Foreign Direct Investment and Income Inequality in China

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This paper examines the impact of foreign direct investment (FDI) on China's income inequality. Two measures of inequality are used in this study: inequality within the urban community and the urban-rural income gap. Data covering 25 provinces from 1990 to 2006 are analyzed using the following techniques: fixed effects, random effects, and system GMM. This study finds that: (1) FDI significantly increases urban inequality and the distributional effect of FDI on urban inequality is robust in all the techniques and different measures of FDI used. (2) there is no evidence that FDI widens income disparity between urban and rural areas.

Keywords: FDI, China, Income inequality, Within-urban inequality, Urban-rural gap

JEL Classification: D31, F21, O15, O53

I. Introduction

How globalization affects income inequality has long been a subject of debate and intellectual discussions. The debate on the distributional impact of globalization often polarizes into two opposite strands of thought. One strand argues that globalization leads to more uneven income inequality because the benefits from globalization are not evenly shared among the citizens of a country. There are clear losers in relative and possibly even absolute terms, although globalization in

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general, may improve overall incomes (IMF 2007). Trade increases differentials in returns to education and skills but globalization marginalizes certain groups of people or geographic regions, and trade liberalization is often not complemented by development of adequate institutions and governance (Hurrell and Woods 2000).

The other strand of thought argues that globalization helps reduce inequality (Srinivasan and Bhagwati 1999; Ben-David 1993). According to this view, the integration of the world economy through globalization may raise income inequality in the earlier stages of development but it eventually declines in the long-run. In addition, Sala-i-Martin (2002a, 2002b) and Lindert and Williamson (2001) find that no significant relationship exists between globalization and income inequality. Moreover, Jaumotte *et al.* (2008) and Reuveny and Li (2003) find that the effects of trade and financial globalization are different. While trade globalization reduces income inequality, financial globalization increases income inequality.

This article focuses on one aspect of globalization, the distributional impact of foreign direct investment (FDI) on income inequality. Specifically it investigates the inflow of FDI and how it is associated with the rising income inequality in post-reform China.

The main reason for studying this problem is that, compared with the distributional impact of trade globalization, only a relatively small number of studies empirically have investigated the effect of FDI on income inequality in host countries, though almost all of the existing studies arrive at quite a consistent conclusion that FDI has invariably led to uneven income distribution in the host countries. If we say that trade globalization affects income inequality by influencing skilled or unskilled labor through imports or exports, then FDI can promote income inequality by raising relative wage of skilled labor to unskilled labor. According to the conventional wisdom, FDI enhances the premium on skilled labor by bringing in skill-biased technology (Aitken *et al.* 1996; Feenstra and Hanson 1997; Graham and Wada 2000). In an economy with institutional segmentation in the labor market and high labor mobility costs, FDI could increase relative wages of skilled labor even without bringing in skill-biased technology (Zhao 2001). Aside from the technology effect of FDI, capital accumulation accompanied by FDI can also affect income inequality in the host countries. Thus, it is by all means interesting and necessary to see whether the distributional effect of FDI reported in previous studies could stand up to a more careful examination.

In China, the rapid increase in the inflow of FDI has not only stimulated many theoretical and empirical studies, but has also generated much debate on the impact of FDI on China's economy among economists. However, studies on the impact of FDI are mainly focused on its growth impact and there have been fewer studies investigating the distributional effect of FDI. Almost all of the existing studies, however, agree that FDI has led to more uneven income distribution in post-reform China (Wan *et al.* 2007; Wu 2000; Xu and Zou 2000; Zhang and Zhang 2003; Zhao 2001; Sun 1998). Some of the studies performed empirical work using decomposition method (Wan *et al.* 2007; Zhang and Zhang 2003).

This study aims to contribute to existing literature by examining the impact of FDI on income inequality. My empirical work differs from previous studies in three ways. First, I study the effect of inward FDI on income inequality not only within the urban areas but also between the urban and rural areas using a set of provincial data. Second, in examining the impact of FDI on within-urban inequality, I measured income inequality from a comprehensive Gini coefficient data set rather than GDP. Third, I utilized the regression method rather than the decomposition method; the existing literature relates FDI to income inequality by applying decomposition technique developed by Shorrocks (1999); while the decomposition technique has the advantage of quantifying the contribution of FDI, it cannot identify its significance when FDI and other factors entered together in an inequality equation. In this paper, I examined whether the impact of FDI on income inequality is significant.

The rest of the paper is organized as follows: Section 2 sketches some theoretical analyses on the distributional effect of FDI; Section 3 presents a background on China's FDI and income inequality; Section 4 shows the analytical framework and empirical specifications; Section 5 presents the results of the empirical analysis; and finally conclusions and discussions are presented in Section 6.

II. Nexus of FDI and Income Inequality

The effects of FDI on income inequality are highly debatable. Generally speaking, there are two hypotheses about the impact of FDI, namely the 'developmental/modernization' hypothesis and the 'world system/dependency' hypothesis. The two hypotheses give quite different

views about the role of FDI in the host countries' economic development.

The modernization theorists argue that FDI provides the host economies with capital, promotes technology transfer, and modernizes their management skills and corporate governance. These, in turn, raise labor productivity and accelerate economic growth (Markusen and Venables 1999; Choi 1998; Blomstrom and Kokko 1996; Hanad and Harrison 1993). They argue that FDI reduce income inequality *via* the Kuznets effect wherein income inequality increases at first as per capita income grows but declines later once a certain level of development is reached.

During the early stages of development, a developing economy is typically characterized by: an increase in the share of the population involved in a narrow modern high-income sector of the economy; an increase in the income gap between the high-income and low-income sectors, and an increase in inequality within each sector. These characteristics directly result in the increase of overall inequality (Tsai 1995; Adelman and Robinson 1989).

In the later stages, as more output is produced and enough labor has been transferred from the traditional agriculture sector to the modern industrial sector, the surplus labor in agriculture gradually disappears and the marginal product of the agriculture labor will be raised to the level of the industrial labor. With the increase in real labor income, economic growth and the likely rise of political democracy therefore result in more equal income distribution (Tsai 1995; Fei and Ranis 1964; Lenski 1966).

According to the modernization hypothesis, the presence rather than the origin of the investment is considered important. This means that capital, whether foreign or domestic, fosters growth and its benefits eventually spread throughout the whole economy. Therefore, even if FDI initially stimulates growth only in some leading sectors and regions, provides benefits to some skilled elites, the growth in the leading sectors and regions could facilitate more equal income distribution within a country in the long run (Tsai 1995).

To most modernization theorists, factors such as the types of economic system and development strategy are the truly crucial determinants of income distribution. As long as the influences of these factors are properly taken into account, the difference in the amount of foreign capital should not cause any significant variance in income inequality (Tsai 1995).

This view is also supported by Dollar and Kraay (2000). They argue that economic growth helps raise the income of the poor more than that of the rich, taking FDI as a useful tool in reducing poverty (Stiglitz 1998). Empirically, this kind of view relates economic growth and income inequality (or FDI and economic growth), and does not relate FDI and income inequality directly.

Contrary to the modernization hypothesis, the dependency hypothesis admits that FDI possibly has a short-term positive impact of the flow on economic growth but it contends that FDI has more long-term negative impacts on economic growth, as reflected in the negative correlation between the inflow of FDI and growth rate (Lheem and Guo 2004).

In the short run, an increase in FDI enables higher investment and consumption and thus contributes to economic growth. However, as FDI accumulates and foreign projects take hold, there will be adverse effects on the rest of the economy that reduce economic growth. This is due to the intervening mechanisms of dependency, in particular, 'decapitalization' and 'disarticulation' (Lheem and Guo 2004).

It is also argued that FDI raises income inequality in the host less developed countries (LDCs) in several ways. First, the most common argument for a negative impact of FDI on income inequality is that FDI raises relative wages of skilled labor in a host country by bringing in skill-biased technology. Using data from the United States, Mexico, and Venezuela, Aitken *et al.* (1996) find that foreign-owned establishments pay higher wages than domestic ones after controlling for other factors. Feenstra and Hanson (1997) and Graham and Wada (2000) find empirical evidence that the growth of FDI is positively correlated with relative wages of skilled labor in Mexico.

Second, the capital-intensive techniques used by foreign investors promote unemployment among unskilled workers and distort income distribution by creating an economy with a small advanced sector and a large backward sector (Reuveny and Li 2003; Jenkins 1996; Lall 1985).

Third, multinational corporations (MNCs) pay low wages in labor-intensive industries such as footwear and clothing and push domestic suppliers to follow suit to reduce the MNCs' purchasing costs (Barnet and Cavanagh 1994; Held *et al.* 1999).

Fourth, FDI creates a new class of 'labor elites' in some leading sectors. These labor elites earn four to ten times the normal wages and other benefits in the comparable domestic sectors and thus raise

income inequality (Girling 1973). Furthermore, it has been noted that an economic-cum-political 'triple alliance' emerges naturally because the labor elites, considered as powerful economic players, and the state are usually supported by foreign investors (Evans 1979). This economic-cum-political alliance then manipulates the exclusive power of the nation state to intervene in the market whenever it does not work for its interest. The formation of the alliance therefore means that there are intrinsic destructive factors in any policy aiming at improving the distribution of income. In fact, it could be one of the most fundamental sources for persistent income inequality in the LDCs (Tsai 1995).

Fifth, host LDCs usually impose smaller taxes on foreign investors, and this reduces government revenues and eventually, welfare expenditures. This, in turn, hurts the poor more than the rich (Hatzius 1997; Human Development Report 1999).

In China, there are also heated debates on the impact of FDI. It has been analyzed that FDI stimulated economic growth (Chen *et al.* 1995; Gao and Wang 2003; Sun and Parikh 2001), improved industry structure (Jiang 1996; Lu 2000; Zhao 2002), and helped to alleviate employment problems (Fu and Balasubramanyam 2005). However, recently, skeptical views on foreign investment began to arise in China, noting that it has failed to lead to effective technology transfer and indigenous innovation capabilities (Wang 2005a; Wang 2005b; Zuo 2003), and failed to improve the living standards of the people even though they increased their outputs. Moreover, some views even claim that it is proper to restrict the inflow of foreign direct investment because there is no longer a shortage of capital in China (Chinese Academy of Social Science 2004; Zuo 2003) and multinational corporations are gradually becoming monopolized (Beijing WTO Research Center 2004; Wang 2005b). In contrast, others claim that China still faces a lack of capital and suffers from employment pressure. They say that for further institutional and system reform, more foreign capital will be advantageous for a substantial period in the future as it serves as an externally imposed momentum (*China Economic Times* 2004. 10. 20).

III. Trend of FDI and Income Inequality in China

A. FDI

One of the most important features of China's economic reform is the encouragement of foreign investment. Since the late 1970s, China

has gradually opened its economy to foreign investors to attract capital and advanced technology. Inward FDI in China can be classified into four stages (Li and Chang 2004; Wan *et al.* 2007).

First stage: The period from the late 1970s to the early 1980s is considered as the initial stage of the inflow of FDI. This period is characterized by setting up new regulations to attract FDI and setting up the Special Economic Zones and 'Open Cities.' The total FDI flows into China in this stage was only U.S.$41 billion.

Second stage: The second stage is from 1985 to 1991. FDI inflows increased stably over this period and about 40% of FDI was located in Guangdong province.

Third stage: The third wave occurred in 1992 after the famous 'Tour to the South' by Deng Xiaoping. FDI accelerated greatly since then and became the most important sources of foreign capital inflow.

Fourth stage: The last stage starts from 2001 after China's accession to the World Trade Organization (WTO). China reduced the tariffs, abolished quota and license arrangement, and opened more sectors to the foreign investors.

For the three decades since China began to integrate with the global economy in 1978, the FDI flows into China have been astonishing. From an economy virtually without any foreign investment in the late 1970s, China has become the largest recipient of FDI among the developing countries and globally the second, next only to the United States since 1993.

FDI flows into China during 1979-2008 constitute over 20% of total FDI in the developing economies. By 2008, the total FDI received in China reached U.S.$755 billion (UNCTAD database, http://stats.unctad.org/FDI/TableViewer/tableView.aspx?ReportId=1254).

The share of FDI flows in the GDP was almost zero in 1978, rose to 2.25% in 1992, and then reached its peak in 1994 at 6.04%, and then began to fall continuously to 2.63% in 2006. The ratio of FDI stock against the GDP increased up to 30% in 2002 but declined slightly after then (see Table 1). It seems that while the absolute amount of FDI is still increasing, the relative FDI shows a decreasing trend in recent period.

A striking feature of inward FDI in China is that coastal provinces have attracted more FDI than inland provinces. From 1990-2006, the three coastal provinces of Guangdong, Jiangsu, and Shanghai ranked top three, while the three inland provinces, Ningxia, Xinjiang, and Guizhou ranked bottom three in terms of the total FDI stock. The top

TABLE 1
INFLOWS OF FDI INTO CHINA

Year	FDI (U.S. billion)	FDI stocks (U.S. billion)	FDI flows/ GDP(%)	FDI stocks/ GDP(%)
1979-1984	4.10	4.10	0.23	0.23
1985	1.96	6.06	0.64	1.47
1986	2.24	8.30	0.75	2.04
1987	2.31	10.62	0.71	2.45
1988	3.19	13.81	0.79	2.76
1989	3.39	17.21	0.75	3.19
1990	3.49	20.69	0.89	3.80
1991	4.37	25.06	1.07	4.32
1992	11.01	36.07	2.25	5.75
1993	27.52	63.58	4.49	8.87
1994	33.77	97.35	6.04	12.54
1995	37.52	134.87	5.15	15.10
1996	41.73	176.60	4.87	17.77
1997	45.26	221.85	4.75	20.77
1998	45.46	267.32	4.46	23.89
1999	40.32	307.63	3.72	26.21
2000	40.72	348.35	3.40	27.08
2001	46.88	395.23	3.54	28.04
2002	52.74	447.97	3.63	29.18
2003	53.51	501.48	3.26	29.12
2004	60.63	562.11	3.14	27.87
2005	60.33	622.43	2.69	26.92
2006	69.47	691.90	2.63	26.10

Note: Author's calculation from various issues of *China Statistical Yearbook*.

three provinces alone attracted more than 48% of the total FDI stock during the same period.

B. Income Inequality

It is generally known that China has been achieving an unprecedented and impressive growth over the last three decades. The average per capita GDP growth rate was 9.9% during the period of 1990-2006 (see Table 2). However, the rapid economic growth has produced an income inequality rate that is among the fastest in the world. According to the data released by National Bureau of Statistics (NBSC), China's Gini coefficient of household income was 0.21 in 1978, but reached 0.465

TABLE 2
DESCRIPTIVE STATISTICS OF USED VARIABLES

Variable	Obs	Mean	Std. Dev.	Min	Max
GINI	425	0.24	0.05	0.13	0.38
URGAP	425	2.62	0.77	1.14	5.36
FDI	425	17.68	22.64	0.15	105.00
GDPGR	425	9.88	4.54	-6.77	37.75
COAST	425	0.40	0.49	0.00	1.00
EDU	425	90.57	9.24	57.60	103.00
INFL	425	105.48	7.30	96.80	126.90
SOE	425	70.72	11.73	30.57	90.14
EXPORT	425	16.83	18.87	2.24	102.05
AGR	425	7.78	2.74	2.13	15.43
GOV	425	13.46	5.52	4.92	34.81
URBAN	425	31.66	16.21	12.26	85.76

Note: See the appendix for the definitions of the variables.

in 2005, higher than the internationally accepted warning level of 0.4.[1] China is being transformed from a country with high equality in income distribution to a country with high inequality.

The widening gap in China's overall inequality is due to the increase in within-urban and within-rural inequalities, and the inequality between urban and rural sectors. Studies on China's inequality using the decomposition method show that the urban-rural gap is the main driving force behind the increased overall inequality (Tsui 1993; Kanbur and Zhang 1999; Shi 2004; Sicular *et al.* 2007).

These three inequalities are presented in Table 3. Between 1988 and 2006, urban income inequality increased by 15 points (from 0.18 to 0.33). While the share of income of the top quintile in total income rose from 26.4% to 38.7%, the bottom quintile's share dropped from 14.7% to 8.4%. The middle class (middle three quintiles) also slightly suffered with the lapse as its claim dropped by 2.3% (from 58.9% to 52.9%).

The widening income gap within the urban region was not evenly shared among the provinces. In some provinces, such as Henan,

[1] The Gini coefficient standard was set up as a warning system for the study of the wealth inequality by global economists and sociologists. It is a universally accepted gauge to measure whether the gap between the rich and poor is tolerable. The warning level of the system is 0.4.

TABLE 3
INCOME INEQUALITY IN CHINA

Year	Urban Gini	Urban-Rural Income Gap	Rural Gini
1988	0.18	2.11	0.30
1989	0.18	2.34	0.30
1990	0.18	2.27	0.31
1991	0.17	2.34	0.31
1992	0.19	2.49	0.31
1993	0.20	2.74	0.32
1994	0.22	2.83	0.33
1995	0.21	2.73	0.34
1996	0.21	2.49	0.32
1997	0.22	2.45	0.33
1998	0.23	2.50	0.34
1999	0.24	2.64	0.34
2000	0.25	2.76	0.35
2001	0.26	2.90	0.36
2002	0.31	3.13	0.37
2003	0.32	3.25	
2004	0.33	3.26	
2005	0.34	3.24	
2006	0.33	3.28	

Note: The urban Gini coefficient and the urban-rural income gap are author's calculation from various issues of *China Statistical Yearbook*. The urban-rural income gap is measured as the urban-rural per capita income ratio. The data of rural Gini coefficients are from Li and Yue (2004).

Jiangxi, and Anhui, not much change has been noted. However, the Gini coefficient in other provinces increased dramatically. Jiangsu province, located in the southeast part of China even increased its Gini by more than 18 points, and Guangdong by 15.8 points, Shanghai by 15.3 points, and Liaoning by 15.1 points (see Table 4). It was found that all the sample provinces except Xinjiang raised their Gini during the period of 1990-2006. A special case, Xinjiang, located in the northwest corner of China, even improved its Gini by 10.3 points.

Increasing income inequality was not only exhibited at the urban level, but also between the urban and rural sectors, the largest contributor to China's overall income inequality. The urban-rural income ratio increased by 1.2 from 2.11 in 1988 to 3.28 in 2006.

The urban-rural income differentials decreased slightly between 1994

TABLE 4
STATISTICS OF SOME USED VARIABLES BY PROVINCE FOR THE PERIOD OF 1990 TO 2006

	GINI		URGAP		GDPGR	FDI stock	FDI stock/GDP
	Mean	$X(T)$-$X(0)$	Mean	$X(T)$-$X(0)$	(%) Mean	(U.S. billion) Mean	(%) Mean
Beijing	0.202	0.093	2.08	1.04	8.18	29.81	29.46
Tianjin	0.241	0.136	2.06	0.76	10.60	28.09	41.44
Shanxi	0.243	0.089	2.58	0.82	8.89	3.88	4.14
Inner Mongolia	0.246	0.081	2.45	1.09	11.31	5.02	3.65
Liaoning	0.229	0.151	1.91	0.41	9.09	38.06	19.68
Jilin	0.237	0.102	2.06	0.92	9.55	5.55	8.25
Heilongjiang	0.248	0.146	1.92	0.75	8.59	9.04	6.51
Shanghai	0.224	0.153	1.83	1.12	9.27	60.93	35.68
Jiangsu	0.247	0.186	1.76	0.61	12.44	113.38	28.11
Zhejiang	0.229	0.143	1.94	0.42	12.57	44.62	11.94
Anhui	0.216	0.073	2.85	0.60	10.51	6.69	5.57
Fujian	0.226	0.091	2.15	0.24	12.47	61.83	49.36
Jiangxi	0.227	0.073	2.13	0.63	10.31	13.04	9.47
Shandong	0.221	0.131	2.30	0.35	12.17	62.75	14.97
Henan	0.233	0.065	2.54	0.57	10.46	9.67	4.60
Guangdong	0.270	0.158	2.62	0.78	11.20	160.17	52.52
Guangxi	0.241	0.126	3.40	1.30	11.04	8.51	14.67
Hainan	0.274	0.137	2.83	0.51	10.11	10.33	75.23
Sichuan	0.248	0.124	2.99	0.14	9.87	12.11	5.63
Guizhou	0.244	0.129	4.03	1.79	8.00	0.77	2.26
Yunnan	0.220	0.134	4.44	2.10	7.95	1.92	2.63
Shaanxi	0.239	0.096	3.38	1.54	8.89	5.82	9.37
Qinghai	0.251	0.112	3.04	1.10	7.92	0.86	2.35
Ningxia	0.246	0.110	2.91	0.67	7.86	0.48	3.06
Xinjiang	0.286	-0.103	3.25	1.38	7.86	0.58	1.40

Note: See the appendix for the definitions of the variables. These data are from various volumes of *China statistical yearbook*, provincial statistical yearbooks, *China population statistical yearbook* and China's National Bureau of Statistics. $X(T)$-$X(0)$ means the change in the value between 1990 and 2006.

and 1997 but since then, have continually increased to historic high levels. The provinces also exhibited a large difference in their urban-rural income gap. While the average ratio of urban to rural income was 1.76 for Jiangsu, 1.83 for Shanghai, 1.91 for Liaoning, and 1.92 for Heilongjiang, it was 4.44 for Yunnan, 4.03 for Guizhou, 3.40 for Guangxi, and 3.38 for Shaanxi. The correlation between urban-rural

TABLE 5
THE CORRELATION MATRIX OF USED VARIABLES

	GINI	URGAP	FDI	GDPGR	COAST	EDU	INFL	SOE
GINI	1.000							
URGAP	0.289	1.000						
FDI	0.341	-0.187	1.000					
GDPGR	0.130	-0.016	0.056	1.000				
COAST	-0.052	-0.500	0.656	0.167	1.000			
EDU	0.440	-0.299	0.349	0.168	0.369	1.000		
INFL	-0.398	-0.017	-0.222	0.237	-0.004	-0.247	1.000	
SOE	-0.299	0.335	-0.435	-0.230	-0.564	-0.543	0.261	1.000
EXPORT	0.180	-0.257	0.590	0.140	0.661	0.320	-0.048	-0.622
AGR	-0.139	0.401	-0.472	-0.135	-0.607	-0.509	0.168	0.565
GOV	0.327	0.570	-0.183	-0.183	-0.422	-0.103	-0.230	0.295
URBAN	0.126	-0.455	0.342	-0.043	0.452	0.529	-0.052	-0.356

	EXPORT	AGR	GOV	URBAN
EXPORT	1.000			
AGR	-0.544	1.000		
GOV	-0.225	0.276	1.000	
URBAN	0.420	-0.577	0.018	1.000

Note: See the appendix for the definitions of the variables.

income ratio and urban Gini is 0.289 (see Table 5).

The increase in inequality within rural areas is not large, with only a 7-point increase between 1988 and 2002. The relatively small increase in rural income inequality is the result of the slow growth of rural income. *Sannong* problem (agricultural, rural, and farmers' problem) is a serious topic in nowadays China. To improve the living conditions of the farmers, the Chinese government has announced its 'Number 1 Document' since 2004 which includes a set of policies such as supporting the development of agricultural production in grain producing areas, developing industrial and service industries in rural areas, assisting the farmers in moving to the urban, and so on.

From the above analysis about China's income inequality, it can be concluded that there is indeed a rise in the inequality in China's income distribution, whether it is among provinces or groups. However, it should be noted that while the general trend in unequal incomes is increasing, a noteworthy feature of China's income distribution is the successful decrease in poverty reduction. China's poverty head count

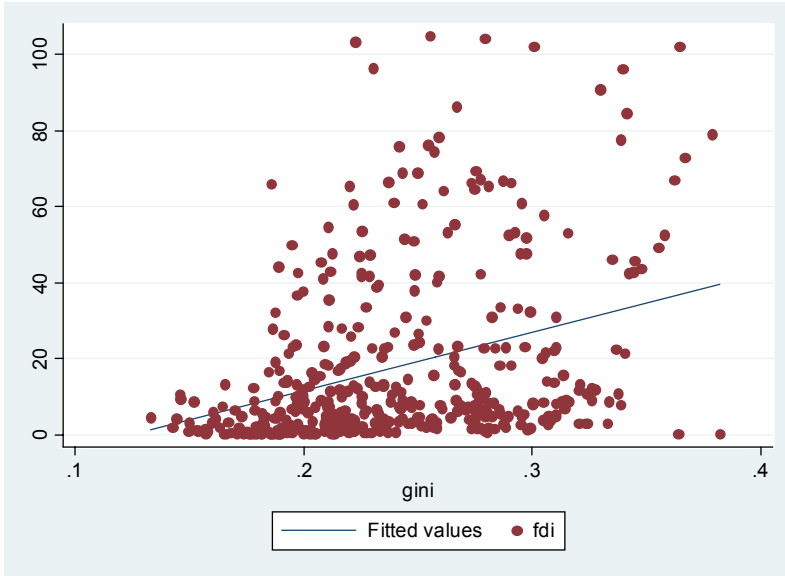

FIGURE 1
RELATIONSHIP BETWEEN FDI AND THE URBAN GINI

decreased to 23 million in 2003 from 125 million in 1985.

C. FDI and Income Inequality

The rapid rise in income inequality in China may be caused by many factors. FDI seems to play a certain role when it comes to the correlation between FDI and urban Gini in Table 5 (0.341). Figure 1 plots the relationship between FDI and regional urban income inequality.

The figure shows a positive relationship between FDI and the urban Gini coefficient. However, we cannot simply conclude that FDI increases income inequality, because once other factors are added, the role of FDI may be not significant. Thus, in the next section, I related FDI and income inequality using more rigorous empirical work.

IV. Research Design

As mentioned in the first section, I study the impact of FDI on China's income inequality within the urban areas as well as inequality between the urban and rural sectors. First, I postulated the following

equation model to investigate the role of FDI on urban inequality:

$$GINI_{it} = \beta_0 + \beta_1 FDI_{it} + \beta_2 GDPGR_{it} + \beta_3 COAST_i + \beta_4 INFL_{it} + \beta_5 SOE_{it} + \beta_6 GOV_{it} + \beta_7 EDU_{it} + \beta_8 URBAN_{it} + \beta_9 EXPORT_{it} + \mu_i + \varepsilon_{it} \quad (1)$$

In Equation (1), $GINI_{it}$, the dependent variable, is the commonly used Gini coefficient in the urban areas of province i in year t. FDI_{it}, the most important factor of this paper, is measured by the ratio of FDI stocks to GDP. $GDPGR_{it}$ is the real per capita GDP growth rate, and $COAST_i$ is the variable relating to geography of province i. This dummy variable takes on a value of 1 for 10 provinces or municipalities located in the coastal areas,[2] and takes on a value of 0 for the remaining 15 provinces. Inflation rate ($INFL_{it}$), the size of state sector (SOE_{it}) and government spending (GOV_{it}) were included to capture government policy. EDU_{it} is the secondary school enrollment rate, as the measure of human capital, and urbanization ($URBAN_{it}$) is measured as the proportion of nonagricultural population in the total provincial population. Another controlled factor is export ($EXPORT_{it}$), measured as the ratio of the volume of export to GDP. For more detailed definitions on these variables, please refer to the appendix.

The error term in Equation (1) is made up of two components: μ_i and ε_{it} . μ_i represents a province-specific effect, it can be considered as the collection of factors that are specific to the province but are not included in the explanatory variables (X_{it}). Failure to take into account these factors may cause an omitted variable bias in the estimation of Equation (1). When μ_i is correlated with the included explanatory variables (X_{it}), the fixed effects (FE) model is appropriate.

When μ_i is not correlated with X_{it}, the random effects model becomes more appropriate than the FE model. I tested the correlation using the Hausman-Wu test.[3] Equation (1) also includes the time-varying parameters of the measurement error, which are likely to be associated with the regressors.

While time-invariant heterogeneity across provinces can be deleted by employing FE model, time-varying parameters are not controlled and endogeneity may remain in the model. To control unobserved

[2] It includes Beijing, Tianjin, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, and Hainan.

[3] Hausman (1978) constructed a test based on the difference between β^{RE} and β^{FE}. The null hypothesis is that difference in coefficients is not systematic. If the difference is large, FE is preferred.

inter-province or inter-household heterogeneity and the associated omitted variable bias, the time-varying parameters of the measurement error and the potential endogeneity, the methodology used is the Generalized Method of Moments (GMM), proposed by Arellano and Bond (1991) and Blundell and Bond (1998). In applying the GMM method, I used as instruments all the explanatory variables except *COAST* and *INFL* which were considered exogenous in this paper. Geography is a purely natural endowment and inflation is seen as exogenous because the monetary policy was set by the central banks, and therefore, unlikely to be correlated with the province-specific time-variant ε_{it} (Xu and Zou 2000). The values of the contemporary explanatory variables lagged at least four times are used as instruments in the equations.

To evaluate whether the GMM model is correctly specified (*i.e.*, whether the instruments used are appropriate), two criteria, the Sargan/Hansen test and the AR(2) test, are performed. The Sargan/Hansen test is an over-identifying restriction test. The null hypothesis of the Sargan/Hansen test is that the instrumental variables are uncorrelated with the residuals. Note that the Sargan/Hansen test is weak when the instruments are many. This is likely to occur in this paper because I used as instruments all the explanatory variables except coast and inflation, and the time period is relatively long (1990-2006).

The AR(2) test is the second-order serial correlation test in the first differenced residuals. The null hypothesis of the AR(2) test is that there is no second-order serial correlation among the differenced residuals. This test provides a further check on the specification of the GMM model.

To investigate the role of FDI in the widening income disparity between the urban and rural sectors, the following equation was tested:

$$\begin{aligned} URGAP_{it} = {} & \gamma_0 + \gamma_1 FDI_{it} + \gamma_2 GDPGR_{it} + \gamma_3 COAST_i + \gamma_4 INFL_{it} + \gamma_5 SOE_{it} \\ & + \gamma_6 AGR_{it} + \gamma_7 EDU_{it} + \gamma_8 URBAN_{it} + \gamma_9 EXPORT_{it} + \mu_i + \varepsilon_{it} \end{aligned} \quad (2)$$

Where $URGAP_{it}$ is the ratio of urban to rural income in province i in year t. Here, fiscal expenditure on agriculture (AGR_{it}) is controlled instead of total government consumption (GOV_{it}). The definitions of the rest are the same as described in Equation (1).

In estimating Equation (2), I also employed the FE, RE, and the

system GMM techniques. In GMM method, the values of the contemporary explanatory variables lagged at least four times, are used as instruments in the equations.

A panel data set covering 25 provinces[4] over the period of 1990-2006 is used to estimate the urban Gini and the urban-rural income gap. Data used in this paper are from various yearly issues of *China Statistical Yearbook, China Population Statistical Yearbook*, provincial statistical yearbooks and China's National Bureau of Statistics.

It is noted that all of the independent variables used in this article are provincial data, even those used in estimating the urban inequality equation. It is more ideal to use the urban-level data in estimating the determinants of urban inequality. However, it is not feasible to get urban measures for many of the variables used in the test equations.

On the other hand, the bias is not large for some variables. For example, FDI is mainly located in urban regions, and all state-owned enterprises are also located in the urban areas. Moreover, urbanization is the ideal variable because I wanted to test how urbanization itself affects income inequality. Government expenditure on agriculture is also ideal in capturing its contribution to the urban-rural income gap.

The urban Gini coefficient is calculated based on the reported grouped data of urban household income. These survey data are available from various issues of provincial statistical yearbooks. While most provinces divide households by seven groups, it is divided by 8 or 5 groups in some provinces. For those provinces which divide households by 8 groups, I neglected the last 8*th* groups (the highest income group) to reduce inter-provincial bias. The urban-rural income gap is defined as urban-rural per capita income ratio after deflating urban and rural incomes by regional urban and rural CPIs respectively.

V. Empirical Results

Tables 6 and 7 report the empirical results for urban inequality and the urban-rural income gap, respectively. Actually, I ran the OLS, FE, RE, and system GMM models but the OLS results are not reported

[4] There are totally 31 provinces or municipalities in China. Among the 31 members, 5 provinces of Hebei, Jilin, Hubei, Hunan, Gansu, and Tibet were excluded from the analysis because of the lack of related data for some years. Chongqing was included in Sichuan province before 1997, and it became a municipality since then. In this paper, I put Chongqing in Sichuan province for the convenience of analysis.

because all the explanatory variables are shown to be statistically significant in OLS model.

In the FE, RE, and GMM models, I relied more on FE model for two reasons: (1) the Sargan/Hansen tests are weak because too many instruments are used as I mentioned in Section 4 and (2) the FE model is preferred to RE model because the Hausman-Wu test favors FE model in all specifications as we see below.

A. The Urban Gini Coefficient

Table 6 exhibits the regression results of the urban Gini. The overall results are encouraging, with more than 70% of the variation in the urban Gini coefficient explained by the independent variables. The R^2 reported for FE and RE models are R^2 within, it measures to what extent the difference in the urban Gini and the provincial mean can be explained by independent variables. The F-statistic is significant at 1% level and the signs of the coefficients are basically expected.

In Model (2), I used the ratio of the flows of FDI to GDP instead of ratio of the stocks of FDI to GDP to test the robustness of the FDI. In Model (3), export, another aspect of globalization, is included to capture the role of export and also to test robustness of FDI. In all models, the Hausman-Wu test favors the FE model.

The results of FDI, government spending, and education are robust. Provinces with higher FDI ratio had larger urban Gini coefficients. The estimated coefficients suggest that an increase in FDI is associated with an increase of the Gini by 0.4 to 1.1.

Provinces with more government consumption had greater urban inequality. This result is consistent with the result of Xu and Zou (2000) who find that income redistribution through government spending tends to shift resources from the rich and the poor to the middle class. Basically, government policy should lean toward the reduction of inequality. However, the results indicate that government's policies may be leaning towards the elites or the middle class, rather than the poor class. The unfavorable treatment by the central government for the poor on medical service is actually an example of the policy distortion. In China, basic medical service started in 1952 is guaranteed only for those who work in the state sector while the unemployed or workers in informal sectors do not have access to the basic medical care. Also, the quality of the service varies between geographic regions, industries or entities.

TABLE 6

DETERMINANTS OF THE URBAN GINI

(Dependent variable = the logarithm of urban Gini coefficient)

	Model (1) (FDI = stocks of FDI/GDP)			Model (2) (FDI = flows of FDI/GDP)			Model (3) (FDI = stocks of FDI/GDP)		
	FE	RE	GMM	FE	RE	GMM	FE	RE	GMM
FDI	0.004	0.005	0.005	0.011	0.011	0.011	0.004	0.005	0.005
	(7.04)***	(9.51)***	(5.73)***	(4.64)***	(4.31)***	(2.32)**	(7.04)***	(9.36)***	(5.86)***
GDPGR	0.006	0.007	0.004	0.003	0.004	0.002	0.006	0.007	0.003
	(4.49)***	(4.78)***	(1.86)*	(2.57)**	(2.64)***	(1.06)	(4.49)***	(4.77)***	(1.40)
COAST	(dropped)	-0.306	-0.227	(dropped)	-0.289	-0.121	(dropped)	-0.323	-0.282
		(-7.63)***	(-4.50)***		(-6.56)***	(-1.58)		(-8.15)***	(-4.92)***
INFL	-0.001	-0.001	-0.001	-0.003	-0.004	-0.004	-0.001	-0.002	-0.0002
	(-1.04)	(-1.50)	(-0.62)	(-3.39)***	(-3.96)***	(-2.67)**	(-1.16)	(-1.81)*	(-0.13)
SOE	-0.002	-0.007	-0.004	-0.004	-0.009	-0.004	-0.002	-0.006	-0.004
	(-1.73)*	(-6.68)***	(-2.38)**	(-3.29)***	(-9.14)***	(-1.40)	(-1.30)	(-5.10)***	(-1.97)*
GOV	0.012	0.012	0.013	0.009	0.010	0.014	0.013	0.012	0.012
	(5.66)***	(6.11)***	(5.77)***	(4.06)***	(4.63)***	(5.13)***	(5.70)***	(6.26)***	(4.50)***
EDU	0.006	0.007	0.012	0.006	0.008	0.013	0.006	0.008	0.012
	(7.11)***	(8.26)***	(5.76)***	(7.10)***	(8.47)***	(6.02)***	(7.03)***	(8.56)***	(5.67)***
URBAN	0.017	0.002	-0.002	0.021	0.003	-0.002	0.017	0.001	-0.001
	(7.81)***	(2.03)**	(-1.18)	(9.33)***	(2.83)***	(-1.32)	(7.21)***	(1.30)	(-1.01)
EXPORT							0.001	0.002	0.001
							(0.85)	(2.01)**	(0.82)
_CONS	-2.584	-1.755	-2.310	-2.243	-1.284	-2.078	-2.622	-1.835	-2.354
	(-13.01)***	(-10.56)***	(-9.45)***	(-11.04)***	(-7.12)***	(-6.76)***	(-12.89)***	(-10.8)***	(-8.32)***
R^2	0.750	0.720		0.733	0.688		0.750	0.721	
Obs.	425	425	425	425	425		425	425	425
Hausman	0.000			0.000			0.000		
Sargan test			0.000			0.000			0.000
Hansen test			1.000			1.000			1.000
AR(2) test			0.135			0.113			0.161

Notes: 1) In parentheses are *t*-values.
2) Test values reported for Hausman, Sargan, Hansen, and AR(2) are *p*-values.
3) R^2 reported for FE and RE are R^2 within.
4) *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.
5) See the appendix for the definitions of the variables.

Interestingly, provinces with higher educational levels had higher Gini coefficients. It is generally known that the spread of education reduces income inequality. However, this and other studies such as that of Xu and Zou (2000) found the opposite. The positive education-inequality relationship may imply that there exists a vicious circle between education and inequality. On one hand, it seems that more than ever, the emerging labor market encourages workers' incomes to be determined more on the basis of their working ability and skills. Inequality may thus increase among individuals with different abilities.

On the other hand, high inequality enables the rich to obtain education first when tuition fee is high relative to income as observed by Perotti (1992). In China, education, together with housing prices and medical costs, is exceedingly expensive and is a big burden for the average household. This in turn worsens the already uneven income distribution. From this perspective, the positive interaction between education and inequality is understandable. To facilitate education and realize education equity, the Chinese government spread the free nine-year compulsory education to urban children starting from September 1, 2008. This is an epoch-making event because educational equality should be at the top of social justice system.

Using the preferred FE model, economic growth, privatization (or the size of the state), and urbanization probably increased urban inequality although they lost significance in some GMM specifications. The positive sign of growth means that while the total pie of the economy is growing, it is shared disproportionally among the citizens. It favored the rich more than the poor. The role of privatization in rising income inequality is well explained in the study of Xu and Zou (2000). According to them, the rich in the urban sector will become richer through their investment in the private sector. The poor will remain poor as the employees of the state sector if they lack political clout and access to credit markets. The powerful, even without sufficient initial resources, may gain power and wealth as a result of their access to credit and profitable, money-making opportunities.

The impact of urbanization on urban inequality is also clear. With the process of urbanization, more rural people are migrating from the rural sector to the urban sector. Because most of the migrants are unskilled, poor peasants with low abilities, they earn a lower wage in the informal sector than citizens or townsmen in the formal sector. Consequently, they become the new poor of the urban sector, and widen urban income disparity.

Inflation rate is shown to be significant only in Model (2). In Models (1) and (3), the sign remains negative, but becomes insignificant. Actually, inflation rate was very high during the early period, but has decreased significantly since 1997, so the impact of inflation on the urban poor has also decreased. As a result, inflation did not change urban income distribution much. The test results of model (3) show that there is no significant impact of export on urban inequality. This result is inconsistent with the studies finding export increases inequality in China (*e.g.,* Wan *et al.* 2007).

Finally, geography affects urban inequality and is quite significant except in the GMM specification of Model (2). It seems that provinces located in coastal region had smaller inequality.

B. The Urban-rural Income Gap

Table 7 shows the regression results of the determinants of the urban-rural income gap. The signs of the coefficients are also basically expected but the R^2 reported are relatively low with about 40% of the variation in the urban-rural income gap is explained by the independent variables. Here, the Hausman-Wu test also favors FE estimates in all models.

As shown in this table, geography is negatively and significantly associated with the inequality between urban and rural sectors. Thus, provinces farther from the coast had larger urban-rural income inequality. This result is consistent with the study of Li and Yue (2004).

Factors such as growth, inflation, privatization, and education increased the income gap between urban and rural areas, while government expenditure on agriculture reduced the gap. These variables are highly significant at the 1% level except in GMM specifications. The statistically positive sign of growth indicates that the rapid economic performance is not evenly shared between urban and rural residents. It helped the urban rich and harmed the rural poor. The role of the state is also highly significant, implying the above theory again. The rich will become richer through their investment in the private sector; the powerful, even without sufficient initial resources, may gain power and riches as a result of their access to credit and profitable, money-making opportunities; and the poor will remain poor if they lack political clout and access to credit markets (Xu and Zou 2000). Because the initial rich and the powerful are mainly urban residents, and most of the poor are powerless, poor peasants, the privatization process widened the income gap between urban and rural sectors. Inflation rate also worsened the urban-rural income gap. In fact, the assets of the urban residents are more diversified, whereas the poor peasants depend mainly on farm products. In China, grain prices have been fixed at a low level for a long period. This resulted in a slow growth of peasants' income and a widening gap between urban and rural residents.

The impact of education on the increasing urban-rural income gap is the result of increasing differentials in returns to education. On the

TABLE 7

DETERMINANTS OF THE URBAN-RURAL INCOME GAP
(Dependent variable = the urban-rural income ratio)

	Model (1) (FDI = stocks of FDI/GDP)			Model (2) (FDI = flows of FDI/GDP)			Model (3) (FDI = stocks of FDI/GDP)		
	FE	RE	GMM	FE	RE	GMM	FE	RE	GMM
FDI	-0.001	0.001	0.016	0.005	0.006	0.016	-0.001	0.002	0.008
	(-0.69)	(0.89)	(3.44)***	(0.76)	(0.96)	(0.63)	(-0.69)	(1.24)	(3.14)***
GDPGR	0.012	0.014	0.002	0.012	0.013	0.011	0.012	0.014	0.005
	(3.61)***	(3.68)***	(0.09)	(3.58)***	(3.36)***	(0.45)	(3.60)***	(3.64)***	(0.37)
COAST	(dropped)	-1.212	-1.732	(dropped)	-1.225	-1.011	(dropped)	-1.215	-1.083
		(-7.30)***	(-3.52)***		(-7.29)***	(-2.32)**		(-7.94)***	(-5.01)***
INFL	0.010	0.009	0.019	0.010	0.008	0.001	0.010	0.008	-0.011
	(4.51)***	(3.70)***	(2.51)**	(4.26)***	(3.25)***	(0.07)	(4.57)***	(3.29)***	(-0.95)
SOE	-0.022	-0.022	-0.016	-0.022	-0.023	-0.012	-0.023	-0.021	0.005
	(-6.88)***	(-7.46)***	(-1.82)*	(-6.85)***	(-7.96)***	(-1.17)	(-6.67)***	(-6.08)***	(0.53)
AGR	-0.048	-0.040	-0.051	-0.047	-0.040	-0.066	-0.047	-0.039	0.001
	(-4.69)***	(-3.74)***	(-1.52)	(-4.63)***	(-3.68)***	(-1.73)*	(-4.66)***	(-3.47)***	(0.02)
EDU	0.008	0.008	-0.004	0.007	0.008	-0.002	0.007	0.008	-0.001
	(3.29)***	(3.13)***	(-0.38)	(3.06)***	(3.14)***	(-0.19)	(2.91)***	(3.03)***	(-0.07)
URBAN	0.002	-0.008	-0.013	0.001	-0.007	-0.016	0.003	-0.010	-0.012
	(0.27)	(-1.92)*	(-1.54)	(0.19)	(-1.76)*	(-2.00)*	(0.48)	(-2.41)**	(-1.46)
EXPORT							-0.002	0.002	0.008
							(-0.77)	(0.58)	(1.48)
_CONS	2.670	3.446	3.232	2.696	3.580	4.819	2.746	3.368	4.027
	(5.86)***	(7.85)***	(2.35)**	(5.88)***	(8.05)***	(2.73)**	(5.89)***	(7.32)***	(1.54)
R^2	0.417	0.409		0.417	0.412		0.418	0.404	
Obs.	425	425	425	425	425	425	425	425	425
Hausman	0.000			0.000			0.000		
Sargan test			0.000			0.000			0.000
Hansen test			1.000			1.000			1.000
AR(2) test			0.103			0.137			0.112

Notes: 1) In parentheses are *t*-values.
2) Test values reported for Hausman, Sargan, Hansen, and AR(2) are *p*-values.
3) R^2 reported for FE and RE are R^2 within.
4) *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.
5) See the appendix for the definitions of the variables.

other hand, fiscal expenditure on agriculture is also significant as expected, implying that input in agriculture could help reduce the income gap between urban and rural sectors.

More importantly, both aspects of globalization, FDI and export, were found to be insignificant. Why does FDI not contribute significantly to the increasing urban-rural income gap in contrast with its impact on urban inequality? As is known, FDI is mainly distributed in the coastal

regions. The problem is that the income gap between urban and rural sectors is more severe in inland regions but not in the coastal regions. From this perspective, it is understandable that FDI may not play a significant impact on the urban-rural income gap. The impact of export on the urban-rural income gap can also be explained in this way.

Finally, urbanization, measured by the share of nonagricultural population in the total provincial population, had no significant impact on the income gap between urban and rural areas. Essentially, urbanization is a cure for the income gap between urban and rural areas, as Chang (2002) argued "... a cure for this problem is to accelerate urbanization in the short run and to promote the growth of the urban sector in the long run. Yet, these policies in the short run may further widen the measured income gap."

However, the pace of urbanization is slow in China because of the faster growth of the rural population than urban population. There are also many restrictions on migration from the rural to urban region. Moreover, the urban sector may not be able to absorb the large rural surplus workers. Therefore, the impact of urbanization on the urban-rural income disparity is not strong.

VI. Conclusions and Discussions

When China launched its open door policy in 1978, China also opened its door to the world economy to acquire access to advanced technology and solve the problem of capital shortage. Since then, FDI has continuously flowed into China. China is now the second largest recipient of FDI only next to the United States. With the increase of FDI inflows into China, the debate on the impact of FDI on Chinese economy has been heated among scholars. However, studies on the effect of FDI are mainly focused on its growth effect, and only few studies investigated the distributional effect of FDI.

This paper has examined the impact of FDI on China's income inequality not only within the urban areas but also between the urban and rural sectors. Using a set of Chinese provincial data covering 25 provinces over the period of 1990-2006, and applying fixed effects, random effects as well as system GMM techniques, this paper suggests the following:

First, factors relating to the economic growth such as FDI, education, privatization, urbanization, as well as economic growth itself have

positive contributions to the rising income inequality in urban China. The statistically significant impact of FDI on increasing urban inequality is robust in all the models employed. These reflect the penetration of the market mechanism into the Chinese economy, which was induced by the reform policy. Intriguingly, government spending also increased urban inequality, and thus implying the possibility of policy distortion.

Second, FDI provides no evidence on the widening urban-rural income gap. The income gap between the urban and rural areas increased with higher growth and inflation rates, higher educational level, and the reduction of SOE share. It is also found that the gap decreased with increasing fiscal expenditure on agriculture.

Third, export exerts no significant impact either on the urban inequality or the urban-rural income gap.

Fourth, provinces farther from the coast not only experienced more uneven income inequality within the urban areas but also experienced more severe income gap between urban and rural sectors.

The empirical results of this paper do provide some evidence for a positive correlation between FDI and inequality in post reform China. Accordingly, my findings are generally consistent with the argument of the dependency theorists. However, the distributional impact of FDI may differ by the difference in the time horizon considered. That means that it is possible that the statistically significantly positive correlation between FDI and inequality obtained in previous studies and this study (in urban sector) could diminish or reverse over significantly longer periods as the modernization theorists argue. Once a certain level of development is reached with relatively high income and technological level, the wage premium on skilled labor due to skill-biased technology brought in by foreign companies decreases. Because nowadays China is possibly under the 'certain level,' it is difficult to simply conclude which theory is right.

Nevertheless, it is important that we understand the impact of FDI on income inequality, so that we can minimize the negative effect, and maximize the benefits associated with FDI. As some scholars argue, FDI provides China with capital and technology, propagate better management practices, raises labor productivity and promotes economic growth (though debatable). But the government usually offers more incentives to high-tech FDI in differentiated sectors, which will increase wage inequality between skilled and unskilled labor. One policy implication is that elimination of special treatment of FDI in those sectors will help reduce the negative impact on income distribution.

Another policy implication that can be drawn from the analysis of this paper is that the government should invest more in public education and thus narrow skills gap among citizens, because FDI increases differentials in returns to education and skills. From this perspective, education is a key to solving income inequality. At the same time, however, a larger skill premium is likely to induce faster increase in private investment in education in China. Then the balance between public and private education will emerge as another problem and it is beyond the scope of this paper.

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Data Appendix

Empirical estimations of the paper are based on annual data covering 25 provinces over the period of 1990-2006. Data sources are from various years of *China Statistical Yearbook, China Population Statistical Yearbook*, provincial statistical yearbooks, and China's National Bureau of Statistics. Variables used for estimations are listed below.

(1) GINI = the urban Gini coefficient. Provincial statistical yearbooks report basic condition of urban and rural households by income percentiles of households.

(2) URGAP = urban-rural income gap. It is defined as the ratio of urban disposable income to rural net income per capita.

(3) GDPGR = the real growth rate of GDP per capita, measured at constant price level.

(4) FDI = the ratio of FDI stocks to provincial GDP.

(5) COAST = a dummy variable. It takes on a value of 1 for 10 provinces or municipalities located in the coastal areas, and takes on a value of 0 for 15 inland provinces. 10 coastal provinces or municipalities include Beijing, Tianjin, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, and Hainan. Inland provinces refer to Shanxi, Inner Mongolia, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Guangxi, Sichuan, Guizhou, Yunnan, Shaanxi, Qinghai, Ningxia, and Xinjiang.

(6) EDU = secondary school enrollment rate.

(7) INFL = the inflation rate measured by CPI.

(8) SOE = the size of state sector, measured as the proportion of

workers and staff in state-owned entities in the total.

(9) EXPORT = the share of the volume of exports in provincial GDP.

(10) GOV = public spending over provincial GDP.

(11) AGR = the proportion of provincial fiscal expenditure on agriculture.

(12) URBAN = urbanization measured by the proportion of non-agricultural population in the total provincial population.

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