An Estimation of Taiwan's Direct Investment in Mainland China and Its Effect on Both Sides' Export Performance Toward the US Market: The Example of Taiwan's Apparel Industry

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It this paper we have imputed the possible outward investment patterns toward mainland China for Taiwan's apparel industry during the period from 1983 to 1991. An empirical model is then established to explicitly examine its possible impact on Taiwan apparel industry's export. This study found that outward investment by Taiwan's apparel industry in mainland China will adversely affect the Taiwanese apparel industry's own export competitiveness. In addition, the growing outward investment of Taiwan's apparel industry in mainland China is an important factor in encouraging the indirect trading activities across the Taiwan Strait. (*JEL* Classifications: F14, F21)

I. Introduction

The economic ties between Taiwan and mainland China are becoming more and more close as Taiwan's government loosens economic restrictions toward the mainland China. This growing economic relationship can be documented by indirect trade statistics from Hong Kong: in 1991, the total value of trade across the Taiwan Strait accounted for 3.85 percent of Taiwan's total trade, while Taiwan's

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[**Seoul Journal of Economics** 1995, Vol. 8, No. 2]

exports to mainland China increased from 1.73 percent of Taiwan's export total in 1981 to 6.14 percent in 1991; in addition, Taiwan's total exports to mainland China accounted for 7.34 percent of mainland China's total imports in 1991.

Although information on the indirect trade across the Taiwan Strait can be obtained through Hong Kong officials, information on the growth of Taiwan's direct investment in mainland China cannot be obtained directly, however, for two major reasons. First, since the relaxation of foreign exchange controls in 1987, each citizen in Taiwan can freely remit US$5 million per year. The government in Taiwan therefore has very limited authority to control the direction of outward investment from Taiwan. Secondly, mainland China authorities regard the statistics of Taiwan's outward investment toward them as a national secret and do not release these statistics to the public. It is, therefore, very difficult to obtain accurate statistics on it. In April 1991, the Taiwan government requested that all domestic firms should formally register their investment items in mainland China as well as the amounts of these investments to the Ministry of Economic Affairs (MOEA) so that the government could have a better idea as to the scope and amount of Taiwanese firms' outward investment in mainland China. It is commonly believed that the amounts reported in response to the above government request were likely to underestimate the true investment values, as most of the reporting firms were afraid that the government might use this information for taxation purposes.

Statistics for 1991 show that up to that year the cumulative amount of Taiwan's outward investment in mainland China was only US$754 million. Compared to Taiwan's outward investment in other Asian countries such as Thailand, Indonesia, Malaysia and Philippines, these registered statistics have probably significantly underestimated the true situation. From the economic point of view, it has become an important issue to Taiwan, because of the potential impact of Taiwan's vest investment toward mainland China. The relevant issues are: how will this outward investment from Taiwan affect Taiwan's and mainland China's industrial development, and how will it subsequently affect both sides' export performance toward their most important export market, i.e., the US? In addition, how will the outward investment from Taiwan interacts with the indirect trade across the Taiwan strait and subsequently affect both sides' export performance?

To evaluate the above impacts, it is necessary for us to estimate the monthly investment amount for each of the industries concerned. We

can then utilize these estimated values to evaluate the impact of Taiwan's outward investment on both sides' export performance. We have selected the apparel industry for our study for two major reasons: first, apparel industry is one of the most important exporting industries for both sides, and therefore deserves our attention. Secondly, although, due to quota restrictions, the value of Taiwan's outward investment toward mainland China is not the highest, it is interesting to know how the quota factor will affect both the indirect trading and outward investment behavior across the Taiwan Strait.[1]

This paper is divided into 4 sections to address the above important issues. In Section II of this paper we will explain explicitly how we will identify an appropriate functional form to evaluate the pattern of the Taiwanese apparel industry's investment in mainland China. In Section III, an empirical model is established to examine this impact, and our discussion of the major empirical findings is presented in Section IV. Finally, in Section V we summarize our major findings and conclusions.

II. The Estimation of Taiwan's Outward Investment Statistics

As indicated above, the major purposes of this study are twofold: first, to estimate outward investment amounts and patterns for Taiwan's apparel industry and secondly, to utilize the above estimates to evaluate the impact of this investment on both sides' export performance toward the US market. To estimate Taiwan's outward investment pattern toward mainland China, one must take into account the following important economical and political factors. San and Tsai (1994) found that the year 1987 was the landmark year for the development of the economic relationship between Taiwan and mainland China. In July of 1987 the government of Taiwan officially approved 29 items of agricultural and raw industrial materials that could be imported indirectly from mainland China. This was the first indirect trade officially approved by the Taiwanese government in the past 3 decades.

[1]In terms of the registered amount, the statistics show that up to April 1991 the total investment amount from Taiwan's apparel sector had reached US$31.995 million. This outward investment amount ranks after electronics (US$102.748), auto parts (US$78.923), shoes (US$58.751), services (US$56.472) and plastic products (US44.582) as the 6th largest investing sector from Taiwan.

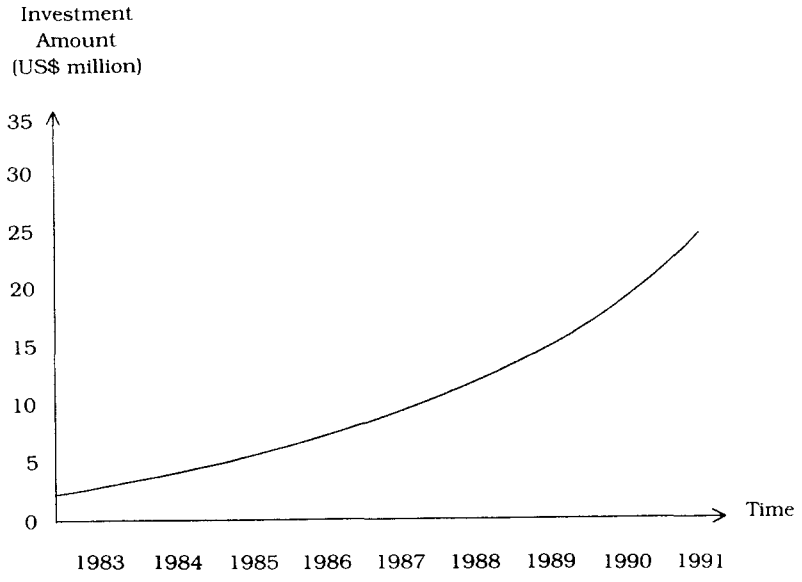

FIGURE 1
THE EXPONENTIAL TYPE OF OUTWARD INVESTMENT FROM TAIWAN

Then, on July 15 of 1987, the Central Bank of Taiwan officially lifted restrictions on foreign exchange. Under the new regulations, each citizen can freely remit US$5 million abroad. Thirdly, in November of the same year, the Taiwanese government officially allowed its citizens to visit relatives in mainland China, and this opened the door for the exchange of civilian citizens. Therefore, by the end of 1987, with Taiwan's new open door policies toward indirect trade and visitation of relatives, and with the relaxation of foreign exchange controls, the door to Taiwan's outward investment toward mainland China was formally opened.

One way to characterize the possible outward investment patterns from Taiwan toward mainland China is to assume that between 1980 and 1987, Taiwan's investment in mainland China was rather static, or increased at a very slow pace, and that after 1987, in light of the many important political and economical events in that year as described above, investment rates began to accelerate. If we consider the above observation and its subsequent assumption reasonable, then we may assume that Taiwan's investment patterns toward mainland China are exponential (e^{rt}). As we can see in Figure 1, under this assumption there was some "illegal" investment in China from Taiwan before 1988,

TABLE 1

ESTIMATION OF EXPONENTIAL TYPE TAIWAN'S MONTHLY OUTWARD INVESTMENT STATISTICS FOR ALL INDUSTRIES AND FOR THE APPAREL INDUSTRY: 1983.1-1991.4

Unit: US$ million

Month	All Industries			Apparel Industry		
	Registered Amount	5 times the Registered Amount	10 times the Registered Amount	Registered Amount	5 times the Registered Amount	10 times the Registered Amount
1983. 1	1.03264	1.05411	1.06293	1.00097	1.02749	1.03724
1983. 2	1.06635	1.11116	1.12983	1.00194	1.05573	1.07587
1983. 3	1.10115	1.17130	1.20093	1.00291	1.08474	1.11593
1983. 4	1.13710	1.23469	1.27651	1.00388	1.11456	1.15749
1983. 5	1.17422	1.30151	1.35685	1.00486	1.14519	1.20059
1983. 6	1.21255	1.37195	1.44225	1.00583	1.17667	1.24530
1983. 7	1.25213	1.44620	1.53301	1.00681	1.20901	1.29168
1983. 8	1.29300	1.52447	1.62950	1.00778	1.24224	1.33978
1983. 9	1.33521	1.60697	1.73205	1.00876	1.27639	1.38967
1983.10	1.37879	1.69394	1.84106	1.00974	1.31147	1.44142
1983.11	1.42380	1.78562	1.95692	1.01072	1.34752	1.49510
1983.12	1.47028	1.88225	2.08008	1.01170	1.38455	1.55078
1984. 1	1.51827	1.98412	2.21099	1.01268	1.42261	1.60853
1984. 2	1.56783	2.09150	2.35014	1.01366	1.46171	1.66843
1984. 3	1.61901	2.20469	2.49805	1.01464	1.50189	1.73056
1984. 4	1.67186	2.32401	2.65527	1.01562	1.54317	1.79501
1984. 5	1.72644	2.44979	2.82238	1.01661	1.58558	1.86185
1984. 6	1.78279	2.58237	3.00000	1.01759	1.62916	1.93119
1984. 7	1.84099	2.72213	3.18881	1.01858	1.67394	2.00310
1984. 8	1.90108	2.86945	3.38950	1.01957	1.71995	2.07770
1984. 9	1.96314	3.02474	3.60282	1.02056	1.76722	2.15507
1984.10	2.02722	3.18844	3.82956	1.02155	1.81580	2.23532
1984.11	2.09340	3.36100	4.07058	1.02254	1.86571	2.31857
1984.12	2.16173	3.54290	4.32676	1.02353	1.91699	2.40491
1985. 1	2.23230	3.73464	4.59907	1.02452	1.96968	2.49447
1985. 2	2.30516	3.93676	4.88851	1.02551	2.02381	2.58736
1985. 3	2.38041	4.14981	5.19617	1.02651	2.07944	2.68371
1985. 4	2.45811	4.37440	5.52320	1.02750	2.13659	2.78365
1985. 5	2.53835	4.61114	5.87080	1.02850	2.19532	2.88732
1985. 6	2.62121	4.86069	6.24028	1.02950	2.25566	2.99484
1985. 7	2.70678	5.12375	6.63301	1.03049	2.31766	3.10637
1985. 8	2.79513	5.40105	7.05047	1.03149	2.38136	3.22205
1985. 9	2.88638	5.69336	7.49419	1.03249	2.44681	3.34203
1985.10	2.98059	6.00148	7.96584	1.03349	2.51407	3.46649
1985.11	3.07789	6.32628	8.46717	1.03450	2.58317	3.59558
1985.12	3.17836	6.66865	9.00005	1.03550	2.65417	3.72948

TABLE 1
CONTINUED

Unit: US$ million

Month	All Industries			Apparel Industry		
	Registered Amount	5 times the Registered Amount	10 times the Registered Amount	Registered Amount	5 times the Registered Amount	10 times the Registered Amount
1986. 1	3.28211	7.02956	9.56648	1.03650	2.72712	3.86836
1986. 2	3.38925	7.41000	10.16854	1.03751	2.80208	4.01242
1986. 3	3.49988	7.81103	10.80851	1.03851	2.87909	4.16184
1986. 4	3.61413	8.23376	11.48874	1.03952	2.95823	4.31683
1986. 5	3.73210	8.67937	12.21179	1.04053	3.03954	4.47758
1986. 6	3.85393	9.14909	12.98034	1.04154	3.12308	4.64433
1986. 7	3.97973	9.64424	13.79726	1.04255	3.20892	4.81728
1986. 8	4.10964	10.16619	14.66560	1.04356	3.29712	4.99668
1986. 9	4.24379	10.71638	15.58858	1.04457	3.38774	5.18275
1986.10	4.38232	11.29635	16.56965	1.04558	3.48086	5.37575
1986.11	4.52538	11.90770	17.61247	1.04659	3.57653	5.57595
1986.12	4.67310	12.55214	18.72091	1.04761	3.67484	5.78359
1987. 1	4.82564	13.2314	19.8991	1.04862	3.77584	5.99897
1987. 2	4.98316	13.9475	21.1514	1.04964	3.87962	6.22237
1987. 3	5.14583	14.7023	22.4826	1.05066	3.98626	6.45409
1987. 4	5.31380	15.4980	23.8976	1.05168	4.09582	6.69444
1987. 5	5.48726	16.3368	25.4016	1.05270	4.20840	6.94374
1987. 6	5.66638	17.2209	27.0002	1.05372	4.32407	7.20232
1987. 7	5.85134	18.1529	28.6995	1.05474	4.44292	7.47053
1987. 8	6.04235	19.1354	30.5057	1.05576	4.56504	7.74873
1987. 9	6.23959	20.1710	32.4256	1.05678	4.6905	8.0373
1987.10	6.44326	21.2626	34.4663	1.05781	4.8194	8.3366
1987.11	6.65359	22.4133	36.6355	1.05883	4.9519	8.6470
1987.12	6.87078	23.6264	38.9411	1.05986	5.0880	8.9691
1988. 1	7.09506	24.9050	41.3919	1.06089	5.2279	9.3031
1988. 2	7.32667	26.2529	43.9969	1.06192	5.3715	9.6495
1988. 3	7.56583	27.6737	46.7659	1.06295	5.5192	10.0089
1988. 4	7.81280	29.1714	49.7091	1.06398	5.6709	10.3816
1988. 5	8.06783	30.7501	52.8375	1.06501	5.8268	10.7682
1988. 6	8.33119	32.4143	56.1629	1.06604	5.9869	11.1692
1988. 7	8.60314	34.1686	59.6975	1.06707	6.1515	11.5851
1988. 8	8.88394	36.0178	63.4546	1.06811	6.3205	12.0166
1988. 9	9.17397	37.9670	67.4481	1.06914	6.4943	12.4640
1988.10	9.47343	40.0218	71.6930	1.07018	6.6728	12.9282
1988.11	9.78267	42.1878	76.2050	1.07122	6.8562	13.4096
1988.12	10.10200	44.4710	81.0010	1.07226	7.0446	13.9090
1989. 1	10.43176	46.8777	86.0988	1.07330	7.2382	14.4270
1989. 2	10.77228	49.4147	91.5175	1.07434	7.4372	14.9642

TABLE 1
CONTINUED

Unit: US$ million

Month	All Industries			Apparel Industry		
	Registered Amount	5 times the Registered Amount	10 times the Registered Amount	Registered Amount	5 times the Registered Amount	10 times the Registered Amount
1989. 3	11.12392	52.0891	97.2772	1.07538	7.6416	15.5215
1989. 4	11.48704	54.9081	103.3994	1.07642	7.8516	16.0995
1989. 5	11.86201	57.8797	109.9068	1.07746	8.0674	16.6991
1989. 6	12.24921	61.0122	116.8238	1.07851	8.2892	17.3209
1989. 7	12.64906	64.3141	124.1762	1.07955	8.5170	17.9660
1989. 8	13.06196	67.7948	131.9912	1.08060	8.7511	18.6350
1989. 9	13.48834	71.4639	140.2982	1.08165	8.9916	19.3290
1989.10	13.92864	75.3315	149.1279	1.08270	9.2388	20.0488
1989.11	14.38331	79.4084	159.5133	1.08375	9.4927	20.7954
1989.12	14.85282	83.7060	168.4893	1.08480	9.7536	21.5698
1990. 1	15.33766	88.2361	179.0933	1.08585	10.0217	22.3730
1990. 2	15.83832	93.0114	190.3646	1.08690	10.2972	23.2062
1990. 3	16.35533	98.0452	202.3452	1.08795	10.5802	24.0704
1990. 4	16.88921	103.3514	215.0799	1.08901	10.8710	24.9668
1990. 5	17.44052	108.9447	228.6160	1.09007	11.1698	25.8965
1990. 6	18.00983	114.8408	243.0040	1.09112	11.4768	26.8609
1990. 7	18.59772	121.0560	258.2975	1.09218	11.7923	27.8612
1990. 8	19.20480	127.6075	274.5535	1.09324	12.1164	28.8987
1990. 9	19.83170	134.5136	291.8326	1.09430	12.4494	29.9749
1990.10	20.47906	141.7934	310.1992	1.09536	12.7916	31.0912
1990.11	21.14755	149.4672	329.7217	1.09642	13.1432	32.2490
1990.12	21.83787	157.5564	350.4728	1.09748	13.5044	33.4499
1991. 1	22.55072	166.0833	372.5299	1.09855	13.8756	34.6956
1991. 2	23.28683	175.0717	395.9752	1.09961	14.2570	35.9877
1991. 3	24.04698	184.5465	420.8960	1.10068	14.6488	37.3278
1991. 4	24.83194	194.5342	447.3852	1.10175	15.0515	38.7179

but it grew at a very slow pace, however, after 1988 it begin to accelerate. However, under the above investment pattern assumption, from January 1983 to April 1991 the sum of the total monthly investment value is equal to the total registered US$31.995 million for the apparel industry. It is important to note that the above registered investment amounts are generally believed to be gross underestimates. To compensate for this possibility, in this study we assume that the true investment amount is first five times, then ten times of the above registered amount. Our monthly estimations under different assumptions are

shown in Table 1. In addition, in this table we also include our estimation of Taiwan's monthly investment in mainland China for all registered industries.

III. The Empirical Estimation Model

After we have estimated the monthly outward investment statistics for Taiwan as whole, as well as for the apparel industry, we can begin to set up our empirical model to evaluate the impact of this investment on both sides' export competitiveness. In our empirical model, we first estimate Taiwan's and mainland China's exports toward the US market. Our empirical model is:

$$TEX = a_0 + a_1 EXCH + a_2 WAGE + a_3 \widehat{FDI} + a_4 USM + e_1 \quad (1)$$

$$CEX = b_0 + b_1 EXCH + b_2 WAGE + b_3 \widehat{FDI} + b_4 USM + b_5 \widehat{IT} + e_2 \quad (2)$$

where

TEX: Taiwan's monthly total export value (in US$ million, data source: EPS tape.)

CEX: Mainland China's monthly total export value (in US$ million, data source: UN statistical tape.)

EXCH: exchange rate between New Taiwan(NT) Dollar and one RMB of Mainland China (data source: *Monthly Financial Statistics*, published by the Central Bank of Taiwan and IMF Financial Statistics.)

WAGE: the ratio of Taiwan's wage index to mainland China's wage index (data sources: *Monthly Labor Statistics in Taiwan Area of the R.O.C.*, published by the DGBAS of the Executive Yuan, Taiwan, R.O.C., and *China Monthly Statistics* and *China Statistics Yearbook*.)

FDI: the estimated monthly investment value (in US$ million.)

USM: total value of imports to the USA (in US$ million, data source: US Customs TSUSA data tape.)

IT: monthly indirect trade statistics between Taiwan and mainland China through Hong Kong (in US$ million, data source: Hong Kong Customs Statistics.)

In the above equations, we would like to examine how will the relative change in exchange rates (*EXCH*), relative speed of adjustments in wages (*WAGE*), the magnitude of Taiwan's investment in mainland

China (*FDI*), of the US aggregate economy (represented by *USM*) and the indirect trade between mainland China and Taiwan (*IT*) affect both sides' total export performance. For the above model, we used the seemingly unrelated regression estimation (SURE) method to take into account the interaction between the both sides. A linear model is selected to estimate the above model.

To examine the apparel industry, initially, we examine what the relevant economic factors are that determine Taiwan's outward investment in mainland China. The model is:

$$\widehat{FDI}_t = c_0 + c_1 EXCH + c_2 WAGE_t + c_3 ADD_t + c_4 LAND + c_5 CIPI + c_6 D + c_7 Q + e_3 \quad (3)$$

where

FDI_t: the estimated monthly investment value (in US$ million) for Taiwan's apparel industry.

$WAGE_t$: the ratio of Taiwan apparel sector's wage index to mainland China's wage index.

ADD_t: the share contributed by the Taiwanese apparel industry's net product value to the total net product value of Taiwan's manufacturing sector (data source: *Monthly Industrial Production Statistics*, MOEA, Taiwan, R.O.C.)

LAND: monthly rate of increase in land prices announced by the government (data source: from the annual statistics compiled by the *United Daily News*, converted into a monthly rate.)

CIPI: the monthly aggregate industrial production index in mainland China,[2] (data source: *China Statistics Yearbook.*)

D: a dummy variable to account for the important political and economical changes in 1987. This variable is set to 0 before July 1987, and to 1 after that.

Q: value of quota, (data source: Taiwan Textile Federation.)

In addition, in this study we would also like to examine the interaction between the outward investment of Taiwan's apparel industry in mainland China and indirect trade (*IT*) across the Taiwan strait. As such, our empirical model is:

$$\widehat{FDI}_t = d_0 + d_1 IT_t + d_2 EXCH + d_3 WAGE_t + d_4 ADD_t + d_5 LAND + d_6 CIPI + d_7 D + d_8 Q + e_4 \quad (4)$$

[2]In mainland China the industrial production index is not broken down by sector.

$$IT_t = e_0 + e_1\widehat{FDI}_t + e_2EXCH + e_3WAGE_t + e_4CIPI + e_5D + e_6Q + e_{55}. \quad (5)$$

Similar to equations (1) and (2), we shall use the SURE method to examine whether an increase in *FDI* will lead to higher *IT*.

As investment in mainland China grows rapidly, an important issue for both Taiwan and mainland China is how it will affect both sides' performance in exporting to the US market. To investigate this issue, we have adopted the Revealed Comparative Advantage index (RCA).[3] After we have computed the RCA index for Taiwan (denoted as RCA_T) and for mainland China (denoted as RCA_C), respectively, we can then utilize these indexes to evaluate how $\widehat{FDI}_t$ and IT_t affect both sides' export competitiveness in the US market. Our resulting empirical model is:

$$RCA_T = f_0 + f_1TP_t + f_2CP_t + f_3\widehat{FDI}_t + f_4USV_t + e_6 \quad (6)$$

$$RCA_C = g_0 + g_1TP_t + g_2CP_t + g_3\widehat{FDI}_t + g_4USV_t + g_5\widehat{IT}_t + e_7, \quad (7)$$

where

TP_t: the average unit price for Taiwan's apparel industry. This statistics is computed directly from TSUSA tape for Taiwan's apparel exports. The purpose of this variable is to reflect the quality of Taiwan's apparel exports.

CP_t: the average unit price for mainland China's apparel industrial. It is also calculated directly from TSUSA tape.

USV_t: US total monthly imports of apparel products (in US$ million).

In setting up the above model, we utilize the estimation of FDI_t from (3) and treat it as the first stage and then utilize this in the second stage estimation, i.e. equations (6) and (7). Instead of using the RCA index to do the export performance evaluation, we can also use both sides' apparel export values directly. The corresponding empirical model will be:

[3]Taiwan (mainland China) apparel industry's RCA index in the US market is defined as

$$RCA_{Taiwan\ (M\ China)} = \frac{\dfrac{\text{Taiwan(M. China) Apparel's Export Total to the USA}}{\text{Taiwan's (M. China's) Export Total}}}{\dfrac{\text{US Apparel's Total Import}}{\text{US Total Import}}}$$

$$TV_t = h_0 + h_1 TP_t + h_2 CP_t + h_3 FDI_t + h_4 USV_t + e_8 \quad (8)$$

$$CV_t = k_0 + k_1 TP_t + k_2 CP_t + k_3 FDI_t + k_4 USV_t + k_5 IT_t + e_9 \quad (9)$$

where TV_t and CV_t are, respectively, the monthly export statistics to the US market of Taiwan's apparel industry and mainland China's apparel industry.

IV. Empirical Results

Based on the computed monthly outward investment statistics from Section II and the empirical model discussed in Section III, we now report our empirical result. Our data period is from January 1983 to April 1991, with 100 months of observations.

A. Total Export Functions for Taiwan and for Mainland China

Table 2 shows that when the NT dollar appreciates against the US dollar faster than does the RMB, the *EXCH* will decrease. However, this decrease in *EXCH* will favorably affect Taiwan's total export (TEX), since the *EXCH* variables for the TEX model in Table 2 are all negative and highly significant. However, these relative changes in the exchange rates between the RMB and NT dollar do not significantly affect mainland China's total export performance. Clearly, we have found no evidence that the exchange rate factor affects the other side's total export performance. As for the relative change in wages, the variable *WAGE* shows no significant impact on Taiwan's total exports. However, for mainland China, the models for CEX show an increase in Taiwan's wages relative to mainland China, (i.e. an increase in *WAGE*) will lead to a decrease in mainland China's total exports. One possible explanation for such a "surprising" result is that the variable *WAGE* also represents relative changes in labor productivity. When Taiwan's labor productivity grows faster than that of mainland China, it will adversely affect mainland China's total exports.

Table 2 also shows that increases in Taiwan's outward investment toward mainland China, i.e., an increase in $\widehat{FDI}$, increases both sides' total exports. This result is also valid if actual total Taiwanese investment is 5 times or 10 times of the total registered value. The important policy implication of this empirical result is that increases in Taiwan's outward investment toward mainland China will likely benefit both sides' export competitiveness. This is because Taiwan's investment will

TABLE 2

EMPIRICAL RESULTS FOR TAIWAN'S AND MAINLAND CHINA'S EXPORT FUNCTIONS
(absolute *t*-statistics)

Variables	Registered Amount		5 times the Registered Amount		10 times the Registered Amount	
	(1)	(2)	(3)	(4)	(5)	(6)
	TEX	CEX	TEX	CEX	TEX	CEX
Const	1637.65	2099.61	1605.51	2323.62	1553.43	2298.98
	(1.87)*	(1.72)*	(1.78)*	(1.88)*	(1.71)*	(1.86)*
EXCH	-77.54	8.94	-86.87	-8.65	-88.16	-10.75
	(3.26)***	(0.27)	(3.60)***	(0.26)	(3.64)***	(0.32)
WAGE	-450.79	-1507.35	-453.25	-1500.57	-452.64	-1492.14
	(1.64)	(3.72)***	(1.61)	(3.68)***	(1.60)	(3.65)***
FDI	46.87	105.22	3.96	10.07	1.53	4.05
	(3.51)***	(3.16)***	(2.68)***	(3.02)***	(2.42)**	(2.94)***
USM	0.09	0.049	0.10	0.05	0.10	0.05
	(5.14)***	(1.72)*	(5.70)***	(1 96)*	(5.88)***	(2.01)**
IT		1.16		1.84		2.13
		(0.54)		(0.94)		(1.12)
R^2	0.85		0.84		0.84	

Notes: * : significant at 10 percent level
** : significant at 5 percent level
*** : significant at 1 percent level

bring more advances in production technology, marketing information and various managerial technologies to mainland China. This certainly will help mainland China to increase its export competitiveness. On the other hand, from Taiwan's prospective, Taiwan's outward investment toward mainland China will help Taiwan's declining industries (such as the manufacturing of shoes, handbags and metal products) to shift their production to mainland China and release many valuable factors of production in Taiwan such as labor, land and capital to other industries. It will, therefore, also enhance Taiwan's overall export competitiveness. In addition, Taiwan firms investing in mainland China can also shift their more labor intensive part of production to mainland China and then ship these semi-finished products back to Taiwan for

final assembly and processing. This will certainly enhance Taiwan's overall export competitiveness.

Table 2 also shows that an increase in total US imports (*USM*) will lead to a significant increase in Taiwan's total exports. An increase in US imports will also positively affect mainland China's total exports. However, when we compare the *t*-statistics of the TEX and CEX equations for the *USM* variable, it is clear that Taiwan enjoys more favorable positive income effect from increased US imports then does mainland China. In Table 2, we also include the indirect trade variable *IT* in the CEX equation to examine how indirect trade between mainland China and Taiwan affects mainland China's export competitiveness.[4] Our result shows that it does not significantly affect mainland China's overall export competitiveness. One possible explanation for this result is that, unlike Taiwan's investments in mainland China which are mainly for export markets, many of the export items from Taiwan to mainland China are final consumer products and they are less connected to export activities.[5]

B. The Taiwanese Apparel Industry's Outward Investment in Mainland China and its Effect on Both Sides' Export Performance in the US Market

Table 3 presents relevant factors which determine the Taiwanese apparel industry's outward investment toward mainland China as well as the interaction between outward investment and the indirect trade of the industry. From the table it is shown that as the NT dollar appreciates against the US dollar faster than does the RMB, the *EXCH* variable declines, and this leads to an increase in the Taiwanese apparel

[4]In our model we do not include an *IT* variable in the TEX equation. The major reason is that Taiwan allows only agricultural and industrial raw materials to be imported from mainland China. It was not until 1992 that semi-finished industrial products could be imported from mainland China. In light of the above restrictions the *IT* variable is not included in the TEX equation for estimation. Mainland China encourages trading (preferably direct) between Taiwan and mainland China so that they may exercise more economic as well as political influence upon Taiwan. Consequently, no restriction is imposed between mainland China and Taiwan.

[5]Most of Taiwanese investment in mainland China is for export only. They are not allowed to sell their products in the domestic market. Certainly this is another major reason why we obtained a significant positive relationship between $\widehat{FDI}$ and CEX.

TABLE 3

EMPIRICAL RESULTS FOR THE APPAREL INDUSTRY'S OUTWARD INVESTMENT AND INDIRECT TRADE

(Linear Model. It is assumed that total investment amount equals total registered amount), (absolute t-statistics)

Variables	(1) FDI_t	(2) FDI_t	(3) IT_t
Const	1.08	1.09	-2855.24
	(131.74)***	(130.04)***	(1.04)
IT_t		-0.000001	
		(0.24)	
FDI_t			2615.99
			(1.03)
EXCH	-0.003	-0.003	7.15
	(15.47)***	(15.44)***	(0.78)
$WAGE_t$	0.001	0.001	40.69
	(0.60)	(0.52)	(0.55)
ADD_t	0.011	0.001	
	(0.88)	(0.88)	
LAND	0.001	0.001	
	(3.47)***	(3.47)***	
CIPI	0.00008	0.0001	0.18
	(5.96)***	(5.70)***	(0.50)
D	0.01	0.10	-31.08
	(7.10)***	(7.10)***	(0.67)
Q	-4.46	-0.000004	0.002
	(4.12)***	(4.13)***	(0.09)
R^2	0.98	0.96	

Notes: *: significant at 10 percent level
**: significant at 5 percent level
***: significant at 1 percent level

industry's outward investment in mainland China. Therefore, the *EXCH* variable's estimation coefficient is negative and highly significant. This result is quite consistent with general business practice in Taiwan. As the NT dollar appreciates, Taiwanese apparel industry's

TABLE 4

EMPIRICAL RESULTS FOR THE APPAREL INDUSTRY'S OUTWARD INVESTMENT AND INDIRECT TRADE

(Linear Model. It is assumed that total investment amount equals 5 times the total registered amount), (absolute *t*-statistics)

Variables	(1) FDI_t	(2) FDI_t	(3) IT_t
Const	5.75	6.10	–60.73
	(3.92)***	(4.15)***	(0.32)
IT_t		–0.0007	
		(0.95)	
FDI_t			18.49
			(1.62)
EXCH	–0.15	–0.15	0.16
	(4.07)***	(4.16)***	(0.04)
$WAGE_t$	0.12	0.14	28.00
	(0.22)	(0.08)	(0.37)
ADD_t	0.78	0.77	
	(2.46)***	(2.47)***	
LAND	0.63	0.68	
	(8.02)***	(8.09)***	
CIPI	0.01	0.01	–0.14
	(8.02)***	(7.69)***	(0.32)
D	1.54	1.55	–33.01
	(5.77)***	(5.86)***	(0.80)
Q	–0.0009	–0.0009	0.005
	(4.74)***	(4.86)***	(0.18)
R^2	0.96	0.94	

Notes: *: significant at 10 percent level
**: significant at 5 percent level
***: significant at 1 percent level

entrepreneurs find it more feasible to invest abroad, either due to their greater investment capability with a stronger NT dollar, or due to their weakening export competitiveness, or both. Table 3 also shows that escalating land prices in Taiwan, (i.e. an increase in *LAND* variable),

TABLE 5

EMPIRICAL RESULTS FOR THE APPAREL INDUSTRY'S OUTWARD INVESTMENT AND INDIRECT TRADE

(Linear Model. It is assumed that total investment amount equals 10 times the total registered amount), (absolute t-statistics)

Variables	(1) FDI_t	(2) FDI_t	(3) IT_t
Const	9.04 (2.28)**	10.06 (2.55)**	2.18 (0.01)
IT_t		−0.002 (1.09)	
FDI_t			7.07 (1.80)*
EXCH	−0.20 (1.94)*	−0.20 (2.02)**	−1.47 (0.35)
$WAGE_t$	0.34 (0.23)	0.12 (0.08)	21.62 (0.29)
ADD_t	2.17 (2.54)**	2.15 (2.56)**	
LAND	2.03 (9.54)***	2.17 (9.60)***	
CIPI	0 05 (8.57)***	0.05 (8.26)***	−0.24 (0.53)
D	3.43 (4.75)***	3.45 (4.86)***	−28.44 (0.72)
Q	−0.002 (4.92)*	−0.002 (5.07)***	0.005 (0.19)
R^2	0.94	0.93	

Notes: *: significant at 10 percent level
**: significant at 5 percent level
***: significant at 1 percent level

rapid economic development in mainland China (leading to an increase in mainland China's industrial production index, *CIPI*), and the economic and political dummy variable, *D*, all have significant and positive impacts on the Taiwanese apparel industry's outward investment in mainland China. In addition, the empirical evidence confirms that the

TABLE 6

EMPIRICAL RESULTS FOR THE APPAREL INDUSTRY'S EXPORT COMPETITIVENESS
(Linear Model. It is assumed that total investment amount equals total registered amount), (absolute t-statistics)

Variables	(1) RCA_T	(2) RCA_C	(3) TV_t	(4) CV_t
Const	21.26	65.10		
	(7.47)***	(1.16)		
TP_t	-0.02	-0.03	0.27	-0.69
	(5.89)***	(0.54)	(0.80)	(2.02)**
CP_t	0.01	-0.14	-0.29	-0.88
	(4.42)***	(2.79)***	(1.14)	(3.36)***
$\widehat{FDI_t}$	-16.10	-51.22	63.69	-12.39
	(5.37)***	(0.88)	(3.70)***	(0.69)
USV_t	-0.0002	0.01	0.08	0.19
	(0.88)	(4.58)***	(6.56)***	(13.85)***
$\widehat{IT_t}$		0.02		0.63
		(0.92)		(5.67)***
R^2	0.6		0.97	

Notes: *: significant at 10 percent level
**: significant at 5 percent level
***: significant at 1 percent level

quota for the industry, dummy variable Q, has a significant negative impact on the Taiwanese apparel industry's outward investment toward mainland China.

In Table 3 equations 2 and 3 we have estimated the interaction between FDI_t and IT_t. Our empirical result shows that FDI_t does not have any significant effect on IT_t and vice versa. Similarly, the SURE estimation model also confirms that variables such as *EXCH*, *LAND*, *CIPI*, *D* and Q all have significant and consistent impacts on FDI_t. None of our explanatory variables was shown to have any significant impact on IT_t. In Table 4 we assume that the outward investment of Taiwan's apparel industry is five times the registered investment value, and we obtained results similar to those of Table 3. In Table 5, the outward investment of Taiwan's apparel industry is assumed to be ten times the registered investment value, and again, similar empirical results are obtained. By comparing the results of Table 3 to Table 5, one can con-

TABLE 7

EMPIRICAL RESULTS FOR THE APPAREL INDUSTRY'S EXPORT COMPETITIVENESS
(Linear Model. It is assumed that total investment amount equals 5 times the total registered amount), (absolute t-statistics)

Variables	(1) RCA_T	(2) RCA_C	(3) TV_t	(4) CV_t
Const	5.59	13.03		
	(20.91)***	(3.74)***		
TP_t	-0.03	-0.02	-0.46	-0.67
	(7.26)***	(0.35)	(2.41)**	(2.68)***
CP_t	0.01	-0.12	0.39	-0.89
	(4.16)***	(2.44)**	(2.03)**	(3.57)***
$\widehat{FDI}_t$	-0.06	-0.98	-9.35	-4.76
	(3.43)***	(2.06)**	(10.70)***	(2.23)**
USV_t	-0.0004	0.01	0.11	0.18
	(2.03)**	(4.03)***	(11.44)***	(14.07)***
$\widehat{IT}_t$		0.86		1.06
		(2.29)**		(5.92)***
R^2	0.56		0.98	

Notes: *: significant at 10 percent level
**: significant at 5 percent level
***: significant at 1 percent level

clude that variables such *EXCH, LAND, CIPI, D* and *Q* are all important in determining Taiwan's apparel industry's outward investment toward China. As FDI_t becomes larger, it has a more significant and positive impact on indirect trade between mainland China and Taiwan (IT_t). Furthermore as the industry's total net output share grows and the resulting ADD_t variable increases, it has a positive impact on the industry's outward investment toward mainland China.

In Tables 6 to 8 we present the empirical results for the *RCA*, TV_t and CV_t models under different investment assumptions. In Table 6, the first two *RCA* equations show that an increase in the export unit price of Taiwan's apparel industry (TP_t) will adversely affect the industry's export competitiveness, as the regression coefficient for the TP_t variable is negative and highly significant. In contrast, however, an increase in mainland China's export unit price, CP_t, will lead to an increase in the Taiwanese apparel industry's export competitiveness and a decrease in

TABLE 8

EMPIRICAL RESULTS FOR THE APPAREL INDUSTRY'S EXPORT COMPETITIVENESS
(Linear Model. It is assumed that total investment amount equals 10 times the total registered amount), (absolute *t*-statistics)

Variables	(1) RCA_T	(2) RCA_C	(3) TV_i	(4) CV_i
Const	5.64 (20.95)***	12.37 (3.53)***		
TP_i	-0.03 (7.40)***	-0.02 (0.44)	0.32 (1.61)	-0.70 (2.70)***
CP_i	0.01 (4.01)***	-0.11 (2.27)**	0.44 (2.19)**	-0.91 (3.51)***
$\widehat{FDI_i}$	-0.02 (2.99)***	-0.41 (2.26)**	-3.32 (10.26)***	-1.19 (1.14)
USV_i	-0.0005 (2.25)**	0.01 (3.74)***	0.10 (10.88)***	0.18 (13.60)***
$\widehat{IT_i}$		0.09 (2.49)**		0.92 (4.82)***
R^2	0.56		0.98	

Notes: *: significant at 10 percent level
**: significant at 5 percent level
***: significant at 1 percent level

the competitiveness of mainland China's apparel industry. Obviously, this result suggests that Taiwan and mainland China are competitors in the US apparel market. Furthermore, investment in mainland China by Taiwan's apparel industry will adversely affect Taiwan's own export competitiveness, but thus far it has had no significant positive impact on mainland China's export competitiveness. Equations 3 and 4 of Table 6 examine the export competitiveness of each country through their export values (i.e. TV_i and CV_i) and show that FDI_i from Taiwan will increase the value of Taiwan's apparel industry's total exports in the US market. Clearly, the results from Table 6 suggest that investment by Taiwan's apparel industry in mainland China will increase the export value of Taiwan's apparel industry but it will adversely affect that industry's over all competitiveness in the US market in terms of its RCA index. Table 6 also shows that an increase in US imports (USV_i) of apparel products will lead to an increase in the value of both sides'

exports to the US market. However, unlike the macro result discussed earlier, mainland China seems to be better able to catch an increasing portion of the growing US market than Taiwan is, judging from the regression coefficients as well as the t-statistics of both countries. Finally, Table 6 also shows that indirect trade between mainland China and Taiwan will enhance mainland China's export competitiveness in the US market, as that $\widehat{IT}$ variable is highly significant in equation 4 of Table 6.

Tables 7 and 8 employ the same empirical model but assume that the total investment of Taiwan's apparel industry is five times, and then ten times the registered value, respectively. By comparing the empirical results in Tables 6 and 8, we may conclude that most of the findings that we have discussed earlier are still valid. These empirical findings can be summarized as follows:

(1) The apparel industries of Mainland China and Taiwan compete with each other in the US market. As the export unit price for mainland China's apparel industry (CP_i) increases, it adversely affects its own RCA index as well as its total export value in the US market, this will lead to increases in Taiwan's RCA index as well as Taiwan's total export value in the US market. This is valid particularly if Taiwan and mainland China engage in price competition in their apparel products. Interestingly, Tables 6 to 8 suggest that an increase in the export unit price of Taiwan's apparel industry (TP_i), which suggests improvement in the quality of its apparel products, will weaken Taiwan's apparel industry's export competitiveness in the US market. This consistent result actually suggests a difficult dilemma that Taiwan's apparel industry is currently facing: Taiwan actively tries to produce a higher quality, more value-added product in the international market in order to avoid head-to-head price competition with other major producing countries such as mainland China, but Taiwan also faces the danger of pricing itself out of the international market. Consumers in the international market may be willing to pay premium for quality apparel made in well-recognized countries such as France or Italy, but may not be willing to pay a premium for apparel of the same quality made in Taiwan.

(2) Except for equation 3 in Table 6, the Taiwanese apparel industry's investment in mainland China is shown to have an adverse impact on its export competitiveness in the US market. Interestingly, equations 2 and 4 in Table 7 and equation 2 in Table 8 all suggest that increased investments from Taiwan will adversely affect mainland China's export competitiveness in the US. One possible explanation for such a result

is that when more and more low-value-added apparel firms are forced to move from Taiwan to mainland China, they may use up many of the valuable quotas that mainland China has, and those relatively low-value-added products may ultimately adversely affect the export competitiveness of mainland China's apparel industry.

(3) An expansion in the US apparel market will benefit both mainland China and Taiwan. But the empirical results seem to suggest that mainland China is in a better position to capture the growing US market. Finally, as for indirect trade between mainland China and Taiwan (*IT*), our empirical results suggest that it will significantly enhance mainland China's export competitiveness in the US market. Judging from the indirect trading for textile products across the Taiwan Strait, Taiwan's major export items to mainland China are polyesters, yarns and fabrics, not final apparel products. Therefore, there is no doubt that *IT* will significantly enhance mainland China's export competitiveness in the US market.

V. Summary and Conclusions

In this study, we have examined both the aggregate impact and the industry-specific impact of Taiwan's outward investment toward mainland China. Our study shows that an appreciation of the NT dollar relative to RMB will not adversely affect Taiwan's total exports, while Taiwan's outward investment in mainland China will favorably induce the growth of Taiwan's total exports. In contrast to the above aggregate result for all industries, the specific study on the apparel industry has shown that outward investment by Taiwan's apparel industry in mainland China will adversely affect the Taiwanese apparel industry's own export competitiveness. This is because mainland China's and Taiwan's apparel products are substitutional rather than complementary to each other in the US market.

The expansion of the US market has been shown to be an important factor in inducing Taiwan's total export drive. However, by examining the apparel industries of Taiwan and mainland China, our empirical evidence seems to suggest that mainland China's apparel industry has better capability than Taiwan's to capture the growing apparel market in the US. From the point of view of the aggregate economy, the indirect trade between mainland China and Taiwan does not have any significant impact on either side's export performance. However, for the apparel industry, our results have shown that *IT* will significantly

enhance mainland China's export competitiveness. In addition, the growing outward investment of Taiwan's apparel industry in mainland China is an important factor in encouraging the indirect trading activities across the Taiwan Strait.

As for the determination of factors encouraging investment by Taiwan's apparel industry in mainland China, this study shows that appreciation of the NT dollar, escalating land prices in Taiwan, rapid economic development in mainland China, and relaxation of economic and political restrictions toward mainland China are all relevant. However, the current quota system, which actually now serves to protect rather than restrict Taiwan's apparel products, has shown to discourage outward investment by Taiwan's apparel industry in mainland China.

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Comment

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In the last few years, there have been many studies which focus on the role of foreign direct investment (FDI) as an important factor of economic growth, particularly in less developed countries (LDCs). FDI benefits both investing and host countries. For investing countries, it helps the overall economy be restructured by transferring abroad industries that are no longer internationally competitive. For host countries, it leads to creating employment, boosting foreign trade volume and bringing in technology.

According to the neoclassical model, FDI raises wages and lessens the degree of underutilized labor in host (capital-importing) countries while lowering the rate of return to capital. On the other hand, investing (capital-exporting) countries will have lower wages and a higher rate of return to capital. These effects of FDI increase per capita income of both countries because it leads to more efficient utilization of resources in production. A larger income increases saving, which raises the level of accumulated capital stock. This happens in either host countries or in investing countries because the former gains from accessing its capital cheaper and the latter is benefitted from earning more on its capital. In the steady state, capital mobility increases long-run per capita incomes in both countries. However, it never increases steady state growth rates. That is, there are 'level effects', but no 'growth effects' in the neoclassical model. The long-run growth rate is determined only by the rate of population growth and exogenous technical progress.

A new theory of economic growth, called as the endogenous growth models, which was born in Chicago in mid-1980s, emphasizes the new role of FDI in economic growth and export competitiveness. According to the new theory, technical progress is endogenously determined by the level of accumulated human knowledge. This occurs because the cost of innovation becomes lower as the level of human knowledge increases. The key assumption in this assertion is that there are tech-

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nological spillovers. In contrast to the neoclassical model, the accumulation of human capital increases steady state growth rates. That is, there are 'growth effects' in the endogenous growth model.

The key advantage of FDI is that it transfers not only capital but entrepreneual skills and new knowledge (ideas). What the new theory implies is that ideas are important factors in production as well as physical inputs. Suppose that FDI occurs at a specific exportable sector. New ideas and entrepreneual services accompanied with FDI will improve the quality of the products in that sector, which contributes to enhance its export competitiveness. If the products of a MNC and those made by its home country are competitive each other in the world market, the latter may lose. Moreover, FDI in a specific sector will yield spillover effects of the kind envisioned by the new theory to the rest of the exportable sectors, which improves the export competitiveness of all exportables. The economy and exports grow because new ideas generate more new ideas.

In my judgement, Professor San, intends to test the proposition described above with a special reference to the case of Taiwan and China. China hosts Taiwan's investment, and an apparel industry is chosen as a specific sector. The first question raised in his paper is how the Taiwanese outward investment to China affects the total export performance of both countries. The second one is how the Taiwanese outward investment to China in an apparel industry affects the export competitiveness of apparel products of each country in the world market, particularly in the US market. The third one is related to the relevance of the indirect trade between two countries to Chinese export performance in all industries and in an apparel industry only.

His answer to the first question is that the Taiwanese outward investment to China is positively related to the total export performance. This estimated result is the one predicted by the theory where FDI are beneficial in both host and investing countries. In particular, it reflects spillover effects of FDI suggested by the endogenous growth model. However, I doubt the credibility of the estimated results mainly because of misspecified analytical framework for estimation. The explanatory variables in equations (1) and (2) in the text are not the variables representing the determinants of total exports. Let me modify the equation for estimation for total exports and express it as a functional form as follows:

$$REX_i = f(REER_i, RY_i, OTHERS_i) \quad i = \text{Taiwan, China} \tag{1}$$

where REX_i = i's real value of total exports, $REER_i$ = i's real effective exchange rate, RY_i = real income of i's major trading partners, and $OTHERS_i$ = other factors relevant to i's total exports. The main determinants of real export values of an economy are real effective exchange rate (the relative prices of goods and service between home and major trading partners) and the purchasing power of importers. The variable *OTHERS* may include *FDI* and *IT* in the text to test the hypothesis that the Taiwanese outward investment to China and the indirect trade are associated with the total export performance of each country.

In fact, I doubt we can get any meaningful results from estimating even this functional form since the magnitude of the Taiwanese FDI to China was very small relative to the total inflows of FDI to China. The cumulative amount of the former up to 1991 was US$754 million while the contracted amount of the latter being US$11,977 million in that year only (Edward K.Y. Chen 1993, Table 13). Professor San, manipulated the registered amount of investment for estimation through adjusting the scale of its absolute amount since it is believed to be underestimated. As shown in his experience, this manipulation of data does hardly change the results that are estimated with original data. What I mean by doubtful estimated results is that the amount of the Taiwanese outward investment to China is too small to affect China's export performance.

Professor San's answer to the second question is that the Taiwanese outward investment to China in an apparel industry adversely affect its export competitiveness in the US market for both countries. This estimated result is contradicted with the prediction of the theory in which FDI in a sector will enhance its export competitiveness in host countries. Why? The opposite result may be attributed to the analytical framework, again.

Before discussing the estimated equation for the second question, let me comment on equations (3)-(5) in the text. For FDI oriented to the export market as in China, important considerations for investors are production and transportation costs, accessibility of markets and supplies and stable exchange rates. In this sense, equation (3) has relevant explanatory variables to estimate the determinants of *FDI*. However, equation (5) which describes the determinants of the indirect trade between Taiwan and China may not be justified as a credible equation for estimation since the characteristics of the direct and indirect trade both base on comparative advantages among traders. As expected, his estimation of equation (5) produces few statistically significant estimat-

ed coefficients for all cases. Instead of *EXCH* and *WAGE* in equation (5), more relevant explanatory variables shall be real income(or industrial production index) of each country, and real exchange rate deflated by unit labor costs.

Turning to the second question, the main determinants of the export performance of apparel products of both countries in the US market should be the relative export prices of their products (of course, measured in US dollar terms) and the purchasing power of the US. Let me modify equation (6) and (7) in the text as a following functional form:

$$RCA_i = g((TP/CP), RYUS, OTHERS_i) \quad i = \text{Taiwan, China} \qquad (2)$$

where *RYUS* denotes real income of the US and *OTHERS* may include *FDI* and *IT* as in the text. In fact, Taiwan and China both compete with the third countries in apparel exports in the US market so that we may substitute ((*TP*/*IUV*), (*CP*/*IUV*)) for (*TP*/*CP*) in (2) where *IUV* stands for US import unit value for apparel products.

Finally, the estimated results for the third question imply that the indirect trade between two countries has been beneficial to Chinese export performance in not only all industries but an apparel industry, as expected. However, this conclusion must be interpreted with caution as discussed above.

Overall, Professor San wrote an interesting paper in which the proposition suggested by the theory was tested with the case of the Taiwanese outward investment to China. However, the analytical framework for test must be modified to produce credible estimated results with given data. Moreover, econometric exercises must be undertaken with precisely defined data and present estimated statistics such as test information on error terms. Finally, it may be interesting to estimate the extent to which the total inflows of FDI for Taiwan and China have been relevant to their own export performance and economic growth. That is, I suggest that we investigate the new role of foreign capital in economic development of capital-importing countries.

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