EXPORTS, FDI, LINKAGES AND REGIONAL DISPARITIES IN CHINA

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Abstract
Pronounced disparities in income and economic opportunities between the coastal and the inland regions of China have often been noted. This paper explores the proposition that regional disparities in China are intimately linked with the structure of her exports and FDI, which results in limited linkages from the growth engines. The spillover and migration effects of exports and FDI on regional income inequalities are investigated. The emphasis on FDI-driven labor-intensive processing-type exports in the coastal regions is found to have attracted the relatively mobile and efficient resources from the inland regions, but have only offered limited growth linkages to them. All this has exacerbated the backwardness of the inland regions.

JEL Codes: F43, J31, O15, O18, R11

Keywords: exports, foreign direct investment, spillover, migration, regional disparity

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1. Introduction

Pronounced disparities in income and economic opportunities between the coastal and inland regions of China have often been noted. Several studies have investigated the factors responsible for regional inequalities. These include the preferential government policies in the coastal regions, their favourable geographical location and superior infrastructure facilities. One other factor that may have contributed to the observed growth in regional disparities in China is the lack of linkages from growth engines. This paper explores the proposition that regional disparities in China are intimately linked with the structure of her exports and FDI, which results in limited linkages emanating from growth engines.

Section 2 of the paper briefly reviews the extent of regional disparities in China. Section 3 sets out the theoretical framework of exports, linkages and regional income inequalities. Section 4 discusses the linkage and migration effects of China's exports and FDI. Section 5 provides empirical evidence. Section 6 concludes.

2. Reforms and regional development in China

China embarked upon economic reforms in 1978 and has gradually opened up the economy to foreign trade and investment since then. In 1988 the Chinese government introduced the 'Coastal regions development strategy' and the 'Two-ends outside' policy that encouraged processing trade in order to exploit China's comparative advantage in abundant cheap labor. Export-oriented FDI was encouraged by fiscal and financial incentives such as tax holidays and tax-rebates for exports. As a result, exports of foreign-invested enterprises (FIEs) and exports on account of processing trade increased rapidly in the coastal regions.

Accompanying the fast growth of exports and FDI and the domestic reforms, the Chinese economy experienced impressive growth. Real GDP per capita for the country as a whole increased from RMB792 to RMB3631 at 1990 constant prices during the period 1978-1999. The growth was, however, not balanced across regions, with disparities growing in the 1990s (Table 1). Coastal regions, on average, have registered a relatively high growth rate since the reforms[1]. The trend was sustained in the 1990s. The inland regions although they registered a growth rate similar to that of the coastal regions in the 1980s, fell behind perceptibly in the 1990s. Real GDP per capita for the inland regions increased 95 percent in the 1990s, while that for the coastal regions increased 144 percent.

Table 1. *Real GDP per capita of coastal and inland regions*

		Real GDPPC (yuan at 1990 constant prices)				% Change			
		1952	1978	1990	1999	1952-78	1978-99	1978-90	1990-99
Coastal	Beijing	462	2807	4881	9960	507	255	74	104
	Tianjin	813	2524	3621	8017	210	218	43	121
	Shanghai	1186	5436	5910	15459	358	184	9	162
	Liaoning	593	1480	2698	5062	150	242	82	88
	Hebei	340	792	1465	3479	133	339	85	137
	Jiangsu	356	936	2016	5352	163	472	115	165
	Zhejiang	305	720	2122	6041	136	739	195	185
	Fujian	277	594	1767	5418	114	812	197	207
	Shandong	248	688	1815	4353	178	533	164	140
	Guangdong	275	799	2395	5886	191	637	200	146
	Guangxi	182	490	1066	2082	169	325	118	95
	Average	**347**	**1018**	**2132**	**5204**	**193**	**411**	**109**	**144**
Inland	Shanxi	316	794	1493	2372	152	199	88	59
	Inner Mongo	471	690	1478	2685	47	289	114	82
	Jilin	416	829	1746	3182	99	284	111	82
	Heilongjiang	636	1227	2028	3844	93	213	65	90
	Anhui	212	531	1182	2362	150	345	123	100
	Jiangxi	310	601	1110	2339	94	289	85	111
	Henan	226	505	1091	2456	124	387	116	125
	Hubei	245	722	1556	3269	195	353	115	110
	Hunan	234	622	1228	2562	166	312	97	109
	Sichuan	182	551	1105	2234	202	306	101	102
	Guizhou	158	381	810	1242	141	226	113	53
	Yunnan	190	492	1224	2234	158	354	149	83
	Shaanxi	231	640	1241	2058	177	222	94	66
	Gansu	340	757	1099	1851	123	144	45	68
	Qinghai	275	931	1558	2340	239	151	67	50
	Ningxia	343	805	1393	2245	135	179	73	61
	Xinjiang	452	681	1799	3247	51	377	164	80
	Average	**255**	**637**	**1280**	**2497**	**149**	**292**	**101**	**95**
National average		**294**	**792**	**1630**	**3631**	**169**	**358**	**106**	**123**

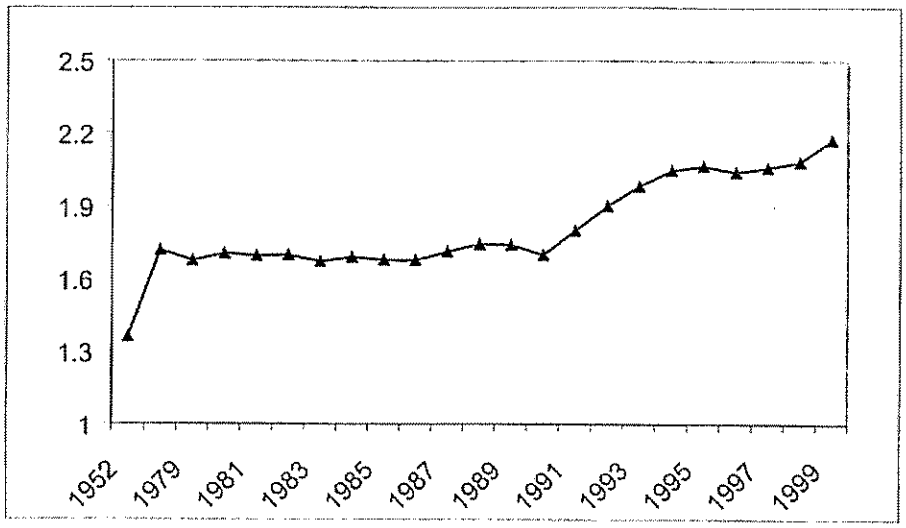
Source: *"Comprehensive statistical data and materials on 50 years of new China." State Statistical Bureau of China, 1999.*

Note: *Growth rates higher than national average level are indicated in shadow.*

GDP per capita in purchasing power terms for the coastal regions in fact began to catch up with that of the Southeast Asian emerging economies including Malaysia, Philippines, Indonesia and Thailand in the early 1990s, and surpassed them in 1996[2]. As a result, regional income inequality in China, measured in

terms of real GDP per capita, enlarged at the rate of 3 percent per year in the 1990s (Figure 1). In 1999, average GDP per capita for the coastal regions at 1990 constant prices were RMB5204, while that for the inland regions were only RMB2497. Lorenze curves and the GINI index[3] for 29 provinces, municipalities and autonomous regions show a similar picture.

Figure 1: Real GDP per capita, Coastal/Inland regions



Source: *"Comprehensive statistical data and materials on 50 years of new China", State Statistical Bureau of China, and author's estimation*

3. Linkage and migration effects of exports and regional income inequalities: theoretical framework

There are two sets of literature on exports, growth and regional disparities in China. One set is the empirical study on exports and growth relationship in China. These studies have found evidence in favour of the export-led growth hypothesis (Kwan and Kwok, 1995; Qiao, 1998; Sun and Parikh, 2001), or a bi-directional causality between exports and output (Shan and Sun, 1998). However, most of these studies are based on aggregate data and they have not controlled for cross-regional heteroscedasticity. None of these studies has taken the sources and nature of export growth into account. Another set of literature relates to regional disparities in China (Yao and Liu, 1998; Yao and Zhang, 2000a and 2001b; Jian *et al.*, 1996; Sachs and Woo, 2000; Tian, 1999; Zhang, 2001; Demurger, 2001 and Demurger, *et al.*, 2002). Most of these studies have included exports and FDI into regression equations as independent variables and found that exports and FDI have a significant positive impact on the growth of the coastal regions, but not on the growth of inland regions. It is argued that the income divergence between the Chinese regions is due to the slow process of

economic spillovers from the growth centres to the remote provinces (Yao and Zhang, 2001b). This paper investigates the factors that are responsible for this slow spillover process in the light of trade and development theories. The spillover and migration effects of exports and FDI are examined.

3.1 Exports, Linkages and Regional Economic Growth

Exports contribute substantially to regional growth. The possible channels through which exports promote growth include: 'vent for surplus' effects, resource reallocation, increased specialisation, market augmentation, capital accumulation, technology transfer and knowledge spillovers, X-efficiency effects, and financing of imports (Myint, 1958; Corden, 1971; Helpman and Grossman, 1991; Baldwin and Caves, 1997). Exports were regarded as the engine of growth for the regions of recent settlement in the 19th century (Nurkse, 1961) and for the newly industrialised countries (NICs) (Krueger, 1995). The causation though could run from growth to exports or mutual reinforcing.

However, for a successful export-led growth process, backward linkages are essential. It is important that the export sector does not remain an enclave. Instead, an integrated process should be established, diffusing stimuli from the export sector to the rest of the economy (Meier, 1995). The strength of the spillover effects depends on the extent of the linkages between the economy and the export sector and the availability of the basic ingredients of development in the domestic economy such as infrastructure facilities, ambitious entrepreneurs and a threshold level human capital (Greenaway and Sapsford, 1994). Moreover, a high proportion of manufacturers in total exports and an advanced production technology in the export sector are essential for generating strong spillover effects to the rest of the economy in terms of technology transfer (Fosu, 1990). If these prerequisites are not met, exports may only lead to economic growth of several regions, with weak spillovers to the rest of the economy.

3.2 Exports/FDI Induced Migration and Regional Income Inequalities

If growth of the export sector attracts substantial immigrants from other regions of the economy, the impact of such exports on regional income inequalities also depends on the costs and benefits of migration for both the home and host regions. For the home regions, there are two major channels through which emigrants may benefit their economy. One is emigrants' remittance that can help home regions to overcome capital constraints, and support economic development. The other channel, which is more important, is 'return migration'. Returning migrants may bring skills and capital to the home economy, contribute to human and physical capital accumulation, and promote the growth

of their home regions. Entrepreneurial activities of returnees may also contribute to wealth generation, and create jobs. Also emigrants may invest in the home region, provide market intelligence and train home labor.

However, emigration may impose welfare costs on the regions when $Wage \neq PMP = SMP$, or when $Wage = PMP \neq SMP$,

where PMP refers to private marginal productivity, SMP refers to social marginal productivity (Bhagwati, 1997). In other words, the home region of the emigrant loses if:

a) the wage rate of the emigrant in the home region prior to emigration was less than his/her PMP; and/or
b) SMP of the emigrant was higher than his/her wage rate.

In both cases, the home region loses the surplus above the wage rate. SMP could be higher than the wage in the presence of externalities generated by the emigrants.

What is the impact of immigration on the host regions? The net welfare effect of immigration equals the immigration surplus net of the fiscal burden imposed by immigrants on native taxpayers (Borjas, 1995). Fiscal costs of immigration is likely to be low in the case of developing countries due to the low welfare levels in these countries, while the positive impact of immigration on the host region tends to be large due to immigrants' contribution to sustaining dynamic growth. In a two-region model, when one region grows fast, with a fixed supply of labor, wages will increase and returns to capital will decrease. In this case, immigration from the other region will relax the labor supply constraint in the fast growth region and arrest a fall in the marginal productivity of capital (Faini, 1996). The fast growth in the richer region can be sustained. Moreover, labor mobility across regions interacting with increasing returns to scale may create a tendency for firms and workers to cluster together. This intensifies agglomeration effects (Krugman, 1991; Puga, 1999). Thus the richer regions will experience growth led by increasing returns to scale and agglomeration effects.

The relatively poor regions may not experience such dynamic growth effects. Growth in the poorer region may not be caused by technical progress, but a 'once-for-all' resource reallocation because of emigration. Also the poorer regions may lose the more able and educated persons due to migration. The two regions may therefore grow at different rates and income disparities may increase.

In sum, exports may have an impact on regional income inequalities in three ways depending on the type and nature of exports. First, exports may be the engine of growth for only some regions, but not for others. Second, if exports in the richer regions are mainly in the form of processing trade, backward linkages toward the poorer regions will be limited. Third, when relatively efficient labor migrates from the poorer regions to the richer regions because of growth in demand for labour in the fast growing export activities, regional incomes are likely to diverge.

4. Exports of China and their linkage and migration effects

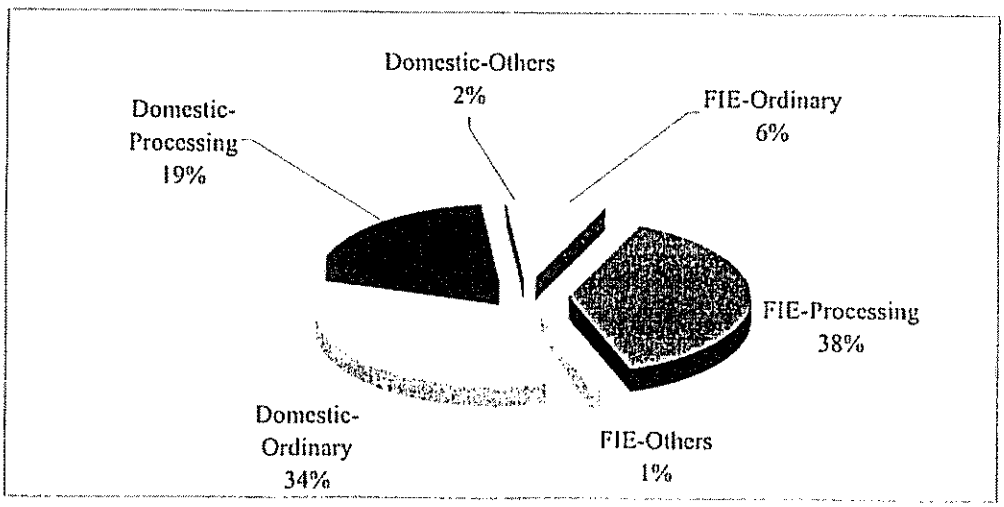
4.1 Linkages Effects of China's Exports

Exports of China over the post-reform period exhibit several distinctive features:

1. high degree of exports related to FDI;
2. high proportion of processing-type exports;
3. high geographical concentration in the coastal regions;
4. relatively high exports/GDP ratio for the coastal regions; and
5. relatively sophisticated export composition in the coastal regions.

Over the past two decades, enterprises with foreign investment (FIEs) have gradually become major export entities in China. In 1999, exports of FIEs accounted for 45 percent of China's total exports of US$195 billion (Figure 2).

Figure 2: Exports by ownership and trade mode, 1999



Source: *China Statistical yearbook, 2000*

Moreover, processing trade has become the major trade mode. Since 1991, exports generated from processing trade have accounted for more than 40 percent of China's total exports. This figure has exceeded 50 percent since 1996[4]. Most of China's exports are concentrated in the coastal regions. Exports in the coastal regions, on average, account for a relatively high proportion of their output. In 1999, exports from the coastal regions accounted for 91 percent of China's total exports. The average export/GDP ratio of the coastal regions was 25 percent, in comparison with 5 percent for the inland regions in the same year (Table 2). Major export commodities of the coastal regions not only include traditional labor-intensive light industries products such as clothing and footwear, but also electrical and machinery equipment and electronic products.

Backward linkages

The impact of an economic activity on the rest of the economy is often via inter-industry linkages. Backward linkages are economic transactions in which an industry gets its inputs from other industries and forward linkages are downstream linkages where an industry's output is sold. What sort of backward linkages have exports in the coastal regions generated for the inland regions? As stated earlier, since 1996, more than 50 percent of exports in the coastal regions are on account of processing trade, which mainly relate to sub-contracts from Hong Kong companies and foreign invested enterprises (FIEs). Exports of China's fastest growing export industries, such as the electronics industry, are mainly on account of processing trade. In 1998, about 80 percent of exports of machinery and electronic products were of the processing-type[5]. In 2001, 99 percent of exports of computer products in Guangdong province were on account of processing trade[6]. The total value of imports in these industries almost matched exports by value (Table 3). These figures suggest that the backward linkages may be limited. Comparing trade data of Mainland China with that of Hong Kong, the rate of value-added for exports of Hong Kong is shown to be 100 percent higher than that for Mainland China. This indicates forward linkages of processing-type exports are also limited in China (Sung, 2000). Although there has been some adaptation of the production process to the use of local raw materials, components and equipment, linkages generated by exports are limited. The export industries appear to be enclaves (Lardy, 1995).

Table 2. *Exports and FDI by regions, 1999*

Regions		GDP	FDI, by 1999	Exports, 1999				
		% as total	% as total	% as total	EX[a]/GDP	Primary %	Processing as % of total	Exports of FIEs as % of total
Coastal	Beijing	2.7	4.13	3.2	23.9	7.6		45
	Tianjin	1.8	3.94	3.3	36.4	9.3	67	72
	Shanghai	4.9	8.19	9.4	37.5	4.0	46	54
	Hebei	5.1	4.16	4.2	16.1	26.2	19	
	Liaoning	5.6	1.99	1.4	4.8	26.3		
	Jiangsu	9.4	12.13	9.5	20.0	3.3	54	51
	Zhejiang	6.5	3.11	7.0	21.1	11.4	24	25
	Fujian	4.3	9.78	5.4	24.8	12.1	53	57
	Shandong	9.4	5.90	6.3	13.2	22.8	53	
	Guangdong	10.3	28.25	40.4	77.0	3.9	78	49
	Guangxi	2.4	2.09	0.6	5.2	17.6	15	18
Average/sum[b]		**62.4**	**83.70**	**90.7**	**25.5**	**13.1**		
Inland	Shanxi	1.8	0.42	0.8	8.2	49.8		
	Inner Mongolia	1.5	0.17	0.4	4.5	33.3		
	Jilin	2.0	0.84	0.6	6.0	43.0		
	Heilongjian	3.5	1.09	0.8	4.4	30.4		
	Anhui	3.6	0.88	0.8	4.7	15.5		
	Jiangxi	2.4	0.81	0.5	3.9	18.0		
	Henan	5.6	1.22	0.6	2.2	17.5		
	Hubei	4.7	1.78	0.8	3.3	10.8		
	Hunan	4.1	1.48	0.7	3.5	14.2	12	
	Sichuan	4.5	1.54	0.6	2.6	18.5		
	Guizhou	1.1	0.13	0.2	3.6	32.2		
	Yunnan	2.3	0.27	0.5	4.1	27.1		
	Shaanxi	1.8	0.90	0.5	5.7	11.9	22	
	Gansu	1.1	0.13	0.2	3.4	18.0		
	Qinghai	0.3	0.01	0.1	4.2	20.3		
	Ningxia	0.3	0.04	0.1	9.8	22.0		
	Xinjiang	1.4	0.11	0.5	7.1	22.4		
Average/sum		**40.0**	**11.80**	**8.7**	**4.8**	**23.8**		

Source: *China statistical yearbook, Almanac of China's foreign trade, Statistical yearbooks of every province of China.*

Note: *a. Exports by origin of products. b. Sum for GDP, FDI and exports as % of total, average for export/GDP ratio and primary products as % of total.*

Table 3. *Fastest growing export industries of China, 1990-1997*

SITC	Commodity	China's Average Annual Growth Rate, 1990-1997	World Market Growth Rate, 1990-1997	$1-\frac{\lvert X-M\rvert}{(X+M)}$	
				1990	1997
752	Automic data proc equip	80%	14%	0.42	0.35
881	Photo apparatus, equipt nes	66%	10%	0.96	0.70
759	Office, adp mch pts, acces	62%	14%	0.57	0.87
771	Electric power machy nes	53%	18%	0.82	0.65
773	Electr distributng equip	53%	15%	0.63	0.99
763	Sound recorders, phonogrph	51%	5%	0.63	0.06
776	Transistors, valves, etc	51%	19%	0.29	0.47
772	Switchgear etc, parts nes	46%	14%	0.78	0.84
793	Ships and boats etc	45%	8%	0.63	0.31
893	Articles of plastic nes	44%	14%	0.74	0.43
764	Telecom eqpt, pts, acc nes	43%	15%	0.48	0.99

Source: *Estimated from International Trade Statistical Yearbook, UN*

Competition and crowding out effects

FDI-related exports in the coastal regions, which have combined cheap labor with foreign capital, may compete with export commodities of the inland regions in the international markets. They are likely to out-compete the inland competitors, crowding them out of the international markets, and restrain export growth of the inland regions. In China, foreign trade companies not only purchase local products for export, they may also purchase goods produced in other provinces for export if the non-local produced goods are more competitive. In 1999, the value of exports by origin in six coastal provinces exceeded the corresponding value of exports by location of trade companies (Table 4). This suggests that some of the products exported by trade companies located in other regions are not produced by local firms, but by firms in these six coastal provinces. Most of these coastal provinces, which may have crowded out products of other provinces, are the growth poles of China since the reforms.

Case study of electronics industry by Wang (1997) finds that before 1990, some indigenous Chinese firms had already introduced technologies to produce magnetic heads for tape recorders. They not only supplied to the domestic market, but also exported more than US$ 100 million every year to the international market. After 1990, however, several foreign invested firms were established in the coastal regions producing similar products, competing with the indigenous firms in both domestic and international markets. Gradually, the indigenous Chinese firms were crowded out of the market.

Table 4. *Differences between exports by origin and by location of trade companies*

10000$

Provinces	1997		1998		1999	
	Exports by origin – Exports by location of trade companies	Imports by destination – Imports by location of trade companies	Exports by origin – Exports by location of trade companies	Imports by destination – Imports by location of trade companies	Exports by origin – Exports by location of trade companies	Imports by destination – Imports by location of trade companies
Beijing	-377591	-1099065	-402186	-1070754	-361813	-1236948
Tianjin	-6717	42902	-3349	49694	4548	76673
Hebei	-59988	47795	-50370	51775	-45911	40766
Liaoning	-104924	91224	-42994	144912	-7197	98743
Shanghai	-30272	86738	-31499	14078	-50871	-5662
Jiangshu	33722	140340	30343	142424	27400	132812
Zhejiang	65895	134993	73868	115671	78231	117443
Fujian	74946	31664	75904	20029	26792	51277
Shangdong	85081	156442	85024	163384	64240	188850
Guangdong	140827	111621	66260	98572	107306	197558
Guangxi	-61284	23021	-20026	17917	-2698	14233

Source: *China foreign trade statistical yearbook, 2000*

Technology and knowledge spillover

Technology and knowledge spillovers are another channel through which exports and FDI contribute to growth. Usually, the extent and quality of technology embodied in export-oriented FDI will influence the degree of technology spillovers. A survey conducted by Young and Lan suggests that, on average, the level of technology embodied in FDI was only two years ahead of that in place in China (Huang, 2001). Although the technology level of FDI has increased since the mid-1990s, when large multinational enterprises began investing in China, case studies in Beijing and Shenzhen report that technology advancement levels of foreign-invested firms are significantly correlated to the equity structures of these firms. High technology levels usually occur in wholly foreign-owned enterprises or joint ventures where foreign partners hold majority equity shares (Wang, 2000). Advanced core technologies are likely to be controlled by foreign investors in these firms. As a result, technology spillovers are likely to be limited.

In his case study of the largest joint venture in China's car assembly industry, the Shanghai-Volkswagon Automotive Company LTD., Nolan (2001 &2002) finds that 'after more than a decade as a junior joint venture partner to the global

giant VW, Shanghai Auto has no capability at all to compete as an independent car maker. VW even expressed doubt publicly whether it would need its partner, SAC, after China entered the WTO' (Nolan, P., 2001). Moreover, it is acknowledged that absorption of knowledge spillovers requires the availability of certain levels of human capital, the presence of entrepreneurship and a market-oriented business environment (Balasubramanyam *et al.*, 1988 and 1996). All these are in short supply in the inland regions.

Empirical evidence of the impact of exports on productivity in China is mixed. Exports are found to contribute positively to the technical efficiency for the township and village enterprises (TVEs), but not to that for the state-owned enterprises (SOEs) (Fu and Balasubramanyam, 2003). Whether there are significant productivity spillovers from the export to the non-export sectors is still a question to answer. Regarding spillovers from FDI, a recent study finds negative spillover effects of industry FDI on domestic firms in the Chinese electronics industry. Such productivity depression effects of FDI on domestic firms appear to be statistically significant in the short run (Hu and Jefferson, 2002). An empirical study by Zhou *et al.* (2002) also finds that domestic firms in industries that have more FDI or have a longer history of FDI tend to have lower productivity.

4.2 Migration and regional growth in China

Emigration and growth of the home regions

Fast growth of exports and FDI has generated considerable opportunities for employment and higher wage rates in the coastal regions. All this has attracted substantial volumes of labor from inland regions to the coastal regions. Recent population census indicates that in 2000 there were about 22 million net migrants working in the 12 coastal provinces[7]. Emigrants usually remit 20-50 percent of their income back home (Worldbank, 1997). Remittances from migrants have raised rural household income to a certain extent. In 1995 remittances accounted for about 25 percent of total income of the receiving rural households and 3.8 percent of total income of all households[8]. Out-migration has also increased the labor productivity of members remaining in their households because of a 'once-for-all' resource reallocation (Li, 1999). However, emigration has also imposed welfare costs on the inland regions.

First, most of the migrants are young and unmarried. It is reported that, in 1995, about 80 percent of migrants were aged between 15 and 35 (Li, 2001). The education level of migrants is higher than that in the regions of their origin, but lower than that in the destination regions. In the year 2000, about 60 percent of

migrants had 9 years schooling or above, while the figure for the average rural population was only 43 percent[9]. These facts suggest that the inland regions have lost relatively young and educated labor. Was all this labor surplus to requirements in the inland regions? Admittedly China has abundant supplies of unskilled cheap labor. However, if we do not merely look at the quantity of labor, but also take into account the structure of the labor force, then this young, educated labor may not be a surplus. It is reported that, because of migration, the average education level of rural residents has significantly decreased; the problem of lack of working-aged labor force has occurred in some inland regions (Hu, 2001).

Second, emigration has increased emigrants' earnings. In 1999, average income of rural migrant-households was 17 percent higher than that of rural non-migrant-households (Hu, 2001). We can infer wage earnings of emigrants prior to emigration were less than their PMP. This implies that there was a surplus of output of the emigrants over their average earnings, which accrued to their home regions and which is now lost with emigration.

Third, emigration appears to increase income inequality in backward regions such as Sichuan mainly due to the lack of mobility of workers in very low-income households (Li, 2001). The growth in inequality in these poor regions will, in turn, affect their economic growth. Therefore emigration in the inland regions may not be favorable to their long-term development. Moreover, if capital could go to the cheap labor in the inland regions, the inland regions may benefit from the growth-induced effects of FDI and exports. Income growth of the inland regions may be higher than the remittances that they receive from migrants.

Immigration and growth of the host regions

In the host regions, immigrants do jobs that non-migrants will not or cannot do. They are complements to non-migrant workers (Knight, *et al.*, 1999). They are an increasingly important group that meets the growth in demand for labor in the coastal regions. Therefore, to a certain extent, immigrants have enabled the coastal regions to sustain their rapid growth. Moreover, the marginal product of migrants is reported to be more than three times their wage rate (PMP > 3*wage) (Knight, *et al.*, 1999). This implies that there is a huge surplus of contribution to output of the immigrants over their average wage. This surplus contributes to the welfare of the coastal regions.

Return migration

Another point that needs to be considered is whether and when the migrants will return. According to Knight *et al.* (1999), whether migrants return or not is determined by the attitudes of the migrants, the enterprises and the government. From the migrants' perspective, whether or not they return may partially depend on wages in the host regions and their marital status (Dustmann, 2001). In the case of inter-regional migration, the social and cultural environment for migrants does not change fundamentally. It is easier for migrants to integrate into the society of another region within the same country than into a foreign land. If access to health and education services for migrants and their children are similar to those for local residents in the host regions, and if wage and opportunity differential between the two regions persists, migrants are unlikely to return. In the case of China, the widening income and opportunity inequalities between the two regional groups, and the lack of facilities for returnees' career or business development in the inland regions, may result in low return migration. The unmarried status of most migrants may increase the duration of their stay in the coastal regions as well.

From the perspective of enterprises, employers of immigrants will try to stabilize migrant labor in order to recover their investment in training them. As the migrant workers move up the job ladder, temporary migration will become economically inefficient. The economic imperative will compel more and more migrants to stay in the host regions and become urbanized (Knight *et al.*, 1999). Finally, whether and when the migrants return also depends on government policy on migration. If government policy is designed towards increasing mobility in the labor market, which induces labor to migrate from the poorer inland regions to the richer coastal regions, rather than a two-way movement of capital and labor, fewer migrants will return.

In sum, given the features of China's exports, it can be argued that:

(1) exports have led to economic growth in the coastal regions, but not in the inland regions. The FDI-funded processing-type exports have generated limited linkages and weak spillovers to the inland regions. All this has aggravated regional income inequalities in China in the 1990s.

(2) Export-oriented FDI in labor-intensive industries in the coastal regions has induced labor in the inland regions to migrate to capital located in the coastal regions. Migration has enabled the coastal regions to sustain their growth. But its effects on the growth of inland regions are of a different nature compared to that on the coastal regions, and mostly unfavorable in

the long run, though contribution of remittances to the home regions cannot be ignored.

This may have led to the divergence of per capita incomes between the coastal and inland regions in the 1990s.

5. Empirical evidence

5.1. Econometric Evidence of Spillover Effects

The foregoing proposition (1) on exports, spillover effects and regional income inequalities can be tested statistically in a log-linear dynamic panel model as follows:

$$y_{it} = \alpha + \varphi x_{it} + \beta l_{it} + \gamma k_{it} + \lambda y_{it-1} + \nu_{it} \qquad (1)$$

where i and t denote regions and time respectively. ν_{it} is a disturbance term which varies across regions and time and possesses the usual properties. y is the growth rate of GDP, x is the growth rate of exports, l is the growth rate of labor input, and k is the growth rate of capital stock.

This growth equation is widely used and accepted in the empirical literature on trade and growth (e.g. Balassa, 1985; Feder, 1983; Salvatore and Hatcher, 1991; Greenaway and Sapsford, 1994; Balasubramanyam *et al.*, 1996). There are three reasons for the explicit introduction of exports into the production function. First, the neutrality of incentives associated with export orientation is likely to lead to higher total factor productivity because of the reasons discussed earlier in section 3. Second, exports are likely to alleviate serious foreign exchange constraints and can thereby provide greater access to international markets. Third, exports are likely to result in a higher rate of technological innovation and dynamic learning from abroad (Salvatore and Hatcher, 1991; Balasubramanyam *et al.*, 1996).

By including a lagged dependent variable (y_{it-1}) we can not only take into account the dynamic process of growth, the lagged dependent variable also provides a proxy variable for many omitted variables (Nair-Reichert and Weinhold, 2001). Because of the problems associated with measuring capital stock in developing countries, we follow the common practice in empirical studies of approximating the rate of growth of capital stock by the share of investment in GDP (Balasubramanyam *et al.*, 1996).

The spillover effects of coastal-region export growth on the growth of the inland regions can be assessed by including a spillover effect variable (s) in the growth equation for inland regions. Instead of following Demurger (2000) who specifies the indicator of diffusion as the weighted average of neighbouring provinces values for the variable under consideration, we measure the spillover effects variable (s_{it}) for inland province i as the weighted average of export growth rates of coastal provinces adjusted by the geographical distances between them and province i. It is calculated with the following equation:

$$s_{it} = \sum w_{jt} * \frac{x_{jt}}{d_{ij}}$$

where w_{jt} is the share of exports of coastal province j in total exports of the coastal regions, x_{jt} is the export growth rate of coastal province j, d_{ij} is the geographical distance between inland province i and coastal province j measured by the distance between their capital cities. The modified growth equation for inland regions is in the form as follows:

$$y_{it} = \alpha + \varphi x_{it} + \beta l_{it} + \gamma k_{it} + \delta s_{it} + \lambda y_{it-1} + \nu_{it} \qquad (2)$$

The data used relates to a panel data set for the coastal and inland regions in China. The data are collected from the China Statistical Yearbook and the Comprehensive Statistical Data and Materials on 50 Years of New China. Because the divergence of per capita income between the coastal and inland regions became highlighted in the early 1990s, we concentrate on the time period 1990-1999. A more detailed description of the sources of data and the measurement of variables is given in Appendix 1.

The model provides a means of examining dynamic effects. It, however, raises the problem of convergence of the estimators because the lagged dependent variable is correlated with the disturbance term (Greene, 2000). Several instrumental-variable (IV) approaches have been proposed for estimation; for instance: the instrumental variables estimator proposed by Anderson and Hsiao (1981), GMM estimator proposed by Arellano and Bond (1991), and Corrected LSDV approach discussed by Kiviet (1995). For estimation of dynamic panel data macroeconomic model in a small sample, the corrected LSDV, though provides the best result, cannot be easily implemented. GMM is a second best solution especially when $T \leq 10$ (Judson and Owen, 1999). Therefore, we use the GMM method that uses all the feasible lags of the dependent variable and other explanatory variables as instruments for $\Delta y_{i,t-1}$.

Because of a possible endogeneity between exports and growth, we apply Wu-Hausman specification procedure to test for the endogeneity between the two variables. One year lagged y_{it}, x_{it} and other exogenous variables are used as instrumental variables because of the short time period of the data set (Nair-Reichert and Weinhold, 2001). If there is endogeneity between exports and growth, we utilise instrumental variable method for estimation, otherwise we use normal fixed or random effects models depending on the estimated Hausman statistics. In order to check for the robustness of the results, we also present results based on different panel data techniques.

Table 5 reports both the static and dynamic panel estimation results. In the case of coastal regions, exports exhibit a significant positive effect on output growth in both the static and dynamic models. Investment also has a positive effect on output growth, but is only statistically significant in the case of the static model. For the inland regions, investment exhibits a significant positive effect on output growth, while the estimated coefficients of exports and labor input variables are not statistically significant. All these facts imply that exports have been the major force of economic growth for the coastal regions, but not for the inland regions. More importantly, the estimated coefficient of spillover effects variable is positive but statistically insignificant. The results are consistent in both the static and dynamic models attesting for the robustness of the results. These results suggest that spillovers from export growth of the coastal regions are weak for the inland regions.

In sum, evidence from statistical tests suggests that exports were the engine of growth for the coastal regions. But they have little impact on the growth of the inland regions. FDI-related processing-type exports seem to have generated limited linkages and weak spillovers to the inland regions.

5.2 Econometric Evidence of Migration Effects

We test proposition (2) on exports/FDI-induced migration and regional income inequalities in two steps. First, we estimate rank correlation coefficients between the number of immigrants in each of the coastal regions and the value of exports and inward FDI in these regions. Rank correlation coefficients are as high as 0.93 for the number of immigrants and value of exports, and 0.77 for the number of immigrants and value of realized FDI (Table 6). This fact suggests that exports and FDI in labor-intensive industries may have attracted labor to capital located in the coastal regions. In Guangdong, the region that has attracted about 30 percent of total inward FDI in China, net migrants numbered around 12 million in the year 2000[10].

Table 5. *Exports and growth: panel data estimation results*

Independent variables	Inland regions						Coastal regions		
	Static	Static	Dynamic	Static	Static	Dynamic	Static	Static	Dynamic
x	0.021	0.000 ***	-0.002	0.003	0.028	0.007	0.106 ***	0.129 ***	0.032 **
	(1.188)	(5.838)	(-0.117)	(0.141)	(0.934)	(0.380)	(2.895)	(2.771)	(2.165)
l	0.035	0.040	0.005	-0.011	0.010	0.038	0.130	0.089	-0.001
	(0.231)	(0.298)	(0.033)	(-0.074)	(0.095)	(0.272)	(0.764)	(0.533)	(-0.021)
k	0.082 ***	0.070 ***	0.037 *	0.082 ***	0.083 ***	0.052 **	0.064 ***	0.067 ***	0.028
	(5.524)	(5.282)	(1.694)	(5.578)	(5.611)	(2.174)	(3.842)	(4.164)	(0.844)
S				0.076	0.032	0.023			
				(1.066)	(0.702)	(0.651)			
y_{it-1}			-0.089 *			-0.176			0.000
			(-1.759)			(-1.509)			(0.554)
Number of observations	144	144	128	144	144	128	99	99	88
Estimation method	FE	IV-FE	IV	FE	IV-FE	IV	FE	IV-FE	IV
Adj R Square	0.21	0.38	0.25	0.230	0.57	0.264	0.284	0.584	0.190
Hausman Statistic (H0=Random effects)	25.7 ***			23.34 ***			8.98 **		
Wu Hausman (p-value) (H0: Exogenicity of x)	0.01		0.33	0.009		0.31	0.000		0.12

Note: t-statistics are in parentheses
*** Significant at the1 percent level
** Significant at the 5 percent level
* Significant at the 10 percent level

Secondly, the proposition on the relationship between migration and regional income inequalities can be statistically testified in a log-linear panel data model of the following form:

$$gap_{it} = \alpha + \beta mig_{it} + \chi str_{it} + \phi fdi_{it} + \mu_{it}$$

where i and t denote regions and time respectively. μ_{it} is a disturbance term which varies across regions and time and possesses the usual properties. *gap* is the ratio of average GDP per capita of coastal regions to that of inland province

i; *mig* is the ratio of number of rural emigrants to population in province i; *str* is a structural variable measured by the ratio of the number of urban employees to total employees in province i; *fdi* is the ratio of FDI in the coastal regions to that in province i.

Because of the possible endogeneity between income gap and ratio, a Wu-Hausman test is applied. One year lagged gap_{it}, mig_{it} and other exogenous variables are used as instrumental variables. If there is endogeneity between income gap and emigration ratio, we use a 2-stage fixed effects model for estimation; otherwise, we use a normal fixed or random effects model depending on the indication of Hausman statistics.

Table 6. *Immigration and FDI in the coastal regions, 2000*

Provinces	Number of Immigrants		Realised FDI by 1999		Exports by places of origin	
	10000 persons	Rank	million US$	Rank	million US$	Rank
Beijing	124	7	12715	7	7667	9
Tianjin	39	10	12109	8	7674	8
Hebei	85	8	6118	11	3278	10
Liaoning	53	9	12800	6	10589	7
Shanghai	202	2	25180	4	24640	3
Jiangsu	199	3	37305	2	26377	2
Zhejiang	183	4	9575	9	20482	4
Fujian	138	6	30078	3	13623	6
Shandong	153	5	18138	5	16093	5
Guangdong	1300	1	86911	1	93428	1
Guangxi	-262	12	6418	10	1640	11
Hainan	16	11	5799	12	609	12
Total	**2230**		**263146**		**226100**	
Rank correlation coefficient (immigrants vs FDI or exports)				0.77***		0.93***

Source: The data of immigrants are derived from the 5th National Population Census of China, 2000, the data of realized FDI and exports are collected from statistical data published by Ministry of Foreign Trade and Economic Cooperation (MOFTEC).

Note: *Immigrants are defined as residents who left their hukou places for more than half a* year. -- *** Significant at the 1 percent level.

The analysis is based on a panel of data for 16 out of 19 inland regions of China over the period 1995-1998. Tibet and Qinghai are omitted due to lack of reliable

data. The data for Congqing are combined with that for Sichuan. The data are from various issues of China Labor Statistical Yearbook and the Statistical Yearbook of China. A more detailed description of the sources of data and the measurement of variables is given in Appendix 1.

Table 7. *The impact of emigration on the backwardness of inland regions: Estimation results*

Dependent Variable: *gap*						
	Fixed-Effects		Random-Effects		2S-Fixed-Effects	
	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio
mig	0.018***	4.176	0.022***	3.039	0.071**	2.204
str	-0.181***	-4.971	-0.274***	-5.177	-0.189***	-7.563
fdi	0.025***	7.219	0.027***	3.297	0.017**	2.696
R-square	0.996		0.991		0.999	
Adj. R-square	0.994		0.990		0.999	
Lagrange Multiplier		75.68***				
Hausman statistics (H0: Random Effects)		14.6***				
Wu-Hausman (p-value) (H0: Exogeneity)		0.000				

Note: *** Significant at the1 percent level
** Significant at the 5 percent level
* Significant at the 10 percent level

Table 7 reports the estimated results. As the Wu-Hausman test indicates significant endogeneity between income gap and emigration ratio, a 2-stage fixed effects model is preferred to the others. The 2-stage fixed effects model has not only provided a way to control for the endogeneity between income gap and emigration ratio, it has also controlled for the regional-specific effects. This is important before we draw any conclusion about the impact of urbanization on regional disparities, because urbanization may reflect the level of economic development in the inland areas, while the inland provinces are themselves heterogeneous in terms of development level. Nevertheless, estimation results of different panel techniques are presented in order to check the robustness of results.

Emigration exhibits a significant positive impact on the income gap between the coastal and the inland regions. A one percent increase in the share of emigrants in the total population will increase the per capita income gap by about 0.07

percent. This fact suggests that migration of young educated labor from the inland regions to the coastal regions contributes to the increasing income gap between the two regional groups. It should be noted that the significant endogeneity between income gap and emigration ratio indicated by the Wu-Hausman statistics suggests a two-way causal relationship between these two variables. While migration has contributed to income inequality, income inequality has also triggered more migration.

The estimated coefficient of the structural variable is negative and statistically significant. A one percent increase in the urban employee to total employee ratio reduces the income gap by 0.19 percent. This fact suggests that urbanization in the inland regions reduces the income gap between the coastal and the inland regions.

The relative FDI ratio also exhibits a significant positive impact on the income gap. A one percent increase in FDI in the coastal regions relative to the inland regions will increase the income gap by 0.02 percent. This fact suggests that the higher the FDI in the coastal regions relative to the inland regions, the higher will be the income gap between the coastal and inland regions.

Another factor that may contribute to the increasing regional income inequalities is the movement of domestic capital. It is argued that, since the reforms, there has been considerable capital flowing from the poor inland regions to the fast growing coastal regions. Loss of the scarce capital by the inland regions may also exacerbate the existing regional income inequalities. However, because of the lack of reliable data on the scale of inter-regional capital flow, this factor is not included in current empirical study.

6. Conclusions

This paper has investigated the spillover and migration effects of exports and FDI and their impact on regional income inequalities in China. Exports are found to exert a positive impact on growth of the coastal regions, while the inland regions have not experienced similar growth inducing effects of exports and FDI. The FDI-based labor-intensive processing-type exports in the coastal regions have attracted the relatively mobile and efficient resources from the inland regions, but have only offered limited growth linkages to them. All this has exacerbated the backwardness of the inland regions. Contrary to some previous studies, we find evidence to suggest that emigration of the inland regions enlarges the income gap between the coastal and the inland regions. Moreover, while the difference in FDI between the coastal and the inland

regions is found to widen the income gap, urbanisation of the inland regions serves to reduce regional income inequalities.

The findings of this study have important policy implications. First, FDI-based labor-intensive processing trade has grown rapidly in recent decades due to the globalisation of production and the increasing liberalisation of trade and FDI. Our results suggest that linkages derived from such trade are limited. The FDI-based processing trade sector still remains as enclaves in the developing countries. Therefore, as pointed out by World Bank (2002), complementary policies are needed to achieve poverty-reducing growth. Second, encouraging labor from the poorer regions to go to capital in the richer regions is likely to aggravate the existing regional disparity. Therefore, for the Chinese government, attracting capital to labor and encouraging foreign and domestic capital to invest in the inland regions would be a feasible method of reducing the regional disparity. Finally, our results suggest that urbanization in the inland regions helps to reduce the regional income inequality and promotes a balanced regional growth. Such urbanization can grow if capital flows to labor.

Notes

1 The coastal regions refer to the three municipalities, Beijing, Tianjin and Shanghai, and the provinces located by the coast including Hebei, Liaoning, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong and Guangxi provinces. Hainan province is excluded because of incomplete data. The rest of the non-coastal provinces are referred to as inland regions. Names of all the provinces in the coastal and inland regions are given in Table 1.

2 The coastal regions of China and the four Southeast Asian economies such as Indonesia, Malaysia, Philippines and Thailand converged over the 1990s at an annual rate of 0.002 percent. Rate of convergence is estimated using the following equation, $(1/T)\log(y_{i,t+T}/y_{i,t}) = \alpha - \beta\log(y_{i,t}) + \varepsilon_{i,t}$ where $y_{i,t}$ is the per capita income in region I at the beginning of the interval. T is the length of the interval. $Y_{i,t+T}$ is the per capita income in country I at the end of the period. β is the annual rate of convergence. If β>0, then we say that the data set exhibits absolute β convergence.

3 GINI index by regions are estimated as

$$G = \frac{1}{2n^2\mu}\sum_{j=1}^{m}\sum_{k=1}^{m} n_j n_k |y_j - y_k|$$

where n= total number of people, μ=average income which equals the total income/total population, m = number of regions, n_j=number of individuals in regions j, y_j=income per capita in region j. The estimated GINI index were 0.218, 0.252, 0.225 and 0.276 for 1952, 1978, 1990 and 1999 respectively.

4 Data source: China Foreign Economic Statistical Yearbook, 1985-2000.

5 Source: China Machinery Industry Statistical Yearbook, 1999.

6 People's Daily (overseas), 03/12/2001. 'Exports of computer products increase rapidly in Guangdong'.

7 Immigrants are defined as residents who left their *hukou* places for more than half a year. This figure includes immigrants who migrate within the province and from other provinces.

8 Source: 1995 household income survey, quoted in Li (1999).

[9] Source: The 5th national population census of China, 2000. quoted in Hu (2001).

[10] Migrants are defined as residents who left their *hukou* places for more than half a year. Source: The 5th National Population Census, 2000.

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Appendix: Measurement of Variables

y = real growth rate of GDP
l = growth rate of number of employees
k = growth rate of capital stock, measured by the share of fixed capital investment in GDP
x = growth rate of exports
s = spillovers from export growth in the coastal regions, measured by the weighted average of export growth rates of coastal provinces adjusted by the geographical distance between them and inland province i.

$$s_{it} = \sum w_{jt} * \frac{x_{jt}}{d_{ij}}$$

where w_{jt} is the share of exports of coastal province j in total exports of the coastal regions, x_{jt} is the export growth rate of coastal province j, d_{ij} is the geographical distance between provinces i and j measured by the distance between their capital cities.
gap = average GDP per capita of coastal regions/GDP per capita of inland region i;
mig = number of rural emigrants work in other regions for region i / population of region i;
str = structure variable measured by the ratio of number of urban employee to number of total employee in region i;
fdi = the ratio of FDI in the coastal regions to that in region i.