行政院及所屬各機關出國報告

（出國類別：進修）

# 赴美國懷俄明大學進修報告


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出國地區：美　國

出國期間：九十一年一月十六日至九十二年一月三日

報告日期：九十二年三月四日

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民國九十二年三月四日

一、摘要

本人係於民國八十七年獲中小企業處推薦參加本部第十三期「國際經濟事務研究班」，並以第一名成績結業，嗣後通過本部甄選於去（九十一）年一月赴懷俄明大學（University of Wyoming）進修「國際事務研究所」（International Studies Program）一年，該系研究所碩士課程共有A、B兩個計畫，本人選擇以B計畫（Plan B）攻讀碩士學位，除依規定修畢三十個學分，上學期選修研究方法論、服務行銷學、人力資源管理及國際貿易學共十二個學分；暑假期間選修金融機構及市場與獨立研究計六個學分；下學期共修習亞洲政府與政治、國際金融、營運資金管理及論文閱讀等十二個學分，總計三十個學分且各科成績均達A；另提交兩份專題研究報告，並通過三位指導教授口頭答辯（Oral Examination）程序後，順利取得文學院碩士學位（Master of Arts），於本（九十二）年一月初返國服務。

本報告係記錄進修人於美國懷俄明大學進修國際事務研究碩士一年內之學習情形及至波士頓、紐約及華盛頓特區之參

訪心得，以下謹就進修情形、專題研究報告、心得與建議等部分提供個人淺見與建議。

二、進修情形

本人於上、下學期及暑假期間共修習十門課、計三十學分，上述十門課之進修情形簡述如下：

（一）研究方法論(Research Method)

該課程係由農經系副教授 Dr. Edward B. Bradley 負責教授，主要內容係教導學生進行社會科學之學術研究方法，包括確定研究問題、詳實描述問題、選定適當之研究方法、蒐集文獻及相關資料、資料分析，進而達成結論，B 教授除帶領學生至圖書館實地了解如何收集研究資料外，另 B 教授亦指導學生依前述研究步驟，逐步進行論文之撰寫，奠定學生日後進行學術研究之基礎概念。

（二）服務行銷學(Marketing of Services)

服務業在目前經濟社會中所扮演之角色愈來愈重要，特別是台灣服務業佔 GDP 的 67% ，同時也是提供就業機會之主要來源，預計未來服務業亦將快速成長，成為經濟活動之主流；本課程係由商學院教授 Dr. Terri Rittenburg 教授，由於服務具

有無形性、無法儲存、生產與消費不可分離及服務品質之變異性等四大特徵，因此有別於傳統有形商品之行銷方法，本課程係以教授服務業之特殊行銷方式為主，包括營利及非營利服務機構之行銷方法，R 教授上課方式生動活潑，並常左以實例教學，以加深學生印象，另該教授並要求學生分組討論及參與課堂討論，以增進學生個案研究討論能力與表達能力；本課程對於了解服務業之策略規劃及營運方式、消費者心理及行為與如何提升服務品質有相當大之助益。

（三）人力資源管理(Human Resource Management)

人力資源實為今日知識經濟時代最重要之生產因素，且愈來愈多的企業已不再視人力資源為成本，而將人力資源視為公司資產，進而積極培育與訓練，以提升企業競爭力；該課程係由商學院教授 Dr. John Jackson 教學，J 教授實務經驗豐富、教學嚴謹且有條理，本課程內容主要包括目前人力資源現況分析、人力資源之規劃、績效管理、工作滿意、海外工作、招募與訓練、平等就業法、工作分析、員工生涯規劃、激勵與報酬、員工福利與權利、工會運作及人力資源之未來發展等議題，對於了解人力資源之應用與發展有相當大之收穫。

（四）國際貿易學(International Trade)

對外貿易為我國經濟發展之原動力，在全民努力下，目前台灣已成為全球第十四大貿易國，近年來國際經貿情勢急遽變化，全球貿易體制日趨自由化、國際化之際，我政府亦積極推動參與國際經貿組織，以因應世界潮流之變化，故選修本課程以加強對國際貿易之基礎理論知識與對國際經貿組織之了解；該課程由商學院資深教授 Dr. William Morgan 教授，M 教授曾於印尼等國家從事國際貿易研究，兼具國際貿易之理論知識與實務經驗，並經常應用理論知識於實際環境中，幫助學生對理論知識之了解，本課程主要探討國際貿易發生之理論模型、關稅與非關稅等貿易保護措施對國際經濟福利之影響、生產要素之國際流動、區域與全球經貿組織及貿易與經濟成長之關係等議題，研習該課程不僅獲得國際貿易之理論知識，且對於理論之應用亦有相當之助益。

（五）金融市場與機構(Financial Markets and Institutions)

由商學院教授 Dr. Vassil A Konstantinov 教授，該課程首先介紹金融機構在解決資訊不對稱性、流動性之維持、價格風險、銀行存款之應用與提供付款功能服務所扮演之特殊角色功能，同時幫助學生了解美國各種不同金融機構及其功能，包括商業銀行、儲蓄銀行、儲蓄互助社、壽險及產險公司、證券公

司、投資銀行、金融公司、基金、創業投資基金等金融機構，此外，對於資本市場及貨幣市場、初級市場及次級市場、利率與收益曲線之關係、外匯市場等金融市場之運作情形亦有深入之介紹，有助於了解金融機構對於國家經濟發展之重要性。

（六）獨立研究(Independent Study)

本課程係由政治系教授 Dr. Wenberg Chai 教授，鑒於我國高科技人才短缺問題日益嚴重，且美國亦正面臨相同之問題，經與渠討論後，決定以解決高科技人才短缺方法為題，蒐集美國各界對於解決此一問題之相關資料，提供我國相關單位解決此一問題之參考，有關該論文之結論將一併於本報告之「專題研究報告摘要」部分中簡述。

（七）亞洲政府與政治(Government and Politics of Asia)

本課程係由政治系教授 Dr. Wenberg Chai 教授，Dr. Chai 為精通中、美、台三邊關係之資深學者，尤對兩岸關係有深入之研究，本課程除對大陸政治體制、經濟發展及社會變遷多所介紹，並針對其他亞洲國家如日本之政治文化發展詳細解說，翟教授並要求每個學生依其興趣選擇一亞洲國家撰寫三十頁之專題研究報告，另研究生須於期末進行口頭報告並接受教授及同學之提問，該課程對增進兩岸互動與了解有相當大之助

益。

（八）國際金融(International Finance)

台灣為一貿易導向型經濟，與世界各國貿易往來頻繁，近來更擠身為世界前十五大貿易大國，隨著金融國際化與自由化的推展，台灣與世界各國的金融關係也越來越密切，因此國際金融這門學科所研究的問題顯得特別重要。

本課程由經濟暨財金系助理教授 Dr. Patrik Hultberg 教授，國際金融在於從貨幣層面探討國際經濟活動，有時候亦可以稱為「開放經濟下之總體經濟理論」，研究的內容主要包括國際收支問題、匯率的決定與變動、匯率變動的總體經濟效應、國際間的資本移動、對外失衡的調整、國際間總體經濟政策效果的傳遞等。

（九）營運資金管理(Working Capital Management)

由商學院教授 Dr. Vassil A Konstantinov 教授，營運資金之管理主要分為短期及長期兩部分，本課程係為公司財務管理之第一部分，著重於公司短期（少於一年）之資產及負債管理，該課程首先介紹一些基本財務管理工具，如貨幣之時間價值、債券評價及風險與報酬之關係，此外，如公司財務報表分析、比率分析來衡量公司資產之流動性、財務槓桿、獲利分析及杜

邦公式分析。

本課程第二部分則探討公司流動資產與負債之管理，包括現金轉換週期、現金預算、現金管理，其中現金管理主要在探討如何決定適當之現金存量、短期債券、應收帳款管理及信用政策；短期融資包括交易信用、短期銀行貸款、商業本票及擔保短期信用。

第三部分係著重於營運資金管理之進階模型應用，包括利用 Baumol 模型及 Miller-Orr 模型來協助決定目標現金存量。本課程對幫助學生獲得公司財務管理相關知識有相當大之助益。

（十）論文閱讀(Graduate Readings)

為了解兩岸加入 WTO 後之互動關係及撰寫專題研究報告「兩岸加入 WTO 後之經貿交流」，爰請以研究兩岸關係見長之政治系教授 Dr. Wenberg Chai 擔任本課程之指導教授，除由翟教授指定閱讀相關書籍外，並與其就該專題報告進行討論以順利完成該報告之研究與撰寫。

（十一）暑期參訪

暑假期間除選修兩門課外，亦由國際事務研究所(International Studies)系主任 Dr. Christian Ukaegbu 安排赴波士

頓、紐約及華盛頓特區參訪，參觀哈佛大學甘迺迪學院及麻州州政府經濟發展局，此外，亦拜會美國聯邦準備銀行、聯合國、紐約證券交易所、美國專利商標局，了解其組織功能、主要業務及運作情形等。

三、專題研究報告摘要（兩篇原文請參見附件一及附件二）：

(一) 兩岸加入 WTO 後之經貿交流

台灣與大陸已於九十一年元月正式成為 WTO 會員國，關於加入 WTO 後對兩岸經貿交流和對台灣經濟之影響，以及在 WTO 架構下如何因應兩岸經濟自由化可能帶來的衝擊，向為各界關注的焦點，本研究報告係探討兩岸在 WTO 架構下如何進行交流。

WTO 堪稱為當今世界的經貿聯合國，其成立宗旨在促進全球貿易自由化、國際分工及經濟資源之有效分配，所有成員皆必須遵守 WTO 制定之自由、平等、互惠、爭端解決機制及公平競爭等原則。

加入 WTO 之後，兩岸經貿關係正常化對台灣經濟可能造成的影響，可以從貿易及投資兩方面來看。首先，從貿易面來看，大陸加入 WTO 後或將有利於台灣對大陸出口擴張；而台

灣現行政策對大陸貨品進口仍設有負面表列的管制與WTO追求自由貿易的基本規範相抵觸，勢將加以調整，將大陸貨品比照其他國家的貨品自由進口，因此加入WTO後兩岸雙邊貿易可能大幅增加，而大陸貨物進口管制放鬆將威脅台灣相關產業的發展。其次，從投資面來看，大陸市場的進一步開放所帶來的商機可能吸引更多台商前往投資，產業外移對台灣經濟穩定發展所帶來的影響。

整體而言，兩岸經貿交流正常化發展勢必造成兩岸經濟更加融合，從而使台灣對大陸經濟之依賴度提高，台灣的經濟自主性降低，另外，在WTO架構下，兩岸之間相互競爭也將加劇，唯雙邊經貿互動格局受影響程度，端視雙方是否完全遵守WTO規範而定，而在WTO多邊體系的架構下，兩岸經貿關係由雙邊轉化為多邊關係，可利用多邊協商機制展開兩岸經貿協商或談判，突破兩岸政治禁忌，因此WTO可望為兩岸經貿交流提供一個較有利的政、經環境，有利兩岸發展務實的經貿關係。

(二) 新經濟時代之高科技人才培育

經濟要能持續發展，科技產業一定要能持續升級與發展，而我國半導體、平面顯示器、數位內容、通訊等四大領域及中

高階資訊軟體和高階生物技術人材面臨嚴重不足的問題，對於這項人才缺口，除建立一個以市場及績效表現為導向的薪資制度、加強在職訓練、教育機構培育市場所需人才及建教合作，以加速我國培育特殊科技人才的能力外，更必須主動積極引進各國科技人才，而不只是獎勵或補助延攬人才而已，更應大幅開放人才交流，才能讓台灣更快速建構一個優質環境留住及吸引人才。

面對高額的人才需求缺口，台灣應利用其產業聚集、資金、技術，特別是員工分紅配股制度的優勢，同時積極改善教育、生活環境、土地、交通、法令及政府效率等缺點，以營造一個吸引海外高科技人才來台發展的良好環境。

四、心得與建議

非常感激本部長官之協助，得以赴美進修。一年美國求學除於學識上有所收穫取得碩士學位外，對於語文能力之提升亦有相當之進步，另外對美國文化與生活亦多有了解，對個人而言增進不少寶貴之人生經驗。以下為本人之心得與建議：

（一）鑒於研修期間僅有一年，本部來此進修人員須於一年內完成學業，且先前於專研中心研習之學分皆未抵減，因

此需花費相當多時間於課業及撰寫畢業論文，對於英文能力之提升有相當之限制，建議可增加英文課程之研修，並將之列入畢業學分內。

（二）鑒於我國未來經貿發展須以全球化為主軸，本計畫似可考慮培育專業翻譯人才，以因應未來本部業務發展需求，且本計畫所培訓之人員回國後應妥為規劃培育歷練與訓練有關工作，以符合本計畫之宗旨。

# Economic Exchanges Across The Taiwan Strait After Taiwan's And China's Entry Into The WTO

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A "Plan B" Paper

Submitted to the International Studies for the Degree of

MASTER OF ARTS

In

INTERNATIONAL STUDIES

University of Wyoming

Laramie, Wyoming

November 2002

Economic Exchanges Across The Taiwan Strait

After Taiwan's And China's Entry Into The WTO

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## I. Introduction

The World Trade Organization (WTO) is a multilateral organization responsible for developing and overseeing the rules governing the conduct of international trade. Its main function is to ensure that trade flows as smoothly, predictably and freely as possible. From time to time it sponsors rounds of multilateral trade negotiations to further liberalize world trade, and it also oversees the adjudication of trade disputes according to a set of principles and rules accepted by its members. After a series of trade negotiations with other nations, on November 11, 2001, with a vote in Qatar by the Ministerial Conference of the WTO, Taiwan finally won admission to the world trade body—one day after China—ending a twelve-year effort (see Table 1). Now both sides across the Taiwan Strait are WTO members. The economic exchanges between Taiwan and China have also moved toward a new stage.

Taiwan's economy is trade-driven. In 2000, the value of international trade in Taiwan was about 91 percent of its GNP.[1] Meanwhile, Taiwan is the fourteenth largest trading country in the world, but it has diplomatic relations with only a small number of countries. It's therefore important for Taiwan to be in the WTO, which provides Taiwan with the opportunity to interact with more countries, and increases its visibility in the international arena.

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[1] In 2000, the total value of import and export in Taiwan was about $288 billion dollars and the GNP was about $314 billion dollars.

For China, the main advantage of being a member of the WTO is that it does not have to routinely claim Normal Trade Relations (NTR) treatment with the U.S., which meant that restrictions could not easily be placed on Chinese exports. Each year the mainland had to renegotiate access. Therefore, WTO membership permits China to invoke multilateral rules to deal with bilateral disputes and to participate in rule making, rather than depend on the U.S. congresspersons and others for access to the global market place. Additionally, Chinese leaders believe that China's WTO membership will help China break out of Western containment and sanctions. China's membership in the WTO also induces the mainland to open up its market and binds China to global rules.

Table 1. The List of Taiwan's Accession to The WTO

| | |
|---|---|
| Jan. 1, 1990 | Application to GATT formally submitted. |
| July 19, 1991 | President Bush announces support for Taiwan's bid. EU follows. |
| Sept. 29, 1992 | GATT board of directors accepted Taiwan's case. |
| Feb. 24, 1994 | First bilateral agreement concluded (with South Africa). |
| Jan. 1, 1995 | WTO replaced GATT. |
| Feb. 24, 1998 | Bilateral agreement concluded with United States. |
| Oct. 25, 1998 | Bilateral agreement concluded with EU. |
| Apr. 13, 2000 | Bilateral negotiations concluded with final country, Brazil. |
| Nov. 10, 2001 | China's entry approved. |
| Nov. 11, 2001 | Taiwan's entry approved. |
| Jan.1 2002 | Accession completed. |

Source: Board of Foreign Trade, Ministry of Economic Affairs, R.O.C.

The WTO can be thought of as the "economic" United Nations. Any WTO member should follow the principles of liberalization, reciprocity and nondiscrimination to facilitate liberalization of global trade. For both Taiwan and China, WTO membership secures access to international markets. However, the Taiwan government is obligated to adjust its economic policies toward China.

Meanwhile, China also faces obligations to reform its economic system and liberalize imports. Naturally, the adjustment pains resulting from economic liberalization exist for both Taiwan and China.

This paper consists of five sections. The first part introduces the current economic exchanges between Taiwan and China, which mainly focuses on trade and investment issues. The second part discusses the obligations of WTO member countries created by WTO principles and rules. The third and fourth parts analyze WTO's likely impacts on Taiwan and economic exchanges between Taiwan and the mainland after both sides become WTO members. The last section predicts how relations between Taiwan and China will be affected due to their obligations as WTO member countries.

## II. Current economic exchanges between Taiwan and China

Economic relations between Taiwan and China have changed dramatically since the Taiwan government lifted martial law in November 1987. This section discusses the economic exchanges across the Taiwan Strait from trade and investment perspectives.

### A. Trade

Due to the relaxation of Taiwan's policies, preferential treatment offered by China and the economic benefits of Taiwanese businessmen in the mainland, indirect trade across the Strait has risen rapidly and comprised a significant portion of both sides' total trade. Over the last two decades, indirect trade via Hong Kong has risen from $0.4 billion in 1981 to $31.3 billion in 2000 (see Table 2). Since 1993, China has become Taiwan's third largest trading partner (next to the United States and Japan) while Taiwan ranks fourth on the mainland's list. As trade has grown between Taiwan and China, the economic interdependence between both sides has also increased. Taiwan's dependency on China has, in particular, expanded rapidly. The ratio of bilateral trade to Taiwan's total external trade has shown an upward trend over the past years (see Table 3). The figure rose from 8.88 percent in 1993 to 10.59 percent in 2000 and 13.18 percent in 2001 (January to August). Taiwan's export dependency ratio vis-à-vis China also increased from 15.20 percent to 17.19 percent

and 21.05 percent in the same time periods. Meanwhile, Taiwan's import dependency ratio vis-à-vis China rose from 1.90 percent to 3.6 percent and 4.37 percent, respectively.

On the other hand, China's trade dependency on Taiwan has not been as high. From January to August 2001, China's trade dependency ratio vis-à-vis Taiwan was only 6.19 percent, less than half of that of Taiwan vis-à-vis China. In addition, China's import dependency ratio vis-à-vis Taiwan has remained at 10 to 12 percent.

From trade content across the Strait, Taiwan has relatively abundant capital and advanced manufacturing technology including machinery, equipment and intermediate products. China enjoys comparative advantages in raw material supplies, low land prices as well as in low-cost labor. Expansions of trade should be beneficial to both economies.[2] The remarkable growth in trade prompted Taiwan's growing interest of investing in China.

[2] Trade between the two sides demonstrates a complement effect on the economies of both Taiwan and China due to the marked disparities in natural resources and stages of development.

Table 2. Trade between Taiwan and China (1981-2000)

Unit: US$ Million; %

| Year | Taiwan's Exports to China | | Taiwan's Imports from China | | Total Trade Volume between the Strait | | Taiwan's Surplus or Deficit (-) | |
|---|---|---|---|---|---|---|---|---|
| | Volume | Growth | Volume | Growth | Volume | Growth | Volume | Growth |
| 1981 | 385 | n.a. | 75 | n.a. | 460 | n.a. | 310 | n.a. |
| 1985 | 987 | n.a. | 116 | n.a. | 1,103 | n.a. | 871 | n.a. |
| 1989 | 3,332 | n.a. | 587 | n.a. | 3,919 | n.a. | 2,745 | n.a. |
| 1990 | 4,395 | 31.9 | 765 | 30.3 | 5,160 | 31.7 | 3,629 | 32.2 |
| 1991 | 7,494 | 70.5 | 1,126 | 47.2 | 8,619 | 67.0 | 6,368 | 75.5 |
| 1992 | 10,548 | 40.8 | 1,119 | -0.6 | 11,667 | 35.4 | 9,429 | 48.1 |
| 1993 | 13,993 | 32.7 | 1,104 | -1.3 | 15,097 | 29.4 | 12,890 | 36.7 |
| 1994 | 16,023 | 14.5 | 1,859 | 68.4 | 17,881 | 18.4 | 14,164 | 9.9 |
| 1995 | 19,434 | 21.3 | 3,091 | 66.3 | 22,525 | 26.0 | 16,342 | 15.4 |
| 1996 | 20,727 | 6.7 | 3,060 | -1.0 | 23,787 | 5.6 | 17,668 | 8.1 |
| 1997 | 22,455 | 8.3 | 3,915 | 27.9 | 26,371 | 10.9 | 18,540 | 4.9 |
| 1998 | 19,841 | -11.6 | 4,111 | 5.0 | 23,951 | -9.2 | 15,730 | -15.2 |
| 1999 | 21,313 | 7.4 | 4,522 | 10.0 | 25,835 | 7.9 | 16,790 | 6.7 |
| 2000 | 25,030 | 17.4 | 6,223 | 37.6 | 31,253 | 21.0 | 18,807 | 12.0 |

Source: Taiwan Institute of Economic Research, Cross-Strait Economic Statistics Monthly No.101 Jan. 2001

Table 3. Trade Dependency Ratio: Taiwan and China, 1993-2001[3]

Unit: %

| Year | Taiwan on China | | | China on Taiwan | | |
|---|---|---|---|---|---|---|
| | Export Dependency Ratio | Import Dependency Ratio | Trade Dependency Ratio | Export Dependency Ratio | Import Dependency Ratio | Trade Dependency Ratio |
| 1993 | 15.20 | 1.90 | 8.88 | 1.59 | 12.44 | 7.36 |
| 1994 | 15.14 | 2.63 | 9.15 | 1.85 | 12.18 | 6.90 |
| 1995 | 13.24 | 2.99 | 8.31 | 2.08 | 11.19 | 6.37 |
| 1996 | 13.96 | 2.74 | 8.70 | 1.86 | 11.66 | 6.55 |
| 1997 | 13.46 | 2.97 | 8.39 | 1.86 | 11.54 | 6.10 |
| 1998 | 15.10 | 3.69 | 9.55 | 2.10 | 11.90 | 6.35 |
| 1999 | 16.07 | 3.57 | 10.11 | 2.03 | 11.79 | 6.51 |
| 2000 | 17.19 | 3.60 | 10.59 | 2.02 | 11.33 | 6.44 |
| 2001* | 21.05 | 4.37 | 13.18 | 1.87 | 10.83 | 6.19 |

* January to August only

Source: Compiled by Da-Nien Liu[4] from Taiwan and China's Customs Import Tapes

[3] Taiwan's export dependency ratio vis-à-vis China refers to the ratio of Taiwan's export volume to China to Taiwan's total exports. China's export dependency ratio vis-à-vis Taiwan refers to the ratio of China's export volume to Taiwan to China's total exports. Taiwan's trade dependency ratio vis-à-vis China refers to the ratio of Taiwan's export and import volume to China to Taiwan's total exports and imports.

[4] Da-Nien Liu is the author of "Taiwan's domestic stability: an economic perspective" in Issues & Studies 38, no. 1 (March 2002): 80-100.

B. Investment

Most overseas investment from Taiwan before 1990 poured into Southeast Asia, but after the easing of political tensions between Taiwan and the mainland, huge amounts of capital has flown into China. In 1987, the government in Taiwan relaxed the foreign exchange control and many Taiwanese businessmen began to invest in the coastal cities of China. Numerous Taiwanese firms at the end of the 1980s moved to the mainland to take the advantages of low labor costs and potential markets. The deterioration of Taiwan's domestic economic environment pushed Taiwanese businessmen to move to the mainland. Additionally, China's preferential offering attracts many Taiwanese companies to invest. These push and pull effects combined create a "Mainland Fever" in 1990.[5] Taiwanese cumulative contracted investment in China reached $47.8 billion by the end of 2000 and actual investment in the mainland was $26.2 billion, making Taiwan the fourth largest investor in China after Hong Kong, the U.S., and Japan (see Table 4). The majority of investments over the past 10 years have been in electronics, basic metals and metal products, petrochemicals and plastics, food and beverage processing, non-metallic minerals, medical equipment, and services. Until recently Taiwan's investment was concentrated in Guangdong, Fujian, and Zhejiang Provinces. As investment has shifted to electronics and IT

[5] See p.78 in "Chinese Mainland and Taiwan" (Chai & Chai, 1976)

production more recently, Taiwan investment has increased dramatically in the Shanghai area.

Trade and investment remain heavily weighted on goods and capital flowing from Taiwan to the mainland. When Taiwan's businessmen shift their capital, facilities and technology to China in order to utilize the mainland's raw materials and low-cost labor, the impact on both sides shows a strong trade diversion effect. This includes the rapid increase of intermediate goods and capital imported from Taiwan, the dramatic rise of China's labor-intensive products produced by Taiwan owned companies exported to developed countries such as the U.S. and the huge decrease of Taiwan's labor-intensive goods exported to these countries. Taiwan's continuous capital and technology flows to the mainland has significantly improved China's production capability and strengthened its competitive power with the same kind of products still being produced in Taiwan. Products from China have engaged in head-on competition with Taiwan.[6] Taiwan's large-scale investment in China has hurt domestic industry on the island and caused unemployment problems.

However, there are many problems arising in China after its rapid economic development, which might disorder the society. These problems include corruption, widening income distribution, regional income disparities, autonomy issues of

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[6] See p.85 in "Chinese Mainland and Taiwan" (Chai & Chai, 1976)

minority nationalities, and suppression of religious groups such as Falungong. These issues are the main economic problems currently facing the China government. Taiwanese businessmen who invest in China cannot ignore such potential crises.

From an economic point of view, the expansion of trade and investment across the Strait may have created a dependence effect on the economic development of both sides and thus brought them closer to each other. In terms of cross-Strait relations, Taiwan's dependency on China has definitely increased the uncertainty for Taiwan—especially since Taiwan's capital has moved to China. Accession to the WTO will expand trade and investment opportunities between Taiwan and China. The economic exchanges between both sides of the Taiwan Strait will become even closer. The next section will introduce some basic principles under the WTO framework.

Table 4. Taiwan's Investment in China (1991-2000)[7]

Unit: US$ Million

| Year | Number of Projects | Contracted Investment[8] | Actual Investment[9] |
|---|---|---|---|
| 1991 | 3,446 | 2,783 | 844 |
| 1992 | 6,430 | 5,543 | 1,050 |
| 1993 | 10,948 | 9,965 | 3,139 |
| 1994 | 6,247 | 5,395 | 3,391 |
| 1995 | 4,778 | 5,777 | 3,162 |
| 1996 | 3,184 | 5,141 | 3,475 |
| 1997 | 3,014 | 2,814 | 3,289 |
| 1998 | 2,970 | 2,982 | 2,915 |
| 1999 | 2,499 | 3,374 | 2,599 |
| 2000 | 3,108 | 4,042 | 2,296 |
| Cumulative Amount at the end of 2000 | 46,624 | 47,816 | 26,160 |

Source: Taiwan Institute of Economic Research, Cross-Strait Economic Statistics Monthly No.101 Jan. 2001

[7] Because of the limits on Taiwanese investments in China, many investments are not reported to Taiwan officials. Adding to the problem, because Taiwanese investments are funneled through a third country, it is unknown how Chinese officials at the local level record Taiwanese investment. Therefore, neither source publishes completely reliable data.

[8] Contracted investment is based on contracts signed.

[9] Actual investment is utilized investment in China.

## III. The essential principles under WTO's multilateral trading system

To fulfill the goals of trade liberalization, expansion of international division and trade, and to increase the efficiency of economic resource allocation, all members of the WTO are devoted to setting up rules through negations and agreements such as GATT 1994, General Agreement on Trade in Services (GATS) and Trade-Related aspects of Intellectual Property Rights (TRIPS). Nondiscrimination, reciprocity, liberalization, dispute settlement mechanism, and fair competition are the cardinal principles under the framework of the GATT/WTO. This section briefly introduces these basic concepts.

First of all, the WTO is based on the principles of reciprocity and non-discrimination. Trade concessions are reciprocal—all member nations agree to lower their trade barriers together, which central to the negotiating framework for tariff reduction since the inception of GATT 1947. During rounds of negotiations for the reduction of tariffs each country will make equivalent tariff concessions. This principle is conceived as a way to discourage or prevent nations from enacting unilateral trade barriers. The loss in protection of domestic industry is thus offset by freer access to foreign markets. The principle of nondiscrimination requires that imports from all countries be treated the same—imports from one nation cannot be given preference over those from another. In other words, a tariff on an imported

product should be applied equally to all members. This is called Most Favored Nation (MFN) treatment. This principle is designed to prevent bilateral trade wars. Meanwhile, nondiscrimination also implies that internal taxes apply equally to domestic and imported products and that regulation treats imported goods "no less favorably" than similar domestic goods. This is called National Treatment, giving foreign goods the same treatment as a nation's own goods.

These two principles proved effective during the early years of GATT negotiations. Member nations slowly peeled away the protectionist barriers they had erected in the 1930s, allowing international trade to expand dramatically.

The next principle is the liberalization of trade in goods, capital and services. Customs regulations curb customs procedures that impede imports. Such activities include rules of transit, customs valuation, customs fees and formalities, and marks of origin. All laws and regulations regarding trade should be formulated and applied in a transparent manner as the WTO calls for the general elimination of quantitative restrictions to trade. Lowering trade barriers is one of the most obvious means of encouraging trade. By the 1980s, the negotiations had expanded to cover non-tariff barriers on goods, services and intellectual property.

Opening markets can be beneficial, but it also requires adjustment. The WTO agreements allow countries to introduce changes gradually, through "progressive

liberalization." Developing countries are usually given longer to fulfill their obligations.

The GATT is often criticized because it lacked an enforcement mechanism. When disputes between countries arose, the members were urged to consult. Should consultations fail, a panel of third-country representatives could be formed to hear the case and issue a ruling. However, the panel rulings were non-binding on parties. Without enforcement, the rules-based system was worthless. Therefore, the new WTO procedures lend greater automaticity to the adoption of the findings of panels charged with settling trade disputes and of a new appellate body designed to hear appeals of panel decisions. One goal of a stronger dispute settlement mechanism is to help member countries eliminate disputes impartially.

Finally, fair competition is also stressed by the WTO. For example, when dumping and injury to domestic producers have been proved, the government in the importing country could levy an antidumping duty. Particularly the use of subsidies is discouraged in general, especially export subsidies. It provides similar rules for the countervailing duty remedy to offset foreign government subsidies.

After realizing the basic framework of the WTO, the next two parts analyze the WTO's impacts on Taiwan and the economic exchanges across the Taiwan Strait under the WTO framework.

## IV. Analysis of WTO's impacts on Taiwan after Taiwan's and China's entry into the WTO

There are several changes caused by Taiwan's accession to the WTO. Measures taken to comply with WTO obligations impacts Taiwan through various resource, service and goods markets.

A. Economic impacts

Taiwan's economic and trading system will become more liberal and transparent following entry into the WTO. The domestic regulations affecting trade in Taiwan will be adjusted to comply with WTO obligations, which will make its economy more efficient and competitive. In addition, producers and exporters in Taiwan will gain a competitive edge as they take steps to adjust to global competition.

Taiwan will also be able to expand its foreign trade because it will gain access to the markets of all other WTO members. There is also no doubt that Taiwan will attract more foreign investment. As advanced technology and new skills are introduced into Taiwan's economy, the scope, quality and competitiveness of the services provided domestically are expected to improve. Such changes will facilitate the overall growth of Taiwan's economy by making it more efficient. These changes will also promote local enterprises' international competitiveness.

Taiwan has the upper hand in competing with foreign countries when trading

with China due to the cultural similarities and common language, as well as its proximity to the rapidly growing mainland market.

However, there are also some challenges facing Taiwan after its accession to the WTO. First, the initial stage of entering the trade body has been of particular concern to those industries that have been protected by the government such as the agricultural and automotive sectors. Taiwan will face great competition from elsewhere, especially China's cheaper agricultural products. For the automotive sector, imported cars will become more attractive due to reduction of tariff. Furthermore, if the existing ban on imported goods from China is relaxed, all sectors will be impacted.

It is estimated that one-third of Taiwan's domestic market will be dominated by cheaper products from China. If the Taiwan government intends to adopt a trade defense clause, this will likely be ineffective as it violates WTO free trade rules and may damage Taiwan's international image as well.

The second problem facing Taiwan's economy is that if Chinese goods are allowed into Taiwan unconditionally, it may aggravate several existing problems. Unemployment will likely increase as manufacturers move their production lines overseas to cut costs and as factories close due to greater competition. In addition, increased capital outflow and a shrinking domestic demand will contribute to

weakened economic growth.

Compared with China, Taiwan continues to have the advantages in terms of its infrastructure development, up-, mid-, and down-stream manufacturing foundation, quality human resources, and ideal geographical position. While making the most of these attributes, the Taiwanese government must further improve its administrative efficiency and, more importantly, enhance cross-Strait transportation links. At this critical juncture, the most important test is how well Taiwan's government itself can perform.

B. Financial impacts

The WTO entry is having a favorable impact on pushing Taiwan toward financial reforms that will give investors more confidence. The Legislative Yuan in Taiwan passed six bills considered crucial for restructuring domestic financial markets. The package included new laws that permit the establishment of financial holding companies, modernize the regulation of securities firms, and set up and regulate a Financial Reconstruction Fund, as well as revisions to the business taxation, insurance, and deposit insurance laws.

Supported by seven financial service industries through business taxes, the Financial Reconstruction Fund will set aside a total amount of US$3.4 billion over a four-year period between 2002 and 2005 to assist and consolidate troubled financial

firms. The Ministry of Finance also issued thirteen licenses during 2001 for the operation of financial holding companies. With the passage of the Business Mergers And Acquisitions Law in January 2002, the government is ambitiously aiming at helping domestic businesses grow into more competitive transnational corporations.

The six financial bills will make for a better financial market, but the degree to which they will be carried out is what really counts. If the Taiwanese government makes the financial market more transparent, more foreign investors will likely invest in Taiwan.

Due to China's accession to the WTO, Taiwan's financial institutions are allowed to set up branches in China. By so doing, Taiwanese businessmen in China could have a more convenient channel to raise funds and transfer their earnings made in China back to Taiwan.

C. Labor markets

In the past, a Taiwanese employee might work for the same company for ten or twenty years, but this scenario will become increasingly rare with Taiwan's participation in the WTO. The reason is that capital flow, particularly outbound investment, will accelerate making businesses more mobile. Many labor-intensive sectors are bound to seek relocation overseas to cut costs so that they can remain competitive. The country where Taiwanese businessmen make most of their foreign

investments is China. At the same time, an increasing number of foreign enterprises are expected to enter Taiwan. Though these businesses may provide some job opportunities, recruitment will be limited to young talent with professional business or technical skills.

As a result, the labor force in Taiwan will develop along two extremes. Those who have long been engaged in traditional manufacturing industries, especially those who are middle-aged or older, will likely lose their traditional jobs. On the other hand, young workers with skills in the high-tech or commercial fields will likely enjoy better career prospects due to increased opportunities from multinational companies and fairer employment treatment under the WTO framework. Helping less-skilled and middle-aged people finding jobs is a priority facing the Taiwanese government.

D. Intellectual property rights

Under the WTO framework, not only are computer programs now protected as literary works, but also the term for copyright protection has been extended from thirty to fifty years after the demise of the author or the publication of the work. The well-defined intellectual property laws will benefit Taiwanese companies in the long run and encourage them to create more innovative products as such items will be legally protected.

In the past, a number of Taiwan's high-tech firms encountered non-tariff trade barriers, were accused of IPR infringement, and were asked to pay exceptionally high royalties. But with Taiwan's entry into the world trade body, local companies can appeal to WTO authorities to settle such matters. Another major advantage of WTO participation is that applicants for patents and trademarks in Taiwan will find it easier to file applications in other member countries within a twelve-month period.

With the completion of necessary legal revisions, the primary challenges facing Taiwan now is how to effectively enforce related laws. In particular, Taiwan has yet to upgrade the quality of its prosecutors and judges to ensure justice and fairness in the process of adjudication. Since intellectual property rights (IPR) involve complicated and technical matters, professional training and experience are essential in dealing with such cases. Taiwan therefore needs to consider setting up a court with specially designated judges to handle IPR cases.

E. Consumers

Consumers in Taiwan will benefit a great deal from Taiwan's accession to the WTO. The subsequent implementation of further market-opening measures, particularly in the agricultural and service sectors, will bring about many positive benefits.

With substantially reduced customs tariffs and relaxed import restrictions,

agricultural and industrial products from China are expected to flood the island. Also, more foreign enterprises and individuals will come to Taiwan to seek business opportunities. All these factors will contribute to intensified market competition between domestic and foreign companies. In their efforts to attract customers, companies will offer more competitive prices, increased variety, and provide better quality service.

Lower prices and greater variety are a welcome result of the WTO entry, but a major concern remains regarding consumer safety. Developing economies like China may exercise lax quality control for items such as pharmaceuticals and this poses a potential health hazard to consumers in Taiwan. It is important, therefore, for the government to play the role of watchdog by setting up a reliable inspection system.

With entry into the WTO, government and people in Taiwan face both benefits and challenges. How to help people overcome problems and take advantage of benefits resulting from entry into the WTO becomes the primary task facing the Taiwanese government.

## V. Analysis of expected economic exchanges between Taiwan and China

As the previous introduction about the basic rules under the WTO framework states, the economic exchanges across the Strait will change. However, the degree of impact depends on the extent to which both Taiwan and China obey the WTO rules or conform to their WTO obligations.

### A. Dispute settlement

Participation in the trade body will enable Taiwan to resolve disputes with trading partners, including China, more efficiently and effectively. The WTO structure—providing for bilateral negotiations, then conciliation if necessary, and finally a hearing before an impartial dispute-resolution panel—will mean an added sense of economic security for Taiwan that lives by international trade yet enjoys diplomatic recognition by only a few nations. Can the WTO framework improve the stalemate between Taiwan and China? The answer might be yes, at least on trade-related issues. All members of the trade body are obliged to respond to requests for consultations by other members through their representative offices to the WTO in Geneva providing a convenient venue for discussion and negotiation. Taiwan will no longer have to worry about such things as sovereignty or equality.

Although Taiwan has expressed that the WTO umbrella will enable the two parties to reestablish contact, China has reiterated its stance that nothing should be

done to "internationalize" the issues facing the two sides. However, if China refused to talk to Taiwan, Taiwan would have to go to the dispute-settlement mechanism. So it is a good mechanism for resolving disputes, depending on the extent to which China is willing to oblige to the rules of that mechanism. If China chooses to ignore the WTO framework for handling disputes with Taiwan, it will still face peer pressure from other countries to sufficiently respect the system and maintain the integrity of the system. "As the Chinese government has won more international prestige, its leaders also have to pay more attention to international norms, often in response to sustained international criticisms."[10]

Meanwhile, some analysts claim that Taiwan will no longer be able to prevent direct investment in China or direct trade, with Foreign Trade and Economic Cooperation (MOFTEC) Minister Shi Guangsheng threatening to eventually file a complaint with the WTO if Taiwan fails to establish the "three links."[11] Furthermore, Beijing expects that Taiwan will no longer be able to restrict Chinese investment in Taiwan.[12] Beijing apparently uses its economic leverage over Taiwanese investors to lobby to Taiwan's government for its own political purposes. "It is China's expectation that if the current economic trend continued, Taiwan will no longer be

[10] Dali L. Yang, "China in 2001: Economic Liberalization and Its Political Discontents"
[11] The three links include direct trade, postal, and transport links between Taiwan and China.
[12] Paul J. Bolt, "Economic Ties Across the Taiwan Strait: Buying Time for Compromise," Issues & Studies, March/April 2001

able to sustain its economic superiority vis-à-vis the mainland, hence the island would be absorbed into the embrace of the "motherland" in a natural manner."[13]

B. Economic interactions

With an MFN clause, any concession offered to one country is automatically extended to all members. Taiwan's and China's entry into the WTO will normalize the economic relations between both sides across the Strait and expand the economic exchanges. Take bilateral trade for example. It will increase substantially after both sides become WTO members. According to the study results from Peter C.Y. Chow, Francis C. Tuan and Zhi Wang, Taiwan's exports to China is expected to increase by $9.2 billion while its imports from China will increase by $658 million. The relatively smaller increase of Taiwan's imports from China results from Taiwan's currently high restriction on imports from China. Meanwhile, Taiwan's trade dependence on China will increase but its trade dependence on industrialized countries will decrease. In contrast, China's trade dependence on Taiwan will decrease but its dependence on the U.S. and western Europe will increase after both sides enter the WTO.[14]

Chinese exports to Taiwan are currently controlled according to the Regulations Governing Permission of Trade Between the Taiwan Area and the Mainland Area,

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[13] Yu-Shan Wu, "Taiwan in 2001: Stalemated on All Fronts"

[14] Peter C.Y. Chow, Francis C. Tuan and Zhi Wang, "The impacts of WTO membership on economic/trade relations among the three Chinese economies: China, Hong Kong and Taiwan"

which were promulgated in April 1993 and amended in October 1996 by the MOEA. Prior to WTO accession almost 50 percent of Chinese agricultural and industrial goods were banned entry into the Taiwanese market. With WTO membership, Taiwan's government has to lift its restrictions on imported goods from China, that is, the mainland will take advantage of the MFN treatment, which will benefit China's export sectors. Meanwhile, Taiwan will increase its exports of technology-intensive goods to the mainland to take advantage of trade creation. However, China has not only replaced Taiwan in the export market of labor-intensive products, but also increased its market share in the technology-intensive goods. The competition across the Strait will become severe in the U.S. and Japan markets, which is a huge threat to Taiwan.

On the other hand, liberalization brings new security concerns for Taiwan as it faces the impact of opening its agricultural and service sectors to Chinese imports, and its manufacturing sector to even more rapid relocation offshore in China. Many foresee that Taiwan will not block opening, but at the same time it will likely move cautiously to shift its policies on goods and services from China.

There also appears to be strong international pressure on Taiwan not to liberally invoke Article 21 of the GATT[15], which has typically been used only in rare instances

[15] GATT Article 21: Security Exceptions, available on the Internet : http://www.wto.org/wto/english/docs_e/legal_e/gatt47_02_e.htm

as a temporary measure. Taipei has not ruled out these options as an emergency measure to restrict certain trade and investment vis-à-vis China. Nevertheless, these exemptions are controversial. Taiwan will most likely turn instead to widely used (and WTO-consistent) mechanisms such as quotas on textiles and other sensitive products, product-specific and general safeguards, subsidies, antidumping measures, export controls, and standards to control the flow of goods and services from China to Taiwan.

The previous analyses reveal that the economic exchanges between both sides are magnified after Taiwan and China became WTO members. The continuous outflows of capital, technology and management techniques to the mainland might hollow out Taiwan's economy and increase Taiwan's dependency on the mainland. However, the "hollow-out effect" does not exist in Taiwan only. China's rapid development also threatens other Asian countries. Some data reveals that foreign investments have been shifted from Southeast Asian countries, South Korea, and Japan to China.

Taiwan's accession to the WTO presents contradictions for Beijing. Membership gives Taipei an equal status to that of Beijing in the WTO and the ability to discuss international trade issues based on parity. Membership enhances the ability of Taiwan to work with other governments as well, which symbolizes the

erosion of Beijing's attempts to isolate Taiwan internationally. On potential issues where Beijing and Taipei may not agree, the WTO allows for the multilateralization of their disputes, but only if either side opts to pursue them under the WTO framework. Some analysts argue that Taiwan may test Beijing by maintaining many existing investment and trade restrictions it has against China after accession to the WTO. This strategy would test Beijing's reluctance to challenge Taiwan in a multilateral setting, as it would call attention to the equal status of Taiwan and China in the WTO. Other analysts argue that Beijing may be reluctant to challenge or work specifically on issues involving Taiwan through WTO multilateral procedures and will continue to try to work through bilateral negotiation. But some Chinese analysts appear to be arguing for a multilateral route with Taiwan, and Beijing's willingness to initiate or respond to a challenge from Taiwan in the WTO should not be ruled out as a possibility.

Since China's emergence as a world competitor is a fact that people cannot reject it, keeping the balance between taking the opportunity and avoiding its threat is a complicated and difficult task.

## VI. Conclusion

WTO commitments and growing business pressures are converging in a way that add pressure for the establishment of direct trade links and a significant reduction in trade and investment barriers in both Taiwan and China. Political jockeying, security concerns, and market protection efforts mean that both governments are likely to move more slowly than some expect to liberalize cross-Strait trade and investment. The process of opening and integrating trade, however, is already well underway, so it is likely to persist.

In this new phase of relations, business interests are likely to continue their calls for increased interdependence across the Strait. Taiwan's government will have to address these demands and the commercial reality of what is already taking place, while at the same time protecting national security and fostering the health of domestic industries based on the island. Business will again find itself pushing for more flexible policies while testing and skirting current restrictions. Government policy will likely continue to lag behind commercial reality. While policy can slow the process of integration, in the age of globalization the Taiwanese government will be limited in its ability to control the flow of capital, goods, and know-how across the Strait. However, it will maintain some ability to slow the commercial flow in the reverse direction from China into Taiwan.

Nevertheless, China still insists that Taiwan is part of China under its "one-China" policy. China may continue to threaten Taiwan by military force and isolation in the international community. Such political pressure also forces Taiwan's government to adopt a conservative policy toward China, which impedes the normal development of economic exchanges between the two sides.

The above discussion has revealed that cross-Strait relations are characterized by high levels of political conflict coexisting with economic cooperation. Because of the differing of political ideologies, the economic exchanges between Taiwan and China cannot proceed without administrative intervention. A lack of mutual trust and common ground has made compromise between the two sides impossible. Unresolved political conflicts hinder the economic cooperation between Taiwan and China. Therefore, the scope and economic benefit of economic exchanges across the Strait are underdeveloped. As Cal Clark said, "Substantial changes in the political and economic spheres have been intertwined and mutually reinforcing, rather than being discrete phenomena following separate dynamics."[16] In fact, the improvement of political interaction is the premise of economic integration across the Strait, especially considering the increasing interdependence between Taiwan and China after both sides become WTO members. The future political interaction between

[16] See p.11 in "Political stability and economic growth." (Chai, Chai & Clark, 1994)

both sides depends on China's upcoming 16th Party Congress in late 2002 and the transition to a new generation of national leadership. The future economic exchanges between Taiwan and China could be normalized to create a win-win situation if the two governments improve their political relations.

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# Building A High-Quality Information Technology Workforce In The New Economy

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A "Plan B" Paper

Submitted to the International Studies for the Degree of

MASTER OF ARTS

In

INTERNATIONAL STUDIES

University of Wyoming

Laramie, Wyoming

November 2002

Building A High-Quality Information Technology Workforce

In The New Economy

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## I. Introduction

The concept of a "knowledge-based economy" was fully clarified by the Organization of Economic Cooperation and Development (OECD) in 1996. A "knowledge-based economy" is directly based on production, distribution and use of knowledge and information. The growing codification of knowledge and its transmission through communication and computer networks has led to the emerging information society.[1] The need for workers to acquire a range of skills and to continuously adapt these skills underlies the "learning economy."

The United States set a good example of how a New Economy is developed. Both the U.S. government and private sectors have acknowledged the importance of training human resource and to develop and apply high-tech information technology. New knowledge has been successfully created, acquired, transmitted and used effectively by enterprises, organizations, individuals and communities in the United States. Thus the U.S. has created the "New Economy" with high economic growth and personal income, low inflation and low unemployment in the last decade, which was due in part to advances in Information Technology (IT). It is increasingly clear that IT plays a significant role in increasing national productivity and sustaining economic growth.[2]

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[1] OECD, Paris 1996, "The Knowledge-based Economy"
[2] See U.S. Department of Commerce, Economics & Statistics Administration, Digital Economy 2000

However, the principal factor that contributes to prosperous development in the United States is the vital emphasis on technological research and development. The basic element for such development is human resources. It therefore goes without saying that talented workers in IT played an important role in the development of the New Economy. Although the dot-com bubble has burst, demand for skilled information technology professionals continues to grow in the United States.[3] This is because the providers of IT products and services are found throughout the economy. The largest group of IT workers is employed in computer services firms, but large fractions also work in manufacturing, financial industries, government, and retail and wholesale trade. High turnover, as well as growing demand, contributes to employers' ongoing scramble to fill IT vacancies. On the other hand, many other countries have severe competition for IT workers. This problem is especially threatening in Europe and Asia. For example, there is a 25 percent gap between jobs created and jobs filled in Germany and the U.K., according to the German Information Technology Association.[4] It is therefore important to look for solutions to a nation's need for IT and skilled IT professionals.

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[3] See The Employment Situation, USDL (Bureau of Labor Statistics), March 9, 2001, on the Internet at http://stats.bls.gov/newsrels.htm

[4] Busse, Torsten, and Mary Brandel. 1998. "The Skills Struggle," Computerworld Global Innovators, December 7, pp.12-13

This paper is divided into six parts. The second part introduces the important role of information technology in the New Economy. The third and fourth parts discuss the IT workforce and its shortage problem. Then the fifth part provides four major approaches to solve this problem. Due to the common culture and language between Taiwan and China, the sixth and final parts specifically analyze the IT talent flows across the Taiwan Strait and how Taiwan's government should deal with this talent exchange.

## II. The importance of Information Technology in the New Economy

The term "New Economy" has been used extensively in recent years. It describes how an economy can capitalize on new technologies, new opportunities, and national investments in computing, information, and communication technologies—or collectively, information technology. New Economy also means that substantial change has occurred in the structure of the economy. This change includes increases in productivity and the impact of investments in the information technology sector.[5] The New Economy refers to particular technological and structural changes that positively impact productivity and growth.[6] To date, the recorded gains in total factor productivity[7] have been attributed in substantial measure to the information-technology-producing industries—that is, those that produce computers, semiconductors, and associated products.

Nowadays, economies grow not only by increasing capital or labor but by finding new ways to combine them more productively. Because the dominant forms of innovation for the last two decades have come from information technology, many analysts point to information technology as central to the New Economy, which means information technology represents a general-purpose innovation that is being

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[5] National Research Council, "Measuring and sustaining the new economy"

[6] Ibid

[7] Total Factor Productivity (TFP) measures the efficiency with which both the labor and capital factor resources are used to produce output. In other words, higher TFP reflects a smarter and better use of the labor and capital resources available for a given level of output. It is defined as: TFP=Output/(Capital+Labor)

applied to every sector and aspect of the economic process.

The network effect is another beneficial phenomena in information technology markets. That is, the more widely a technology is deployed, the greater its value becomes. For example, if you buy Windows, its value may increase as more people buy it, because that increases your ability to communicate and interact with other people. In a certain sense, network effects can bring increasing rates of return; as innovation spreads, its productivity benefits can increase not just arithmetically but quadratically.

Finally, productivity gains come not just from faster processing of information but also from changes in the way a firm operates and from additional technological advances made possible by information technology. Moreover, as information technology spreads and its potential is more widely recognized, it generates demand for even faster processing—another round of information technology innovation. This demand forms the economic basis for Moore's Law[8]. Moreover, these enormous and regular increases in chip power provided the technological basis for the Internet, which in turn now generates more rounds of cascading innovation[9] in how businesses and governments operate and what they produce, such as e-commerce and e-government.

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[8] Moore's Law: the computing capacity of chips doubles every 18 months

[9] As industries apply information technology to their businesses, economists see evidence of what might be called cascading innovation.

Since information technology is playing such an important role in our daily life and the economy, the next section will discuss the IT workers who make our life more convenient and our economy more prosperous.

## III. What is the IT workforce?

"Information technology" is a broad term encompassing computer and communications technology. In general, IT workers are those persons engaged primarily in the conception, design, development, adaptation, implementation, deployment, training, support, documentation, and management of information technology systems, components, or applications.[10]

It is useful to distinguish between different types of IT workforce because the nature and scope of IT work is highly diverse. Generally speaking, the IT workforce can be divided into two categories. Category 1 work involves the development, creation, specification, design, and testing of an IT artifact, or the development of system-wide applications or services, and IT research. Category 2 work primarily involves the application, adaptation, configuration, support, or implementation of IT products or services designed or developed by others.[11] Any given IT worker is likely to do work that involves a mix of Category 1 and Category 2 work, which means that the boundary between Category 1 and Category 2 workers is fluid. For ease of discussion, Category 1 workers are individuals who are responsible for a greater amount of Category 1 work relative to Category 2 work and Category 2 workers are responsible for a greater amount of Category 2 work relative to Category

[10] National Research Council, "Building a Workforce for the Information Economy"
[11] Ibid.,

1 work.[12]

Different category workers need different education, knowledge and experience for doing IT work. First of all, Category 1 work generally requires more years of formal education in IT-related disciplines than Category 2 work. Specifically, some Category 1 work requires mathematical concepts and skills. Other Category 1 work needs people with well-developed conceptual and abstract reasoning ability. Category 2 workers often require an associate's degree, professional/technical or vocational certificate.[13]

Formal knowledge includes facts, principles, theories, algorithms, and so on (see Table 1). Most education and training programs are designed to enhance formal knowledge. Informal knowledge, on the other hand, is "situated" and includes work styles and "situated understandings about materials, tools, and techniques." This knowledge is tacit and seldom recorded. It exists primarily in collective memory and work practices of a local "community of practice." Sometimes, the learning and skills that are acquired and used in one context may be difficult to transfer to another context. Some recruiters and employers recognize the power of learning through experience. In job advertisements, employers often stress that demonstrated ability and experience are the most important hiring factors—college degrees and ranking

[12] Ibid.,
[13] Ibid.,

were secondary factors.[14]

Table 1. Types of Knowledge Required for IT Work

| | Enduring | Perishable |
|---|---|---|
| Hard (technological) | Intellectual abilities, including logical reasoning and the ability to apply algorithms to solve problems<br><br>Understanding of basic physics and electronics concepts supporting IT | Knowledge of particular hardware or software languages or systems (e.g., COBOL, client servers, Java) |
| Soft | Social abilities, including the ability to learn from others and develop "tacit" knowledge<br><br>Ability to translate between technology experts and users<br><br>Knowledge of basic business practices | Knowledge of a particular company or industry |

Source: National Research Council, 2000, "Building a Workforce for the Information Economy"

Quantitative analysis illustrates the influence of on-the-job learning. Table 2 shows the estimated impact of experience on the productivity of software developers engaged in developing large software systems. About a year of experience in a programming language and with a particular system environment is necessary for a worker to develop an average level of productivity, and more years of experience in

[14] Hal Salzman, "Information technology labor market."

these areas (up to about 3 years) enhance productivity further. However, beyond 3 years, additional experience with a system environment or with a programming language has no impact on productivity.[15]

Table 2. Multipliers Relating Experience of Project Personnel to Time Required for Project Completion

| | Applications Experience | Virtual Machine Experience* | Language Experience | Personnel Experience (product) |
|---|---|---|---|---|
| 1 month | 1.29 | 1.21 | 1.14 | 1.78 |
| 4 months | 1.29 | 1.10 | 1.07 | 1.52 |
| 1 year | 1.13 | 1.00 | 1.00 | 1.13 |
| 3 years | 1.00 | 0.90 | 0.95 | 0.86 |
| 6 years | 0.91 | 0.90 | 0.95 | 0.78 |
| 12 years | 0.82 | 0.90 | 0.95 | 0.70 |

*A "virtual machine" consists of the complex of hardware and software that supports the task being programmed.

Source: National Research Council, 2000, "Building a Workforce for the Information Economy"

After this brief introduction to the IT workforce and the requirements needed, next section will examine the problems in the IT labor market from both demand-and-supply and compensation perspectives. After that, the current situation in Taiwan will be analyzed.

[15] National Research Council , "Building a Workforce for the Information Economy"

## IV. Current IT labor market

To understand the problem of IT worker shortage, the supply and demand in the IT labor market and the compensation changes methods will be applied to examine the shortage problem.

### A. Methods to examine IT workforce shortage

Shortages might be caused by market changes that occur faster than labor supply can adjust. In occupations such as IT industry, where it takes several years for people to gain skills, sustained increases in the demand for labor can prevent supply from catching up. As long as demand grows more rapidly than supply, it is impossible for the market to reach equilibrium. A primary characteristic of a tight labor market is that many employers of the IT industry report large numbers of vacancies for IT positions. Overall, today's IT labor market is tight, although the nature and extent of such tightness varies by employer, by type of IT work involved, and by geographical locale.

It is hard to predict whether the current tightness in the IT labor market will continue or not. For example, due to the current economic recession, some IT workers have been laid off but some positions are still quite prosperous. It depends on the skills of the worker and the needs of the IT company. In the long term, if continued growth in the IT sector and in the use of IT by IT-intensive firms is highly

likely, so the need for IT workers will increase. On the other hand, all sectors in the economy experience periods of greater and lesser growth (or even contraction). When they occur, downturns in the IT sector and in the IT-intensive industries may reduce the amount of IT work that can be supplied and increase the number of available workers. Such downturns are also likely to result in reduced demand for IT workers, with a consequent decline in the need for IT workers and a slack labor market.

Another important indicator of a dynamic labor market with strong demand for workers is rising compensation. Rising compensation levels may indicate strong demand that leads to a bidding up of the amount that employers are willing to pay at the margin for labor. For example, a study of the U.S. Department of Commerce indicates that wages for those employed by IT-producing firms are significantly higher and have grown faster than average wages across all private sector industries, particularly for workers in the IT software and services industries.

Furthermore, the presence of unexercised and/or unvested stock options and equity stakes in the compensation of workers in a relatively new and growing industry may help to explain the fact that mean wages in the IT sector have risen only somewhat more rapidly than wages in other sectors of the economy. Because stock options and/or equity stakes that represent deferred compensation are an increasing

part of worker compensation packages in the IT industry, as suggested above, wages alone become a poorer measure of total compensation as time goes on. Thus, the omission of stock options and equity stakes is a problem when comparing wage trends in IT versus those in other sectors.

B. Current situation of the IT workforce in Taiwan

In contrast to the recession-plagued traditional industries, the high-tech sector—led by the information technology industry—has become the force driving Taiwan's current economic development. In 1986, the gross domestic product (GDP) of the high-tech industries was only 14.9 percent of that of the manufacturing sector. In 1991, the percentage increased to 16.75 percent. In 1999, the figure further rose to 26.75 percent.[16] In 2000, the exports of PC-related electronics products, including precision instruments, accounted for 41.36 percent of the total exports of the manufacturing sector.[17] These figures reflect the increasing importance of the PC-related electronic industry in the high-tech industries and even the manufacturing sector as a whole. Thus, the development of the PC-related electronics industry has not only facilitated the transition from labor-intensive to a technology- and capital-intensive industrial focus, but has also been the motor driving Taiwan's economic growth in recent years.

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[16] National Income in Taiwan Area of the Republic of China (Directorate—General of Budget, Accounting, and Statistics, Executive Yuan, Republic of China, 2001)

[17] MOEA Statistics Department, Economic Indicator (Taipei: 2000)

In fact, the key factor that has helped Taiwan's technology industry grow so fast and become such an important part of the global manufacturing chain is the high-quality workforce. Due to the concerted efforts by the Taiwan government, research institutions, and the business community, Taiwan can point to the following advances in science and technology development since 1985. Total R&D spending rose from only 0.96 percent of GDP in 1984 to 1.85 percent in 1996. Moreover, the private sector overtook the public sector in R&D spending for the first time in 1993, and since then, R&D expenditures of private sectors have grown much more rapidly than those of the public sector. In addition, the number of research personnel per 10,000 people increased from 11.8 in 1984 to 33.4 in 1996. Because of a steady and significant increase in the number of scientific and technical papers published internationally by local researchers, from 1988 to 1996 Taiwan's world ranking rose from 30th to 18th in the Science Citation Index (SCI).[18] From 1982 to 1997, high tech-intensive products increased their share of total exports from 18 percent to 48.6 percent. But with the continuing development of high-tech industry, Taiwan has faced a tightness in the IT labor market. From the industrial survey results conducted by the Council for Economic Planning and Development (CEPD), R.O.C., the predicted annual shortage of technology workforce in Taiwan is about 26,000

[18] Science Citation Index (SCI) was provided by the Institute for Scientific Information

workers between 2001 and 2006, especially in IC design, electro-optical engineering, and telecommunication sectors. Employers in technology-related industries expressed that they have had difficulties in obtaining sufficiently educated and experienced workers.[19] This could diminish Taiwan's technology competency in the global markets and affect the economic development in the future.

[19] Council for Economic Planning and Development (CEPD), R.O.C., 1997

## V. Approaches to solving the problem of the IT workforce shortage

There are several solutions that have been proposed to solve the problem of IT workforce shortage. This section will introduce four major approaches, which can be divided into short-term and long-term categories. In the short-run, employers can recruit IT workers from foreign countries, enhance the on-the-job training and increase compensation, which can help solve the problem directly. On the other hand, education strategy and partnership programs between university and industry can build up IT workforce in the long run.

### A. Establish a market-based, pay-for-performance compensation system

From the economists' traditional view, the quantity of labor demand exceeds the quantity of labor supplied, that is, there would be excess demand—firms want to hire more workers at the prevailing wage than there are people willing to work. The expected result would be upward pressure on wages, increasing the amount of labor and reducing the amount demanded until new equilibrium wage rate is reestablished. Thus, when demand for IT workers exceeds supply, IT firms will be unable to obtain all the labor they require, and will therefore offer higher wages in order to attract IT workers from elsewhere.

However, this compensation approach would establish broad pay ranges, tie base pay to market rates, and link increases in pay to competencies and results to attract

and retain IT talent. In addition, the compensation system would ensure that managers have the flexibility to pay individual workers for their respective skills and competencies as well as their contributions to the organization. Offer pay bonuses to attract and retain workers for hard-to-fill positions, such as IT positions requiring specific technical skill sets.

B. Recruit IT workers from foreign countries

Recruiting skilled foreign professionals through job fairs in foreign countries and issuing them temporary visas brings in the most skilled foreign technical workers. Some IT companies are also considering outsourcing key components overseas if they can't find qualified workers in the home countries, which shows that IT companies have strong needs for temporary guest workers to solve their problem immediately.

In addition, some computer companies argue that they need some foreign workers because they sell computer products worldwide and foreign workers can help them tailor products to that particular market. Diversity provides companies with opportunities to have a broader, more diverse set of people, ideas, and experience and is valuable because it often reflects the diversity of customers and marketplace.

However, some domestic groups are opposed to increasing the number of foreign skilled workers. They argued that temporary guest workers in the high-tech

sector would adversely affect educational and employment opportunities for local citizens and make high-tech careers less attractive to local students. Nevertheless, bringing in temporary high-skilled foreigners seems to be the easiest way for the IT companies to satisfy their immediate workforce demand. So the question is, how to protect domestic IT workers? If the domestic labor market were really injured, the government can take legislative action such as regulating the number of foreign workers businesses can import or setting up a quota allowing a certain number of foreign workers into the home country. This could be examined each year and adjusted according to the current economic development.

C. Enhance on-the-job training

Another way to solve the problem of the IT workforce shortage in the short run is through training. Companies should invest more in entry-level training and retraining of existing personnel. For example, Intel Corp. spends more than $100 million per year in a variety of programs designed to improve the education and training of America's workforce. Hewlett-Packard also spends $55 million per year to education.[20] Additionally, professional societies should provide greater assistance in retraining and continuing education for IT professionals. The most critical factor in training success is that individuals must be willing to commit themselves to

[20] Electronic News, 1999

lifelong learning so that they can remain technically competitive. The Internet and distance learning also provide businesses with easier, more economic and immediate ways of training employees.

Studies of software support personnel, and microcomputer and network technicians reveal the value of informal learning.[21] These studies indicate that individuals and groups were able to solve IT problems and develop innovative approaches based on the knowledge gained through day-to-day work experience with others and technical systems themselves.

Despite the potential benefits to improved IT worker training, high turnover and time pressures discourage employer investments in these areas. To overcome these disincentives to invest in training, employers of IT workers could share training costs. Shared training would help overcome the "free rider" problem that results when some firms (often the larger firms) invest in education and training; other firms then recruit the trained employees. Member companies would pool their training resources and achieve economies of scale.[22]

D. Education strategy

In the long run, changing strategy for educating IT workforce can solve the shortage problem. Future economic development depends on the quality of schools

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[21] Brian T. Pentland "Bleeding edge epistemology: practical problem solving in software support hotlines"

[22] Margaret Hilton, "Shared training: learning from Germany"

and the ability of students to compete in an increasingly technical world. The difference today is the rapid rate at which people need to adapt to change and cope with the new technology around us. The education system has not kept pace with these trends.[23] In addition, as the business environment rapidly changes, the skills required for success in business are also evolving. Some IT companies argue that the current school system cannot provide enough students with the adequate skills and knowledge necessary for success in the IT world. Therefore, educators should set up an appropriate information channel to understand the types of abilities that industries are demanding of their IT workers in order to "periodically reassess the skills needed by business and make certain that those skills are included in their curricula."[24] In addition, educators need to enhance practical education and increase the number of teachers qualified to teach IT skills in order to reduce the gap between education and reality.

In Taiwan, to solve the problem of the IT workforce shortage, the Ministry of Education is implementing programs to increase faculty and student enrollment in IT-related departments in universities. At the same time, the Ministry of Education is also revising the regulations to empower all universities to set up collaborative

[23] Carlene, 2000
[24] Giullian, 2000

programs with industries and R&D institutes. Thus the government is actively trying to increase the supply of IT workers in the future.

E. Industry and university partnership program

Establishing cooperation programs between businesses and universities is another way to educate current and prospective IT workers. Mansfield (1996) depicted how businesses and universities are forming partnerships for mutual benefits, and how R&D funding of universities by businesses has increased threefold since 1988. Partnerships are a way for businesses to influence academic curricula and affect the IT skills and business skills of university faculty and students. For example, Texas Instruments provides numerous programs and partnerships across the U.S. to improve K-12 math and science education.[25] Though partnership programs can bring mutual benefits, it is important to avoid IT faculty being lured away and absorbed by businesses. One possible way is to modify the compensation system for teachers in order to encourage better teaching and research performance and attract talented people to come teach and stay at universities.

From the discussion above, knowledge is becoming an increasingly important factor of productivity in today's economy. IT is a tool that helps facilitate knowledge dispersion more effectively and efficiently. Studies also show that IT can

[25] Electronic News, 1999

improve productivity. Therefore, we could say that IT is driving today's economic development. However, surveys also show that workforce shortage exists in IT industry. This is also true in Taiwan. How to deal with this problem is an important issue facing all nations.

On the other hand, studies have revealed some possible solutions to the problem of the IT workforce shortage. In the short-term, an easy approach is to recruit workers from foreign countries to increase the IT workforce supply although it might be difficult for Taiwan to compete for foreign workers. The reasons include lack of an appealing living environment and uncertain cross-Strait relations. Taiwan's government might have to improve the current living environment and businesses might have to provide strong incentives to attract high-tech workers from abroad. In addition, the government in Taiwan needs to offer some incentives to encourage businesses to train current employees. In the long-term, changing education policies to meet the demand of industries and establishing industry and university partnership programs are feasible strategies for Taiwan to set up the groundwork of supplying IT workers within the country.

Among the previous solutions, recruiting IT workers from foreign countries might be the least feasible strategy for IT companies in Taiwan. However, it is more possible to recruit IT talent from China because of common language and cultural

factors. Therefore, next part will discuss the IT talent flows across the Taiwan Strait.

## VI. IT talent flows across the Taiwan Strait

Exchange of human capital is the most intimate form of international commerce, and, despite political differences, economic globalization has added this dimension to cross-Strait relations. In the past few years, hundreds of thousands of skilled Taiwanese personnel have accepted working assignments in China, and the Taiwan government is beginning to permit Chinese technological talent to enter its labor force.

The MOEA's[26] survey in 1998 revealed that more than 35% of the interviewed Taiwanese companies that have invested overseas have employed, or have tried to employ Chinese professionals to work for them. This is particularly true for big enterprises, which show more interest in hiring Chinese professionals.

Common language is the reason Taiwanese companies are hiring Chinese professionals. In addition, human capital flows across the Taiwan Strait are facilitated by the networking of production through international channels, especially through high-tech centers located in the U.S.. According to Zhang Rujing, CEO of Semiconductor Manufacturing International, the firm's major recruitment target is returning Chinese students with graduate degrees. In 2000, China's own universities also produced 50,000 to 60,000 graduates with master or doctoral degrees in

[26] Ministry of Economic Affairs, R.O.C.

engineering. This huge pool of brainpower is potentially an important source for Taiwan's IT companies. The role of highly skilled human resources on both sides of the Taiwan Strait is mutual and complementary. Let's take a look at the following perspectives.

First, a gap exists between scientific knowledge and marketable technologies in China. A lack of marketable capabilities and management skills are major weaknesses for China's technology development. However, Taiwan's manpower advantages in marketing, financing, and legal services help it occupy a strategic position. From this perspective, Taiwan and China could develop a mutually complementary relationship with manpower interaction in the technology-oriented sector.

Secondly, the real brain drain is not occurring between Taiwan and China, but between the Greater China[27] area and the U.S.. This drain is the result of rational choices by talented individuals. The Silicon Valley, the high-tech capital of the world, is a huge magnet that attracts Chinese talent from both sides of the Strait. Work experience in Chinese, Taiwanese, or foreign firms provides a good springboard from which Chinese engineers can leap to their ideal work destinations. The springboard effect brings bright students and practitioners from both sides of the

[27] "Greater China" as used here includes China, Taiwan, Hong Kong and Macao areas.

Taiwan Strait to the U.S., and thus integrates Chinese talent outside both Taiwan and China.

Last but not least, in Taiwan major corporations in the IT industry still have a shortage of advanced IT talent. To make matters worse, new Taiwanese IT factories in China attract both Taiwanese and Chinese engineers. The tug-of-war between Taiwan and China now more or less focuses on consolidating human resources.

The preceding discussion demonstrates that in analyzing high-tech talent flows between Taiwan and China, two important factors must be taken into account. First, because market globalization is the major force behind the talent flows, attracting the best ethnic Chinese talent has become a main task for both Taiwan and China to undertake since the rest of the world is also competing for IT workers. In the era of globalization, talented IT professionals rationally choose the desired place to render their services. Both Taiwan and China are struggling to lure Chinese talent in order to cope with the high-tech talent shortage. Therefore, Taiwanese companies will face further constraints if their government maintains the current policies that limit the quality and quantity of the free flow of talent from China.

Although Taiwan's government has gradually opened itself to incoming Chinese talent, the total number of Chinese skilled workers working in Taiwan is still limited. Only 730 Chinese high-tech workers had gone to Taiwan by the end of September

2000.[28] While easing legal restrictions, the Mainland Affairs Council in Taiwan has emphasized the need for strengthening its supervising capacities in order to oversee the duration of stay, scope of work, and general activities of Chinese professionals in Taiwan. From the industry perspective, the complex application process discourages the introduction of advanced Chinese IT professionals. The skeptical attitudes of the government further hinder the integration of Chinese talent within the local Taiwanese environment. The result is that in order to avoid trouble, Taiwanese firms often prefer to establish their own R&D teams in China. Such steps can help firms fully utilize China's huge advanced manpower, as well as gain access to the market.

The effectiveness of government intervention in facilitating free talent flows in Taiwan is constrained by non-economic factors, such as national security concerns. Facing competition from China to attract global talent, these constraints put Taiwan in an unfavorable position. However, the government policies of selective intervention and selective withdrawal must be based on a solid understanding of current economic interactions as they are mingled with various forces of globalization. Talent flows driven by market mechanisms across the Taiwan Strait are among the most salient phenomena in the era of globalization.

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[28] Feng Chen-yu, "Science and Technology Build a Bridge Across the Taiwan Strait," Taipei, Exchange (February 2001), p.36

## VII. Conclusion

In the era of globalization, human capital is the most precious asset for boosting high-tech and New Economy development. Different from traditional components of the manufacturing industries such as land and labor supply, advanced human capital is highly mobile. Equipped with professional skills and knowledge, advanced talent enjoys more freedom to choose the best places to maximize the return on their brainpower.

Economic globalization promotes the international division of labor and cross-border cooperation on IT design, production, and management. The global network serves as a vehicle to integrate advanced talents from both sides of the Taiwan Strait. The geographic site of advanced talent integration may be located on either side of the Strait.

The cross-Taiwan Strait talent flows indicate that instead of strengthening the regulative framework to control talent outflows, some states are beginning to revise legal restrictions to provide favorable conditions to attract advanced talent from abroad. These efforts are demonstrated by the new policies of Taiwan and China to extend the work scope and duration for foreign professionals, and also policies to attract ethnic Chinese high-tech elite abroad. However, Taiwan's policies to introduce Chinese talent are constrained by domestic political concerns. On the

other hand, urban centers on both sides of the Taiwan Strait are putting special efforts into improving infrastructure and luring global talent. Such efforts include improving transportation, communication, environment conditions, and general amenities. The more important task of these urban centers is to create a global culture of diversity and tolerance. One model is the Silicon Valley and the San Francisco Bay Area in which it is located, which share numerous advantages, from major universities and high-tech institutions to cultural and environmental amenities. These elements have long been major factors in attracting advanced IT talent.

The cross-Strait talent interaction demonstrates that economic globalization has brought the bilateral relationship into the global arena. Globalized market forces promote new waves of Taiwanese high-tech investment into China and also an outflow of brainpower. To cope with the globalized market forces of talent flows, there exist only limited sets of instruments for state intervention. Facing the multiple challenges of promoting international competitiveness, reconstructing the global networking of production, and attracting top talent around the world, Taiwan is compelled to readjust its role and adopt the strategy of selective intervention and selective withdrawal in the era of globalization. In view of this, Taiwan not only has to overcome these problems but also catch up with the advanced countries in the technology field so as to turn Taiwan into a global competitor.

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# UNIVERSITY OF WYOMING

## Office of the Registrar, Laramie, Wyoming 82071

Name: YANG, CHING-YA
STUDENT NR: 520-43-6891
PRINT DATE: 02/05/2003 PAGE NR: 1

Issued to: STUDENT (DIPLOMA TRANSCRIPT)

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GRADUATE Academic Record

Higher Education Institutions:
NATIONAL CHENGCHI UNIVERSITY 09/1960 - 06/1994
Degree: BACHELOR OF ARTS 06/1994

Degrees Awarded:
MASTER OF ARTS 12/20/2002
COLLEGE OF ARTS & SCIENCES
Major: INTERNATIONAL STUDIES
Cum GPA: 4.000

2002 SPRING
Admitted Program:
COLLEGE OF ARTS & SCIENCES
MASTER OF ARTS
Major: INTERNATIONAL STUDIES

| | | | | | |
|---|---|---|---|---|---|
| AGEC 5650 | RESRCH METHODS | A | 2.0 | 8.00 | |
| AGEC 5890 | ADV PROBS:AG ECON | A | 1.0 | 4.00 | |
| ECON 4720 | INTERNAT'L TRADE | A | 3.0 | 12.00 | |
| MGT 4410 | HUM RESOURCE MGT | A | 3.0 | 12.00 | |
| MKT 4440 | MKT OF SERVICES | A | 3.0 | 12.00 | |

| | AHRS | EHRS | QHRS | QPTS | GPA |
|---|---|---|---|---|---|
| Current | 12.0 | 12.0 | 12.0 | 48.00 | 4.000 |
| Cumulative | 12.0 | 12.0 | 12.0 | 48.00 | 4.000 |

2002 SUMMER

| | | | | | |
|---|---|---|---|---|---|
| FIN 4520 | FIN MKTS/INSTITUTS | A | 3.0 | 12.00 | |
| INST 5990 | SEM:IND STUDY | A | 3.0 | 12.00 | |

| | AHRS | EHRS | QHRS | QPTS | GPA |
|---|---|---|---|---|---|
| Current | 6.0 | 6.0 | 6.0 | 24.00 | 4.000 |
| Cumulative | 18.0 | 18.0 | 18.0 | 72.00 | 4.000 |

***** No Further Entries This Column *****

2002 FALL

| | | | | | |
|---|---|---|---|---|---|
| ECON 4740 | INTERNAT'L FINANCE | A | 3.0 | 12.00 | |
| FIN 4410 | WRKG CAPITAL MGT | A | 3.0 | 12.00 | |
| POLS 5230 | GOVT & POL OF ASIA | A | 3.0 | 12.00 | |
| POLS 5570 | GRADUATE READING | A | 3.0 | 12.00 | |

| | AHRS | EHRS | QHRS | QPTS | GPA |
|---|---|---|---|---|---|
| Current | 12.0 | 12.0 | 12.0 | 48.00 | 4.000 |
| Cumulative | 30.0 | 30.0 | 30.0 | 120.00 | 4.000 |

Requirements Completed for
MASTER OF ARTS
*** End of GRADUATE Academic Record ***

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# University of Wyoming

The Trustees of the University by virtue of the authority vested in them and on the recommendation of the faculty of

## The Graduate School

Have conferred the degree of

## Master of Arts

on

## Ching-Ya Yang

with all the Rights, Privileges, and Honors pertaining thereto, given at Laramie, Wyoming, on the twentieth day of December, in the year Two thousand and two.

President of the Trustees

President of the University

Secretary of the Trustees

Dean of the Graduate School