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The Double Dividend of More Equally Distributed FDI:
Analyzing Regional Variation in the FDI-Growth Nexus across Chinese Cities

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Abstract

This paper reassesses the relationship between FDI inflow and local growth in China, shedding a critical light on what is popularly viewed as a success story of Chinese economic reform. Following arguments that FDI both led to increasing disparities and may have been an obstacle to local domestic growth, I apply a quantile regression technique, which explicitly takes the regional distribution of foreign investment into account. The results, surprisingly, provide supportive evidence both for the view that foreign investment in some cases suppressed domestic growth rather than spurring it, as well as for the current efforts of the Chinese government to channel a larger portion of foreign investment into poorer regions. The paper therefore calls for further domestic liberalization as appropriate policy towards international direct investment.

I. Introduction

The impressive growth performance of China after its opening up to the world economy has attracted a great amount of attention in academic circles and among the general public. It is commonly accepted that much of this economic success is related to the massive inflow of foreign investment, providing China with a relatively cheap source of capital, new technologies, modern management methods, and increased domestic competition. For many years, China has continuously been the number one direction for foreign direct investment (FDI) amongst developing countries, and is regarded as a role model by many other countries. Similarly, its success in attracting such a large amount of investment has been widely regarded as proof for the success of the Chinese government's reform strategy. Subsequently, large volumes of academic research showing the beneficial effects of FDI inflows in China have been produced, trying both to justify as well as to explain the seemingly obvious correlation between growth and FDI inflows.

However, looking at the performance of FDI in China more closely, several arguments remind us to be more humble and cautious in making such claims. Most prominently, the steep rise in regional disparities between FDI-receiving coastal areas and the left-behind inland-provinces led to some criticism on the regionally unbalanced opening-up strategy that has been part of the Chinese economic reforms. After extending the privileges to attract foreign investment virtually to the whole country, the Chinese government started to specially promote FDI in the underdeveloped western

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region in the framework of its “develop the west”-strategy. Nevertheless, these attempts seem to have hardly borne fruits until now.

A second aspect of China’s FDI performance is the relationship between domestic and foreign investors. As Huang (2001a, 2001b, 2001c, hereafter 2001) argues in a series of papers, foreign direct investment could only be so successful because of the repression of domestic economic actors. The overregulation of their economic activities and their inability to trade and invest freely between different governments’ jurisdictions within the same country, for example, effectively barred domestic Chinese entrepreneurs from realizing many promising investment opportunities. Though not necessarily limiting growth, financing development through FDI meant that the same growth rate was achieved with higher national costs than in a situation where domestic resources, entrepreneurial as well as financial, would have been used more efficiently.

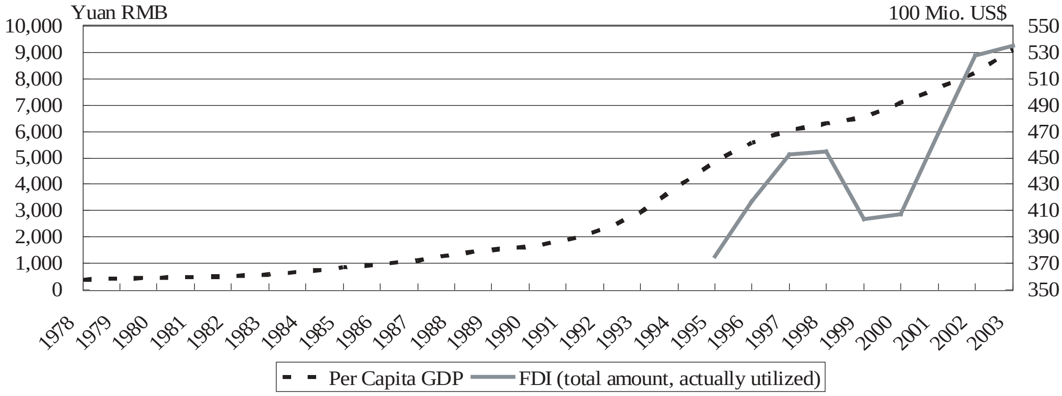
The objective of this paper is to reassess the FDI-growth debate by explicitly taking into account the two counter-arguments described above. For this purpose, the effects of FDI on growth are analyzed specifically focusing on differences between poorer and richer localities, allowing the relationship to vary across the income distribution. The methodological tools to examine such a diverse relationship are the decomposition analysis of distributional inequalities on the one hand, and the econometric technique of quantile regressions, as developed by Koenker (1978), on the other. The results, surprisingly, produce supportive evidence both to Huang’s (2001) argument that foreign investment inflows in China may reflect weaknesses of the Chinese economy rather than strengths, as well as to the current efforts of the Chinese government to channel a larger portion of foreign investment into poorer provinces. Therefore, it is argued that a more equal distribution of FDI across China’s regions has the potential of yielding a double dividend: increasing overall growth as well as reducing regional income disparities.

II. FDI and Growth in China

In the general economic literature, FDI is perceived to have various positive impacts on growth and development. These range from the potential of FDI to increase the host country’s capital stock and to enhance competition in local markets, to possible technology and skill transfers and consecutive productivity growth.[1] Critical writers, on the other hand, voice concern over the potential of FDI to destroy local competitors, the sometimes poor record of multinational companies regarding local working conditions and environmental standards, as well as the crucial dependency and therefore potential instability that large inflows of foreign capital might create.[2]

For the Chinese case, the FDI-growth nexus is mainly discussed in the framework of analyzing regional inequality. Here, regional differences in international openness and especially FDI inflows are often identified as important factor explaining regional disparities.[3] Other proposed determinants of regional disparities in China include geographical factors, central governments preferential policies, fiscal decentralization, and economic and industrial structures, including ownership arrangements and marketization.[4] Obviously, many of these explanations overlap or interact with the presence or inflow of FDI.

Figure 1 Average per capita GDP and FDI Inflow in China



Data Source: China Statistical Yearbook 2004.

Given the seemingly successful performance of China regarding both FDI inflow as well as growth, depicted in figure 1, the current literature mainly reflects the general positive arguments regarding the impact of FDI on growth mentioned above. These arguments are mostly supported by the existing empirical literature as well. The following paragraph intends to summarize some main contributions in this regard. However, I do not attempt to provide a comprehensive overview on the topic, but rather to cite examples from a vast literature.

Most of the studies, including Démurger (2000), Kueh (1992), Lemoine (2000), OECD (2003: pp. 29ff.), Shan, Gang and Sun (1997), Sun, Hone and Doucouliagos (1999), and Wei (1993), find a strong positive FDI-growth relationship. For example, Démurger (2000) applies a growth accounting framework similar to the one used in this paper to examine the link between regional growth and international openness. In her results, she finds both domestic factors of production as well as export growth to have little to no impact on regional growth performance, leaving foreign investment as the "preeminent factor in China's growth" and sole "engine of China's growth process".[5]

As transmission mechanisms, she proposes that the institutional pattern of promoting FDI to be bound to joint venture and cooperation agreements played an important role, since this particular investment design helps the dispersion of more efficient production and management techniques, and eventually spurs the development of local entrepreneurship. This view, however, contradicts openly with Kueh's (1992) observation that Sino-Foreign joint ventures have been largely isolated from the rest of Chinese businesses, mainly due to the government's strategy of maximizing foreign exchange earnings by export oriented FDI, therefore "alienating" the FDI sector and seriously restricting the spill-overs from foreign investment to the Chinese economy.[6]

More critical on the topic are Lardy (1995), Potter (1995), Zhang and Zheng (1998) and, especially, Huang (2001). Huang argues, among other things, that the strong inflow of FDI into China is accompanied by systematic legal, financial, and administrative disadvantages of indigenous firms.[7] Domestic state-owned enterprises suffer frequent detailed and discretionary bureaucratic interference and often have to carry the burden of predatory taxes and fees, while non-state firms have almost no access to credit from public financial institutions and face high regulatory and legal uncertainty. He stresses the nature of FDI as an *ownership arrangement* rather than solely a flow of capital and possibly technology. If local entrepreneurs are administratively barred from realizing future growth opportunities, FDI can help to fill this gap. This discrimination against domestic companies might not necessarily lead to a lower national growth rate, but it surely induces additional costs to the local economy in form of foreign claims on future economic profits.

As to the question of technology transfer, the empirical evidence proposes that transfers of technology into China through FDI are rather limited.[8] Zhang (2002), for example, states that "the contribution of FDI to China's technological progress through technology transfer is still not noticeable".[9] A crucial condition in this regard is assumed to be the host country's ability to effectively absorb the advanced technology, which is according to Borensztein, De Gregorio and Lee (1995) contingent on a minimum threshold stock of human capital. The bargaining power of local governments versus multinational corporations has also been proposed as an important condition for technology transfer.[10] For the Chinese case, thus, one would logically expect FDI to play a larger role in the growth of more developed regions.

In summary, it has been undisputed that foreign direct investment, through the combination of its growth enhancing effects paired with a very unequal regional distribution, has contributed strongly to the rise in interregional economic disparities.[11] Nevertheless, the question of whether there is a dispersion of FDI-induced growth effects towards other regions continues to be a topic of lively debate.[12]

In contrast to all previously cited papers, this paper argues that it is not useful to assume the relationship between foreign investment and growth to be homogeneous across rich and poor localities, taking city-level data as an example. Effects of FDI on growth can vary across localities for a number of reasons. Several previous papers propose that the FDI-growth relationship should be weaker in less developed areas, because these possess less of the human capital endowments that are important to create linkage effects between the foreign invested sector and the local economy. If so, the current strategy of the Chinese government to spur the development of poorer regions by redirecting more FDI to the inland and western provinces (the so-called *"Develop-the-West"*- or *"Go-West"*-strategy) may have limited prospects for success. On the other hand, if Huang's (2001) argument is correct that FDI in China uses opportunities that local entrepreneurs are banned from, instead of creating new opportunities and growth, thus representing a weakness of the Chinese economy rather that a strength, this might even be reflected in a negative correlation between FDI and growth in the richer, fast growing cities where current business opportunities are concentrated. Therefore, the next sections introduce an econometric technique that allows us to specifically address distributional aspects in the impact of FDI on growth, and describe the data that will be used in the following analysis.

III. Methodology

In this paper, the relationship between local growth and FDI share will be assessed using basic descriptive tools as well as regression analysis. In the descriptive section, I apply Theil-index decomposition to compare the regional distribution of per capita GDP and FDI, especially focusing on the intra-provincial component of this relationship.[13] In the regression section, the following simple, autoregressive growth accounting framework is applied to a panel of Chinese cities:

$$\begin{aligned}\ln\left(pc\ GDP_{i,t}\right) = \alpha_1 + \alpha_2 \ln\left(pc\ GDP_{i,t-1}\right) + \\ \alpha_3 \ln\left(pc\ investment\ in\ fixed\ assets_{i,t-1}\right) + \\ \alpha_4 \ln\left(share\ of\ FDI\ in\ GDP_{i,t-1}\right) + \varepsilon\end{aligned}$$

Main explanatory variables for the per capita GDP in city i and year t are assumed to be the previous year's per capita GDP, per capita investment and the share of foreign direct investment in GDP, also with a one-year lag. The lagged per capita GDP is included to control for location specific effects excluded from the equation, as differences in human capital, general conditions, or any kind of historical path dependencies. Therefore, this specification does not require the introduction of cross-section (city-) specific effects to control for cross-section heterogeneities. In selected cases, however, additional province-specific or year-specific effects are included in this equation.

Because FDI is included in the total investment, the FDI-share variable explicitly estimates the technological progress augmenting impact of FDI, which can be considered to originate either in technology and skill transfers from multinational corporations or in an improved competitive business environment.

As for the estimation technique, I supplement the commonly used least square regression by the semi-parametric quantile regression technique introduced by Koenker and Bassett (1978) and operationalized by Koenker and D'Orey (1987).[14] Recently, conventional estimation techniques for growth regressions have been criticized for a number of weaknesses.[15] Some of the problems discussed in the literature are parameter heterogeneity, the presence of extreme observations, model uncertainty and nonlinearities. Several alternative options have been proposed, including GMM panel data techniques, robust regression analysis, extreme bound analysis, the application of regression trees or the non-parametric density estimation of transition probability functions.

Quantile regression can be interpreted as a disaggregation of the traditional linear model. While the common least square estimation assumes the relationship between two variables to be described by a single, representative coefficient with constant variance errors, quantile regression allows for a variation of that coefficient and its dispersion along the conditional distribution of the dependent variable. Thus, in the specific case of this paper, poorer cities (that are, cities with an average per capita GDP that is located in a lower quantile of the sample distribution) can be affected by an explanatory variable differently than cities with higher average per capita GDP.

Such a property is especially important if one is interested in the distributional impact of the explanatory variable. As Mello and Perelli (2003: 646) point out, explanatory variables can affect conditional distribution of the dependent variable in a number of ways. For instance, they can affect the dispersion, the skewness, stretch one tail, fatten the other, etc. In this case, one would like to estimate the entire conditional distribution, so that the use of quantile regression would be more appropriate then conditional mean estimation methods. On the other hand, if the explanatory variable affects only the location of the conditional distribution as in the classical homoskedastic linear regression model then conditional mean estimation methods are preferable.

Although quantile regression shares the objective of uncovering relationships missed by traditional data analysis, its concept differs significantly from other robust regression methods. Robust estimation is designed to deal with mistakes due to inappropriate data. On the other hand, quantile regression as applied here is concerned with mistakes due to summarizing disparate quantile effects into a single, potentially misleading, relationship.[16] When using quantile regression, questionable observations remain in the data set. Instead, independent coefficients are estimated for the entire conditional distribution, using the entire data set to derive each coefficient.

More specifically, the coefficients β_j in a quantile regression are estimated to minimize the sum of weighted absolute deviations for each quantile. Let's define the residual for each observation i as $r_i = y_i - \sum_j \beta_j x_{ij}$. Then, the quantity being minimized with respect to β_j is $\sum_i |r_i| h_i$, and the weights h_i are asymmetric functions of the quantiles q ($0 < q < 1$), with $h_i = 2q$ if $r_i > 0$, and $h_i = 2(1-q)$ otherwise. This minimization problem is solved via linear programming techniques.[17] The coefficients of a quantile regression can be interpreted as the marginal change in the specific conditional quantile of the dependent variable due to marginal change in corresponding explanatory variable.[18]

Since the estimation technique itself as a point estimation method belongs to the robust regression methods,[19] each observation will exert its influence strongly only in the specific part of the conditional contribution where it is located, while leaving the rest of the distribution largely unaffected. Thus, one can obtain a result based on all information available in the data set, without risking too much distortion due to possibly defective data.

However, while quantile regression estimates are inherently robust to contamination of the response observations, they are potentially sensitive to contamination of the design observations.[20]

For example, if measurement error alters the ordering of the observations in the conditional distribution, the weighting procedure explained above is biased. Therefore, it seems to be advisable to cross-check the plausibility of the quantile regression results with alternative methods, as explained below.

A more traditional way to address similar concerns is the estimation of OLS coefficients for a regression with slope dummy variables representing a grouping of the dependent variable. Thus, such an estimation is additionally performed in this paper to cross-check the results from quantile regression. However, it should be noted that there might arise econometric problems from the slope dummy regression. Introducing slope dummies virtually creates a truncated dependent variable, which can lead to the problem of sample selection bias, as noted by Koenker and Hallock (2001: 147) and Heckman (1979). Moreover, although grouping takes into account only the observations which are in one group for estimating a parameter, thus eliminating the influence of outliers outside the group, within a group each observation has the same (potentially distorting) influence. Obviously, the regression results depend very much on the specific grouping procedure, and will be unstable if there is heterogeneity in the coefficients. The choice of groups, however, can only be ad-hoc. Beside this, limiting the inference to just a subgroup of the data significantly reduces the degrees of freedom in the estimation. In quantile regression, on the other hand, all the sample observations are actively in play in the process of regression fitting for each quantile.

Quantile regression techniques have come into common use in labor economics and in the analysis of the quality of education.[21] Recently, it has also been proposed to apply this method to the subject of growth regressions.[22] The use of quantile regression techniques in this paper is, beside the more technical advantages described above, especially motivated by the particular objective of the study. Since I am concerned with describing and analyzing the distribution of growth across China, it is obviously necessary not only to operate with methods estimating central location measures like the sample mean (as it is done in the OLS case), but also to take the distribution of both variables into account. Quantile regression, describing the distribution of the dependent variable conditional to the explanatory variable, provides a tool to do so.

IV. Data

One important aspect of this paper is that it draws on sub-provincial data, more specifically city-level data on urban areas, to analyze the FDI-growth nexus. Decomposition of regional disparities in China provides evidence that the economic structure and growth dynamics within Chinese provinces themselves are rather diverse, and the main proportion of growth disparities can actually be observed below the provincial level.[23] The data utilized in this study are taken from the Urban Statistical Yearbooks of China 2000 - 2003, published by the National Bureau of Statistics (NBS). To fill some of the gaps in the reported data, or to verify and cross-check questionable figures, additional official statistical publications have been used as well, in particular Provincial Statistical Yearbooks compiled by the different provincial statistical agencies.

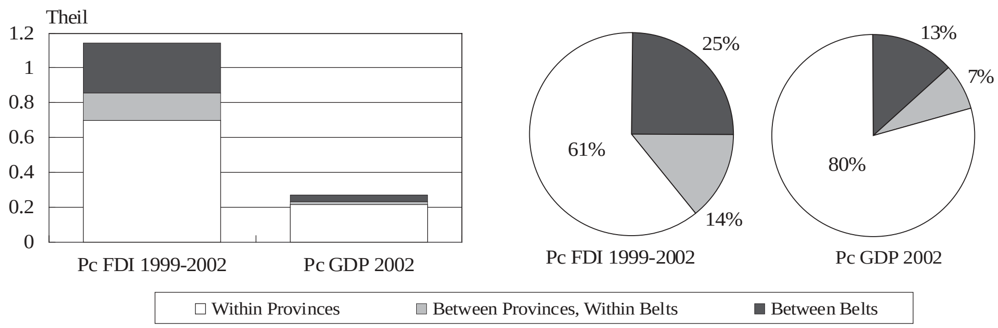
The data comprise a panel of 657 cities across 26 Chinese provinces for the time period from 1999 to 2002.[24] Since not all data are available during all four years, the total number of observations used in the regressions reduces to 1,960 instead of 1,971. Variables taken from the Yearbooks are gross domestic product, year-end population, total investment in fixed assets, and actually utilized foreign direct investment at the year-end. Cases in which no foreign investment was reported in a locality, the FDI share has been approximated by 0.0000001 to allow logarithmic transformation.

The data set is similar in nature to the first data set applied in Wei (1993), who uses city data for 434 cities from 1988 to 1990, and the additional city-level data set in Démurger (2000), who analyses 107 cities between 1988 and 1993.[25] However, I am able to employ a much larger panel of cities, describing the newest time period currently available. Furthermore, and in contrast to Démurger (2000), I exclude data on adjacent rural counties and county-level cities, to avoid both double counting as well as the introduction of an additional urban-rural bias in the data set.[26] Similarly, the data set totally excludes any data on rural prefectures. Generally, there is a trade-off between the advantages of a longer time dimension of the data and more detailed indicators available on the urban level compared with the loss of regional generality due to neglecting rural data. However, this study is still expected to provide a general picture of the impact of FDI on the Chinese economy, since cities, as administrative and economic centers, can easily be interpreted as representing neighboring rural areas.

V. Descriptive Analysis

In this section, the distribution of per capita GDP and per capita FDI across cities, provinces and macro-regions[27] is described and analyzed. To account for the larger variability of foreign capital inflows, the FDI variable is represented by the sum of annual inflows between 1999 and 2002, while GDP as well as population data is for 2002.

Figure 2 Vertical Structure of FDI and GDP Distribution

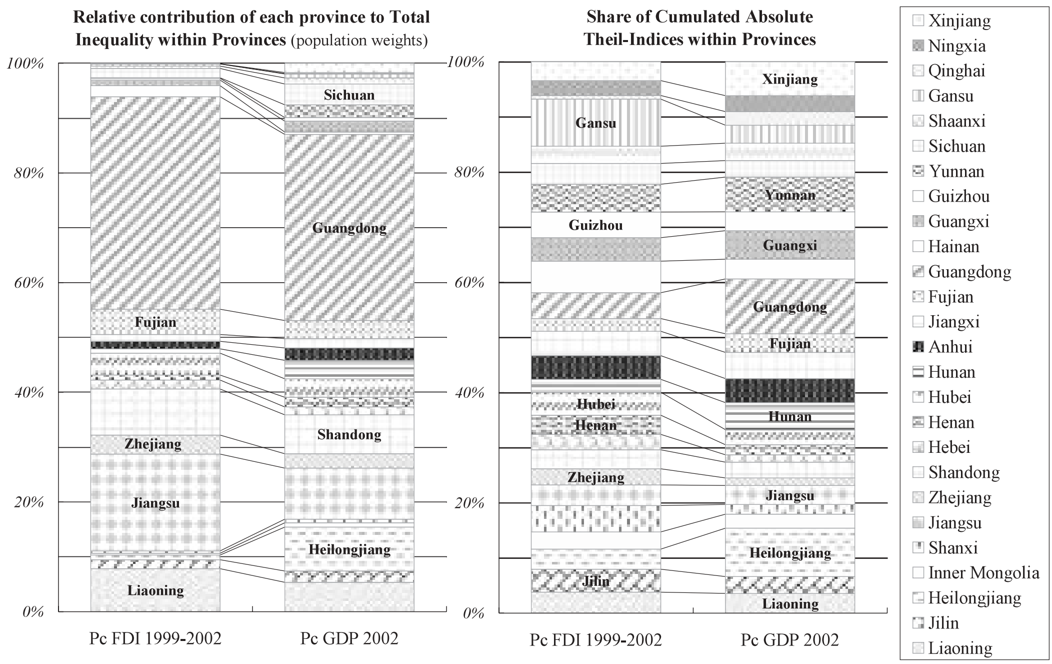


Note: Pc GDP - 652 observations; Pc FDI - 662 observations; 26 provinces;
Belts: Coastal, Central and Western; Theil-index decomposition.

To start with, figure 2 presents a decomposition of overall distributional inequality of both variables, as measured by the Theil-index, into the contributions of different levels of aggregation. It reveals that, although FDI is more unequally distributed than GDP, a larger percentage of inequality in the latter is explained on the sub-provincial level.

Within provinces, large portions of per capita GDP inequalities can be explained by just a few provinces, as the left graph in figure 3 shows. The graph describes the relative contribution of each province to the intra-provincial component of the total Theil-index (the ordinate measuring the percentage of total intra-provincial disparities), which means it is weighted by provincial population shares. The largest proportions in both FDI and GDP disparities are reported for Guangdong and Jiangsu, which combine large population shares with high inequality levels. Important relative contributions to disparities in FDI can also be observed for the cases of Shandong and Liaoning, mainly due to their population size. These provinces, however, show smaller shares in GDP disparities. Heilongjiang, on the other hand, reports large disparities in GDP, but negligible differences in the FDI distribution within the province.

Figure 3 Horizontal Structure of FDI and GDP Distribution within Provinces

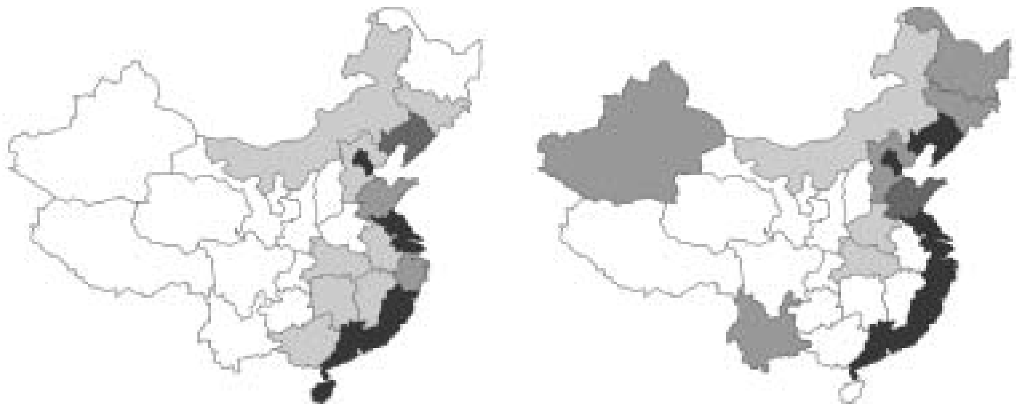


Note: See figure 2.

If the inequality level of each province is analyzed independently, as in the right-hand side of the figure 3, differences between provinces appear to be smaller. The graph shows absolute (unweighted) inequality within provinces measured by Theil-indices, with the total sum of all provincial Theil-indices standardized to 100 per cent to provide comparability between FDI and GDP. Guangdong, again, shows high inequality in both FDI and GDP distribution, as does Yunnan. Similarly, Heilongjiang still exhibits large intra-provincial GDP disparities. Most notably, however, the correlation between both distributions is rather small, and provinces with comparatively unevenly distributed FDI do not necessarily show high inequality levels in per capita GDP. Correspondingly, the correlation coefficient of the two series of absolute Theil-indices is only 0.18, compared with a (population-weight inflated) correlation coefficient for the previous relative Theil-index contributions of 0.95.

The maps in figure 4 report a similar picture. While on the provincial level, high per capita FDI and GDP levels are often correlated, as depicted in figure 4, the inequality structures within provinces seem to be independent, as shown in figure 5.

Figure 4 Average Pc FDI 1999 - 2002 (left) and Pc GDP 2002 (right) of Chinese Provinces



Note: See figure 2; no data for Tibet; Chongqing is treated as part of Sichuan;
For these and the following maps:

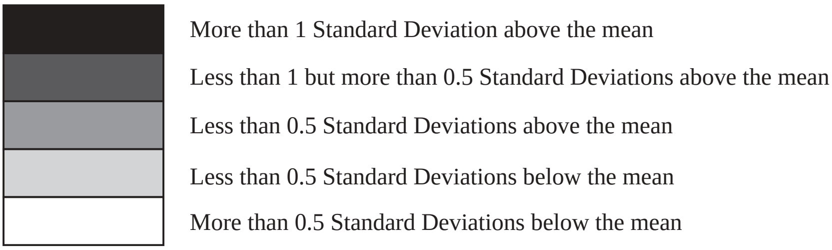
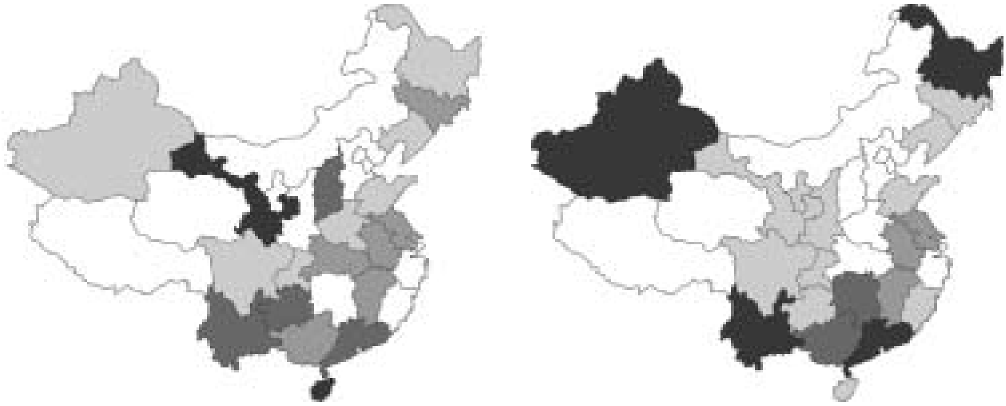


Figure 5 Distribution of Pc FDI 1999 - 2002 (left) and Pc GDP 2002 (right) within Chinese Provinces



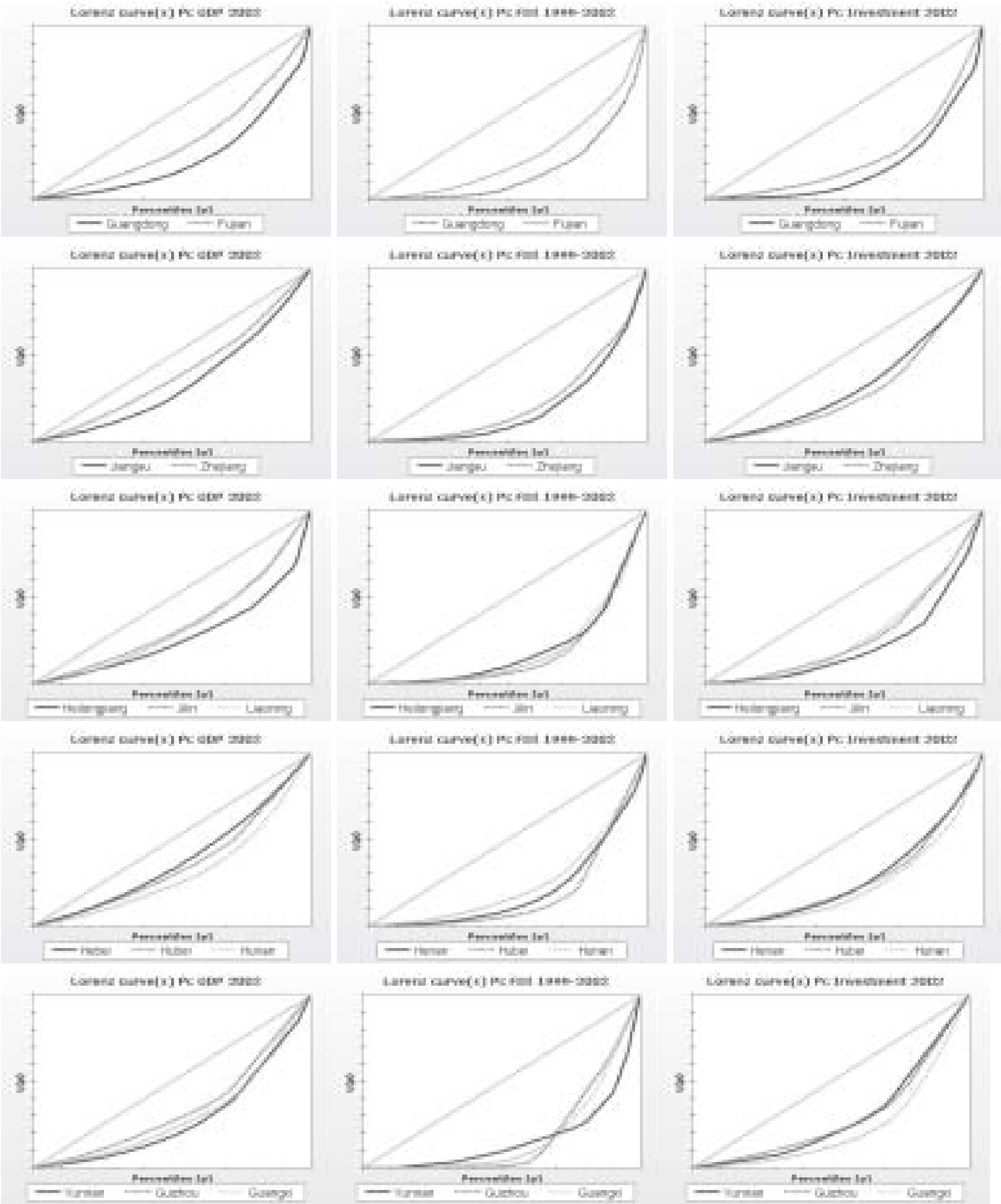
Note: See figure 4; additionally: no data for Beijing, Tianjin, and Shanghai.

Coastal provinces show consistently high per capita FDI and GDP levels, but vary widely with regard to their intra-provincial distribution. As before, Guangdong and Yunnan are outstanding in both FDI and GDP disparities, while Heilongjiang combines very unevenly distributed per capita GDP with a relatively equal distribution of per capita FDI.

Another, alternative way of presenting these facts is by comparing provincial Lorenz curves, as shown in figure 6. Beside graphs on per capita GDP and FDI, Lorenz curves on per capita investment are provided as additional information.

For better comparability, the curves are grouped by provinces with similar geographical and economical structures and characteristics: in the first line the two southern coastal provinces of Guangdong and Fujian, below that the two eastern coastal provinces of Jiangsu and Zhejiang, followed by the three northeastern provinces of Heilongjiang, Jilin and Liaoning, than the three central provinces of Henan, Hubei and Hunan, and finally the southwestern minority-rich but income-poor provinces of Yunnan, Guizhou and Guangxi.

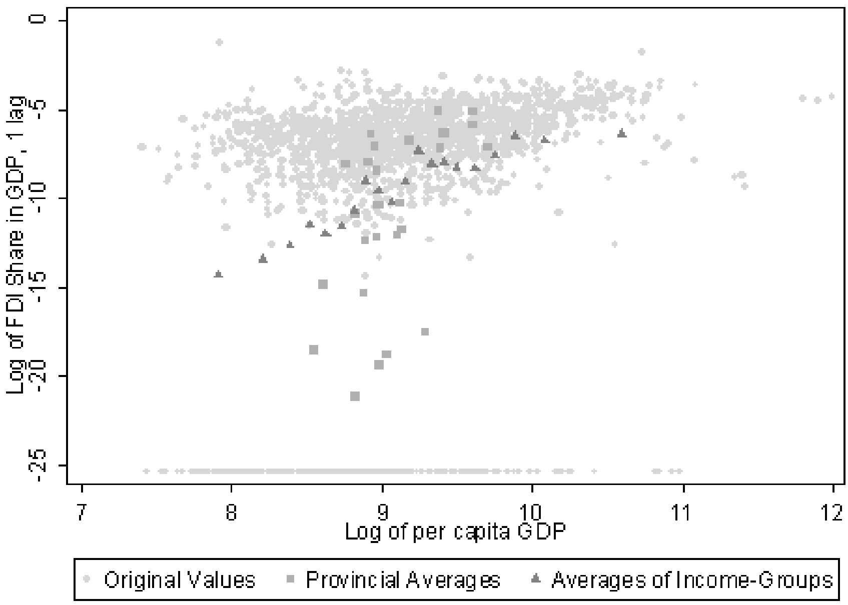
Figure 6 Provincial Lorenz Curves of Pc GDP, Pc FDI, and Pc Investment, Selected Provinces



Obviously, while the FDI distribution in the southern and eastern coastal provinces closely mirrors the distribution of GDP, this does not hold for the other three examples. For some of these, differences in per capita investment may explain a part of the picture. On the other hand, for the eastern coastal as well as the southwestern province cluster, capital stock distribution exhibits few similarities with the provincial distribution of GDP.

Finally, figure 7 addresses the question of a possible bi-variate relationship between the FDI-intensity of a city's economy and its local output by graphing both variables in a scatter diagram.

Figure 7 Scatter Diagram of Pc GDP and FDI Share, Including Provincial and Group Averages



Besides showing the original city-level observations, the graph also reports the location of 26 provincial averages and the averages of 20 groups of cities, categorized according to their per capita GDP. While it is difficult to identify the proposed bi-variate relationship using city data or 26 provincial averages, the averages of groups of cities defined by their per capita GDP (20 equal-sized groups) show a positive correlation between the variables, with this relationship being more dispersed in middle income groups and even weaker for city groups with the highest per capita GDP. Thus, the graph proposes that although there is a clear relationship between FDI share and per capita FDI, it may be not observable across the whole sample or when cities are partitioned into provinces.

Overall, this section revealed that due to the regional heterogeneity within provinces, the relationship between FDI inflows and GDP on the sub-provincial level is very weak. Only for a few newly rich provinces along the southern and eastern coast, disparities in FDI could probably cause intra-provincial growth disparities, while for the traditionally industrialized and rich provinces in the northeast as well as the middle income provinces in the center, this link promises to have only weak explanatory power. In the poorest provinces in the southwest however, notably neither FDI nor total investment can satisfactorily explain intra-provincial income disparities. Therefore, other-than-economic reasons may play a main role in local development in these regions.

VI. Regression Results

The previous section reported a rather weak correlation between the distribution of FDI and GDP by using simple descriptive methods and considering the regional structure and composition of both variables. Such an analysis facilitates linking the results directly to a specific region and comparing regions with each other. Its insights, however, necessarily remain partial and one-dimensional. To get more comprehensive results, the following paragraph applies panel-data regression analysis to the data set as a whole.

As a first step, the test equation introduced in section III is estimated using conventional Least Squares. To correct the inherent heteroskedasticity problems, White-heteroskedasticity consistent standard errors and probability values are reported. Alternative specifications including year-specific dummies as well as province-specific dummies are also introduced. While the former allow for changing intercepts between years, the latter account for province-specific institutional settings and spillovers between cities due to geographic proximity and administrative linkages. The regression results for these specifications are presented in table 1.

As a first impression, all explanatory variables are significant and have the expected sign, with the FDI share exhibiting a positive impact on per capita GDP. The different models provide consistent results. When including dummy variables, the year-specific effects appear to be especially significant; however, all three dummy specifications increase the explanatory power of the estimation only marginally. Similarly, the information criteria provide mixed results: while the Akaike criterion favors the inclusion of province-specific effects, the Schwarz criterion rejects them. Since the more complex model provides no substantial improvement over the original formulation, I choose the simple specification to test further. Finally, Wald tests reject the joint excludability of lagged investment and FDI-share.

Table 1 OLS-Regression Results, Different Model Specifications

Dependent Variable: Log of per capita GDP	Original Model	Including Year-Specific Effects	Including Province Specific Effects	Including Year- and Province Specific Effects
Log of per capita GDP in t-1	0.9552*** (63.755)	0.9546*** (63.587)	0.9455*** (48.942)	0.9446*** (48.604)
Log of per capita fixed investment in t-1	0.0241*** (3.506)	0.0236*** (3.388)	0.0255*** (3.058)	0.0251*** (20972)
Log of FDI share in GDP in t-1	*0.0011*** *(2.061)*	*0.0011*** *(2.079)*	*0.0014** *(1.760)*	*0.0014** *(1.749)*
Intercept	0.3136*** (3.141)	0.3337*** (3.392)	0.3981*** (3.152)	0.4219*** (3.348)
Year-Dummies#		2/2		2/2
Province-Dummies#			11/25	12/25
R^2 / Adjusted R^2	0.941/0.941	0.941/0.941	0.943/0.942	0.943/0.942
No. of Observations	1960	1960	1960	1960
Akaike Inf. Crit.	-3.67	-3.67	-3.68	-3.68
Schwarz Inf. Crit.	-3.66	-3.66	-3.59	-3.59

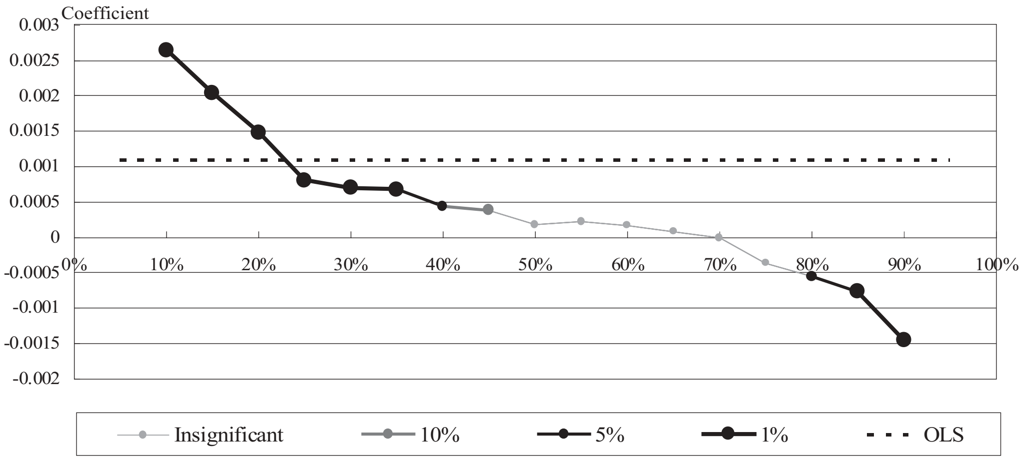
*, **, and *** denote statistical significance at the 10, 5, and 1 percent level, respectively

number of dummy variables significant at the 10 percent level / total number of dummy variables

Generally, these results seem to provide support to the hypothesis of a significant positive impact of foreign direct investment on local growth in China, though only of small magnitude. However, the descriptive analysis in the previous section cast serious doubt on the general validity of such a relationship. Moreover, as explained before, one cannot assume the correlation between the two variables to be constant across the whole conditional distribution. Previous literature also questions a positive relationship for both poor and rich regions. Therefore, the remainder of this section explores whether the general result of the OLS regression might conceal a more diverse reality. The technique used in this paper is the quantile regression method introduced in section III, which allows us to estimate coefficients that are variable along the conditional distribution of the dependent variable.

Figure 8 depicts the quantile regression results for the coefficient of the FDI share in GDP in the previously chosen test equation (original model) for various quantiles across the conditional distribution of local per capita GDP. Specifically, the axis of abscissae displays the quantiles of the conditional distribution of per capita GDP, with intercepts more to the right representing cities with higher per capita GDP, and the ordinate reports the corresponding quantile regression coefficients. Different significance levels of the coefficients are indicated by varying line patterns. For comparison, the previous OLS coefficient is shown as a dotted line.

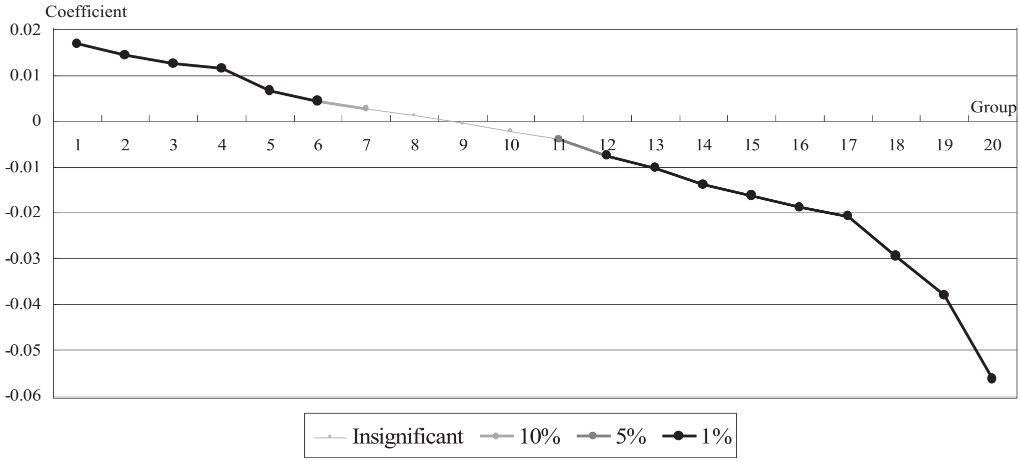
Figure 8 Quantile Regression Results for the Coefficient of the Log of FDI Share in GDP, 1 Lag



Dependent Variable: Log of per capita GDP

A similar graph (see figure 9) can be drawn by running an OLS-regression on the above model including slope dummies for the FDI variable, based on the grouping according to per capita GDP levels of cities introduced in figure 7. The most noticeable difference between the two graphs is that the dummy-slope OLS result reports a larger negative impact of FDI in richer cities, while predicting positive effects to be restricted to the poorest 35 per cent of the distribution.

Figure 9 OLS Regression Results for the Coefficients of Slope Dummy Variables for the Log of FDI Share in GDP, 1 Lag



Dependent Variable: Log of per capita GDP

Note: Slope dummy variables for the log of the FDI Share in GDP are defined for 20 equal-sized groups according to the city's per capita GDP; other variables and the intercept are assumed to be common for the whole sample; panel: 657 observations, 3 years, fixed effect specification, R^2=0.80.

As easily apparent from the graphs, the hypothesis of a homogenous FDI-growth relationship has to be rejected. Although the coefficient appears to be significant in most parts of the conditional distribution, particularly in its tails, it changes its algebraic sign between poorer and richer regions. This sign change might also explain the relatively small p-value of the FDI share coefficient in the OLS regression.

For poorer cities, the relationship appears to be significantly positive, and even more so the poorer the locality. Given this result, a lower absorbing capacity in poorer regions cannot generally be confirmed. However, this cannot automatically be taken as a sign that no minimum human capital threshold has to be met, in the sense proposed by Borensztein, De Gregorio and Lee (1995). By including lagged per capita GDP as explanatory variable, the specification implicitly controls for differences in initial human capital. The growth effects measured here are therefore to be interpreted net of human capital endowments.

Although there may exist serious doubts on whether the large regional disparities between coastal and western regions can be effectively solved by increased resource transfer towards poorer provinces,[28] this result at least supports the strategy of the Chinese government to increase the share of foreign direct capital in these resource flows. In this sense, the "Develop-the-West"-campaign seems to focus on the correct aspect of economic development. However, it remains unclear how the objective of increasing the share of FDI in poorer regions is to be achieved. One has to be very careful not to repeat previous mistakes, trying to attract foreign investors by discriminating against local entrepreneurs. Such a strategy would be likely to destroy the positive linkage between FDI and growth for poorer regions.

In richer cities, on the other hand, a larger share of FDI in GDP exerts a negative impact on local growth. From the previous discussion this is, at first sight, surprising. Two possible, non-exclusive explanations may be applicable. First, the result might reflect a simple over-concentration of FDI in some areas, leading to congestion effects, rising costs and diminishing returns to foreign investment. Secondly, the outcome of a negative FDI-growth connection can also be interpreted as evidence confirming Huang's (2001) argument on the nature and mechanisms of FDI in China. In this case, some FDI substitutes local investment rather than creating new growth opportunities, thus solely posing an additional cost on the local economy. Whatever explanation applies, the analysis refutes many of the overly optimistic results obtained in previous studies. While still having a positive overall effect on the economy, FDI's distribution and the specific mechanisms that drive its inflow into China also tend to produce negative results for parts of the economy.

Finally, in the central quantiles of the conditional distribution, no significant relationship between the two variables can be observed. This cannot come as a surprise, because the descriptive analysis of the FDI-GDP relationship revealed only a weak correlation in “higher-middle class” provinces, which can primarily be found in north-east and central China. One might speculate that one important reason for this result is the existence of a significant sector of traditional state-owned enterprises, for which the inflow of foreign direct investment represents both a chance as well as a threat. In such a situation, the positive spillovers from FDI may be partly neutralized by even more restrictive or protectionist industrial policies. Here as well as for the richer regions, the most appropriate policy advice with regard to international capital inflows remains therefore the domestic liberalization of the Chinese economy.

VII. Shortcomings of the Analysis and Possible Extensions

Unavoidably, there remain several shortcomings with the above analysis, of which I mention only the few that I consider most limiting. First, exclusion of the large share of the rural economy in China, as well as the three richest province-level municipalities from the analysis, while necessary from the methodological point of view, obviously reduces the universal validity of the results. Second, although dynamic interdependencies are considered by using lagged values of the explanatory variables, it is not possible in this model to make a qualified judgment on causalities, which may run in both directions. Third, an explicit inclusion of local human capital endowment in the form of educational attainment could probably improve the interpretation of the regression results. Fourth, even if the quantile regression model allows for changing coefficients along the conditional distribution, any nonlinearity within the regression quantile is not accounted for, since the model only focuses on a linear FDI-growth relationship. Therefore, possible scale economies or agglomeration effects cannot be identified and might cause a bias in the results. Finally, the impact of FDI on the local economy obviously depends crucially on the kind of FDI, its purpose and specific focus. Export-oriented FDI in labor-intensive industries in the coastal areas, market-focused FDI in the large metropolitan areas, and the activity of multinational corporations exploiting natural resources in western China, obviously will affect the local economy in very different ways. Assuming a homogenous FDI variable therefore might give us little insight into the real mechanisms behind the FDI-growth link. Given all these limitations, there still seems to be some room for extensions of the analysis.

VIII. Conclusion and Policy Implications

This paper analyzed the impact of foreign direct investment on local growth in China, using a recent panel of sub-provincial level data. By applying a quantile regression technique, distributional aspects in the FDI-growth relationship were explicitly addressed. Traditional estimation methods where added to check the robustness of the quantile regression results.

As a summary, the results provided evidence of strong heterogeneity in the distribution of FDI across China, especially in the distributional pattern within provinces. Furthermore, within the overall positive impact of FDI on growth, there exist considerable dynamics in this relationship between poorer and richer cities.

Compared with the distribution of per capita GDP, per capita FDI appeared to be distributed more unevenly. Descriptive analysis identified that while above the provincial level, especially between macro-regions, a close correlation between per capita GDP and FDI distribution can be observed, this does not hold true for the sub-provincial level. Besides, most of the regional disparities in FDI are explained within provinces, underlining the need for a better understanding of the economic implications of the distributional pattern of FDI on a disaggregated level.

By applying regression analysis, the impact of FDI on local growth was analyzed further, focusing on the possibility of changing regression coefficients across the conditional distribution of the dependent variable. It was found that FDI exhibits a significantly positive influence on growth in poorer localities, a significantly negative influence on growth in richer cities, and is insignificant in the center of the conditional distribution. The results were consistent across the distribution, and robust to a change in model specifications and estimation techniques.

This outcome to some extent contradicts previous studies. There, FDI was proposed to be more beneficial in richer regions, which were assumed to have a better absorptive capacity for transferred technology and skills due to their higher human capital level. In contrast, the findings in this paper show that during recent years in China, FDI inflows contributed significantly especially to the development in poorer areas.

Even more surprising, it could be shown that increases in the FDI-share in GDP have actually limited local economic growth in richer parts of the country. Two possible explanations have been suggested for this pattern. On the one hand, the outcome may represent excess supply and supply shortages of FDI in different regions of the country, combined with diminishing returns of FDI relative to the size of the local economy. On the other hand, the negative impact of FDI in richer areas might be interpreted as a sign of structural problems in the demand for FDI. Although coastal China possesses ample profitable growth opportunities, administrative and financial restrictions bar many domestic companies from realizing them. Especially in the thriving coastal regions, FDI inflows can thus play the role of a warning indicator. Discriminating against domestic companies and suppressing local entrepreneurship leads to reduced local welfare and less growth.

The paper has shown that a more equal regional distribution of FDI in China has the potential both to improve the economic performance in regions poorer *and* limit negative impacts in richer regions. In this sense, distributing FDI more equally can be expected to bring a double dividend of local growth to the Chinese economy.

Notes:

1 See Borensztein/De Gregorio/Lee 1995; Helleiner 1989, pp. 1454 ff., 1469ff.; World Bank 2000, p. 81, Young/Hood/Peters 1994.

2 See Stiglitz 2002, pp. 67ff..

3 See for example Fujita/Hu 2001; Gao 2002; Dayal-Gulati/Husain 2000; Fleisher/Chen 1997; Sun 2001; Zhang 2001.

4 See for example Aziz/Duenwald 2001; Bao et al. 2002; Cai/Wang/Du 2002; Chan/Chan 2000; Chen/Feng 2000; Chen/Fleisher 1996;; Démurger et al. 2002; Fan 1995; Hare/West 1999; Jones/Li/Owen 2001; Kanbur/Zhang 2001; Meng/Wu 1998; Ravallion/Jalan 1996; Riskin/Zhao/Li 2001; Yang/Huang 1997; Ying 2000; Zhao/Tong 2000.

5 Démurger 2000, p. 35.

6 See Kueh 1992, p. 679; Moreover, Fan (1999) reports that FDI reduced total factor productivity growth in state-owned enterprises (which make up the majority of joint venture partners), therefore casting doubt on the hypothesis of increased spill-over effects within joint ventures.

7 See Huang 2001c, p. 4, and for the following arguments Huang 2001b, pp. 173, 181, and Huang 2001c, pp. 5f., 27, 181.

8 See Young/Lan 1997, Zhang 2002.

9 Zhang ZY. 2002, p. 93.

10 See Yeung/Li 1999.

11 See e.g. Chen/Fleisher 1996, Tsui 1996, and Zhang 2001; however, as Wei and Wu (2001) report, FDI actually led to a reduction in urban rural disparities within regions.

12 Compare for example Ying 2000, Zhao/Tong 2000.

13 For a detailed explanation on the decomposition method, see Reuter 2004a.

14 All quantile regressions in this paper are estimated using the software package EasyReg International by Herman J. Bierens, Pennsylvania State University, Version March 1st, 2004, see URL (2004/09/01): http://econ.la.psu.edu/~hbierens/EASYREG.HTM; Stata was used for additional inference.

15 See Temple 2000, Durlauf/Johnson 1995, Sianesi/Van Reenen 2003.

16 See Bassett/Tam/Knight 2002, p. 17f..

17 See StataCorp 2003, p. 283.

18 See Buchinski 1998, p. 98. As Buchinski further points out, "[o]ne should be cautious with interpreting this result. It does not imply that a person who happens to be in the θth quantile of one conditional distribution will also find himself/herself at the same quantile had his/her x changed." See ibid..

19 For example, the quantile regression for the 50 percent quantile is also called the Least Absolute Deviation (LAD) or median regression.

20 See Buhai 2004, p. 5.

21 See for example Buchinski 1994/1995, Mwabu/Schultz 1996, Eide/Showalter 1998/1999.

22 See Mello/Perelli 2003, Cunningham 2003, Barreto/Hughes 2004.

23 See Reuter 2004a.

24 The province-level municipalities Beijing, Tianjin, Shanghai as well as the autonomous region Tibet are excluded because no comparable disaggregated data for the city level is available. Data for Chongqing, which became a province-level municipality in 1996, is included into Sichuan.

25 See Wei 1993, p. 14, and Démurger 2000, pp. 41f..

26 For a discussion of the sub-provincial administrative division of China see Wei/Wu 2001, pp. 8f., 25; and Démurger 2000, p. 60.

27 The three macro-regions are defined as coastal (Hebei, Liaoning, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi, Hainan), central (Shanxi, Inner Mongolia, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan) and western (Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang) belt.

28 See Reuter 2004b.

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