this policy from the coastal provinces to the inland regions. From 1979 to 1983, the Special Economic Zones were given priority to attract foreign capital and technology to the country. Between 1984 and 1991, the establishment of Coastal Open Zones enlarged the area covered by the favorable FDI policy. In the third stage, from 1992 to 1999, the government adopted a new approach and began to implement a nation-wide open FDI policy. In the most recent stage, from 2000 onwards, the country has been attempting to boost the economic development of the western regions of the PRC and to improve living standards there. The PRC government has adopted a number of favorable policies to attract FDI, including preferential tax treatment, the freedom to import inputs, the right to foreign exchange swaps with other foreign investors, and simplified licensing procedures, in an attempt to incentivize overseas investors to direct more foreign capital to the western regions. However, as Figure 3 shows, the FDI growth rate in the western region of the PRC still lags far behind that of the eastern coastal regions, even in the years since the western development plan was formally implemented.[5] In the following empirical analysis, we partition our sample into pre- and post-2000 groups based on the aforementioned gradual FDI policy advancement. This partition helps us to examine whether

[5] We classify Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, and Guangdong as the eastern region of the PRC and treat Inner Mongolia, Guangxi, Sichuan, Chongqing, Guizhou, Yunnan, Xizang (Tibet), Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang as the western region of the PRC.

the focus of and changes in FDI policy have shaped FDI inflows and whether this policy itself is the cause of the Lucas paradox in the PRC.

Figure 3: Comparison of FDI growth in eastern and western regions of the PRC

This figure presents a comparison of FDI inflows in eastern coastal region of the PRC and western inland region of the PRC since 2000, when the western development plan was formally implemented by the Chinese government. Eastern coastal regions include Shandong, Jiangsu, Shanghai, Zhejiang, Fujian and Guangdong, and the western inland regions include Inner Mongolia, Guangxi, Sichuan, Chongqing, Guizhou, Yunnan, Xizang (Tibet), Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang.



Source: Annual issues of the China Statistical Yearbook published by the National Bureau of Statistics.

In general, the FDI pattern in the PRC supports the Lucas paradox, i.e., capital flows to rich areas rather than to poor areas. The eastern coastal provinces of Guangdong, Jiangsu, and Fujian are the most developed and wealthiest regions in the PRC, and they also attract most of the FDI inflows. In the remaining sections of the paper, we present the results of our formal test on the Lucas paradox in a single country context and provide possible explanations for it.

3. LITERATURE REVIEW

3.1 The Lucas Paradox

In the standard neoclassical economic framework, the law of diminishing returns implies that the marginal product of capital is higher in a less productive (poorer) economy. This law predicts that if capital flows freely and competitively, it will continue to flow exclusively to poorer economies until capital-labor ratios, or wages and capital returns, are equalized, according to the formal argument put forward by Lucas (1990). However, in the same study, he also compared the economies of the US and India in 1988. According to the theoretical prediction, the marginal product of capital in India should be 58 times higher than that in the US. If this calculation is correct and the market is sufficiently integrated, then capital goods should flow rapidly from the US or other rich countries to India or other poor countries. However, such a phenomenon has almost never been observed, thus resulting in the formation of the Lucas paradox in the international macroeconomics and finance literature.

Research in this field shows that with slight modifications to standard neoclassical theory, the Lucas paradox may not arise. There are two schools of thought on this paradox (Alfaro and Kalemli-Ozcan 2005). The first argues that the different fundamentals that affect the

productive structure of an economy, such as technological development, differences in human capital, government policy and institutional structure, can cause marginal returns on capital to vary (Lucas 1990; King and Rebelo 1993; Razin and Yuen 1994; Gomme 1993). The second school focuses on imperfections in international capital markets (Lucas 1990; Gertler and Rogoff 1990; Gordon and Bovenberg 1996). Market failure and political risk keep a large amount of capital out of most developing countries, even though such capital would enjoy higher returns. Alfaro and Kalemli-Ozcan (2005) undertook a comprehensive study to explore the rationale behind the Lucas paradox and found that a low level of institutional quality was the leading explanation for the paradox during the 1970–2000 period. They concluded that strengthening the protection of property rights, reducing corruption, increasing government stability and establishing a high-quality bureaucracy are the necessary prescriptions for increased capital inflows to poor countries.

However, most of these factors may not be directly applicable to the FDI patterns observed within the PRC. All of its provinces and cities have similar fundamentals and the same legal system and cultural traditions. In general, they also share similar levels of technological development, government economic policy and institutional structures, not to mention similar features of market failure and political risk. Although some fundamentals, such as human capital, are not allocated evenly across provinces and cities, people can migrate freely within the country, as there are no restrictions on labor movement. It is also possible, however, that Alfaro and Kalemli-Ozcan's findings suffer from a serious endogeneity issue: it is very likely that FDI improves these fundamentals, as well as market efficiency, political stability, and the overall economy. Therefore, taking advantage of the natural laboratory of the PRC, we examine the Lucas paradox in a manner that is free from endogeneity and differences in institutional structure.

Gourinchas and Jeanne (2007) argue that cross-country differences in per capita income largely reflect differences in countries' total factor productivity. This argument implies that, all else being equal, countries with faster productivity growth should invest more and should attract more foreign capital. However, this is not consistent with the pattern of net capital flows across developing countries. Instead, capital seems to flow more to countries that invest and grow less. Gourinchas and Jeanne call this failure of capital to follow growth "the allocation puzzle."

Using a large country-level sample, Prasad, Rajan, and Subramanian (2007) find that the PRC, India and other high- and medium-growth countries or country groups all export significant amounts of capital, whereas low-growth countries or country groups receive significant amounts, which supports the findings of Gourinchas and Jeanne (2007). Prasad, Rajan, and Subramanian (2007) argue that this phenomenon represents a deeper version of the Lucas paradox. Furthermore, the correlation between growth and the current account balance in their sample period, 1970 to 2004, was positive, not negative as predicted by Gourinchas and Jeanne's argument.[6] Prasad, Rajan, and Subramanian (2007) argue that when presented with good, high-return investment opportunities, poor economies lack the corporations or financial systems necessary to easily take advantage of arms-length foreign capital and ramp up substantial investment in an efficient manner. In other words, poor economies are largely incapable of absorbing foreign capital inflows and improving their economic circumstances. This capability explanation may be applicable to the PRC, as different regions have different levels of development in their financial systems and corporate structures. These differences may be why foreign capital has flowed to eastern coastal regions, which benefit from both a relatively developed financial system and more modern corporations.

[6] A more negative current account balance indicates a larger net inflow of foreign capital, and a more positive balance a larger net outflow.

3.2 Determinants of FDI

There are two strands of literature on the determinants of FDI. The first identifies the firm characteristics that affect investment decision-making in multinational enterprises. Williamson's transaction cost theory and the subsequent internalization theory (Rugman 1980; Dunning 2001) provide the cornerstone of such research. However, the internalization hypothesis is difficult to test empirically. Research and development, and advertising intensity are often used as proxies for potential demand for firm internalization, although they have been challenged. The second strand of research focuses on the external macroeconomic factors that affect FDI decisions, especially exchange rates, taxes and tariffs, institutions and trade protectionism (Blonigen 2005). The results of empirical research on the determinants of FDI at the macro level are still far from conclusive, because many hypotheses have not been tested or are not supported by the data. Chakrabarti (2001) systematically evaluates the robustness of the partial correlation between the level of FDI and a wide assortment of economic indicators. His results lend strong support to the explanatory power of host country market size, as measured by per capita GDP. To a certain extent, his study provides another piece of empirical evidence on the existence of the Lucas paradox at the country level. In addition, he reveals that the relationships between FDI and many of the variables often reported in the empirical literature (i.e., exchange rates, taxes and tariffs, trade protectionism, etc.) are not very robust.

As the PRC now receives more foreign capital in the form of FDI than any other country, several studies have investigated the determinants of FDI in the PRC. Wang and Swain (1995) examine its host country determinants and identify such positive factors as the PRC's GDP, GDP growth, wages, and trade barriers and such negative factors as interest rates and exchange rates using data from 1978 to 1992. Wei (1995b) showed that, despite the large amount of FDI flows into the PRC, the level of that inflow per capita is still low compared with an average host country.

Some research based on provincial- or city-level data has recently emerged. Head and Ries (1996) and Cheng and Kwan (1999, 2000) note the agglomeration effect or self-reinforcing effect of FDI itself. They find that the effect of wages on FDI is negative, although Chen (1996) contends that wage costs do not affect it. He also finds that education, as a proxy for the labor quality of human capital, has little significant impact on FDI. This finding indicates that human capital does not play an important role in attracting FDI, which is in contrast to the argument put forward by Lucas (1990). Sun, Tong and Yu (2002) analyzed the spatial and temporal variations in FDI among the PRC's 30 provinces between 1986 and 1998 and provided evidence to show that the importance of FDI determinants varies over time. For example, wages sometimes have a positive effect and sometimes have a negative effect, and the GDP level varies from no effect to a highly positive effect. This finding indicates that the nature of FDI changes over time in the PRC.

However, most of the aforementioned studies suffer from reverse causality, i.e., the macroeconomic impact of FDI. Sun (1999) concluded that FDI creates additional trade in the PRC. Chen (1999) confirmed that FDI has a positive impact, both in promoting the PRC's host province total trade flows with the rest of the world and in increasing bilateral trade flows between the PRC and its trading partners. Chen, Chang, and Zhang (1995) provided evidence to show that FDI had a positive impact on output growth between 1978 and 1990. Wei (1995a) looked at different cities in the PRC and found that, in the late 1980s, FDI contributed to a higher level of growth. Using a sample of 10 provinces, Sun (1998) further confirmed that FDI significantly promoted the economic growth of the PRC between 1985 and 1996. Madariaga and Poncet (2007) produced similar results. Shan, Tian, and Sun (1999) applied a six-variable VAR model to the PRC's quarterly data from 1985 to 1996 and concluded that there is two-way causality between FDI and economic growth, although whether FDI is the cause or the consequence of that growth remains unclear. To mitigate the reverse-causality problem, we employ the GMM method in this paper.

In addition, most of the above mentioned literature devoted little attention to the Lucas paradox in the PRC. For example, Cheng and Kwan (2000) overcame the endogeneity issue by using the GMM method to establish the determinants of FDI location, but they provided no direct analysis of the relationship between GDP or growth and FDI. Rather, their main objective was simply to identify the determinants of FDI stocks and show the relationship between actual and equilibrium FDI stocks.

In addition to being addressed in relation to the Lucas paradox, the role of institutions has recently captured the attention of academics as a sub-branch of the FDI determinant literature. Globerman and Shapiro (2002, 2003), for example, examined the importance of governance infrastructure as a determinant of US FDI in other countries. They defined this infrastructure as a political, institutional, and legal environment that favors transaction freedom, secures property rights, and is transparent with regard to government and legal processes, factors they found to exert a positive impact on attracting US FDI. Moreover, they showed that these variables determine the magnitude of FDI across countries that receive it. Habib and Zurawicki (2002) investigated the relationship between corruption and FDI. Their analysis indicated that both the level of corruption in the host country and the absolute difference in that level between the host and home countries have a negative impact on FDI. Reinhart and Rogoff (2004) argued that sovereign risk provides an explanation for the Lucas paradox. Alfaro, Chanda and Kalemli-Ozcan (2004) discussed the moderating effect of financial markets on the relationship between FDI and economic growth and found that countries with well-developed financial markets gain more from the FDI they receive. This finding indirectly implies that sound market conditions, especially those directly related to corporate operation and the capacity to absorb capital, as discussed in Prasad, Rajan, and Subramanian (2007), play a role in directing capital flows away from regions with a higher marginal product of capital.

Based on these previous studies and our unique PRC setting, we propose two possible explanations for the Lucas paradox in the PRC and hypothesize that less corruption and a sound market infrastructure resolve it. In other words, corruption and less developed market conditions exert an impact on distorted capital flows into regions with a lower marginal product of capital rather than a higher one.

4. METHODOLOGY

We specify the following empirical model to test the Lucas paradox in the PRC. Based on Lucas' (1990) logic, a variation in economic development across regions results in different marginal products of capital and subsequently prompts capital to flow from regions with a higher marginal product of capital to those with a lower marginal product of capital. Our objective is to examine whether rich economies or regions receive more capital and poor economies or regions less. We adopt the dynamic panel data GMM estimation methodology. We obtain regional economic data for year one and then examine the FDI inflows in the following year. Next, we obtain such data for year two and examine those inflows in year three, and so on. This empirical framework essentially provides us with a dynamic view of the relationship between economic development and subsequent foreign capital inflows. One advantage of this framework is that it allows us to detect economic differences and subsequent FDI inflows across regions year by year, rather than examining the variation in a single year, as Alfaro and Kalemli-Ozcan (2005) did. They considered one year's per-capita GDP and then examined the following year's FDI inflows across countries. However, there is a possibility that within the entire sample period, more capital may flow to wealthy regions in some years and to poor regions in others.

In addition, FDI exhibits a strong self-reinforcing effect, as documented by Head and Ries (1996) and Cheng and Kwan (1999, 2000). Therefore, FDI inflows follow an autoregressive

AR(1) process. To put it more formally, the aforementioned empirical framework is actually a panel data regression, which is specified by the following equations.

$$\begin{aligned} y_{it} &= \alpha y_{i,t-1} + \beta' x_{i,t-1} + u_{it}, \\ u_{it} &= \theta_i + \tau_t + \nu_{it}, i = 1,2,\cdots,N, \text{t} = 2,3,\cdots,T \end{aligned}, \quad (1)$$

where y_{it} is the inflow of FDI in region *i* at time *t*; θ_i and τ_t are the province- or city-specific effect and the time-specific component, respectively; ν_{it} is the error term; $\alpha y_{i,t-1}$ is the self-reinforcing effect of FDI; and $x_{i,t-1}$ is a vector of lagged variables, which contains economic development proxies, including GDP and per capita GDP or growth and the other control variables.

To estimate this dynamic panel data model (1), we deal with the time-specific effects, τ_t, by including time dummies in the regression. The province- or city-specific effects cause the serial correlation problem of disturbances in the model. Fixed-effect and random-effect procedures are possible solutions, but another important possible reverse-causality problem remains. As FDI may also have a feedback effect on economic development (Sun 1998, 1999; Chen, Chang, and Zhang 1995; Wei 1995a; Shan, Tian, and Sun 1999), we have to deal with the potential reverse-causality issue of the macroeconomic variables. Given these econometric concerns, we choose the GMM framework to estimate the dynamic model in the panel data, mainly following Arellano and Bond (1991); Arellano and Bover (1995); and Blundell and Bond (1998).

If we include the time dummies in the regression as explanatory variables embedded in $x_{i,t-1}$, we obtain the difference version of the dynamic panel model (1) (Arellano and Bond, 1991):

$$\Delta y_{it} = \alpha \Delta y_{i,t-1} + \beta' \Delta x_{i,t-1} + \Delta \nu_{it}. \quad (2)$$

The province or city effects are then eliminated by the difference. Assuming that the error term, ν_{it}, is not serially correlated and the explanatory variables, $x_{i,t-1}$, are weakly exogenous, i.e., they are assumed to be uncorrelated with future realizations of the error term, Arellano and Bond (1991) suggested the following two moment conditions.

$$E[y_{i,t-s} \Delta \nu_{i,t}] = 0 \quad for \;\; s \geq 2; t = 3,\cdots,T. \quad (3)$$

$$E[x_{i,t-s} \Delta \nu_{i,t}] = 0 \quad for \;\; s \geq 2; t = 3,\cdots,T. \quad (4)$$

Based on these two moment conditions, Arellano and Bond (1991) proposed a two-step GMM estimator. In the first step, the parameters were estimated based on the assumption that the error terms are independent and "homoskedastic" across regions and over time. In the second step, the residuals from the first-step estimation are used to construct a consistent estimate of the variance-covariance matrix. The two-step GMM estimator derived through the foregoing procedure is called the difference estimator.

However, this difference estimator is not perfect, as it eliminates the region-specific effects that are due to the difference operation (Blundell and Bond 1998), a problem that may induce potential biases and imprecision and thus result in a serious efficiency loss. To alleviate this problem, following Arellano and Bover (1995) and Blundell and Bond (1998), we explore additional moment conditions using level regression (1):

$$E[\Delta y_{i,t-1}(\theta_i + \nu_{i,t})] = 0 \quad for \;\; t = 3,\cdots,T. \quad (5)$$

$$E[\Delta x_{i,t-2}(\theta_i + \nu_{i,t})] = 0 \quad for \;\; t = 3,\cdots,T. \quad (6)$$

With these four moment conditions, (3)–(6), the system GMM estimator from the dynamic panel data regression becomes more efficient than the difference two-step GMM estimator, which uses only a subset of the conditions, i.e., (3)–(4).

The consistency of the GMM estimator depends on the validity of the moment conditions and the validity of the assumption that the error terms do not suffer from serial correlation. The first validity check is carried out using the Sargan test.[7] If the null hypothesis of no over-identification is rejected by analyzing the sample analog of the moment conditions, the overall validity of the instruments chosen in the estimation will be open to question. For a second validity check to ensure that the error terms are serially uncorrelated, we check the serial correlation property of the level residuals using the Arellano-Bond m_1 and m_2 statistics.[8] If the level residuals are indeed serially uncorrelated, then, for the first-difference equation in (2), the residuals will follow an MA(1) process, which implies that the first-order autocorrelations are non-zero but that the second- or higher-order autocorrelations are zero. By testing the null hypotheses of zero first- and second-order autocorrelations, respectively, we expect the significant m_1 statistics and insignificant m_2 statistics to support our empirical specification.

Neither the difference nor the system estimator is perfect. As Arellano and Bong (1991) and Blundell and Bond (1998) pointed out, the one-step estimator is asymptotically inefficient relative to the two-step estimator, whereas the asymptotic standard errors for the two-step estimators are biased downwards. There is thus a trade-off between efficiency and inference reliability. In addition, when the number of instruments is equal to or larger than the number of cross-sectional units, both the standard errors and the Sargan test are seriously biased downwards, which induces the biased asymptotic inference. As this paper is intended to document whether there is any relationship between FDI inflows and economic conditions or growth, we focus more on the unbiased and reliable inference from the sample. Thus, in the following empirical analysis, we primarily consider the first-step estimator.

Our explanatory variables are mostly macroeconomic measurements. Based on previous research, they are not strictly exogenous, and thus we do not need to go through the specification selection procedure used in Cheng and Kwan (2000). We construct the instrument set by including all of the macroeconomics-related variables, which is another reason for our focus on the first-step estimator. We explain this issue in more detail in the following sections.

5. SAMPLE SELECTION AND DATA DESCRIPTION

We hand-collect two sets of data at the provincial and city levels. The provincial data cover 30 provinces and municipalities[9] directly under the central government between 1995 and 2005. The GDP and growth data for each province are collected from China Data Online,[10] and the FDI and other related data are from the China Statistical Almanac. The final provincial-level sample consists of 341 province-year observations. A detailed description of all of the data is included in the Appendix.

[7] The Sargan test, which is a test of over-identifying restrictions, checks the validity of instrumental variables. The hypothesis tested here is that the instrumental variables are uncorrelated to some set of residuals, and therefore that they are acceptable, "healthy" instruments. If the null hypothesis is confirmed statistically (that is, not rejected), then the instruments pass the test and are valid by this criterion. The Sargan statistic is asymptotically distributed as a chi-square if the null hypothesis is true.

[8] Please refer to Arellano and Bond (1991) for details.

[9] The municipalities directly under the central government include Beijing, Tianjin, Shanghai, and Chongqing.

[10] See http://chinadataonline.org/. China Data Online is authorized by the China National Bureau of Statistics.

Our city-level data are collected from the China City Statistical Yearbook (CCSY)[11] for the 1990–2005 period. This yearbook contains rich statistical information on all cities in the PRC. We identify the cities according to the CCSY in each year and code them identically if they have the same name over the sample period. The CCSY actually provides two different sets of data for each variable. One covers all of a city's geographical and administrative sub-regions, including rural or countryside areas, and the other covers only urban areas, thus excluding countryside and county-level cities. The urban area data are more stable relative to the data for the entire city, as some cities, especially county-level cities, have been involved in administrative mergers and relocations. We therefore use these data to avoid any potential measurement error.[12] Many of the required statistical items are not provided for the earlier years. We therefore truncate the first few years' data and restrict the sample period to 1994–2005. The final city-level sample consists of a total of 5,290 city-year observations.

Three different measures of Chinese FDI inflows are used in practice—the number of FDI contracts, contracted FDI inflows and actual FDI inflows used. We choose the latter as our dependent variable, as not all contracted FDI inflows are realized. Actual FDI inflows used is thus a more reliable measure of FDI inflows. Apart from for Xizang (Tibet), this statistical item is provided in both the China Statistical Almanac and the CCSY.

The key explanatory variables we take into account are regional GDP, per capita GDP, and economic growth, which together represent the level of economic development. All of the data are adjusted based on the price level in 1990. The per capita GDP item is not provided every year in the CCSY, especially during the 1990s, which imposes a serious restriction on the number of observations in our samples. We construct another per capita GDP variable ourselves, which is calculated as total GDP divided by the population of each region. Some of the newly established cities or those included in the CCSY for the first time often have very high growth rates. We mitigate the concern of outliers by "winsorizing" the economic growth variables at the 1% level.

Following the previous literature (Poncet 2007; Blonigen 2005; Cheng and Kwan 1999 and 2000; Sun, Tong, and Yu 2002), we select the following control variables in our analysis. At the provincial level, we include tax revenue, international trade volume, domestic investment level, average wage, and railway length. At the city level, we include average wage, education expenditure, average savings, and transportation volume. We initially included several other control variables: retail sales and per capita retail sales at the provincial and city levels, to capture market size and demand; fixed assets or real estate investment at the city level to capture capital requirements; all roads and high-grade roads at the provincial level to capture infrastructure; and total import volume at the provincial level to capture the degree of openness. Unfortunately, there was a high degree of correlation among many of the pairs of variables. Hence, to avoid the multi-collinearity problem, we discarded these highly correlated variables.

We take the natural logarithm of all of the variables except for growth. Table 1 presents the descriptive statistics. As reported in Panel A, the logarithmic FDI inflow in one province-year has a mean of 11.08 with a standard deviation of 1.72 at the provincial level. There is considerable variation in the other variables. It can be seen that each variable has a different number of observations in the sample. For example, GDP and per capita GDP have 341 observations and tax only 288. The basic statistics at the city level are reported in Panel B. The mean and standard deviation of the logarithmic FDI inflow in one city-year are 7.44 and 2.15, respectively. The degree of variation is larger than that at the provincial level, although there are similarly imbalanced observations for each variable. GDP has 5,115 observations, whereas per capita GDP, denoted by GPC 1 taken from the CCSY, has only 1,392

[11] This yearbook is published by the China National Bureau of Statistics on an annual basis. It includes a large amount of information on Chinese cities.

[12] However, as a robustness check, we also use the data for the entire city, but the results remain qualitatively similar.

observations. Our own constructed per capita GDP, which is denoted by GPC 2, increases the number of observations to 4,250.

Table 1: Descriptive Statistics

The sample period for the provincial-level data is from 1995 to 2005, whereas that for the city-level data is from 1994 to 2005. The number of cities included in the sample changed over time. More cities were included in the China City Statistical Yearbook in the earlier years than in the later years. Sample sizes, means, medians, standard deviations, minimums, first quartiles, third quartiles and maximum values are reported.

Panel A: Provincial Level

	Sample	Mean	Median	Std. Dev.	Min.	25%	75%	Max.
FDI	317	11.08	11.07	1.72	6.20	10.18	12.31	17.98
GDP	341	7.71	7.88	1.08	4.02	7.20	8.44	10.02
GPC	341	8.92	8.84	0.63	7.52	8.46	9.30	10.92
Growth	340	11.03	10.55	2.81	4.30	9.00	12.60	23.83
Tax	288	0.28	-2.47	4.49	-5.95	-3.56	5.49	8.62
InTra	335	12.35	12.51	2.71	3.00	11.80	13.88	17.57
DomInv	334	6.75	6.81	1.03	3.41	6.14	7.48	9.80
Wage	330	9.14	9.12	0.49	8.33	8.74	9.47	11.61
Rail	319	7.55	7.68	0.83	5.37	7.10	8.03	10.13

Panel B: City Level

	Sample	Mean	Median	Std. Dev.	Min.	25%	75%	Max.
FDI	3665	7.44	7.47	2.15	0.00	6.08	8.84	13.53
GDP	5115	13.27	13.18	1.19	8.55	12.54	13.91	18.32
GPC 1	1392	9.57	9.59	0.72	4.44	9.10	10.05	11.93
GPC 2	4250	9.10	9.09	0.79	5.37	8.53	9.62	12.51
Growth	3644	12.62	12.30	9.40	-20.30	8.70	16.10	46.10
Wage	4258	8.89	8.83	0.59	0.00	8.46	9.30	16.55
Edu	3218	-4.63	-4.73	0.75	-9.00	-5.17	-4.14	-1.13
Saving	3443	-0.69	-0.68	1.01	-4.50	-1.44	0.07	2.88
Trans	2596	-6.79	-6.69	1.02	-12.24	-7.43	-6.09	-1.75

Source: Annual issues of the China Statistical Yearbook published by the National Bureau of Statistics.

Table 2 reports the correlation matrix of the logarithmic variables at the provincial and city levels, respectively. We find that FDI is positively correlated with GDP and per capita GDP, but is not correlated with GDP growth at either the provincial or city level. The level of correlation among the other control variables is generally not very high, based on the threshold value of 0.7 used in Sun, Tong, and Yu (2002), which is consistent with Alfano and Kalemli-Ozcan's findings (2005). They find no evidence of a spurious problem arising from highly correlated variables in regression specifications similar to those used in Monte Carlo simulations and other tests.

Table 2: Correlation Matrix

This table presents the correlation coefficients between pairs of variables at the provincial and city levels, respectively.

Panel A: Provincial Level

	FDI	GDP	GPC	Growth	Tax	InTra	DomInv	Wage	Rail
FDI	1.00	0.73***	0.66***	0.24***	-0.06	0.34***	0.67***	0.30***	-0.08
GDP		1.00	0.56***	0.18***	-0.30***	0.42***	0.94***	0.24***	0.27***
GPC			1.00	0.32***	0.11*	0.38***	0.65***	0.67***	-0.22***
Growth				1.00	0.13**	0.27***	0.27***	0.35***	0.01
Tax					1.00	0.06	-0.18***	0.17***	-0.12*
InTra						1.00	0.45***	0.33***	-0.39***
DomInv							1.00	0.37***	0.15***
Wage								1.00	-0.20***
Rail									1.00

Panel B: City Level

	FDI	GDP	GPC 1	GPC 2	Growth	Wage	Edu	Saving	Trans
FDI	1.00	0.72***	0.64***	0.64***	0.07***	0.43***	0.52***	0.55***	0.28***
GDP		1.00	0.75***	0.80***	0.01	0.61***	0.58***	0.66***	0.30***
GPC 1			1.00	0.96***	0.27***	0.49***	0.65***	0.79***	--
GPC 2				1.00	0.01	0.70***	0.76***	0.87***	0.52***
Growth					1.00	-0.02	-0.01	-0.03	-0.08***
Wage						1.00	0.76***	0.73***	0.37***
Edu							1.00	0.81***	0.39***
Saving								1.00	0.55***
Trans									1.00

*, ** and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

"--" indicates that the estimation was not performed due to the limited sample size.

Source: Annual issues of the China Statistical Yearbook published by the National Bureau of Statistics.

6. EMPIRICAL RESULTS

6.1 OLS Results

We first conduct ordinary least squares (OLS) regression controlling for regional and time effects. Table 3 reports the regression results at the provincial level. We estimate eight models. In columns [1] to [3], we present the base-line results of regressing FDI on one-period lagged GDP, GDP per capita or GDP growth with lagged FDI. In columns [5] to [7], we add the other control variables, including tax, international trade, domestic investment,

average wage and railway length. In columns [4] and [8], we include both per capita GDP and GDP growth in the same regression to test which variable is dominant in determining FDI inflows. We find significantly positive and stable coefficients of lagged FDI inflows in all of the models, which demonstrates the self-reinforcing effect of FDI and is consistent with the findings documented by Head and Ries (1996) and Cheng and Kwan (1999, 2000). We show that neither total GDP nor total economic activity positively influences subsequent FDI inflows, as reported in columns [1] and [5]. We also find that provinces with higher per capita GDP do indeed attract greater FDI inflows, as demonstrated in columns [2] and [6]. In other words, foreign capital flows to wealthier provinces, which is the exact capital flow pattern predicted by the Lucas paradox. In columns [3] and [7], we test the deeper version of this paradox by replacing GDP or per capita GDP with GDP growth to evaluate economic growth. We find that the estimated coefficients are insignificant, although the signs are consistent with our expectations. When we include both per capita GDP and GDP growth simultaneously, as reported in columns [4] and [8], per capita GDP retains its significantly positive influence on regional FDI inflows. We find no direct evidence of the deeper version of the Lucas paradox discussed by Prasad, Rajan, and Subramanian (2007) when we use only the provincial-level sample. Our results show that FDI flows into the PRC do not follow GDP growth.

As previously discussed, there are three different measures of FDI inflows in the PRC—the number of FDI contracts, contracted FDI, and actual FDI used. Although we initially employed the latter as our dependent variable, we also used contracted FDI to check the robustness of our results, and the results of this are reported in Column 9. We find that the coefficient of per capita GDP remains significantly positive.

Table 3: OLS Regression Results using Provincial-Level Data

This table presents the OLS regression results using provincial-level data. We control for both regional and time effects. In columns [1] to [3], we include only single GDP, per capita GDP or GDP Growth together with lagged FDI in the regression. In columns [5] to [7], we add the other control variables to the regression specifications. In models [4] and [8], we include both per capita GDP and GDP Growth at the same time, with and without the other control variables, respectively. Column [9] replaces Actual FDI used with Contracted FDI as the dependent variable. *t*-statistics are in brackets.

Dependent Variable: FDI									
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Lagged FDI	0.45***	0.43***	0.45***	0.43***	0.41***	0.39***	0.41***	0.39***	0.24***
	[8.16]	[7.62]	[8.27]	[7.64]	[6.50]	[6.15]	[6.50]	[6.05]	[3.71]
GDP	0.30				0.45				
	[0.85]				[0.78]				
GPC		1.20**		1.31**		1.31**		1.31**	1.53**
		[2.27]		[2.12]		[2.00]		[2.00]	[2.32]
Growth			0.02*	0.02			0.03	0.03	
			[1.82]	[1.64]			[1.61]	[1.62]	
Tax					0.00	0.00	0.00	0.00	-0.16
					[0.46]	[0.39]	[0.56]	[0.34]	[-1.57]
InTra					0.00	0.00	0.00	0.00	-0.1
					[-0.98]	[-1.11]	[-0.68]	[-1.01]	[-1.18]
DomInv					0.26	0.23	0.27	0.20	0.40***
					[1.14]	[1.01]	[1.22]	[0.90]	[2.75]
Wage					0.10	0.08	0.10	0.07	0.05
					[0.96]	[0.77]	[0.97]	[0.69]	[0.43]
Rail					0.66*	0.58	0.66*	0.53	0.18
					[1.73]	[1.52]	[1.73]	[1.39]	[1.18]
Regional effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-square	0.91	0.84	0.92	0.85	0.72	0.67	0.56	0.69	0.69
# of Province	30	30	30	30	28	28	28	28	27
Sample size	285	285	284	284	242	242	241	241	240

*, ** and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Source: Annual issues of the China Statistical Yearbook published by the National Bureau of Statistics.

The results of a similar regression using the city-level data are exhibited in Table 4. As we have two variables that measure per capita GDP, one taken directly from the CCSY and the other constructed as the ratio of total GDP to total population, we employ a total of ten regression specifications. Columns [1] to [4] include only lagged FDI and the specifications that represent economic conditions or growth. Columns [6] to [9] add the other control variables. Note that at the city level, there are relatively few cities that have all of the variables, with many of them lacking the transportation variable in particular. Hence, we include this variable only in model [6], along with total GDP. Columns [5] and [10] include both calculated per capita GDP and GDP growth simultaneously to show which variable is dominant in attracting FDI inflows. The self-reinforcing effect of lagged FDI is also documented using city-level data, except for in models [2], [6] and [7]. This may be due to the small sample size for regressions [2], [6] and [7]. Contrary to what we found using the provincial-level sample, columns [1] and [6] demonstrate the significantly positive effect of total GDP. It seems that total GDP is more important to a city than to a province in attracting additional FDI. We find no significant results in columns [2] and [7], where the per capita

GDP data taken directly from the CCSY are used. However, when we switch to our calculated per capita GDP data, we find significantly positive coefficients. Therefore, the Lucas paradox is documented at the city level. In models [4] and [9], we find a city's economic growth to have no effect on FDI inflows, which suggests that GDP growth is unable to alter the fact that cities with higher per capita GDP have greater FDI inflows, as shown in columns [5] and [10].

Table 4: OLS Regression Results using City Level Data

This table presents the OLS regression results using city-level data. We control for both regional and time effects. In columns [1] to [4], we include only single GDP, per capita GDP or GDP Growth together with lagged FDI in the regression, with [2] the per capita GDP data taken directly from the CCSY and [3] our own constructed per capita GDP data. In columns [6] to [9], we add the other control variables to the regression specifications. In models [5] and [10], we include both our own constructed per capita GDP and GDP Growth at the same time, with and without the other control variables, respectively. Column [11] replaces Actual FDI used with Contracted FDI as the dependent variable. *t*-statistics are in brackets.

Dependent Variable: FDI											
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
Lagged FDI	0.19***	-0.05	0.19***	0.25***	0.24***	-0.09***	-0.29***	0.14***	0.24***	0.23***	0.15***
	[9.27]	[-1.41]	[9.38]	[10.04]	[10.03]	[-2.82]	[-4.91]	[5.50]	[7.78]	[7.60]	[5.62]
GDP	0.38***					0.59**					
	[3.81]					[2.55]					
GPC 1		-0.05					-0.07				
		[-0.39]					[-0.41]				
GPC 2			0.44***		0.42***			0.51***		0.35*	0.08
			[3.77]		[2.88]			[2.96]		[1.75]	[0.39]
Growth				0.00	0.00				0.00	0.00	
				[0.68]	[0.24]				[1.35]	[1.03]	
Edu						0.15	-0.17	0.14	0.13	0.07	0.03
						[1.21]	[-0.60]	[1.39]	[1.05]	[0.59]	[0.25]
Wage						0.03	-0.01	0.10	0.18	0.15	-0.05
						[0.21]	[-0.05]	[1.00]	[1.23]	[1.03]	[-0.41]
Saving						0.49***	0.00	0.14	0.24*	0.14	-0.02
						[2.73]	[-0.02]	[1.21]	[1.9]	[1.05]	[-0.12]
Trans						-0.03					
						[-0.50]					
Regional effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-square	0.69	0.3	0.66	0.64	0.70	0.42	0.79	0.61	0.67	0.69	0.37
# of City	532	263	532	507	507	502	252	530	504	504	532
Sample size	2917	964	2916	2156	2155	1500	486	1992	1499	1499	2018

*, ** and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Source: Annual issues of the China Statistical Yearbook published by the National Bureau of Statistics.

6.2 GMM Results

Due to the potential endogeneity problem and other econometric issues in our OLS regression, we adopt the dynamic panel data GMM estimation described in Section 4. Using the provincial-level data, we estimate the same regression specifications as those in Table 3, and the results are reported in Table 5. In columns [1] to [3], in addition to the lagged FDI inflows, we include only GDP, per capita GDP and GDP growth, respectively and treat these

as the instrument variables. The coefficients of both GDP and per capita GDP are significantly positive, whereas that on GDP growth is slightly positive. To assess whether our GMM estimators are reliable, we first carry out a check using the Sargan test. None of the Sargan statistics from columns [1] to [3] can reject the null hypothesis that an over-identification problem does not exist. We then look at the Arellano-Bond m_1 and m_2 statistics, which test for the existence of first- and second-order autocorrelation, respectively. The results in columns [1] to [3] show that the m_1 statistics are all rejected, which means that the residuals in the first-difference equation (2) exhibit first-order correlation. However, none of the m_2 statistics can be rejected, thus indicating that the residuals in the first-difference equation (2) are not second-order correlated. In columns [5] to [7], we include the other control variables in the regression, as in Table 3. As the above mentioned literature showed, macroeconomic variables face the issue of endogeneity (Sun 1998, 1999; Chen, Chang, and Zhang 1995; Wei 1995a; Shan, Tian, and Sun 1999). The specification selection procedure used by Cheng and Kwan (2000) shows that macroeconomic variables, such as wages and income, suffer from endogeneity, whereas education and infrastructure do not. Therefore, for our GMM specification selection, we include tax, international trade, domestic investment, and average wage in the instrument sets, as well as the variables used in models [1] to [3]. The coefficient of GDP becomes slightly positive, but the results for lagged FDI and per capita GDP remain intact. After adding the control variables, the impact of GDP growth on FDI inflow disappears. The effect of GDP growth does not outweigh the per capita GDP effect when we include both per capita GDP and GDP growth in the same regressions as those shown in models [4] and [8]. The Sargan test of over-identifying restrictions indicates that the orthogonality conditions cannot be rejected, and the m_2 test for the second-order autocorrelation of the first-differenced residuals suggests that the error term is not serially correlated. Thus, we do not reject the null hypothesis that the instruments are appropriate. The strong link between per capita GDP and FDI does not appear to be driven by simultaneity bias in models [4] to [8]. The dynamic panel data GMM estimations also confirm the Lucas paradox at the provincial level in the PRC, and subtly support its deeper version. As a robustness check, we replace actual FDI used with contracted FDI as the dependent variable in column [9] and find that per capita GDP still plays a positive role in attracting FDI inflows.

The PRC's policies toward FDI have undergone various changes in terms of priorities. Former PRC leader Deng Xiaoping toured Guangdong and Shanghai in early 1992, which encouraged a larger wave of FDI. Most of this investment was in the form of wholly-owned subsidiaries of foreign companies. A further surge in FDI preceded and accompanied the PRC's accession to the World Trade Organization (WTO) in 2001. As a robustness check to make sure that our results are not mainly driven by government policy toward FDI, we partition our full sample into pre- and post-2000 sub-samples. Figure 1 clearly demonstrates that there was a regime switch around 2000. We redo all of the tests using the sub-sample data, and the results are shown in Panel B of Table 5. We find that per capita GDP exerted a positive influence on attracting regional FDI inflows in both periods, which indicates that the government's FDI incentive cannot explain the Lucas paradox at the provincial level.

Table 5: GMM Estimation Results using Provincial-Level Data

This table presents the results of dynamic panel data GMM estimation using provincial-level data. Panel A shows the estimation results for the entire sample. In columns [1] to [3], we include only single GDP, per capita GDP or GDP Growth together with lagged FDI in the regression. In columns [5] to [7], we add the other control variables to the regression specifications. In models [4] and [8], we include both per capita GDP and GDP Growth at the same time, with and without the other control variables, respectively. Column [9] replaces Actual FDI used with Contracted FDI as the dependent variable. In panel B, we present the estimation results for the 1995-1999 and 2000-2005 sub-samples, tabulating only the coefficients of GDP, per capita GDP and GDP Growth in each model. The null hypothesis of the Sargan test is that the instruments used are not correlated with the residuals. The null hypotheses of the *m1* and *m2* statistics are that the residuals in the first-difference regression (2) exhibit no first- and second-order correlation, respectively. *p*-values are in parentheses, and *t*-statistics are in brackets.

Panel A: Total Sample

Dependent Variable: FDI

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Lagged FDI	0.43***	0.32***	0.56***	0.48***	0.54***	0.55***	0.68***	0.55***	0.72***
	[4.50]	[2.81]	[6.35]	[6.62]	[10.14]	[10.95]	[15.46]	[11.57]	[17.04]
GDP	0.57***				0.70*				
	[2.21]				[5.20]				
GPC		1.15***		1.04***		1.10***		0.10***	0.39***
		[3.77]		[4.68]		[5.62]		[5.78]	[3.97]
Growth			-0.02	-0.01			0.03*	0.02	
			[-0.65]	[-0.66]			[1.81]	[1.10]	
Tax					0.00	0.00	0.00	0	0
					[0.97]	[0.84]	[1.02]	[0.95]	[-0.44]
InTra					0.00	0.0001*	0.00	0.00	0
					[0.28]	[-1.78]	[0.82]	[-1.64]	[-0.22]
DomInv					0.33**	-0.15	0.29	-0.20	0.27***
					[1.97]	[-0.83]	[1.57]	[-1.12]	[3.86]
Wage					0.23**	0.05	0.15	0.05	0.02
					[2.46]	[0.60]	[1.59]	[0.55]	[0.18]
Rail					0.04	-0.21**	-0.17**	-0.24**	0.01
					[0.48]	[-2.55]	[-1.98]	[-2.95]	[0.30]
Sargan Test	59.59	30.96	45.99	86.75	229.93	234.7	253.32	282.75	204.78
(p-value)	(1.00)	(1.00)	(1.00)	(1.00)	(0.652)	(0.566)	(0.223)	(0.082)	(1.08)
m1	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
m2	(0.446)	(0.618)	(0.381)	(0.351)	(0.108)	(0.080)	(0.070)	(0.078)	(0.446)
# of Province	30	30	30	30	28	28	28	28	27
Sample size	285	285	284	284	242	242	241	241	240

	Panel B: Sub-sample estimation					
	sub-period: 1995–1999			sub-period: 2000–2005		
	without control var.	Sargan Test	*m2*	without control var.	Sargan Test	*m2*
GDP	0.54 [1.11]	(0.828)	(0.788)	0.58* [1.85]	(1.000)	(0.449)
GPC	1.05** [2.47]	(0.880)	(0.780)	1.23*** [2.81]	(1.000)	(0.632)
Growth	0.05 [0.81]	(0.628)	(0.550)	-0.03 [0.94]	(1.000)	(0.425)
	with control var.	Sargan Test	*m2*	with control var.	Sargan Test	*m2*
GDP	0.80*** [2.75]	(0.217)	(0.392)	0.71*** [4.35]	(0.714)	(0.188)
GPC	1.66*** [3.22]	(0.089)	(0.328)	1.36** [5.38]	(0.847)	(0.224)
Growth	0.06 [1.23]	(0.247)	(0.280)	0.03 [1.27]	(0.131)	(0.192)

*, ** and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

"--" indicates that the estimation was not performed due to the limited sample size.

Source: Annual issues of the China Statistical Yearbook published by the National Bureau of Statistics.

Table 6 presents the GMM estimation results using the city-level sample. The regression specifications are the same as those used in Table 4. We find that the coefficients of lagged FDI in each model are significantly positive, which demonstrates the stable self-reinforcing effect of FDI itself. We first include only single economic conditions or growth variables in the regression, together with the lagged FDI in models [1] to [4]. GDP is shown to have a significantly positive effect on FDI inflows in column [1], as does our own calculated per capita GDP in column [3].[13] When we include both the GDP per capita and GDP growth variables simultaneously in model [5], the former maintains its significantly positive effect, whereas the latter plays no significant role in determining subsequent FDI inflows. We then add the other control variables to the models reported in columns [6] to [10]. Because of the limited number of observations for the transportation variable, we include it only in the regression, along with the other variables in column [6]. Similar to the procedure adopted at the provincial level, we include macroeconomic variables, the average wages and savings of residents, together with the variables used in models [1] to [5] in the instrument sets used for the GMM specifications. The results generally mirror those of models [1] to [5]. GDP and calculated per capita GDP both exert a significantly positive impact, as reported in columns [6] and [8], whereas CCSY per capita GDP and GDP growth are shown to be statistically significant in columns [7], [9] and [10]. With regard to the other control variables, we find that education expenditure has a positive influence on FDI inflows, but wage cost effects are shown to be of little importance, which is consistent with Lucas (1990) and Chen (1996). We show that education expenditure, which serves as a proxy for human capital to a certain extent, has a significant influence on FDI inflows. Finally, we check the validity of the GMM structures for each model. All of the models pass the Sargan test with high *p*-values, thus justifying the GMM identifications. The Arellano-Bond m_1 and m_2 statistics show that the residuals in the first-difference equation (2) are first-order autocorrelated, but not second-order autocorrelated, except for models [6] and [8], in which the m_2 tests are slightly rejected. To sum up, the city-level sample also supports the existence of the Lucas paradox within the PRC under the dynamic panel GMM framework. Although we find no direct reverse-causality relationship between economic growth and FDI inflows, the results tell us that these inflows are not driven by regional economic growth to any great extent, which is not inconsistent with the deeper version of the Lucas paradox discussed by Prasad, Rajan, and Subramanian (2007). We then partition our sample into pre- and post-2000 sub-

[13] However, the coefficient of per capita GDP taken directly from the CCSY is not significant. This could be due to the relatively small sample. Economic growth has no effect on FDI inflows, as shown in column [4].

samples, with the results tabulated in Panel B. We find that the coefficients of per capita GDP are significantly positive in both periods.

Table 6: GMM Estimation Results using City-Level Data

This table presents the results of dynamic panel data GMM estimation using city-level data. Panel A shows the estimation results for the entire sample. In columns [1] to [4], we include only single GDP, per capita GDP or GDP Growth together with lagged FDI in the regression, with [2] the per capita GDP data taken directly from the CCSY and [3] our own constructed per capita GDP data. In columns [6] to [9], we add the other control variables to the regression specifications. In models [5] and [10], we include both our own constructed per capita GDP and GDP Growth at the same time, with and without the other control variables, respectively. Column [11] replaces Actual FDI used with Contracted FDI as the dependent variable. In panel B, we present the estimation results for the 1994–1999 and 2000–2005 sub-samples, tabulating only the coefficients of GDP, per capita GDP and GDP Growth in each model. The null hypothesis of the Sargan test is that the instruments used are not correlated with the residuals. The null hypotheses of the *m1* and *m2* statistics are that the residuals in the first-difference regression (2) exhibit no first- and second-order correlation, respectively. *p*-values are in parentheses, and *t*-statistics are in brackets.

Panel A: Total Sample

Dependent Variable: FDI

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
Lagged FDI	0.35***	0.29***	0.35***	0.42***	0.36***	0.32***	0.28***	0.36***	0.37***	0.36***	0.35***
	[11.56]	[3.85]	[10.34]	[10.21]	[10.35]	[7.05]	[3.53]	[9.18]	[9.27]	[9.26]	[8.7]
GDP	0.84***					0.94***					
	[7.86]					[4.56]					
GPC 1		0.12					0.27				
		[0.49]					[1.20]				
GPC 2			0.88***		1.21***			0.67**		0.35**	1.03***
			[4.57]		[5.86]			[2.12]		[2.33]	[2.7]
Growth				0.00	0.00				0.00	0.01	
				[0.18]	[0.84]				[0.59]	[1.64]	
Edu						0.27*	-0.07	0.25*	0.38***	0.24	0.47
						[1.77]	[-0.10]	[1.70]	[2.6]	[1.61]	[0.95]
Wage						0.01	0.52*	0.13	0.17	0.11	-0.21
						[0.10]	[1.73]	[1.07]	1.37	[0.93]	[-1.57]
Saving						0.12	0.45	0.17	0.67***	0.18	0.03
						[0.51]	[1.06]	[0.82]	[3.42]	[0.81]	[0.12]
Trans						-0.08					
						[-0.73]					
Sargan Test	109.19	17.61	94.44	59.87	95.77	77.97	26.16	112.06	94.32	111.31	78.19
(p-value)	(0.88)	(0.99)	(0.99)	(0.94)	(0.99)	(0.48)	(0.94)	(0.59)	(0.76)	(0.87)	(0.89)
m1	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	--	(0.00)	(0.00)	(0.00)	(0.00)
m2	(0.11)	(0.33)	(0.18)	(0.61)	(0.42)	(0.09)	--	(0.04)	(0.64)	(0.71)	(0.72)
# of City	532	263	532	507	507	502	252	530	504	504	532
Sample size	2917	964	2916	2156	2155	1500	486	1992	1499	1499	2018

Panel B: Sub-sample estimation

	sub-period: 1994–1999			sub-period: 2000–2005		
	without control var.	Sargan Test	*m2*	without control var.	Sargan Test	*m2*
GDP	1.09*** [5.74]	(0.39)	(0.54)	0.71*** [5.46]	(0.94)	(0.30)
GPC 1	--	--	--	0.21 [0.49]	(0.99)	(0.33)
GPC 2	1.29*** [3.85]	(0.29)	(0.49)	0.65*** [2.66]	(1.00)	(0.47)
Growth	0.00 [0.60]	(0.11)	(0.73)	0.00 [0.05]	(1.00)	(0.97)
	with control var.	Sargan Test	*m2*	with control var.	Sargan Test	*m2*
GDP	0.72*** [3.88]	(0.14)	(0.04)	1.12*** [3.15]	(0.96)	(0.64)
GPC 1	--	--	--	0.21 [0.98]	(0.89)	--
GPC 2	0.65 [1.41]	(0.12)	(0.04)	0.94 [1.49]	(0.99)	(0.87)
Growth	0.01 [0.98]	(0.57)	(0.60)	-0.01 [-0.72]	(0.95)	(0.71)

*, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

"--" indicates that the estimation was not performed due to the limited sample size.

Source: Annual issues of the China Statistical Yearbook published by the National Bureau of Statistics.

6.3 Round-tripping Issue

A significant portion of FDI in the PRC may in fact be the result of round-tripping. Xiao (2004) pointed out that part of the PRC's FDI inflows arise from to the return of PRC capital that has gone abroad for rent- or value-seeking purposes. The World Bank, in its "Global Development Finance 2002," highlighted the importance of this kind of round-tripping FDI in the PRC[14] and estimated it to be around one quarter of total FDI. Xiao (2004) estimates that round-tripping FDI in the PRC is likely to be in the range of 30% to 50%, which is much higher than the World Bank estimate. Round-tripping FDI may be the driving force of the Lucas paradox in the PRC, because the bulk of such FDI would come from the wealthier areas of the country.[15] However, this is not of very serious concern to our conclusion. We argue that round-tripping FDI does not have to flow back to where it came from. Economic law tells us that capital, whether foreign or domestic, aims at high-return investments. Round-tripping FDI is thus free to choose to flow to other areas with high marginal returns. In addition, Xiao (2004) argues that round-tripping FDI is either intended to get around legal or administrative constraints or to seek value-added financial services in an international financial and trade center, such as Hong Kong, China. These advantages are almost the same in all regions of the PRC. Round tripping is used to take advantage of the preferential policies available only to foreign investors. After its accession to the WTO in 2001, the PRC removed many of the incentives for it.

The best way to tackle this issue is to obtain round-tripping FDI data at the regional level and then subtract the round-tripping FDI from the total FDI in each region. Unfortunately, such data is not available, and hence we adopt an approximation method to deal with it. Our approach is to consider a relatively extreme situation. First, we calculate the median level of regional FDI inflows in each year. Second, for those regions in which the amount of FDI inflows exceeds the median level in a given year, we assume that 35% of the total FDI inflow

[14] See Box 2.3 on page 41 of this report (World Bank, 2002).

[15] We would like to thank a referee for pointing out this concern.

is round-tripping FDI, and remove it;[16] for the regions with below-median total FDI inflows in that year, we do nothing. Then, based on this adjusted FDI data, we redo all of the empirical analysis. The results change little when compared with Tables 3 to 6, with some of them becoming even more significant to a certain extent.[17] Therefore, we conclude that round-tripping poses no serious threat to our main findings.

7. POSSIBLE RESOLUTIONS

In this section, we attempt to resolve the Lucas paradox in the PRC. As discussed in the previous sections, the fundamental and institutional variables used in cross-country studies are not directly applicable, as the provinces and cities within the PRC share a common legal system, level of political risk, and cultural structure.

We propose two regional institutional factors to explain the paradox and the distortion of the distribution of foreign capital inflows within the PRC. First, we hypothesize that corruption plays a role in this distortion. The PRC is regarded as a highly corrupt country. According to the official records of the Central Commission for Discipline Inspection of the Communist Party of China from 1997 to 2002, there were 861,917 corruption cases under investigation, 842,760 corruption cases concluded and 846,150 people punished, of whom 137,711 were expelled from the Communist Party. Corrupt regions do not provide open and equal market access to all competitors. Price and quality become less important than access, which increases the cost of operation relative to a competitive market. This may be a major disincentive for foreign investors, and we thus hypothesize that a lower corruption level would weaken the GDP effect on attracting capital and mitigate the paradox. We proxy corruption by the total number of corruption cases scaled by the population in each province. The larger the scaled number is, the higher the level of corruption that a particular province suffers. Our second regional institutional factor is an index based on several Chinese regional marketization indices developed by Fan and Wang (2003) (we call it the m-index). This index is compiled by the PRC's National Economic Research Institute (NERI) for each province and major municipality and captures (1) the relationship between government and the market, such as the role of the market in allocating resources and enterprise burden in addition to normal taxes; (2) the development of the non-state economy, such as the ratio of industrial output by the private sector to total industrial output; (3) the development of a production market, such as regional trade barriers; (4) the development of a factors market, such as FDI and the mobility of labor; and (5) market intermediary and legal institutional environment (e.g., the protection of property rights). These five perspectives are constructed based on a series of specific sub-indices. We select the m-index and two of these five perspectives—the relationship between government and the market and market intermediary and legal institutional environment—and one sub-index, the marketization of the financial industry, as potential resolutions to the Lucas paradox. Wei (2000) tests the way in which FDI is affected by non-transparency, unstable economic policies, weak property rights protection, and poor governance and finds that a less developed market has a negative impact on FDI. We expect that if these indices can explain the paradox to some extent, then a higher score would reduce the GDP effect on FDI inflows. In other words, if a region is less developed at the market economic and institutional levels, then foreign capital will be less likely to consider it even if it has a higher marginal product of capital.

Table 7 represents the basic statistics of the five possible explanatory proxies and their correlation with FDI, GDP, and economic growth. It can be seen that the corruption level is negatively correlated with FDI inflows, and the other four factors are positively associated

[16] As noted, Xiao (2004) estimated that 30% to 50% of total FDI in the PRC should be regarded as round-tripping. We think that 35% is reasonable for our extreme scenario analysis.

[17] To save space, we do not tabulate the results with the effect of the round-tripping removed. They are available from the authors upon request.

with them. We also find the corruption level to be negatively associated with GDP, per capita GDP, and economic growth, and all four market development variables to be positively correlated with economic development.

Table 7: Descriptive Statistics of Institutional Factors

Panel A presents the descriptive statistics of five regional intuitional factors: the number of corruption cases scaled by population (n4p) for each province, market intermediary and legal institutional environment index (m5), relationship between market and government index (m1), marketization of financial industry index (m4a) and the m-index (m-index). Panel B shows the correlation matrix among FDI, GDP, per capita GDP, economic growth and the five regional intuitional factors.

Panel A: Institutional factors:	Sample	Mean	Std. Dev.	Min.	Max.
Corruption Cases (n4p)	268	0.54	0.49	0.02	5.38
Market Intermediary & Legal Institutional Environment (m5)	341	5.14	1.88	1.73	11.04
Relationship between Market and Government (m1)	341	5.92	2.09	-2.22	9.18
Marketization of Financial Industry (m4a)	341	4.43	2.10	0.00	8.98
M index (m-index)	341	5.40	1.66	1.57	9.74

Panel B: Correlation Matrix

	FDI	GDP	GPC	Growth	n4p	m5	m1	m4a	mindex
FDI	1.0000	0.7390***	0.6700***	0.2462***	-0.1436*	0.6667***	0.6842***	0.6277***	0.8250***
GDP		1.0000	0.5601***	0.1763***	-0.3617***	0.3892***	0.7475***	0.6584***	0.7738***
GPC			1.0000	0.3237***	-0.0710	0.7320***	0.3722***	0.5052***	0.6659***
Growth				1.0000	-0.1249**	0.1428***	0.0073	0.1295**	0.2095***
n4p					1.0000	0.0036	-0.4005***	-0.2696***	-0.3482***
m5						1.0000	0.3712***	0.5240***	0.6558***
m1							1.0000	0.6568***	0.8194***
m4a								1.0000	0.7618***
m-index									1.0000

*, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Source: Annual issues of the China Statistical Yearbook published by the National Bureau of Statistics.

We interact the regional institutional variable with per capita GDP and use this as a regressor to test for the significance of institutional factors in resolving the Lucas paradox. If the estimated positive impact of per capita GDP on FDI is indeed weakened by the regional institutional variables, then we should observe a positive and significant coefficient for the interactive term. Table 8 reports the results using both OLS (panel A) and the GMM (panel B) method. All of the regression models include the other control variables, such as tax, trade, investment, wage, and railway. Column [1] is the benchmark, with only per capita GDP and the other control variables. Column [2] includes only the institutional variables. Column [3] includes both per capita GDP and the institutional variables, and column [4] adds the interactive term. The results are mixed and are not significant. However, in some of the regression models, the effect of per capita GDP on FDI inflows is actually weakened by the regional institutional factors. In addition, the results become more significant when the GMM estimation method is used. Most of the institutional factors exert a significant impact on regional FDI inflows and weaken the effects of per capita GDP. However, the interactive terms are generally not significant, although some of them show the expected signs.

Table 8: Regression Results after Including Regional Institutional Factors

This table adds the regional institutional factors into the previous regression model. The results using OLS and GMM are reported in panels A and B, respectively. Model [1] is the benchmark, including only per capita GDP as the explanatory variable. Model [2] includes only the regional institutional factors in the regression. Model [3] considers both GPC and the institutional factors. Model [4] adds the interactive term based on model [3]. All of the models include the other control variables.

Panel A: OLS	[1]	[2]	[3]		[4]		
	GPC	Inst.	GPC+Inst.		GDP+Inst+GDP*Inst.		
	Beta1	Beta2	Beta1	Beta2	Beta1	Beta2	Beta3
Benchmark:	1.31**						
	[2.00]						
Institutional Factors:							
Corruption Cases		-0.27*	1.32**	-0.30**	1.35**	-1.80	0.17
		[-1.84]	[1.98]	[-2.02]	[2.01]	[-0.80]	[0.67]
Market Intermediary & Legal Institutional Environment		0.01	1.31**	0.00	0.90	-0.72	0.08
		[0.11]	[1.99]	[0.02]	[1.18]	[-1.01]	[1.02]
Relationship between Market and Government		0.06	1.32**	0.06	2.00**	0.95	-0.10
		[0.74]	[2.02]	[0.81]	[2.54]	[1.63]	[-1.53]
Marketization of Financial Industry		-0.17***	1.03	-0.16***	0.89	-0.32	0.02
		[-3.53]	[1.60]	[-3.31]	[1.05]	[-0.55]	[0.27]
M index		0.18	1.20*	0.14	1.08	-0.02	0.02
		[1.36]	[1.81]	[1.07]	[1.34]	[-0.03]	[0.24]
Panel B: GMM	[1]	[2]	[3]		[4]		
	GPC	Inst.	GPC+Inst.		GDP+Inst+GDP*Inst.		
	Beta1	Beta2	Beta1	Beta2	Beta1	Beta2	Beta3
Benchmark:	1.10***						
	[5.62]						
Institutional Factors:							
Corruption Cases		-0.29*	1.21***	-0.52***	1.28***	0.96	-0.16
		[-1.75]	[6.29]	[-3.60]	[5.63]	[0.37]	[-0.54]
Market Intermediary & Legal Institutional Environment		0.27***	0.89***	0.12*	1.19**	0.74	-0.06
		[4.38]	[3.72]	[1.74]	[2.52]	[1.10]	[-0.85]
Relationship between Market and Government		0.34***	1.07***	0.26***	0.68	-0.33	0.07
		[3.78]	[5.31]	[3.61]	[1.12]	[-0.44]	[0.80]
Marketization of Financial Industry		0.15***	0.97***	0.10**	0.90*	-0.06	0.02
		[3.50]	[4.54]	[2.39]	[1.84]	[-0.09]	[0.25]
M index		0.67***	0.78***	0.54***	1.09**	1.02	-0.06
		[6.81]	[3.54]	[6.09]	[2.37]	[1.40]	[-0.74]

*, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Source: Annual issues of the China Statistical Yearbook published by the National Bureau of Statistics.

As there may be concern that these results are spurious due to the high degree of correlation between GDP and the chosen regional institutional factors, we further employ a two-stage regression model. We first regress per capita GDP on each institutional variable and then plug the residual as the independent variable in the second-stage regression. The independent portion of per capita GDP even has a negative coefficient, although not a

significant one, when the m-index and its interactive term are added. The interactive terms are rarely significant.

Table 9: Two-Stage Regression Results after Including Regional Institutional Factors

This table shows the two-stage regression results after including the regional institutional factors. In the first stage, we regress per capita GDP on each regional institutional factor to obtain the residual standing for the portion of per capita GDP that is not related to the regional institutional factors. In the second stage, we use the "residual" GDP per capita instead of the "actual" GDP per capita in each model in Table 8, using both OLS (panel A) and GMM (panel B). Model [1] is the benchmark, including only GDP per capita as the explanatory variable. Model [2] includes only each regional institutional factor in the regression. Model [3] considers both GPC and the institutional factors. Model [4] adds the interactive term based on model [3]. All of the models include the other control variables.

Panel A: OLS	[1]	[2]	[3]		[4]		
	GPC (Resid)	Inst.	GPC (Resid)+Inst.		GPC(R)+Inst+GPC (R)*Inst.		
	Beta1	Beta2	Beta1	Beta2	Beta1	Beta2	Beta3
Institutional Factors:							
Corruption Cases	0.56	-0.27*	1.32**	-0.41**	1.34**	-0.41**	0.10
	[0.93]	[-1.84]	[1.98]	[-2.54]	[1.99]	[-2.50]	[0.41]
Market Intermediary & Legal Institutional Environment	0.24	0.01	1.31**	0.32*	1.00	0.30	0.06
	[0.30]	[0.11]	[1.99]	[1.82]	[1.18]	[1.62]	[0.58]
Relationship between Market and Government	0.44	0.06	1.32**	0.21*	2.03**	0.21*	-0.10
	[0.93]	[0.74]	[2.02]	[1.94]	[2.44]	[1.93]	[-1.37]
Marketization of Financial Industry	1.07***	-0.17***	1.03	-0.01	0.85	-0.02	0.02
	[3.90]	[-3.53]	[1.60]	[-0.06]	[1.02]	[-0.14]	[0.34]
M index	0.35	0.18	1.20*	0.45**	1.28	0.46**	-0.01
	[1.04]	[1.36]	[1.81]	[2.26]	[1.28]	[2.11]	[-0.11]
Panel B: GMM	[1]	[2]	[3]		[4]		
	GPC (Resid)	Inst.	GPC (Resid)+Inst.		GPC (R)+Inst+ GPC (R)*Inst.		
	Beta1	Beta2	Beta1	Beta2	Beta1	Beta2	Beta3
Institutional Factors:							
Corruption Cases	0.95***	-0.29*	1.22***	-0.57***	1.37***	-0.54***	-0.24
	[4.77]	[-1.75]	[6.20]	[-3.84]	[6.05]	[-3.94]	[-0.85]
Market Intermediary & Legal Institutional Environment	0.52**	0.27***	0.90***	0.35***	0.64	0.38***	0.04
	[2.15]	[4.38]	[3.76]	[5.69]	[1.33]	[7.07]	[0.52]
Relationship between Market and Government	0.83***	0.34***	1.08***	0.39***	0.65	0.39***	0.07
	[4.24]	[3.78]	[5.33]	[5.13]	[1.00]	[6.22]	[0.74]
Marketization of Financial Industry	0.51**	0.15***	0.96***	0.25***	0.79**	0.28***	0.05
	[2.55]	[3.50]	[4.53]	[5.59]	[2.02]	[7.07]	[0.73]
M index	0.15	0.67***	0.77***	0.74***	-0.45	0.75***	0.26**
	[0.71]	[6.81]	[3.54]	[8.27]	[-0.78]	[8.90]	[2.46]

*, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Source: Annual issues of the China Statistical Yearbook published by the National Bureau of Statistics.

To sum up, we propose two institutional factors to resolve the Lucas paradox in the PRC, and the results partially support our hypothesis. However, the empirical evidence is fragile, to say the least.[18] We posit that this may be due to the difficulty of identifying well-constructed regional institutional and marketization development variables, especially across

[18] In fact, we have explored other variables, which we think have potential economic rationale to solve the Lucas paradox in the PRC. However, they all show no better results than those shown in Table 8 and Table 9.

regions within one country. Therefore, we believe more micro- and firm-level analysis may be needed to explain or resolve the Lucas paradox in the PRC.

8. CONCLUSIONS

This study has examined the relationship between economic development and FDI inflows within a single country, the PRC, to ascertain whether foreign capital is attracted to rich regions, which would contradict the prediction of neoclassical economic theory. We hand-collect two regional samples based on provincial- and city-level data and adopt the GMM estimation framework to deal with the endogeneity issue, because FDI inflows can also cause changes in macroeconomic performance.

The GMM estimation results support our conclusion that at both the provincial and city levels in the PRC, the more developed the regional economy is, the more attractive it is to foreign capital, even after considering the round-tripping FDI issue, thus demonstrating that the Lucas paradox exists within the PRC. Prasad, Rajan and Subramanian (2007) documented a phenomenon, which they call a deeper version of the Lucas paradox, whereby low-growth groups of countries received more significant amounts of foreign capital in the 2000–04 period. However, our samples demonstrate no such significant negative relationship between regional economic growth and FDI inflows. Instead, our results simply show that there is a very weak statistical relationship between economic growth and FDI across Chinese regions, which implies that high-growth provinces and cities are unlikely to attract greater FDI inflows. This conclusion is not consistent with the standard neoclassical capital-follows-growth theory, although our results are compatible in part with the findings of Madariaga and Poncet (2007), i.e., that FDI promotes economic growth when the GMM framework is used to analyze the data. Therefore, we conclude that economic growth may be the consequence, but not the cause, of FDI in the PRC.

After documenting the existence of the Lucas paradox in the PRC, we take a further step and explore possible explanations for it. However, we find neither strong nor robust evidence and thus leave this issue to future research.

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APPENDIX

Definition and source of variables

Variable	Definition	Source
Provincial Level:		
FDI	Actual foreign capital utilized	China Statistical Almanac
GDP	Total Gross Domestic Product	China Data Online
GPC	Per capita GDP	China Data Online
Growth	GDP growth	China Data Online
Tax	Tax revenue per capita	China Statistical Almanac
InTra	International Trade	China Statistical Almanac
DomInv	Domestic Investment	China Statistical Almanac
Wage	Average wage	China Statistical Almanac
Rail	The length of railways	China Statistical Almanac
City Level:		
FDI	Actual foreign capital utilized	China City Statistical Yearbook
GDP	Total Gross Domestic Product	China City Statistical Yearbook
GPC1	Per capita GDP taken directly from the yearbook	China City Statistical Yearbook
GPC1	Per capita GDP constructed by the authors	China City Statistical Yearbook
Growth	GDP growth	China City Statistical Yearbook
Wage	Average wage	China City Statistical Yearbook
Edu	Education expenditure per capita	China City Statistical Yearbook
Saving	Residents' savings per capita	China City Statistical Yearbook
Trans	Transportation volume per capita	China City Statistical Yearbook