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Adversaries and Partners

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THE CROSS-STRAIT ECONOMIC RELATIONSHIP'S IMPACT ON DEVELOPMENT IN TAIWAN AND CHINA

Adversaries and Partners

_____ Douglas B. Fuller
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Abstract

This paper evaluates the impact of ongoing cross-strait economic integration on the development of China and Taiwan. The overall impact has been positive for both economies. Taiwan's industrial employment remains robust even as it transforms into a knowledge-based economy. Taiwanese investment has spurred China's technological development.

Keywords: Taiwan, China, economic development, economic integration, cross-strait relationship

Introduction

This article assesses the impact of trade and investment across the Taiwan Strait on the economic development of Taiwan and China,¹ and finds that the benefits for each side have outweighed the costs thus far. While there have been fears of hollowing out of manufacturing in Taiwan² with the

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1. In this article, the Republic of China (ROC) will be referred to as Taiwan and the People's Republic of China (PRC) will be referred to as China for no other reason than that these terms are a convenient shorthand for these two economies.

2. In the Taiwanese context, hollowing out has been seen as the loss of manufacturing production and jobs. Many Taiwanese, including prominent officials and economists, such as *Asian Survey*, Vol. 48, Issue 2, pp. 239–264, ISSN 0004-4687, electronic ISSN 1533-838X. © 2008 by The Regents of the University of California. All rights reserved. Please direct all requests for permission to photocopy or reproduce article content through the University of California Press's Rights and Permissions website, at <http://www.ucpressjournals.com/reprintInfo.asp>. DOI: AS.2008.48.2.239.

opening of trade with China following the latter's accession to the World Trade Organization (WTO), this article argues that Taiwan has adjusted remarkably well to increasing trade with and investment in China. For the Taiwanese, even in some sectors, such as manufacturing employment, where one might expect to see severe economic dislocation and adjustment, the effects have been relatively minor. From China's vantage point, there have been charges that foreign investors, including Taiwanese,³ have come to dominate China's economy, particularly its export sector, even as these foreign investors have brought little actual technology and knowledge to China.⁴ This article will provide evidence that Taiwan has in fact played a critical role in boosting China's technological development, despite charges to the contrary. Nonetheless, the gains from integration are not the only story in the cross-strait economic relationship. There were also costs to this increasing integration and disappointments in areas where benefits had been expected. First, this article will present the historical development and general statistics of the cross-strait economic relationship. Then it will examine the economic impacts of integration on Taiwan and China. Finally, the conclusion will consider the sustainability of current trends.

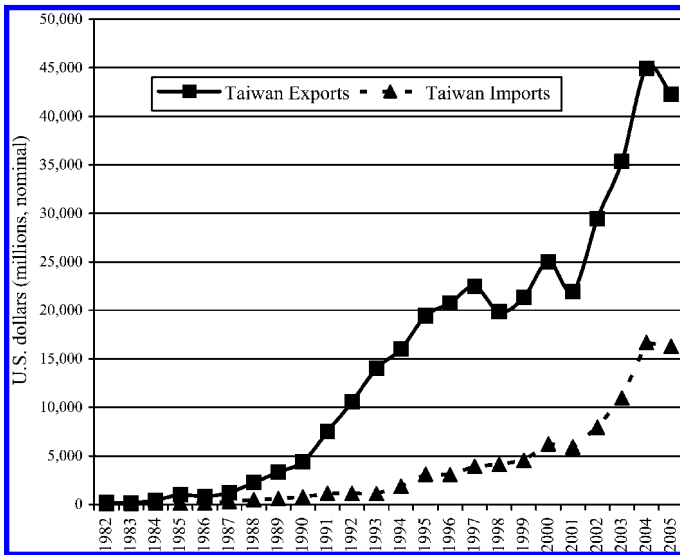
1. The Historical Development and Current Magnitude of Cross-Strait Economic Ties

The initial reaction of Taiwan's government to the beginning of reforms in China was to completely ban imports from and exports (even indirect ones) to the PRC. Over the course of the 1980s, the Taiwanese government gradually loosened restrictions on investment and trade, even as China continued to open up its economy to both. In 1985, indirect exports channeled through Hong Kong were legalized, and unofficial Taiwanese tolerance of small-scale investments in mature industries emerged. With the lifting of martial law in 1987, Taiwanese were permitted to visit China for the first time since the end of the civil war in 1949. This new regulation, combined with capital

the former head of the Council on Economic Planning and Development (CEPD) Chen Bo-zhi, have raised the specter of Taiwan's hollowing out as resources flow from Taiwan to China. See "Xuezhe Guandian: Fangxiang Zhengque, Qidai Dianfan" [Scholar's viewpoint: Direction is correct, expecting a (new) model], at CEPD's website, <http://www.cedi.cepd.gov.tw/document_info.php?fPath=13_386&documents_id=925&CediID=399a00bd0eaea7709e96d8f6ca01a40d>, accessed February 26, 2008.

3. The investors from Taiwan, Hong Kong, and Macao are treated as their own category of investors separate from both domestic and foreign investors in the Chinese government's statistical data. But for most important purposes, such as tax breaks and sectoral restrictions on investment, they are given treatment equivalent with foreign rather than domestic firms.

4. Yasheng Huang, *Selling China* (New York: Cambridge University Press, 2003).

FIGURE 1 *China-Taiwan Bilateral Trade*

SOURCE: Mainland Affairs Council, ROC, based on statistical data from the PRC and Taiwan, available at <<http://www.mac.gov.tw/big5/statistics/em/>>, accessed February 27, 2006.

outflows in the context of the appreciation of the New Taiwan Dollar following the 1985 Plaza Accords, opened up significant investment and trade opportunities with China. As always, legalization trailed actual trade and investment flows—Taiwan only issued regulations permitting indirect trade, investment, and technical cooperation with Mainland China in 1989.

With growing investment in China, the Taiwanese government in 1990 decided to increase its supervision of flows of technology and capital to China by requiring that all investments over US\$1 million be registered with the Ministry of Economic Affairs' (MoEA) Investment Commission (see Figure 1). Investors were prohibited from investing in certain “valued” industries and a list of prohibited investments was created. In 1996, in the face of continuing investment in China including from Taiwan’s prized electronics sector, Taiwan President Li Denghui announced his Jieji Yongren (No Haste, Be Patient) policy that introduced new regulatory hurdles for investment in the mainland. Investment was capped at US\$50 million for each investment, and technology-sector investment had to be approved on a case-by-case basis. This was simultaneously a liberalizing move (items were moved off the prohibited investment list) and a constraining one, in

that investments still had to be vetted by the commission. These regulations established a pattern that would be repeated time and again. Each round of expanding China investment alarmed the Taiwanese government, which would try to regain some control over the flow. But demands for a freer hand from the Taiwan business community meant that regulations were never strict enough to truly impede the cross-strait economic relationship.

This cycle repeated itself once again when Chen Shuibian came to power in 2000, because the sectoral shift of investment (see Figure 2) worried the Taipei government. Whereas in the early years of legal investment a mix of sectors invested in China, in more recent times the electronics industry came to dominate the effort. More worrisome for Taiwanese officials was the increasing investment in higher value-added parts of the electronics industry from the late 1990s onward.⁵ Even the notebook computer segment began to move production to China, despite specific Investment Commission prohibitions against this. While these prohibitions were still officially in force, this author visited a number of major Taiwanese manufacturers' plants in China where notebooks were being produced.⁶

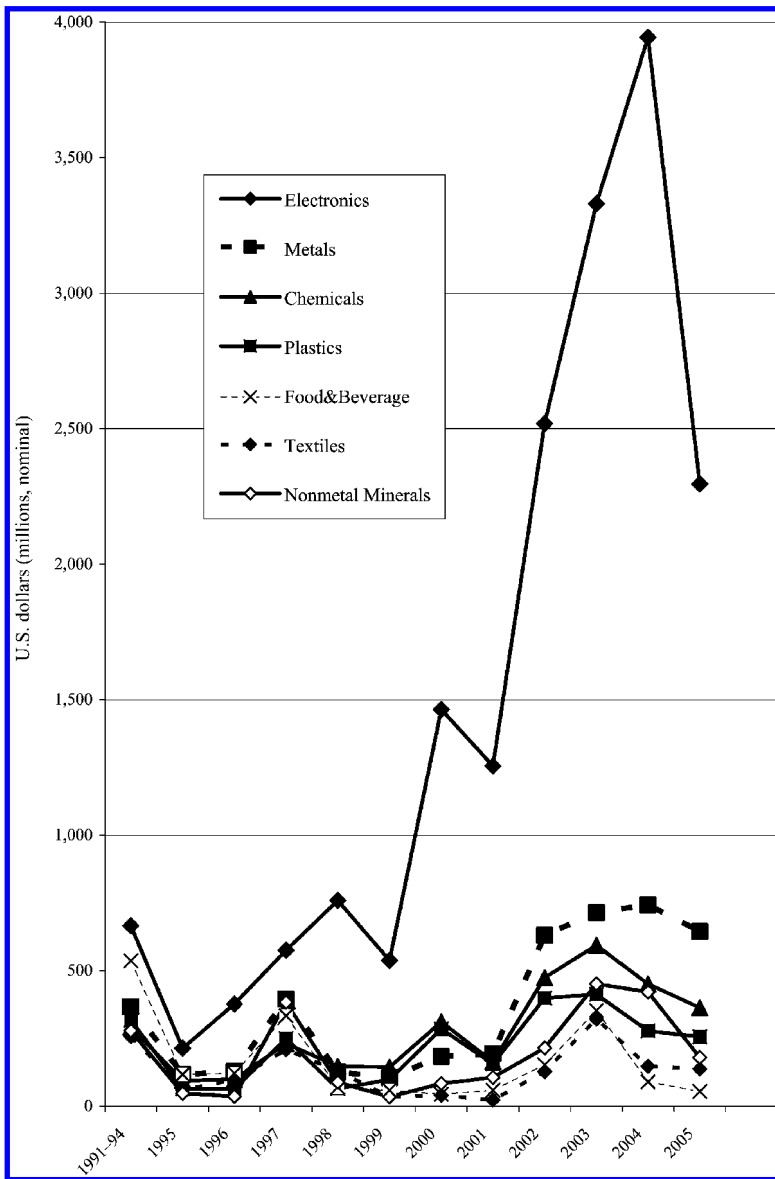
The Taiwanese government was alarmed by these business trends, yet the business community demanded greater access to investment in China because of competitive pressures pushing Taiwanese manufacturers to make use of China's relatively cheap labor.⁷ Chen Shui-bian, after convening a conference with business leaders, in August 2001 announced his Jiji Kaifang, Youxiao Guanli (Active Opening, Effective Management) policy toward economic integration with China. The liberalization measures announced were substantial: the US\$50 million investment cap was scrapped, the investment cap was lifted to equal 40% of a firm's total worth, direct investment was permitted, the bar requiring investment approval was raised to US\$20 million, and the prohibited investments list was reduced. However, some of the measures took a year to implement, and it was not

5. Douglas B. Fuller, "The Changing Limits and the Limits of Change: The State, Private Firms, International Industry, and China in the Evolution of Taiwan's Electronics Industry," *Journal of Contemporary China* 14:44 (2005), pp. 483–506.

6. Some firms tried to justify their production of notebooks through a loophole in Taiwanese law. The law defined Taiwanese notebook computer generations by the central processing unit (CPU) used, e.g., Intel Pentium 2. Some firms claimed to manufacture notebooks without placing the CPUs in them in China. However, this author's observations in plants in China indicate that these CPU-less notebooks were not the only Taiwanese notebooks produced in China.

7. Michael Chase, Kevin Pollpeter, and James Mulvenon, "Shanghaied? The Economic and Political Implication of the Flow of Information Technology and Investment across the Taiwan Strait," RAND, Technical Report 133 (July 2004). This report covers the wage pressures to move production to China historically (pp. 3–9) and in recent years (pp. 13–14 and 71–72).

FIGURE 2 *Investment by Sector*



SOURCE: Investment Commission, MoEA, ROC, at <<http://www.moeaic.gov.tw/>>, accessed February 27, 2006.

clear which prohibited items would be legalized. Conflicts between government and business over the details played out across several sub-sectors of electronics.⁸ The end result was the same: partial liberalization with continued restrictions or clarifications of restrictions. This compromise gave the business community some of what it wanted while partially assuaging the government's concerns about hollowing out.

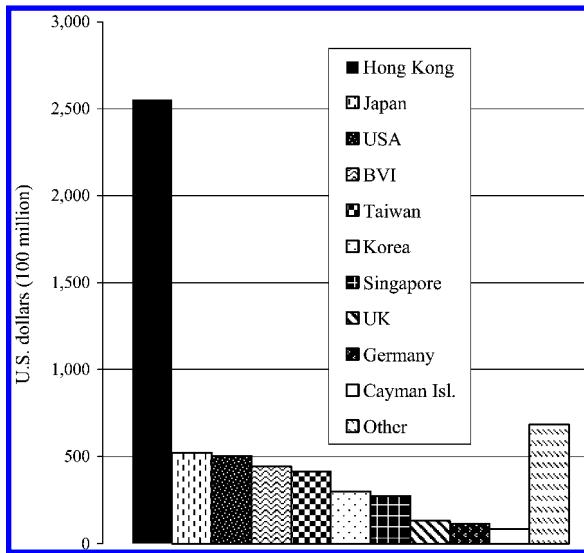
The cycle of increased integration followed by generally ineffective state attempts to manage the cross-strait economic relationship continued in President Chen's second term. At the beginning of 2006, Chen announced a change in economic policy by shifting the focus and scrambling the words of his previous policy. The new policy was Youxiao Kaifang, Jiji Guanli (Effective Opening, Active Management) and promised a tightening up of actual supervision of Taiwanese investment in China. And yet, when Chen convened an economic summit between his administration and business leaders in Taiwan, no breakthroughs were made either in terms of further regulation, as hoped for by Taiwanese independence supporters, or further liberalization, as pushed for by Taiwanese business people. In short, the cross-strait economic policy debate had reached a stalemate.⁹

While the sheer volume of investment and trade demonstrates the increasing importance of China to Taiwan's economy, investments from Taiwan also have become a large proportion of China's growing foreign direct investment (FDI) inflows. In nominal terms reported by China's government, Taiwan's is the fifth largest source of FDI in China. However, the data seriously underestimate Taiwan's role, for two reasons. First, much of Taiwan's investment has flowed through Hong Kong, which helps to explain why the former colony's quite small economy has contributed by far the largest amount of FDI. Second, as Taiwanese investors, especially those investing in items on the prohibited list, came under increasing scrutiny from the Taiwanese government, they began to move their indirect investments through discreet offshore banking locations in the Caribbean.¹⁰ This movement of Taiwanese funds also explains why minor economies such as the Cayman

8. For the semiconductor case, see Chyan Yang and Shiu-wan Hung, "Taiwan's Dilemma across the Strait: Lifting the Bar on Semiconductor Investment in China," *Asian Survey* 43:4 (July/August 2003), pp. 681–96.

9. Hwee Hwee Ong, "Taipei Economic Forum Fails to Reach Consensus," *Straits Times*, July 29, 2006.

10. Witness, for example, the case of the Semiconductor Manufacturing International Corporation (SMIC). This Taiwanese-invested firm built a 200mm wafer fabrication facility (a plant for manufacturing semiconductor chips) in China when it was still illegal to do so under Taiwanese law. The firm registered in the Caribbean to place itself beyond the reach of Taiwanese authorities. The Taiwanese government has since threatened the founder, Richard Chang, with arrest if he enters Taiwan.

FIGURE 3 *China's Cumulative Realized FDI, 1979-October 2005*

SOURCE: Mainland Affairs Council, ROC, based on PRC data, at <www.mac.gov.tw/big5/statistics/em/156/29.pdf>, accessed February 27, 2006.

Islands and the British Virgin Islands (BVI) have been among the top 10 largest investors in China over the reform period (see Figure 3). When one includes the Taiwanese FDI to China coming through these regions, it is likely that Taiwan is actually the second largest source of China's FDI after Hong Kong. Taiwan probably accounts for over 10% of China's cumulative US\$610 billion in FDI; some estimates place Taiwan's contribution as high as US\$150 billion.¹¹ Even with such large flows of trade and capital, the question remains what impact these flows have on each economy. The next two sections address that question for Taiwan and China, respectively.

2. The Impact of Economic Integration on Taiwan: Triumphs of Adjustment

In evaluating Taiwan's economic integration with China, three issues are paramount: the extent of hollowing out of its industrial base and employment, Taiwan's successful industrial adjustment, and the disappointment

11. Ong, "Taipei Economic."

of Taiwanese business in pursuing the “China Dream”¹² of conquering that potentially huge market.

2.1 The Absence of Hollowing out in Taiwan

Fears of the hollowing out of domestic industry are precisely fears of the loss of manufacturing jobs. Thus, one needs to examine industrial employment to look for evidence of hollowing out. What is most striking about the Taiwanese case is how minimally integration with China has harmed industrial employment (defined in Taiwanese statistics as manufacturing, mining, utilities, and construction employment). It is in the area of industrial employment where one would expect cheap low-skilled Chinese labor to displace less-educated Taiwanese workers as Taiwan and China furthered their economic integration through increasing trade and investment flows. In fact, comparing 1991 to 2005, Taiwanese industrial employment has actually risen slightly in absolute numbers, and industry has only experienced a slight decline in its overall share of employment (see Table 1). Even with the increasing employment of guest workers in the industrial sector from 1992 onward, there was less than a 1% decline in the number of locals employed in industry between 1992 and 2005. Indeed, the only year where more locals were employed in industry than 2005 was 1992.¹³ All of this evidence suggests that fears of the hollowing out of Taiwan’s industry and employment have been highly exaggerated.

Distinguishing manufacturing employment from the broader category of industrial jobs, the same pattern of robust employment holds. Manufacturing employment in Taiwan peaked at 2.8 million workers in 1987, well ahead of the shift of manufacturing plants to China.¹⁴ The gentle de-

12. The phrase “China Dream” denotes the dream of selling billions of products to China’s large population and has been used by a number of commentators on China’s economy and business environment. For example, see Joe Studwell, *The China Dream: The Quest for the Last Great Untapped Market on Earth* (Boston: Atlantic Monthly Press, 2002); and James McGregor, *One Billion Customers: Lessons from the Front Lines of Doing Business in China* (New York: Free Press, 2005), p. 2. The Taiwanese have also used similar phrases to denote the same “China Dream.” See, for example, “Xijin Taojinmeng Sui, Taishan Xian Huiliu Qushi” [Go west gold rush dream broken, now a trend of Taiwanese businessmen returning home], *DaJi Yuan* [Epoch Times], October 6, 2005, <www.epochtimes.com/gb/5/10/6/n1076694.htm>, accessed May 22, 2007.

13. See Council of Labor Affairs, ROC, at <<http://www.cla.gov.tw>>, for the foreign labor employment by sector; and Directorate-General of Budget, Accounting, and Statistics, ROC, at <<http://www.dgbas.gov.tw>>, for the overall employment by sector. Both websites were accessed on February 27, 2006.

14. Manufacturing employment data in this paragraph are from the *Statistical Yearbook of the Republic of China*, available online at <<http://eng.state.gov.tw/public/data/dgbas032/bs2/yearbook-eng/y0251.pdf>>, accessed July 9, 2007.

TABLE 1 *Employment in Taiwan, 1991–2005* (in thousands of workers, unless otherwise noted)

Year	Total Employment	Foreign Total	Local Total	Industry	Industry %	Foreign Industry	Local Industry	Service Total	Service %
1991	8,439	NA	NA	3,370	39.93	NA	NA	3,977	47.13
1992	8,632	16	8,616	3,419	39.61	15.27	3,403.73	4,148	48.05
1993	8,745	98	8,647	3,418	39.08	90.07	3,327.93	4,323	49.43
1994	8,939	152	8,787	3,506	39.22	137.54	3,368.46	4,456	49.86
1995	9,045	189	8,856	3,504	38.74	170.15	3,333.85	4,587	50.71
1996	9,068	237	8,831	3,399	37.49	205.37	3,193.63	4,751	52.39
1997	9,176	248	8,928	3,502	38.17	207.75	3,294.25	4,795	52.26
1998	9,289	271	9,018	3,523	37.92	216.53	3,306.47	4,944	53.23
1999	9,385	295	9,090	3,492	37.21	219.22	3,272.78	5,118	54.54
2000	9,491	327	9,164	3,534	37.23	219.48	3,314.52	5,220	54.99
2001	9,383	305	9,078	3,377	36	190.82	3,186.18	5,299	56.48
2002	9,454	304	9,150	3,332	35.24	180.34	3,151.66	5,413	57.25
2003	9,573	300	9,273	3,334	34.83	176.01	3,157.99	5,543	57.9
2004	9,786	314	9,472	3,446	35.21	179.85	3,266.15	5,698	58.23
2005	9,942	327	9,615	3,558	35.79	179.84	3,378.16	5,793	58.27

SOURCE: Council of Labor Affairs, ROC, at <<http://www.cla.gov.tw>> for the foreign labor employment by sector; and Directorate-General of Budget, Accounting, and Statistics, ROC, at <<http://www.dgbas.gov.tw>> for the overall employment by sector. Both websites were accessed on February 27, 2006.

cline in manufacturing jobs did, however, coincide with the revaluation of the New Taiwan Dollar, which took place from 1985 to 1987 in the wake of the Plaza Accords. In 2005, Taiwan still had 2.7 million manufacturing jobs, higher than any year after 1989. Even taking into account foreign laborers,¹⁵ 2.55 million domestic workers were employed in manufacturing in 2005, higher than any year since 1992. Contrast this with Hong Kong's experience, where manufacturing employment collapsed as factories moved to China.¹⁶

As for overall employment, despite the twenty-fold increase in foreign guest workers between 1992 and 2005, the ability of Taiwan to employ almost one million more local workers in 2005 than in 1992 (an almost 12% increase in numbers of Taiwanese employed) is impressive. Most of the employment increase was in the service sector, but that is to be expected in a maturing economy.

Employment is only part of the story. One also needs to examine trends in income distribution across the population to see if economic integration has led to declining wages for industrial workers despite overall robust levels of employment. Integration has not been entirely painless for Taiwanese workers despite Taiwan's excellent employment performance. As should be expected when an economy with higher wages integrates with another with generally lower wages, Taiwan has experienced increasing wage inequality in recent years. As measured by the Gini index, a widely accepted measure of income inequality in which a lower number signifies more equality in income distribution,¹⁷ Taiwan's inequality has increased

15. Data on foreign laborers in manufacturing are taken from the Council of Labor Affairs, ROC, available at <<http://statdb.cla.gov.tw/html/year/d11030.pdf>>, accessed July 9, 2007. Given that the data prior to 2001 on foreign workers cited in this article do not separate out manufacturing employment from other types of industrial employment, the assumption used here is that the pattern of over half the foreign industrial workers working in manufacturing during 2001 to 2005 also holds true for the earlier years.

16. Stephen W. K. Chiu and Ching Kwan Lee, "After the Hong Kong Miracle: Women Workers under Industrial Restructuring," *Asian Survey* 37:8 (August 1997), p. 56, shows that Hong Kong's manufacturing employment fell by more than half between 1987–95. According to Hong Kong's government, it more than halved again between 1995 and 2005 and was just 5.3% of total employment in 2005. Government data are available at <<http://www.censtatd.gov.hk>>, accessed May 22, 2007.

17. To obtain the Gini index, the Gini coefficient is multiplied by 100. Using the Gini index is superior to looking at average wage levels when examining the problem of hollowing out for two reasons. First, the Gini index captures the distribution of income across the population rather than simply the average of all wage earners. Second, hollowing out would predict increased inequality (precisely what the Gini index measures) as lower educated manufacturing workers become disproportionately unemployed, but because average wage rates do not necessarily provide data on such inequality, wage data cannot capture hollowing out-driven inequality.

from a low of 27.7 in 1980 to approximately 34 in recent years.¹⁸ However, it must be noted that Taiwan's high point of inequality in recent years was in 2001, during the bursting of the Internet bubble, when Taiwan's Gini index was 35.0. Thus, increasing trade with China cannot be the only culprit in terms of Taiwan's increasing inequality of income distribution. Indeed, more than half of the increase in inequality as measured by the Gini index had occurred by 1990 when the Gini index reached 31.2, even though economic integration with China was still in its infancy at the time. Furthermore, the recent years of heightened integration have witnessed relatively stable income distribution with a trend of slightly declining income inequality since 2001. Moreover, Taiwan's Gini index places its level of income inequality roughly in the middle of the advanced economies, in recent years. Indeed, despite an incomplete welfare state, Taiwan's inequality is still lower than that of the major neoliberal Anglo-American economies, if higher than that of the social democratic welfare states of Northern Europe.¹⁹

Overall, Taiwan's purported hollowing out seems more myth than reality. Industrial employment remains high. Income inequality has been relatively stable and moderate, compared to the rest of the advanced industrial economies, during a period when more Taiwanese manufacturing has moved to China and Taiwan has opened up its economy, as mandated under the agreement for its 2002 entry into the WTO. This trend of stable income distribution sustained over time, combined with continued high levels of industrial employment, suggests that Taiwan is neither hollowing out nor simply preserving industrial employment by lowering the wages of industrial workers.

2.2 Public and Private Initiative in Taiwan's Industrial Adjustment

The fact that Taiwan has run a large and generally growing trade surplus with China (see Figure 1) helps explain why Taiwan's industrial employment

18. The Gini index was 33.85 in 2004 and 34.0 in 2005. More recent years are not yet available. The Gini data for Taiwan are from the Council of Economic Planning and Development, *Taiwan Statistical Data Book, 2007* (Taipei: Council of Economic Planning and Development, 2007), p. 20. As this source rounds up to the nearest tenth for the Gini index, the more precise figure of 33.85 for 2004 was from the Asian Development Bank, *Key Indicators, 2007*, vol. 38 (Manila: Asian Development Bank, 2007), p. 32, although the year was incorrectly listed as 2003 in this source.

19. The comparison of Taiwan and other advanced countries is based on data from John Weeks, "Inequality Trends in Some Developed OECD Countries," Organization for Economic Cooperation and Development, Department of Economics and Social Affairs (DESA), Working Paper, no. 6, October 2005.

has not declined in the face of increasing economic integration. But this still begs the question of how Taiwan accomplished this feat of exporting manufactured goods to China, the “workshop to the world.” This feat is all the more impressive when one considers that the core of Taiwan’s industry, electronics, has seen its manufacturing move to China.²⁰ For example, manufacturing of personal computers (PCs), the heart of Taiwan’s electronic end-products sector, has moved completely out of Taiwan except for pilot production (author interviews).²¹

Taiwan has avoided many adverse consequences of manufacturing’s move offshore because it has been able to create new competitive advantages in certain segments of electronics and maintain existing competitiveness in one key component, semiconductors. Even in less technology-intensive and more labor-intensive industries, such as auto parts and bicycles, Taiwan has maintained its competitive edge. In technology-intensive sectors, Taiwan’s government has played a crucial role in industrial adjustment; the following section will examine both private and public initiatives in this process.

To understand how Taiwan adjusted in the key electronics sector, this section examines three industry segments (semiconductors; flat-panel displays, known as active matrix liquid crystal displays [AMLCDs];²² and mobile devices) and the new policy to attract multinationals’ (MNCs) research activities to Taiwan. These cases demonstrate that through a mix of private and public initiatives, Taiwan’s electronics sector has been able to shift to new competencies and maintain existing strengths despite the move of computer manufacturing offshore, principally to China.

In 2000, two groups of Taiwanese semiconductor engineers announced plans to create foundries, firms that fabricate but do not design their own semiconductor chips, in China. From that time on, the Taipei government has been alarmed by the prospect of China threatening one of the most technology-intensive areas where Taiwan is competitive. Indeed, Taiwan for years has dominated the international foundry industry, routinely representing over 70% of the global foundry market.²³

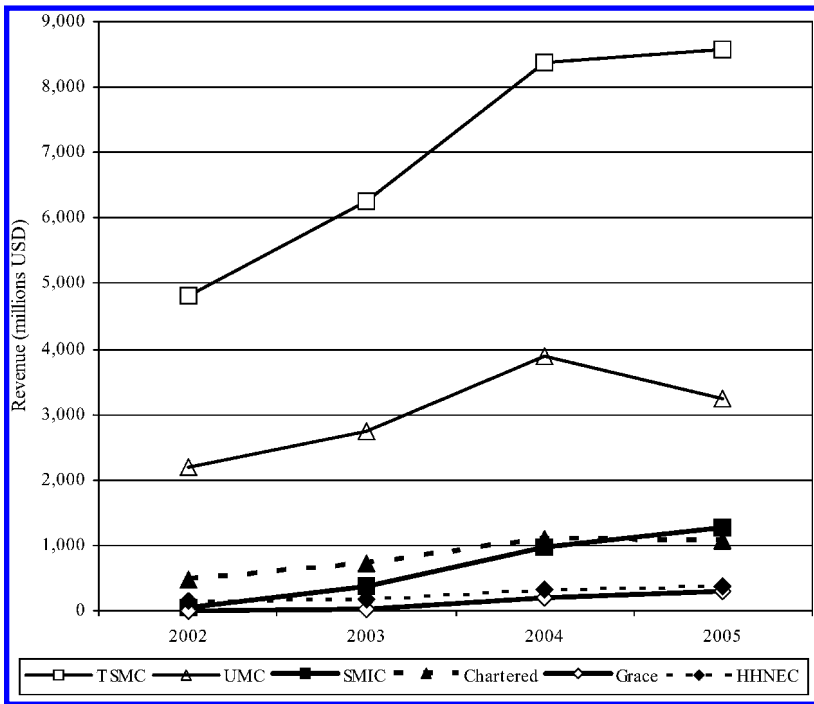
One of the two new foundry start-ups in China, Semiconductor Manufacturing International Corporation (SMIC), has been quite successful in

20. Douglas B. Fuller, Akintunde I. Akinwande, and Charles G. Sodini, “Leading, Following, or Cooked Goose: Explaining Innovation Successes and Failures in Taiwan’s Electronics Industry,” *Industry and Innovation* 10:2 (2003), pp. 179–96.

21. Interviews with electronics companies in Taipei, Taoyuan, Hsinchu, and Tainan, in 1999, 2000, 2002, and 2003.

22. Technically, AMLCDs are only one type of flat panel displays, but the media often use flat panel displays to refer specifically to AMLCDs.

23. Fuller, “The Changing Limits.”

FIGURE 4 *Foundry Revenue, 2002–2005*

SOURCE: IC Insights data provided by an interview subject.

ramping up production, increasing sales revenue, and boosting its market share since production started in 2002.²⁴ However, SMIC has not threatened the commanding position of Taiwan's foundry giants, Taiwan Semiconductor (TSMC) and United Microelectronics (UMC). These firms continue to increase their revenues and command imposingly large shares of the global foundry market (see Figure 4). That market continues to grow as more and more semiconductor firms outsource their production to foundries. Thus, SMIC's gain has not been TSMC's and UMC's loss. Instead, SMIC has displaced the leaders' perpetual and distant follower, Singapore's Chartered, as the third largest foundry. Grace, the other Taiwanese-run, China-based

24. For a case study of SMIC, see Douglas B. Fuller, *Creating Ladders out of Chains: China's Technological Upgrading in a World of Global Production*, Ph.D. diss. (Massachusetts Institute of Technology, 2005).

foundry, and China's domestic champion, Huahong NEC (HHNEC), are still very small players in the global foundry market.

Given the skill-intensive demands of semiconductor fabrication and the developed competencies in Taiwan's large engineering community, there has been little incentive for the Taiwanese semiconductor industry to mimic the rapid shift overseas of Taiwan's computer manufacturing. SMIC appears to have developed a successful model of bringing skilled Taiwanese engineers to China to train local persons, but the fact remains that TSMC and UMC each have only one fabrication facility in China. Indeed, when TSMC and UMC have set up fabrication plants overseas, they generally have gone to advanced industrial countries where skilled engineers are located. TSMC has its own plants or joint ventures in Singapore and the U.S. UMC has its own plants or joint ventures in Japan and Singapore. These facilities have more total capacity than these firms have in China. Furthermore, most of their production capacity remains in Taiwan.

Although the Taiwanese state originally created both TSMC and UMC, the continued competitiveness of its semiconductor fabrication has had little to do with government policy beyond preferential tax treatment. On the contrary, the one recent government initiative in semiconductor fabrication technology was undermined and ultimately abandoned because of the refusal of TSMC and UMC to take part.²⁵ Nevertheless, in moving into new segments of the electronics industry, Taiwan's government has continued to play a critical role. In particular, the quasi-governmental Industrial Technology Research Institute (ITRI) has continued to diffuse new technologies to industry, which then blossom commercially. ITRI's approach to technological diffusion and upgrading has been to master advanced foreign technologies in its own labs and then diffuse them. This diffusion typically takes one of two paths. ITRI either spins off researchers from these labs into new commercial ventures or it transfers the technologies (often along with staff) to existing firms that supported or collaborated on the research. This so-called ITRI model of technological upgrading has been well documented,²⁶ but its continued effectiveness has been questioned. Fortunately for Taiwan, the cases of AMLCDs and mobile technologies indicate that the ITRI model still works.

For AMLCDs, ITRI was less of a major force than has been typical in the past. Most of the Taiwanese AMLCD firms received their technology directly from Japan rather than from ITRI. However, the research institute

25. See Fuller, "The Changing Limits"; and Fuller et al. "Leading."

26. Dan Breznitz, *Innovation and the State* (New Haven, Conn.: Yale University Press, 2007); John A. Mathews, "Origins and Dynamics of Taiwan's R&D Consortia," *Research Policy* 31(2002), pp. 633–51; Fuller et al., "Leading"; and Fuller, "The Changing Limits."

did play an active role in training engineers in AMLCD manufacturing techniques.²⁷ Consequently, Taiwan grew from being a nonentity in the global display industry in 2000 to the largest producer of AMLCDs in the world today.²⁸

What is interesting about the distribution of this relatively new Taiwanese industry is how quickly production has moved to China. As early as 2001, Taiwanese producers were building back-end LCD module plants in China. However, this distribution of the industry has been to Taiwan's advantage. The back-end module assembly is the labor-intensive part of the process. The actual making of the liquid crystal display is capital- and skill-intensive and remains in Taiwan. From the perspective of creating high-wage employment with the potential of creating technological spillovers, this type of cross-strait distribution of production is just what Taiwan should want.

ITRI has led the way in acquiring and transferring mobile technologies, such as cellular phone technology, to local firms by training local engineers through its Computer and Communication Research Laboratories (CCL). In fact, many of the computer firms, such as Quanta, Acer, and Compal, were able to benefit from ITRI's technology transfer to become major producers of mobile phones.

In contrast to ITRI's success in diffusing information technology (IT) knowledge to Taiwanese firms, the ITRI research units that are not connected to IT have been less successful in spurring local innovation. Instead, those mature manufacturing industries that have managed to stay competitive in the face of cross-strait integration, such as bicycle and auto parts manufacturing, have done so with little effective state support.

Although the bicycle industry has moved some production of mass-produced bicycles to China, it has kept the manufacture of higher value-added, custom bikes in Taiwan. Production of these bicycles relies on a dense network of specialized suppliers co-located in central Taiwan. In essence, for the custom bicycles the industry follows the Italian industry district model based on a network of small and medium enterprises (SMEs) with focused competencies; this is much harder to replicate in China. Thus, it is not surprising that much of the industry remains in Taiwan.²⁹

Other industries have taken a similar path. After-market auto parts (i.e., replacement parts) have been the driving force behind Taiwan's auto parts

27. This brief synopsis of the development of Taiwan's AMLCD industry relies heavily on the account in Fuller et al., "Leading."

28. "Taiwan Dogs Korea for LCD Share," *Business Week*, June 14, 2006.

29. This section is based on Michelle Hsieh, *The East Asian Miracle Revisited: The Taiwan-South Korea Comparison Based on a Case Study of the Bicycle Industry*, Ph.D. diss. (Department of Sociology, McGill University, 2005).

success story and the industry has received virtually no government technological help or guidance. In contrast to Taiwan's heavily protected and inefficient auto assembly industry, the after-market auto parts makers are focused on overseas markets. This focus has forced them to be efficient. Unlike in the case of auto assemblers, for auto parts the barriers to achieving technological independence have been relatively low because these parts are often readily reverse engineered. Yet, Taiwanese manufacturers have still been able to distinguish themselves from Southeast Asian and Chinese auto parts makers, which rely solely on cheap labor, because the Taiwanese have developed skills in electronic data exchange with their key retailers, primarily in the U.S., to receive, process, and track orders.³⁰ Despite the heavy reliance of Taiwan's domestic assemblers on imported parts, and falling protectionist barriers with Taipei's 2002 entry into the WTO, Taiwan in 2005 was still able to run a substantial trade surplus in parts because of its competitive after-market components. Taiwan's surplus was more than US\$1 billion, despite having over US\$2.5 billion worth of imports.³¹

Taiwan's most recent economic development plan, the "Challenge 2008" Six-Year Development Plan (2002–07), continued tax breaks for established technology sectors such as AMLCDs and semiconductors, but it also embarked on policies heretofore unseen in Taiwan. Breaking with historical practice of eschewing tax breaks to lure MNC research and development (R&D) activities,³² Taiwan has initiated a new aggressive push to recruit MNCs as well as local firms to establish R&D centers in Taiwan. From having virtually no such activities in the 1990s, a number of major technology firms such as Intel, Sony, and IBM have established 31 R&D centers—even while subsidies for these centers have been kept in check. These trends indicate this policy has been at least moderately successful thus far.³³ Because it spanned more than one presidential term, it is clear that this program was heavily influenced by Taiwan's economic bureaucracy in terms of planning as well as execution. Thus, even if Chen Shuibian had lost the 2004 presidential election, the plan would have remained in place.

30. Edward Cunningham, Teresa Lynch, and Eric Thun, "A Tale of Two Sectors: Diverging Paths in Taiwan's Automotive Industry," in Suzanne Berger and Richard K. Lester, eds. *Global Taiwan: Building Competitive Strengths in a New International Economy* (Armonk, N.Y.: M. E. Sharpe, 2005).

31. The data were provided by Mr. Chih-yen Tai, Industrial Economics and Knowledge Center (IEK), a unit of ITRI.

32. For Taiwan's past refusal to lure MNCs with incentives, see Douglas B. Fuller, "Globalization for Nation-Building: Taiwan's Industrial and Technology Policies for High-Technology Sectors," *Journal of Interdisciplinary Economics* 18 (2007), pp. 203–24.

33. Fuller, "The Changing Limits."

2.3 *Taiwan's Frustrated China Dream*

Taiwan's integration with China has not been without its setbacks. First and foremost, like many others, the Taiwanese have been gripped by the "China dream"—capturing a market of over one billion customers. And like most of those seized by this dream, the Taiwanese have often been disappointed.

The Taiwanese are in some sense uniquely dependent on the China dream and possess special advantages for attempts to realize it. This dependency arises because Taiwan's home market is quite small and has inhibited the development of globally competitive Taiwanese brands.³⁴ Thus, geographic and cultural proximity dictate that China is the logical "home" market of significant size for the Taiwanese to use to develop brands. The same geographic and cultural proximity also may serve as Taiwan's competitive advantage in utilizing China as its home market. These potential advantages only make realizing the China dream more critical for the Taiwanese, because there are not any realistic alternative home markets.

Several Taiwanese brands have been very successful in China. Giant Bicycle is the largest bicycle brand in China. Kang Shifu and President Group dominate the large instant noodles market and have extended their reach into other food and beverage products, such as bottled tea. Kang Shifu's success is particularly impressive because this firm was only a small-scale supplier of inputs for Taiwan's instant noodle firms before it set up its own instant noodle manufacturing operations in China. In contrast, President Group and Giant have simply extended their prevailing business operations to China.

The success of Taiwan's food and beverage firms in China illustrates the advantage that cultural proximity gives Taiwan in certain product areas. Similarly, in the media industry, cultural knowledge is critical. Outside of the food and beverage business, Taiwan's success in culture-intensive industries has been limited. In the media sector, this is because the PRC strictly prohibits majority ownership by non-domestic Chinese firms. Thus, while Chinese audiences like Taiwanese pop stars, Taiwanese media companies have little opportunity to take these cultural products and craft them into large media businesses, given China's regulations.

In China's electronics market, the performance record of Taiwanese brands is abysmal, particularly given the strengths of Taiwan's large electronics industry. The Taiwanese sector traditionally grew by manufacturing products for other brands, but a number of its firms have dreamed of creating their own brands in the Chinese market. The widely known Taiwan computer maker Acer has tried to become a major player in China for almost a decade. For all its efforts, the firm still commands only a small

34. Fuller et al., "Leading."

slice of the Chinese market. Until 2005, regulations prevented foreign firms from setting up their own retail distribution networks in China,³⁵ but protectionist measures were only part of the problem. Major international brands such as IBM, Hewlett-Packard, and Dell, were able to gain market share in China despite retail restrictions. However, the position of these firms in the global industry has differed markedly from Acer's: they offered higher-end models justified by their renowned brands, whereas lesser-known Acer had to compete on price points with local Chinese brands such as Lenovo and Founder.

For mobile phones, the other IT end-product where Taiwanese have become major international players, restrictions are even more stifling. Until 2005, China's Ministry of Information Industry (MII) restricted the number of foreign brands that could sell their mobile phones in China. That year MII installed a more open system that gave over 30 more firms rights to sell their own brands of mobile phones. Originally, only one Taiwanese maker, Dbtel, was able to sell its own brand of phones in China. Beijing's regulations clearly have not shown any favoritism to their Taiwanese compatriots: all the major international brands had licenses to sell in China, while the Taiwanese were kept out. To add insult to injury, Taiwan's Korean rivals, LG and Samsung, enjoyed licenses under the restrictive regime.

The irony is that China's techno-nationalist dreams of building world-class high-technology industries do not include Taiwan, ostensibly an integral part of China. Despite China's political and territorial claims regarding Taiwan, China's technology and economic policymaking apparatus has continued to regard Taiwanese and even Hong Kong-based firms as foreign firms when it comes to government support for strategic industries. Of course, firms from Taiwan, Hong Kong, and Macao have also benefited from the same lower tax rates enjoyed by foreign firms.³⁶ In effect, the Chinese government has been quite consistent in giving firms from these economies effectively the same treatment given to foreign firms.

Thus far, the dream of the China market has been somewhat of a disappointment for Taiwanese firms that had hoped to build a global brand from a major presence there. The future does not look very promising either. The restrictions on the media appear likely to remain in place, and China's openness to foreign brands means there is not much space to develop Taiwanese ones.

35. China was supposed to open distribution in December 2004 according to its WTO commitments. Instead, China opened them only in 2005 according to the U.S.-China Business Council, <<http://www.uschina.org>>, accessed February 27, 2006.

36. From January 1, 2008, the Chinese government has started gradually phasing out the preferential tax treatment of foreign firms, with the corporate tax rates of foreign and domestic firms targeted for unification at a 25% tax rate in 2012.

3. True Patriots

3.1 *How China Benefits from Cross-Strait Economic Integration*

Given the relative size of their economies, China's public debates about the economy are far less concerned about Taiwan than are Taiwanese debates about China. Still, commentary on Taiwanese investment has often been critical. Yasheng Huang's *Selling China: Foreign Direct Investment during the Reform Era* sees investment from the ethnic Chinese economies, a category that includes Taiwan, as bringing little technology or new knowledge to China. Taiwanese investors have often been accused of relatively egregious labor practices compared to other foreign investors in China.³⁷ This section will weigh the evidence about the impact of integration with Taiwan; it finds that on balance, Taiwan has made an overwhelmingly positive contribution to China's development, especially in the area of technology.

Given that 34% of Taiwan's reported investment in China is in IT³⁸—the actual figure is likely to be higher because Taiwanese IT investment is under-reported as companies try to avoid government restrictions on investment—examining the impact of Taiwan's IT investments in China is critical. Taiwan's investment has contributed dramatically to China's development because it features a significant technology component ignored by some critics of Taiwan's FDI, such as Yasheng Huang. This technology can be seen through two sets of data. First, the Taiwanese semiconductor industry is training significant numbers of engineers in China. Second, the R&D units of Taiwanese IT firms in China are becoming increasingly innovative as measured by the increasing number of U.S. patents produced by these China-based units.

Turning to the semiconductor industry, we will look at the design and fabrication aspects because these segments are more technologically intensive than assembly and packaging. As more and more firms have focused on design while outsourcing fabrication to foundries such as TSMC and UMC, the design segment has blossomed. In fact, fabless design houses (i.e., design firms without their own fabrication facilities) in the past 20 years have gone from producing 0.3% of global semiconductor revenue to producing 14%.³⁹ The spectacular growth of Taiwanese fabless design firms has made the island into the second largest center of fabless design after

37. Anita Chan, *China's Workers under Assault* (Armonk, N. Y.: M. E. Sharpe, 2001).

38. Government of the ROC, Mainland Affairs Council, <<http://www.mac.gov.tw>>, accessed February 27, 2006.

39. Jodi Shelton, "FSA Update: What's on the Mind of FSA CEOs?" (2003), Fabless Semiconductor Association (FSA), <<http://www.fsa.org>>, accessed February 27, 2006.

the U.S. Taiwan's share of global fabless revenue was 28% in 2004 and had doubled since 1996.⁴⁰

With this strong competitive position, one might think Taiwan would not need to expand to China, but the growing demand for design engineers forced Taiwanese fabless firms to look abroad. Except for a few brave pioneers in the late 1990s, the first wave of Taiwanese design firms invested in China in 2000. This was the critical year because Taiwan had experienced an Internet boom that lured many engineers away from chip design. The shrinking supply of engineers available to design firms at a reasonable price forced them to explore sources of engineers abroad. In addition to having geographic and cultural proximity, China has been producing large numbers of engineers,⁴¹ so the Taiwanese firms decided to explore this market.

Based on interviews⁴² with 58 design firms⁴³ in China employing approximately half of the country's overall design work force,⁴⁴ the Taiwanese firms were extremely active. They trained one-third of the local designers who were trained in actual design skills. In contrast, most Chinese firms did not teach their engineers anything but reverse engineering. The Taiwanese firms generally reported that local engineering graduates required more training than their Taiwanese peers but had a good basic engineering education, which made them highly responsive. At least seven of the top 10 largest Taiwanese design firms have design centers in China (see Table 2). Two others *may* have centers there, but Chinese subsidiaries of Taiwanese design firms are often hard to locate because their managers strive to hide their identities from the Taiwanese authorities, who maintain restrictions on investments in semiconductor design.⁴⁵

In semiconductor fabrication, the established Taiwanese foundries have made only a moderate contribution to training China's engineers because they each have only one factory in China. Instead, experienced Taiwanese

40. Ibid.

41. Robert Fogel, "Why China Is Likely to Achieve Its Growth Objectives," presented at the Institute of Government and Public Affairs Seminar, University of Illinois at Chicago, 2005.

42. By author, with the bulk of the interviews conducted in the years 2001–07, with a few initial interviews in 1998.

43. One of these firms has sold its design operation in China, and five other firms had only sales operations.

44. This estimate is based on an I-Suppli estimate of total Chinese designers and the numbers of engineers employed as reported by each firm during interviews.

45. For example, many Taiwanese firms use different names for their Chinese subsidiaries. Design investments are no longer banned, but they have restrictions on sophistication of design (measured in terms of the lithography width of fabrication process) done in China. Furthermore, many of the firms set up shop in China before it was legal to do so and therefore face legal problems if they report their activities to the Taiwanese Investment Commission now.

TABLE 2 *Taiwanese Design Centers in China*

<i>Revenue Rank among Taiwanese Design Firms</i>	<i>Name</i>	<i>China Design Team</i>
1	Mediatek	Yes
2	VIA	Yes
3	Realtek	Yes
4	Sunplus	Yes
5	Novatek	No
6	ALI	Yes
7	Elan	?
8	Elite	?
9	Faraday	Yes
10	Holtek	Yes

SOURCE: Author interviews.

chip engineers left these firms to set up new foundries in China. The two most prominent firms, Grace and SMIC, were founded in 2000 and have become two of the largest semiconductor manufacturers in China. SMIC is now the third largest foundry globally (see Figure 2). What SMIC and Grace really have contributed is work force training: most of the engineers at these firms are local. From 2001 to 2003, SMIC trained 800 local engineers to complement the 400 engineers it brought from Taiwan and elsewhere.⁴⁶ In contrast, the largest domestic Chinese firm, HHNEC remains reliant on Japanese engineering expertise.⁴⁷

In R&D of IT products, the important contribution of Taiwanese firms is also evident. Of the 939 corporate IT U.S. utility patents firms originating from China⁴⁸ and created by foreign MNCs, large Chinese firms, or Taiwanese firms, 689 are from Taiwanese firms, including Grace and SMIC.⁴⁹ More

46. This figure is based upon interviews and an internal report from China's Ministry of Science and Technology.

47. Fuller, *Creating Ladders*.

48. U.S. patents list the location of the patent inventor, so all U.S. utility patents with a China-based inventor were considered to originate from China. Only those patents created by inventors working for a foreign MNC, large Chinese IT firm, or Taiwanese firm were counted as part of the total of 939 patents in order to be able to measure the relative contributions of foreign MNCs, large Chinese firms.

49. The U.S. Patent Office awards utility and design patents. Design patents for the exterior appearance of a product are not technology-intensive so they were excluded. Most patents are invented and held by individuals. Corporate means those patents funded and owned by corporations. The patent data were accessed on May 9, 2006, at U.S. Patent and Trademark Office's database website, <<http://patft1.uspto.gov/netahtml/PTO/search-bool.html>>.

important, the Taiwanese firms show a much larger share of their patents coming from China than do other foreign firms. Among non-Taiwanese foreign firms, only Microsoft can claim to have even 1% of its U.S. utility patents originating from China. Five Taiwanese firms (Hon Hai, Inventec, UMC, Winbond, and SMIC) are among the top 10 U.S. IT utility patent holders from China, and all have at least 1% of their patents from their Chinese operations.

Several Taiwanese companies have explicitly embraced using China as a major base of operations beyond manufacturing. Inventec, a major computer manufacturer, calls its strategy the “Twin Towers” approach, with one tower in Taiwan and the other in China. Hon Hai, a major component and computer producer, has gone so far as to list its Chinese assets on the Hong Kong stock market in order to circumvent continued Taiwanese restrictions on total investment in China. Both Hon Hai and Inventec derive a large percentage of their U.S. utility patents from China, 18% and 32%, respectively. Hon Hai has a very large U.S. portfolio of almost 3,000 patents (comparable to the portfolio of a mid-sized U.S. technology company such as Seagate), proving that Hon Hai’s commitment to research in China is not trivial.

3.2 The Role of Venture Capital

Taiwan’s contribution is not limited to training local engineers and pursuing R&D activities in China. Taiwan’s venture capitalists have also contributed to China’s technological development. Major Taiwanese-backed venture firms such as Acer Venture Capital, Investar, China Merchant & Fortune Venture, and Sino-Century have invested in numerous technology start-ups based in China.

From interviews with eight local Chinese, five Taiwanese, and nine foreign venture capitalists, it is clear that the Taiwanese firms are making a qualitative difference in spurring technological development, through their selection of investment targets. The local Chinese venture capitalists are primarily state-owned financial vehicles with little experience or competence in selecting promising start-ups or fostering their growth. To the extent that they have been able to contribute effectively to technology entrepreneurship in China, they have done so by following the lead of foreign and Taiwanese investors. In other words, they allow foreigners and Taiwanese to select and help manage the investment targets while the Chinese co-invest in selected start-ups.

The foreign venture capitalists, primarily American venture firms, look at China and see a place bereft of technology because they compare it to Silicon Valley, the heart of the American technology venture capital business. The Taiwanese, with their experience in building up technology enterprises

in a relatively technology-backward economy, have not been daunted when confronted with a similar task in China. Consequently, while the American firms have been concentrating on technology-light but profitable services such as Internet and wireless services, the Taiwanese have been primarily investing in firms attempting to create technology in semiconductor and wireless segments.

Where the Taiwanese have failed to contribute to Chinese development is in Taiwan's traditional area of strength, manufacturing. While Taiwanese firms have been helping China develop capabilities in the human capital-intensive manufacturing sector of semiconductors, the traditional Taiwanese assemblers of electronics and other products have not contributed much to China's development because of their closed manufacturing networks. When Taiwanese firms move to China, they tend to move their entire cluster of suppliers as well. Thus, they do not help to cultivate a supply base of local Chinese firms. Yang and Hsia's study of Taiwanese production networks in the Yangtze River Delta found that local Chinese suppliers were limited to furnishing 6% of total production value to the Taiwanese electronics network located in that area.⁵⁰ My own interviews with seven electronics Taiwanese manufacturers in the Pearl River Delta also discovered that overwhelmingly, these assemblers relied on foreign-invested (including Taiwanese-invested) firms. None reported procuring more than 5% of the value of their inputs from local Chinese firms. Five of these firms had been in China for more than five years at the time of the interviews, suggesting that even with time there had been little progress in developing local suppliers. Michelle Hsieh found the same pattern of closed supplier networks in her investigation of Taiwan's bicycle production in China.⁵¹ The one positive note in my interviews at manufacturing plants was in a large, decade-old complex where a significant number of plant executives were local, in contrast with the typical situation in which the management is almost entirely Taiwanese. Still, with Taiwan's other large contributions to China's technological development, the failure to build up Chinese manufacturers should count as a singular disappointment rather than the definitive feature of China's experience with cross-strait economic integration.

4. Sustainability of Trends

Can Taiwan continue to integrate with China without sustaining high costs of adjustment with its lower-wage neighbor? The good news for those con-

50. You-Ren Yang and Chu-Joe Hsia, "Local Clustering and Organizational Dynamics of Trans-border Production Networks: A Case Study of Taiwanese IT Companies in the Greater Suzhou Area, China," *Environment and Planning A* 39 (2007), pp. 1346-63.

51. Hsieh, *The East Asian Miracle Revisited*.

cerned about Taiwanese hollowing out from increased trade with China is twofold. First, Taiwan's few heavily protected sectors pre-WTO, such as auto assembly, employ only a small fraction of Taiwan's manufacturing work force, so WTO-mandated opening up will not cause widespread unemployment. Second, China's labor cost advantage may be shrinking: there is increasing evidence of rising wages amid *mingonghuang* (labor shortages).⁵² Furthermore, the Taipei government's efforts to transform Taiwan from a manufacturing to knowledge-based economy are succeeding, as evidenced by the growing number of foreign R&D centers and Taiwan's increasing international patent portfolio.⁵³

The downside is that China's massive investments in education⁵⁴ could significantly depress Taiwanese white-collar wages⁵⁵ in the future if several conditions were to apply. First, Taiwanese white-collar workers are unable to avoid direct competition with Chinese white-collar workers by occupying different sectors or niches. Second, the global demand for such workers as Taiwan and China produce does not increase faster than the global supply, a condition that in part depends on what sectors or niches exist in the global marketplace. Finally, all of this assumes that China can create equally productive white-collar workers while controlling for cost, i.e., Chinese workers produce as much value per dollar of wages as their Taiwanese counterparts.

Given Taiwan's reliance on overseas markets, the danger of downward pressure for Taiwanese educated workers would exist even if Taiwan chose to avoid integration with China. Richard Freeman has examined such a declining wage scenario for U.S. engineers in the face of competition from engineers in China and India, and argues that such a scenario is plausible.⁵⁶ If Taiwan is still trying to compete in the U.S. and other marketplaces, Taiwan will face Chinese competition regardless of its level of direct economic integration with China, although without Taiwanese investment, the training of China's human capital would likely take much longer.

One must keep in mind the legitimate proviso that free-trade advocates always have for those worried about the costs borne by workers in certain sectors. Free traders invariably point out that there are always new industries

52. Wang Yue-sheng, "Mingonghuang shi dui di chengben moshi de ziwo jiaozheng" [The labor shortage is a self-correction for the low labor cost model], *Ershiyi Shiji Jingji Baodao* [Twenty-First Century Economic Herald], March 13, 2006.

53. Donald Floyd and Paul Meyer, "Global Patent Trends 2001," Lehman Brothers Report, June 2002.

54. Fogel, "Why China."

55. Here we define white-collar workers as university-educated workers.

56. Richard Freeman, "Doubling the Global Workforce," presented at the Center for Economic Performance, London School of Economics, 2004.

and niches we cannot anticipate. This observation suggests possibilities for unanticipated new sources of demand in the same sector for what would otherwise be displaced workers, and entirely new fields of industrial activity that could absorb these workers. The trick, of course, is to encourage those activities to spring up in one's own economy and to ensure that one's own work force is able to seize these opportunities. ITRI's track record in cultivating new activities, plus Taiwan's high level of entrepreneurship and sound educational system for technologists, all suggest that Taiwan should be able to sidestep China's competition by developing new and/or niche activities that the latter does not possess. And this possibility is in addition to Taiwan's current ability to stay at least one step ahead of China in similar areas of technology.

As for China, Taiwan will continue to contribute significant amounts of technological progress if three conditions hold: (1) China's growth areas match Taiwan's strengths, (2) China's maldistribution of investment capital continues, and (3) China's enforcement of intellectual property rights (IPR) does not significantly improve. All three conditions are likely to hold true for the medium term.

Taiwan's strengths match some of China's growth areas. One of China's industrial growth engines is IT, and this sector is precisely where Taiwan is strongest. If China continues to follow the path of other Asian developers, IT will likely remain a major driver of growth.⁵⁷

China's maldistribution of finance through its support for inefficient state-favored firms and neglect of small, private, and entrepreneurial firms has long been a drag on the country's innovation. Thus, Taiwanese have played an outsized role, in part because of the constraints on domestic innovation in China. Will finance continue to play such a role in China? With high rates of savings and a healthy fiscal situation, China is under little pressure to change its current system of subsidizing its inefficient banking system. Officials still prefer to control the commanding heights of the economy.⁵⁸ Moves to reform the financial system have been baby steps compared to the thorough reforms needed.⁵⁹

China's lax IPR regime does not deter Taiwanese technology firms from investing, because they have been accustomed to operating in environments

57. Henry S. Rowen, Marguerite Gong Hancock, and William F. Miller, eds., *Making IT: The Rise of Asia High Tech* (Stanford, Calif.: Stanford University Press, 2006).

58. Margaret M. Pearson, "The Business of Governing Business in China," *World Politics* 57 (2005), pp. 296–322.

59. Nicholas Hope and Fred Hu, "Reforming Chinese Banking: How Much Can Foreign Entry Help?" presented at the Fourth Annual Conference on Chinese Policy Reform, Stanford Center for International Development, September 30 to October 1, 2005.

with relatively lax intellectual property enforcement. In contrast, many MNCs are more cautious of placing valuable activities in China because of the opaque environment.⁶⁰ For example, in integrated circuit design, American MNCs have placed quite sophisticated activities in India, where the English legal structure is relatively (for a developing country) sound and transparent as well as familiar to American firms. The same firms place only the most unsophisticated part of the design process, layout, in China.⁶¹ With MNCs deterred by China's lack of transparency, the Taiwanese have played a relatively outsized role in bringing technology to China. China's legal structures are improving, but most likely it will take a long time before the IPR regime is strong enough for the comfort of MNCs.

60. Xiaohong Quan, *Multinational Research and Development Labs in China: Local and Global Innovation*, Ph.D. diss. (University of California at Berkeley, 2005), argues that MNCs have placed R&D activities in China primarily because they have been able to segment the R&D value chain so control of valuable knowledge is kept in the home base of the MNC.

61. Fuller, *Creating Ladders*.