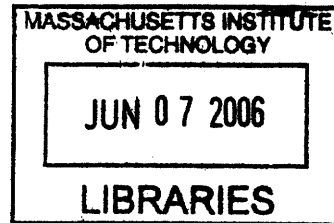


**Offshoring Is Not the Panacea: Ensuring  
Sustainable Employment in the US Manufacturing  
Industry by Leveraging Demand Proximity**

by  
Alexandre Bartolin  
Ing. ETP  
Paris, France, 2004

Submitted to the Department of Civil and Environmental Engineering  
in partial fulfillment of the requirements for the degree of  
Master of Science in Transportation and Master of Science in Civil  
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# Offshoring Is Not the Panacea: Ensuring Sustainable Employment in the US Manufacturing Industry by Leveraging Demand Proximity

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## Abstract

This thesis investigates the theme of “manufacturing offshoring” that became a political issue during the 2004 U.S. presidential election. As during previous elections, employment became a key focus on the home front. Whereas the 1992 presidential election was marked by the debate around the loss of manufacturing jobs due to NAFTA, the 2004 election focused on both manufacturing and services jobs lost due to offshoring to low cost countries. For the first time, well paying jobs, such as IT programming, were outsourced to emerging countries like India or China. Offshoring of “white collar” jobs became the focus of academic, consultant, and journalist discussions in U.S., whereas offshoring of manufacturing activities generated comparatively less interest.

For decades offshoring of manufacturing activities to low cost countries was used by American companies to either reduce production cost or to avoid high tariffs on exports. Offshoring strategy was historically applied in labor intensive industries, such as the apparel and electronics sectors. On the other hand, the influence of offshoring on high-tech industries was assumed to be limited. However, with the fast technological development of China and India, this paradigm might change quickly.

This thesis explores the U.S. manufacturing sector by looking at employment and trade data at a macro-level. The terms offshoring and outsourcing will be defined and the main international trade theories discussed. The thesis develops a model to show that offshoring was only a part of the reason for the shrinkage in manufacturing employment between 1997 and 2003; the others being a drop in demand and gains in productivity. After introducing several case studies of companies in the apparel sector and the semi-conductor industry, a framework for understanding the offshoring decision process is developed. This framework defines the conditions needed to make manufacturing in U.S. competitive with production abroad.

Finally through a detailed study of the expansion of the Chinese economy and the

Wal-Mart phenomenon, the thesis presents the next challenges of the U.S. manufacturing sector: the birth of new competitors for high value added products and the rising constraints on price due to the pressure of retailers on manufacturers.

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# Contents

<b>1</b>	<b>Introduction</b>	<b>17</b>
1.1	Thesis Context . . . . .	17
1.2	Thesis Synopsis . . . . .	18
1.3	Summary of findings . . . . .	19
<b>2</b>	<b>General Facts and Snapshot of the U.S. Economy in 2005</b>	<b>21</b>
2.1	U.S. Employment . . . . .	21
2.2	GDP by Industry . . . . .	30
2.3	Personal Consumption Expenditures . . . . .	33
2.4	Trade . . . . .	36
<b>3</b>	<b>What is Offshoring?</b>	<b>47</b>
3.1	Definition of Offshoring . . . . .	47
3.2	Drivers of Offshoring Activities . . . . .	49
3.3	Hidden Cost of Offshoring . . . . .	51
3.4	History of Offshoring . . . . .	56
3.5	The Old Paradigm of Trade-related Job Losses . . . . .	59
3.6	Which Industries Are the More Vulnerable? . . . . .	62
3.7	Which Types of Jobs Are the Most Vulnerable? . . . . .	65
3.8	Offshoring by Numbers . . . . .	68
<b>4</b>	<b>Economic Theories</b>	<b>73</b>
4.1	Absolute Advantage Theory: Adam Smith . . . . .	73

4.2	Comparative Advantage Theory: The Ricardian Model . . . . .	74
4.2.1	Assumptions . . . . .	74
4.2.2	Model . . . . .	74
4.2.3	Conclusions and Limitations . . . . .	76
4.3	Trade and Income Distribution: The Specific Factors Model . . . . .	76
4.3.1	Assumptions . . . . .	77
4.3.2	Model . . . . .	79
4.3.3	Conclusions and Limitations . . . . .	82
4.4	Resource Differences and Trade: The Heckscher-Ohlin Model . . . . .	83
4.4.1	Assumptions . . . . .	83
4.4.2	Model . . . . .	83
4.4.3	Factor Price Equalization . . . . .	85
4.4.4	Leontief Paradox . . . . .	86
4.4.5	Conclusions and Limitations . . . . .	87
4.5	The Standard Trade Model . . . . .	87
4.6	Bhagwati, Panagariya, Srinivasan (2004) . . . . .	87
4.6.1	Model 1 . . . . .	88
4.6.2	Model 2 . . . . .	88
4.6.3	Model 3 . . . . .	89
4.6.4	Conclusions . . . . .	90
4.7	Samuelson (2004) . . . . .	90
4.8	Discussion . . . . .	91

**5 How Are Trade and International Competition Impacting Employment in the U.S. Manufacturing Sector 93**

5.1	Recessions and Employment: Is the Current Trend Structural or Cyclical? . . . . .	96
5.2	U.S. Manufacturing Imports . . . . .	103
5.3	Model . . . . .	109
5.4	Case Studies . . . . .	114

5.4.1	The Case of the U.S. Apparel Industry . . . . .	114
5.4.2	The Case of a European Semi-Conductor Firm: STMicroelectronics . . . . .	123
5.5	Productivity and Offshoring . . . . .	126
5.6	Framework If Location Decision . . . . .	127
5.6.1	Existing Frameworks . . . . .	128
5.6.2	New Framework . . . . .	131
5.7	The Future of U.S. Manufacturing . . . . .	138
<b>6</b>	<b>China, an Increasingly Attractive Spot for American Companies</b>	<b>143</b>
6.1	China, a Growing Power . . . . .	143
6.2	Competitive Advantages . . . . .	144
6.2.1	Labor Force and Utility Costs . . . . .	144
6.2.2	Large Domestic Market . . . . .	145
6.2.3	Positive Political Change . . . . .	147
6.2.4	Manufacturing Specialization . . . . .	148
6.3	Weaknesses . . . . .	150
6.3.1	Intellectual Property . . . . .	151
6.3.2	Suppliers Network . . . . .	151
6.3.3	Logistics and Distribution . . . . .	153
6.3.4	Management Resource . . . . .	156
6.4	Case Study: Automotive Industry in China . . . . .	156
6.4.1	Operations in China . . . . .	157
6.4.2	Chinese Procurement . . . . .	158
6.5	Conclusion . . . . .	159
<b>7</b>	<b>Wal-Mart: Implementing Innovative IT System to Support Global Sourcing</b>	<b>161</b>
7.1	Wal-Mart and The U.S. Retail Industry . . . . .	161
7.2	Sourcing and Selling Globally . . . . .	163
7.3	The Example of China . . . . .	167

7.4	RFID: Wal-Mart's Next Competitive Advantage . . . . .	170
7.4.1	Wal-Mart IT System 1.0 . . . . .	170
7.4.2	Wal-Mart IT System 2.0 . . . . .	171
7.5	The Future of the Wal-Mart World . . . . .	178
<b>8</b>	<b>Conclusions</b>	<b>181</b>
<b>A</b>	<b>Appendix from Chapter 2</b>	<b>185</b>
<b>B</b>	<b>Appendices from Chapter 4</b>	<b>187</b>
<b>C</b>	<b>Appendices from Chapter 5</b>	<b>191</b>
<b>D</b>	<b>Appendices from Chapter 6</b>	<b>201</b>

# List of Figures

2-1	U.S. Employment by Sector . . . . .	22
2-2	U.S. Manufacturing Employment . . . . .	23
2-3	U.S. Employment Distribution Evolution 1870-2001 . . . . .	23
2-4	U.S. Employment Distribution Evolution 1870-2001 . . . . .	24
2-5	Occupational Distribution of U.S. Employment . . . . .	25
2-6	U.S. Business Dynamics . . . . .	27
2-7	U.S. Manufacturing Business Dynamics . . . . .	29
2-8	U.S. Business Dynamics Comparison . . . . .	30
2-9	U.S. GDP by Major Type of Product . . . . .	31
2-10	Annual Personal Consumption Expenditures per Capita by Type of Goods . . . . .	34
2-11	Distribution of U.S. Population by Age . . . . .	35
2-12	U.S. Consumer Expenditure by Population Age . . . . .	36
2-13	U.S. Trade Balance 1960-2003 . . . . .	38
2-14	U.S. Goods Trade Balance 1960-2003 . . . . .	39
2-15	U.S. Services Trade Balance 1960-2003 . . . . .	40
2-16	U.S. Goods Imports Partners . . . . .	43
2-17	Simple Model of Good Production . . . . .	44
3-1	Market Location and Facility Location . . . . .	49
3-2	Normalized International Comparisons of Hourly Compensation Costs for Production Workers in Manufacturing between 1975 and 2003 (U.S.=100)	50

3-3	Modeled Economics for a Typical Industrial Product Sourced from a Low Cost Country . . . . .	52
3-4	International Comparisons of Hourly Compensation Costs for Production Workers in Manufacturing between 1975 and 2003 (U.S. dollars)	54
3-5	International Comparisons of Hourly Compensation Costs for Production Workers in Different Manufacturing Industries in 2002 (U.S.=100)	55
3-6	Transportation Costs and Telecommunication Costs . . . . .	57
3-7	Simple Company Models . . . . .	58
3-8	The Factors Which Determine the Location Decision . . . . .	67
4-1	The Ricardian Model: Labor Supply Curve . . . . .	75
4-2	The Specific Factors Model: One Economy Model . . . . .	77
4-3	The Specific Factors Model: Production Frontier . . . . .	78
4-4	The Specific Factors Model: Marginal Product of Labor Curve . . . . .	79
4-5	The Specific Factors Model: Production Frontier . . . . .	79
4-6	The Specific Factors Model: The Value of Labor's Marginal Product . . . . .	80
4-7	The Specific Factors Model: Price Change . . . . .	81
4-8	The Specific Factors Model: The Relative Supply Curve . . . . .	81
4-9	The Specific Factors Model: International Trade and Price Convergence	82
4-10	The Heckscher-Ohlin Model: Resources Intensity . . . . .	84
4-11	The Heckscher-Ohlin Model: Relative Supply Curve . . . . .	85
4-12	Model 1: Marginal Product Curve and the Distribution of Income . . . . .	88
4-13	Model 2: Good Ressources Requirements . . . . .	88
4-14	Model 2: Income Distribution Before Offshoring . . . . .	89
4-15	Model 2: Income Distribution After Offshoring . . . . .	90
5-1	U.S. Manufacturing Employment . . . . .	97
5-2	U.S. Employment and Recession Periods . . . . .	98
5-3	U.S. Non-farm Employment Dynamic during Recession Periods . . . . .	99
5-4	Recession Effect on the U.S. Manufacturing Employment . . . . .	101
5-5	US Employment Dynamic during the 2001 Recession by Industry . . . . .	102

5-6	US Manufacturing Employment Dynamic during Recession Periods . . . . .	102
5-7	Origin of U.S. Manufacturing Imports . . . . .	103
5-8	Profile of Imports Partners . . . . .	105
5-9	U.S. Manufacturing Imports Share from China and Other Low Cost Countries . . . . .	106
5-10	U.S. Manufacturing Imports Share from China and Other Low Cost Countries by Industry . . . . .	107
5-11	U.S. Manufacturing Industries Employment and Imports Changes . . . . .	109
5-12	Correspondence Between Domestic Employment, Domestic Use, Ex- ports and Imports . . . . .	112
5-13	U.S. Manufacturing Employment Dynamic 1997-2003 . . . . .	113
5-14	Supply and Demand Origin in Apparel and Leather and Allied Prod- ucts Industries in the US . . . . .	117
5-15	U.S. Employment in Apparel and Leather and Allied Products Industries	118
5-16	Supply and Demand Origin in Textile Mills and Textile Mill Products Industries in the U.S. . . . .	119
5-17	Employment in Textile Mills and Textile Mill Products . . . . .	120
5-18	Principal Semi-Conducteur Manufacturers . . . . .	123
5-19	Factors Influencing the Offshoring Decision . . . . .	129
5-20	Key Criteria to Determine the Products to Offshore to LCCs . . . . .	130
5-21	Criteria to Determine the Location of the Production Steps of a Product	132
5-22	Example of the Location Strategy of a Company with a Set of 4 Products	133
5-23	The Old Paradigm of the Offshoring Decision . . . . .	134
5-24	The Offshoring Decision Factors Today . . . . .	135
5-25	Production Location Possibilities . . . . .	136
5-26	Production Facilities Possibilities . . . . .	137
5-27	Company's Optimal Location and Ownership Architecture . . . . .	138
5-28	Optimal Location Depending on Skills Requirements and Distance Fac- tor Levels . . . . .	140
5-29	The Trends in U.S. Manufacturing Activities . . . . .	141

6-1	Comparative Production Costs . . . . .	145
6-2	The Chinese Wholesale Channel Structure . . . . .	155
7-1	Wal-Mart Imports from China, 2001-2004 . . . . .	168
A-1	U.S. Productivity Growth . . . . .	185
B-1	Specific Factors Model: the Marginal Product Curve and the Distribution of Income . . . . .	187
B-2	Model 1:Gains from Outsourcing in a one-good Model . . . . .	188
B-3	Model 2 . . . . .	189
C-1	Recessions and Employment Changes . . . . .	192
C-2	Employment Change and Exporting Countries GDP per capita Change	196
C-3	US Manufacturing Industries . . . . .	197
C-4	Demand and Supply . . . . .	198
C-5	International Labor Cost Comparison in the Apparel and Textile Industries . . . . .	199
D-1	Recessions and Employment Changes . . . . .	201
D-2	Output of Chinese Selected Manufacturing Goods . . . . .	203
D-3	U.S. Imports from China . . . . .	204

# List of Tables

2.1	U.S. GDP by Industry . . . . .	32
2.2	U.S. Employment Share by Industry . . . . .	32
2.3	Annual U.S. GDP Percentage Change by Industry . . . . .	33
2.4	Annual U.S. GDP Percentage Change by Industry . . . . .	38
2.5	Annual U.S. GDP Percentage Change by Industry . . . . .	40
2.6	U.S. Imports Partners 1989 and 2004 . . . . .	41
2.7	Distribution of Imports by End-use Category . . . . .	45
2.8	Distribution of Exports by End-use Category . . . . .	45
2.9	Exports and Imports Relative to GDP and Degree of Openness . . . . .	46
3.1	Distribution of U.S. Imports by End-use Category . . . . .	61
3.2	Distribution of U.S. Export by End-use Category . . . . .	61
3.3	U.S. Job Losses due to Offshoring . . . . .	68
3.4	MLS Program, Separations by Selected Employer Action, First Quarter 2004 . . . . .	69
3.5	Reason for Layoff, First Quarter 2004 . . . . .	70
3.6	Separations due to overseas relocation and imports competition be- tween 1996 and 2004, U.S. private nonfarm sector . . . . .	71
4.1	The Ricardian Model: Unit Labor Requirement . . . . .	75
4.2	Leontief Paradox: US 1947 Data . . . . .	86
4.3	Leontief Paradox: US 1962 Data . . . . .	86
4.4	Leontief Paradox: Work force skills level . . . . .	86
4.5	Composition of Developing Country Exports . . . . .	92

5.1	Recession Effect on U.S. GDP Employment . . . . .	100
5.2	U.S. Manufacturing Industries . . . . .	111
5.3	Summary of the Results . . . . .	114
5.4	Growth Rate of Selected Countries . . . . .	125
5.5	Productivity Gain and job Losses . . . . .	127
5.6	Production Cost Differential between the U.S. and China . . . . .	130
7.1	Example of U.S. brands' percentage of sales to Wal-Mart . . . . .	164
7.2	Wal-Mart's U.S. Market Share for Some Products . . . . .	164
7.3	Number and Location of Wal-Mart Stores . . . . .	166
C.1	List of Low Cost Countries . . . . .	193
C.2	Imports Origin . . . . .	194
C.3	Imports Origin . . . . .	195
C.4	Apparel U.S. Wages . . . . .	200
D.1	China's total exports and imports by groups of commodities . . . . .	202
D.2	Export Value by Major Categories: January - May 2004 . . . . .	205

# Chapter 1

## Introduction

### 1.1 Thesis Context

After the 1997 Asian financial crisis, the concurrent 9/11 crisis and the burst of the internet economy bubble, Americans have been extremely concerned about the situation of employment. Nevertheless, the situation seems to be fairly different from the chaotic image produced by the Media, politics, and analysts. According to The Economist, between 1980 and 2002, America's population grew by 23.9% and the number of employed Americans grew by 37.4%. In 2006, 134.5 million Americans are in work: a near-record, both in absolute terms and as a proportion of the population. The gap between the reality of the employment in the U.S. economy and the perception of many American workers can be explained by the large losses of jobs in the manufacturing industry, sector which used to be considered in the past as the first employer in the country. The two most evident reasons for these job losses are the continual increase of productivity in the U.S. manufacturing sector and the increase of outsourcing of manufacturing activities. Large improvements in telecommunications technology such as Internet technologies and the consistent rising skill levels of workforce in emerging economies have made international sourcing a tangible option for many American industries and companies. The consequence is that employment in manufacturing is shrinking and the service industry might not be able to absorb every person, thus causing a potential net loss of American jobs.

In the early 20th century, immigration of numerous people from European countries was the main fear for American people. In the 1930s, capitalism was often viewed as a job destructive theory. Then, automation was considered as the next predator of American jobs. In 1929, Stuart Chase asked in its famous book, “Men and Machines”, “Has the machine in its last furious manifestation begun to eliminate workers faster than new tasks can be found for them?” In the 1980s, Japan and its incredibly growing companies were thought to cause the endless decline of US manufacturing. These economic trends have been considered at some point in the American history as a driving cause for future job loss. Today, nobody will seriously argue that these changes in economic practices have negatively impacted U.S. economy. Joseph Schumpeter exposed this dynamic process in his theory of Creative Destruction: “The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers’ goods, the new methods of production or transportation, the new markets, the new forms of industrial organization that capitalist enterprise creates. [These developments] incessantly revolutionize the economic structure from within, incessantly destroying the old one, incessantly creating a new one.” [106] This thesis examines if Schumpeter’s prediction still stands today for the increase of imports from low costs countries, the relocation of manufacturing capacities abroad, and the rise of new low cost competitors such as China. The thesis determines how U.S. companies can still produce domestically, supplying employment in the U.S., while being competitive with imports from offshore production.

## 1.2 Thesis Synopsis

Chapter 2 presents a snapshot of the U.S. economy in 2006. Employment trends, GDP level by industry, trade data and U.S. personal expenditure will be studied. Chapter 3 will clarify the definition of offshoring, as well as its historic context. The most vulnerable industries will be identified and the available data to measure the number of jobs lost in the manufacturing sector due to offshoring exposed. In chapter 4, international economic theories related to the offshoring decision will be explained. Chapter

5 shows the evaluation of the number of jobs lost in manufacturing for the period of 1997 to 2003, following the model developed by Baily and Lawrence (2004) [32]. Two industry case studies, a framework of the location decision are exposed as well. In chapter 6, the case study of the Chinese economy, and its implication for U.S. companies, will be investigated. Finally, chapter 7 will exposed the practical implication of massive sourcing from low cost countries through the Wal-Mart example.

### **1.3 Summary of findings**

The offshoring decision is not a macro-economic decision: two companies competing in the same industry will decide to locate their production either in low cost countries or in the U.S. depending on their specific products, customers, and strategy. For instance, a company might decide to stay in the U.S. to compete on product variability and responsiveness to change in domestic demand, whereas another company will source its products from low cost countries to compete on price. The macro-economic study has revealed that the origin of imports is not correlated to the level of job losses in U.S., implying that low cost countries are exporting products that look like products from developed countries. Rising Asian economies, like China, are producing more and more advanced products, embedding the latest technologies. It is obvious that these countries are not looking to be only a manufacturing subcontractor for American brands and are becoming real competitors of American companies not only in Asia, but also in the U.S. for the most advanced products. It appears that there is no valid reason to believe that these new competitors will not be able to produce products as advanced technologically as American's products in the future. With the convergence of U.S. and Asian countries' manufacturing expertise and technological knowledge, companies will not decide to manufacture goods in the U.S because of quality or technology disparity. Insuring manufacturing jobs in U.S. implies finding a sustainable advantage that production offshore cannot acquire easily in the future. It appears that competing on the proximity to the customers is a sustainable solution for U.S. domestic manufacturing.



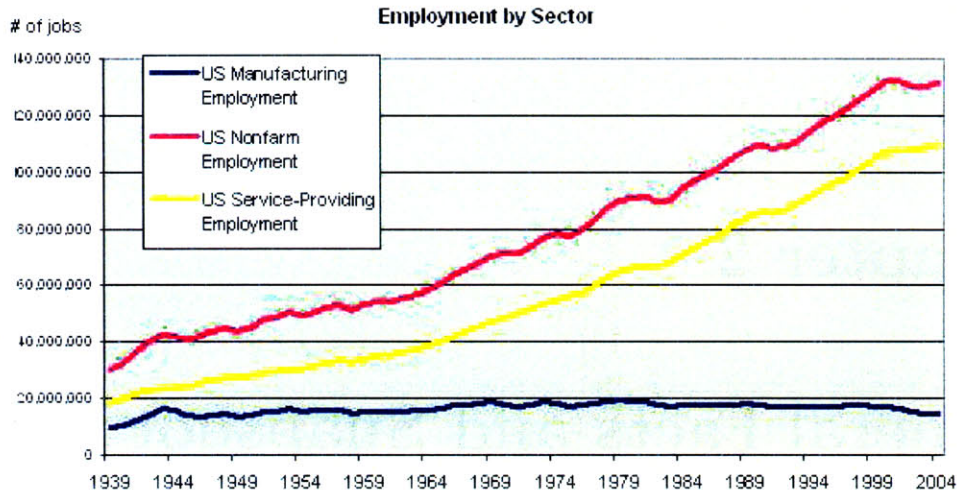
## Chapter 2

# General Facts and Snapshot of the U.S. Economy in 2005

*“The movement of jobs to the developing countries does not alter the overall level of employment in the advanced economies; however, the pattern of employment, to be sure, does change”, The Economist, February 2004 [46]*

### 2.1 U.S. Employment

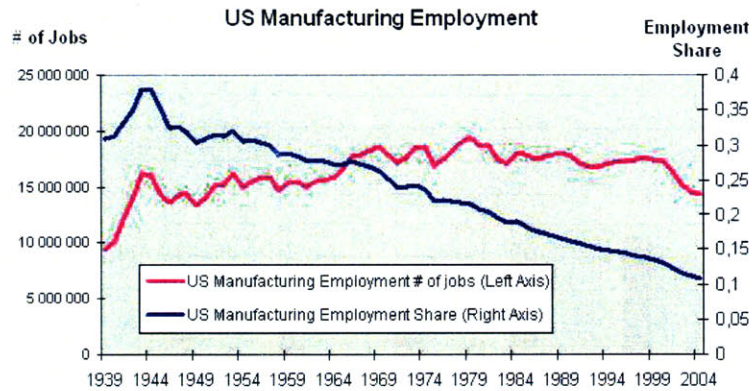
During the last sixty years, employment in the U.S. has shown strong and consistent growth. The total number of workers increased three-fold (passing from 40 million non-farm workers in 1945 to 135 million in 2006), with job growth almost exclusively in the services industry (Fig. 2-1). Employment in the manufacturing sector, on the other hand, remained constant during this period, and began to fall after 1990.



Source: Bureau of Labor Statistics (BLS) - Current Employment Statistics (CES) Program  
<http://www.bls.gov/ces/home.htm>

Figure 2-1: U.S. Employment by Sector

In 2005, the manufacturing industry employed approximately 10.6 percent of all U.S. workers, compared with 30 percent in 1956 (Fig. 2-2). The manufacturing employment share declined, primarily due to productivity gains accompanied by restructuring of this industry sector.



Source: BLS - CES Program

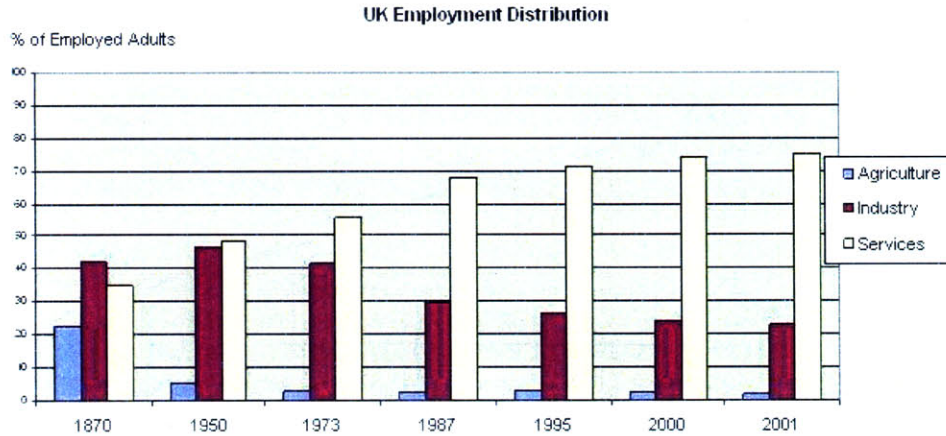
Figure 2-2: U.S. Manufacturing Employment

Looking at international data (Fig. 2-3 and Fig. 2-4), the U.S. tends to follow the same trends as the UK, France, and Germany. Industrialized countries successively build their economic development on agriculture, manufacturing, and then services sectors. The decline in the agriculture sector can be explained by the fact that once a country reaches a high level of productivity through automation, it can move human resources from old economic sectors to the new booming industries. The shift from manufacturing to service is explained by a combination of factors, namely, offshoring, outsourcing, international competition on home and foreign market and productivity gains.



Figure 2-3: U.S. Employment Distribution Evolution 1870-2001

U.S. employment distribution change can be explained by different causes. First,



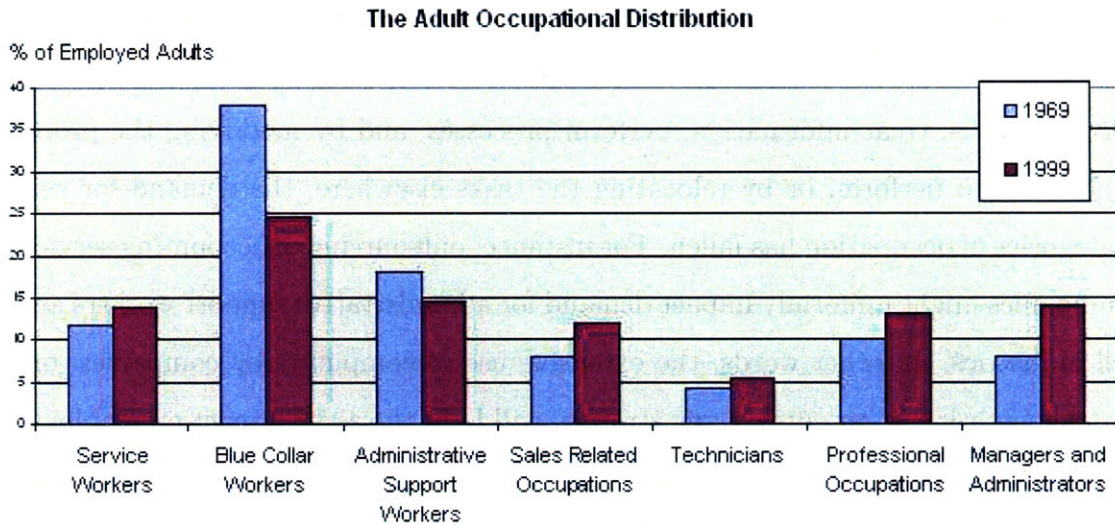
Note: Agriculture includes agriculture, forestry, and fishing / Industry includes mining, manufacturing, electricity, gas and water supply and construction

Source: Robert H. McGuckin: "Can manufacturing survive in advanced countries?" The Conference Board, March 2004 / 1870-1987: Angus Maddison, *Dynamic Forces in Capitalist development*, (New York: Oxford University Press, 1991), 248-249 / 1995 - 2001: GGDC, The Conference Board

Figure 2-4: U.S. Employment Distribution Evolution 1870-2001

U.S. productivity has increased dramatically since 1980, especially in the manufacturing sector (Appendixes 2.1). Thus, automation of manufacturing processes initially reduced the requirement for human resources in many manual or repetitive tasks. Second, sourcing of labor-intensive and less technologically advanced goods (like apparel or footwear) from low cost countries (LCC) has been used for years by multinational companies. Since the 1990s, large imports from such countries as China, Mexico or other low-cost countries have competed with U.S. national production for a wider array of products. Moving activities overseas or sourcing goods from abroad reduces the relative demand for unskilled labor force in the U.S., in much the same way as replacing these workers with automated production. [48] Consequently, relative demand for blue-collar workers has declined, since the mid-1970s, changing the distribution of the U.S. labor force. In 1969, Blue Collar workers represented 38 percent of U.S. workers and only 24.5 percent thirty years later. During the same period, the share of service workers, professional occupations and managers has increased strongly (Fig 2-5).

Thus, business sourcing location and productivity gains reduced the absolute number of workers in the U.S. manufacturing sector, but also shaped employment distribution between industries and occupations. Consequently, employment changes will



Note: Data represent all industries  
 Service workers: waiters, janitors, policemen, childcare workers, and other job which require face to face interaction with customer  
 Blue collar workers: craftsmen, assembly line workers, day laborers  
 Sales related occupations: from McDonald's clerks to stockbrokers to real estate agents  
 Professional occupations: engineers, teachers, scientists, lawyers  
 Source: Levy and Murnane 2004 "The New Division of Labor" / March 1970 and March 2000 Current Population Surveys

Figure 2-5: Occupational Distribution of U.S. Employment

be explored within two dimensions: the industrial dimension, and the occupational dimension. The industrial dimension refers to classification by Industries such as the North American Industry Classification System (NAICS) which distinguishes the different industries by grouping together establishments that use the same or similar processes to produce goods or services. The occupational dimension refers to classification by Occupations such as the Standard Occupational Classification (SOC) which classifies workers into occupational categories.

For the industrial dimension, technological breakthroughs or international competition can massively impact demand for a type of product. For instance, increase of imports of apparel and footwear trimmed down U.S. employment in these industries for all types of occupations, dismantling a huge part of these industries in the U.S. For the occupational dimension, business evolutions and new practices in companies, such as outsourcing, offshoring, automation, or intensive use of IT have largely modified the profile of employment within the manufacturing industry. Thus, business and

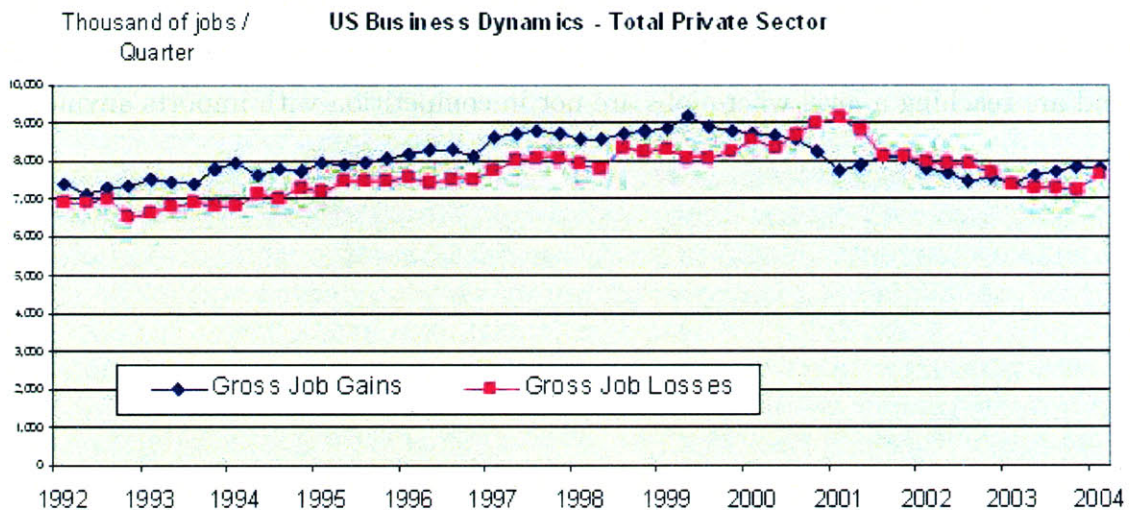
economic mutations have changed both the level of employment and the employment distribution between occupations within each industry: by changing the way workers process tasks, treat information, perform processes, and by modifying the processes and tasks to perform, or by relocating the tasks elsewhere, the demand for certain categories of occupation has fallen. For instance, outsourcing of accounting services in companies might uniformly impact demand for administrative support workers among all industries. In other words, the extensive use of computers by companies, or the implementation of an outsourcing strategy will have the same impact on employment among all manufacturing industries, but a discriminated impact on occupation.

Thus, job demand changes have altered the set of skills now needed to perform emerging types of jobs. The new set of skills required to fulfill high demanded job can be observed by looking at employment data by occupation. "The new division of Labor", recently published by Levy and Murnane, explores the impact of IT and computers on U.S. employment (Fig. 2-5). [86] An interesting conclusion of the book is a comparison of U.S. occupational distribution of jobs between 1969 and 1999, corresponding to two business cycle peaks. Over a thirty year period, blue collar and administrative support workers employment share declined from 38 percent to 24.5 percent, and from 18 percent to 14.5 percent, respectively. These two occupational categories require the least advanced education level. Thus, the employment share of low skilled jobs dropped from 56 percent to 32.5 percent. During the same period, the employment share of service and professional occupations, technicians, managers and administrators, and sales related occupations jumped from 44 percent to 67.5 percent. Therefore, employment growth has been mainly concentrated in service-providing industries.

For this purpose, the Bureau of Labor Statistics (BLS) issues employment statistics by occupation. The Occupational Employment Statistics (OES) program provides employment and wage estimates for over 800 occupations using the 2000 Standard Occupational Classification (SOC) system. The workforce is divided into 820 occupations according to occupational definition of jobs and the SOC system. Data is available from 1988 to 2003.

In chapter 5, a detailed study of the U.S. manufacturing sector employment changes

will be developed through both the occupational and the industrial dimensions. The impact of offshoring and more broadly, the impact of trade and international competition on employment, job numbers, and job occupational composition will be identified. Between 2001 and 2004, employment issues have been the foremost topic of the presidential elections. The net change in employment level has become the cornerstone for media reporting, political agenda, and U.S. worker concern. The Bureau of Labor Statistics introduced, in 1992, a new survey to track the creation and destruction of jobs. These data provide complementary information on current employment trends. The Business Employment Dynamics (BED) survey consists of a set of statistics pertaining to gross job gains and losses from 1992 forward. The data provide a picture of the dynamic state of the labor market that underlies economic expansion and contraction. Between 1993 and 2002, 8 million jobs were created and destroyed, on average, every quarter in the U.S. Private sector (Fig. 2-6). For instance, Federal Reserve Board Chairman Alan Greenspan has indicated that it is not unusual for 1 million workers to quit or be fired in a single week, while another 1 million are hired. [63]



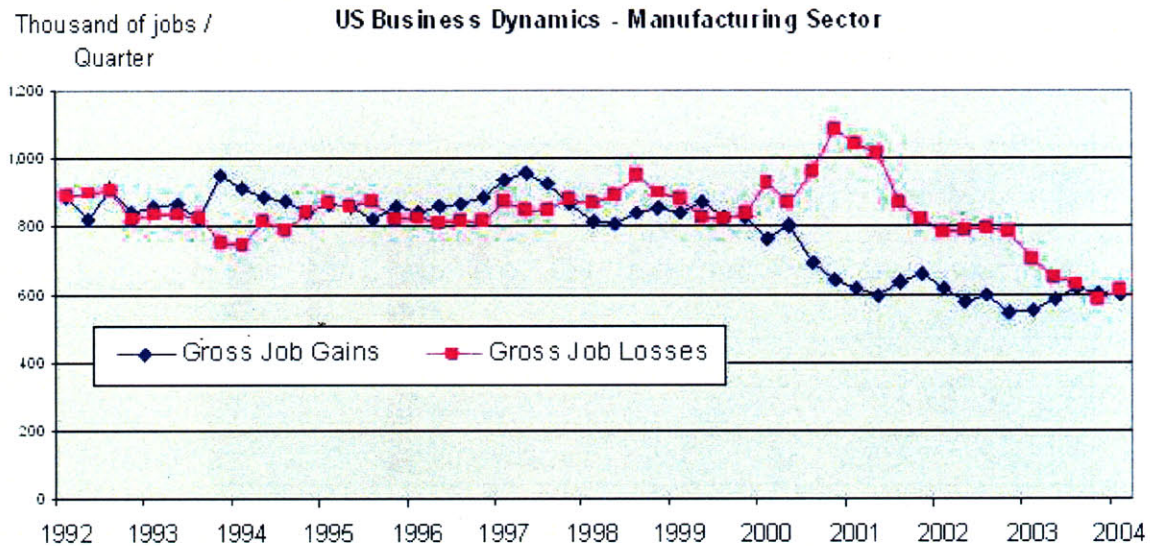
Source: BLS / [http://www.bls.gov/bdm/total\\_private.gif](http://www.bls.gov/bdm/total_private.gif)

Figure 2-6: U.S. Business Dynamics

Indeed, job losses can result from lower levels of job creation, or higher levels of job destruction than usual, or both simultaneously. During the 2001 recession,

employment creation levels shrank from 9 million to less than 8 million per quarter. During the same period, job losses soared up from 8 million to 9 million per quarter. After 2001, job losses per quarter came down to their initial pre-recession level at approximately 8 million per quarter. Concurrently, job-gain levels remained at the recession level, approximately 8 million per quarter. Therefore, the term “jobless-recovery” has been applied by political and economic analysts to describe the post-recession employment dynamic.

A similar picture can be observed for the manufacturing sector (Fig. 2-7), though a pre-recession differential between job gains and job losses was small. During recession, job losses increased by 25 percent, from 0.8 million jobs per quarter to 1 million jobs per quarter. At the same time, job gains decreased by 25 percent, from 0.8 million jobs per quarter, to 0.6 million jobs per quarter. Thus, the jobless-recovery is even more pronounced for manufacturing. The job-gain levels remained at the recession levels two years after the recession ended. Moreover, current job creation in the manufacturing sector is not due to a strong creation of new jobs, but rather, an exceptionally low level of job losses, below average pre-recession levels. This trend might reveal that U.S. has reach a level where industries cannot move any more jobs and are reaching a level where jobs are not in competition with imports anymore.

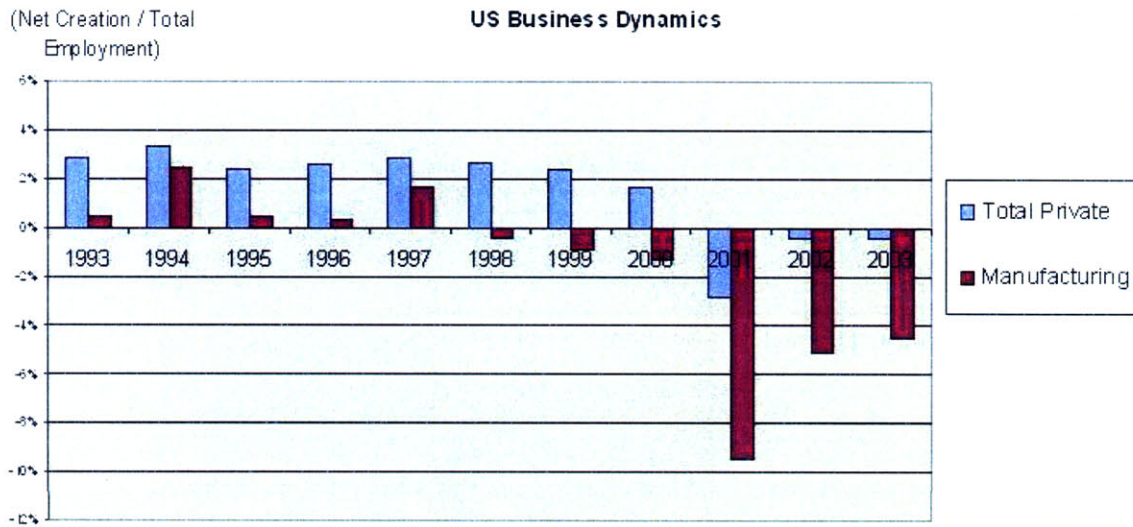


Source: BLS / <http://www.bls.gov/bdm/manufacturing.gif>

Figure 2-7: U.S. Manufacturing Business Dynamics

Figure 2-8 shows that the manufacturing sector has consistently performed poorly compared to the entire private sector in terms of job creation. Between 1993 and 1997, the manufacturing sector constantly gained proportionally fewer jobs than the private sector as a whole. Between 1998 and 2000, the manufacturing sector lost jobs while the U.S. economy still showed net job creation.

The 2001 recession impacted the manufacturing sector more severely than the private sector, as a whole. This picture is consistent with the long term employment changes in the U.S., and comparable with the situation in many other industrialized nations. Nevertheless, the amplitude of job destruction in the manufacturing sector since 2001 reveals more than the standard long term shift from manufacturing jobs to services jobs. Chapter 5 attempts to explain the recent job losses in the US manufacturing sector.



Note: Value on Y-axis = (Gross Job Gain - Gross Job Losses) / Employment. The ratio is evaluated for each year. It is displayed for the manufacturing sector (NAICS 31-33) and for the Total Private sector  
 Source: BLS / Author

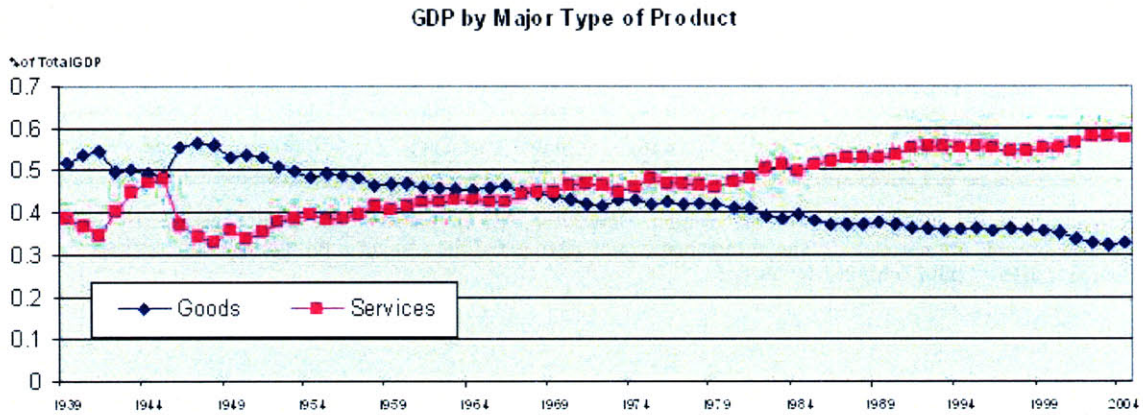
Figure 2-8: U.S. Business Dynamics Comparison

## 2.2 GDP by Industry

The Gross Domestic Product (GDP) is the market value of all final goods and services produced within a country during a given time period. GDP is commonly used as the foremost indicator of economic progress and development. GDP includes only goods and services produced within the geographic boundaries of the country, regardless of the producer's nationality.

The Bureau of Economic Analysis (BEA) provides U.S. GDP data by goods and services (Fig. 2-9). Since 1968, the service sector has had a higher weight in the US economy than the goods producing sector. The services-providing industry includes wholesale trade, retail trade, transportation and warehousing, utilities, information, financial activities, professional & business services, education & health services, leisure & hospitality sectors. The good producing industry includes natural resource & mining, construction and manufacturing sectors. In 1949, the good-producing industry counted for 56 percent of the U.S. GDP, compare to 33 percent

in 2004. On the other hand, the service-providing industry counted in 2004 for 57 percent of the U.S. GDP, compare to 34 percent in 1948.



Note: Goods producing includes Construction, Natural resources & mining and Manufacturing  
 Source: Bureau of Economic Analysis, National Income and Product Accounts Table, Table 1.2.5 / Author

Figure 2-9: U.S. GDP by Major Type of Product

At a more detailed level, the manufacturing sector, by itself, counted in 2004, for 13 percent of the whole U.S. GDP compared with almost 30 percent in 1950 (Table 2.1). During the same period, the finances and services sectors have grown dramatically, from 11 to 21 percent, and from 8 to 23 percent, respectively. However, U.S. GDP has grown spectacularly since 1950 from \$1,777B (billion of 2000 dollars) to \$10,390B in 2004 (billions of 2000 dollars). Consequently, the value added by the manufacturing sector is considerably greater today than in the past, even though its share of the U.S. economy has been divided by three over the last 50 years. Such performance is due to consistent productivity gains. Nevertheless, these numbers suggest that other industries have experienced an even greater growth during the last decade.

Table 2.1: U.S. GDP by Industry

Value-Added as a Percentage of GDP by Industry	1950-SIC	1960-SIC	1970-SIC	1980-SIC	1987-NAICS	2000-NAICS	2004-NAICS
Agriculture, forestry, and fishing	0.07	0.04	0.03	0.02	0.02	0.01	0.01
Mining	0.03	0.02	0.02	0.04	0.02	0.01	0.01
Construction	0.04	0.05	0.05	0.05	0.05	0.04	0.05
Manufacturing	0.28	0.27	0.24	0.21	0.17	0.15	0.13
Wholesale, Retail, Transp., Information	0.27	0.26	0.25	0.24	0.23	0.22	0.22
Finance, insurance, and real estate	0.11	0.14	0.14	0.15	0.18	0.20	0.21
Services	0.08	0.10	0.12	0.14	0.18	0.22	0.23
Government	0.11	0.13	0.15	0.14	0.14	0.12	0.12

Note: Data before 1987 are based on SIC system. Data after 1987 are based on the NAICS system. Bridges between the two systems are not closed. The author has grossly aggregated data to get a full horizon time series.

Source: : BEA / data compiled by author

As expected, employment level has paralleled the GDP trends. Employment in manufacturing used to represent 28 percent of the total jobs in US after World War II, compared to only 10 percent in 2005 (Table 2.2). Employment in other goods producing sectors (construction and mining) remained almost at the same share. During the same period, the services-providing industry has captured one third of the total jobs in the U.S.

Table 2.2: U.S. Employment Share by Industry

Employment Share by Industry	1950-SIC	1960-SIC	1970-SIC	1980-SIC	1987-NAICS	2000-NAICS	2004-NAICS
Agriculture, forestry, and fishing	0.04	0.03	0.02	0.02	0.02	0.01	0.01
Mining	0.02	0.01	0.01	0.01	0.01	0.00	0.00
Construction	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Manufacturing	0.31	0.29	0.27	0.23	0.17	0.13	0.12
Wholesale, Retail, Transp., Info.	0.26	0.25	0.25	0.26	0.23	0.22	0.21
Finance, Insurance, and Real Estate	0.04	0.04	0.05	0.06	0.06	0.06	0.06
Services	0.13	0.14	0.16	0.23	0.30	0.36	0.33
Government	0.15	0.19	0.21	0.18	0.17	0.16	0.16

Note: Data before 1987 are based on SIC system. Data after 1987 are based on the NAICS system. Bridges between the two systems are not closed. The author has grossly aggregated data to get a full horizon time series

Source: BLS / data compiled by author

Thus, during the last decade, the U.S. manufacturing sector created fewer jobs and generated less value compared to services or other sectors. Between 1977 and 2004, the manufacturing sector consistently showed weaker growth than the U.S. economy as a whole (Table 2.3). During this period, the GDP of the manufacturing sector grew annually by 6.3 percent on average, compared to 10.4 percent for the U.S. economy. The services and finance sectors, on the other hand, grew by 14.8 percent and 13.2 percent, respectively. Between 2000 and 2004, the manufacturing sector growth was

weak, increasing on average by only one percent annually, compared to 6.7 percent for the U.S. economy with 8.2 percent annually in the services and finance sectors.

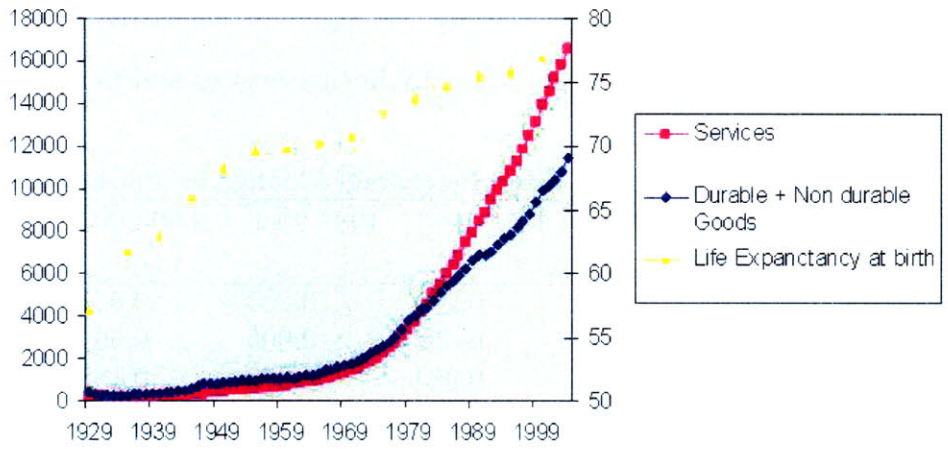
Table 2.3: Annual U.S. GDP Percentage Change by Industry

Average Annual Real GDP percentage change	1977-1987	1987-2000	2000-2004	1977-2004
Gross domestic product	0.149	0.083	0.067	0.104
Agriculture, forestry, and fishing	0.059	0.006	0.094	0.038
Mining	0.064	0.078	0.138	0.081
Construction	0.165	0.096	0.116	0.124
Manufacturing	0.103	0.050	0.010	0.063
Wholesale, Retail, Transp., Info.	0.130	0.061	0.048	0.084
Finance, insurance, and real estate	0.196	0.101	0.082	0.132
Services	0.214	0.120	0.082	0.148
Government	0.160	0.085	0.088	0.113

Note: Data before 1987 are based on SIC system. Data after 1987 are based on the NAICS system. Bridges between the two systems are not closed. The author has grossly aggregated data to get a full horizon time series. Value added by industry has been corrected to represent Real value added using 2000 Dollars  
Source: BEA / data compiled by author

## 2.3 Personal Consumption Expenditures

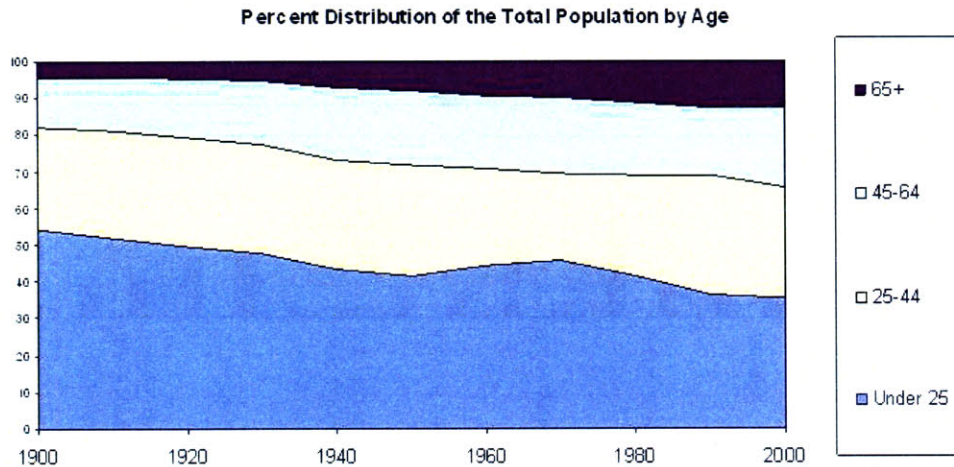
Advanced economies are shifting more resources to services, particularly in the distribution, finance, and business services areas. As seen previously, several factors are driving this process: productivity gains in manufacturing and agriculture, increases in demand for services due to an aging populations and higher overall income and, development of new services. Simultaneously, personal consumption expenditures per capita for services have become higher than expenditures for goods in the early 1980s (Fig. 2-10). Moreover, between 1984 and 2004, expenditures for services grew by 5.7 percent annually on average, compared to 4.1 percent for goods expenditures. During the 2001 recession, expenditures for services still grew faster than expenditures for goods. Indeed, services expenditures increased by 4.4 percent annually between 2000 and 2004 compared with 3.6 percent for goods expenditures.



Source: National Income and Product Accounts Table / BEA National Vital Statistics Reports, Vol. 53, No. 6, November 10, 2004 / Table 12

Figure 2-10: Annual Personal Consumption Expenditures per Capita by Type of Goods

One of the main reasons for the increase of service expenditures is the aging U.S. population through its increasing need for health care. Between 1980 and 2000, the fraction of the population over 65 years old has increased from 11.3 percent to 12.4 percent, whereas the share of the population between 45 and 64 has increased from 19.6 percent to 22 percent (Fig. 2-11).

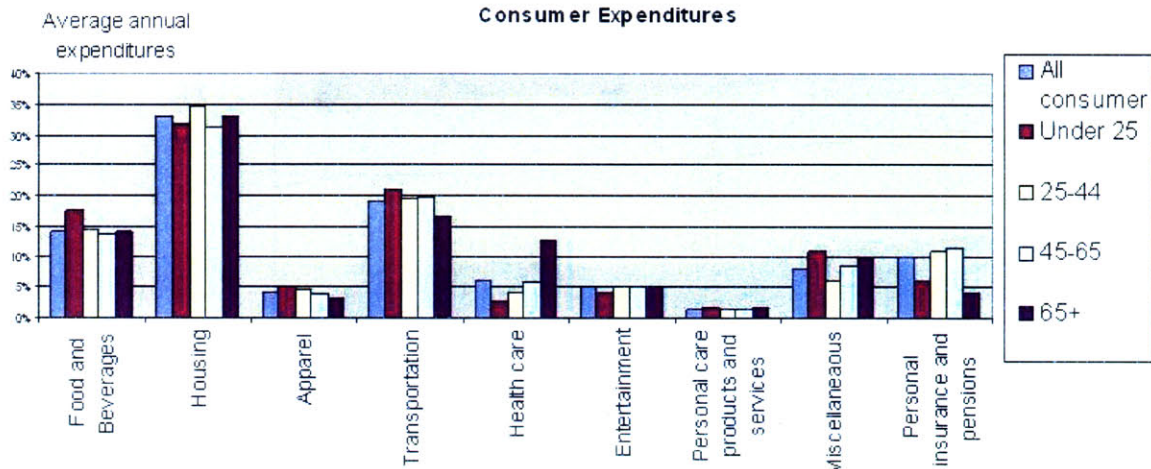


Source: U.S. Census Bureau, decennial census of population, 1900 to 2000 / Demographic Trends in the 20th Century, 2002

Figure 2-11: Distribution of U.S. Population by Age

The 65 and older population numbered 35.9 million in 2003 and represented 12.3 percent of the U.S. population. By 2030, there will be approximately 71.5 million senior citizens, more than twice than 2000 figure according to the Administration on Aging (AoA), an agency in the U.S. Department of Health and Human Services. According to this same agency, people over 65 represented 12.4 percent of the population in the year 2000, but are expected to grow to be 20 percent of the population by 2030. The phenomenon of an aging population has become a burning topic with the explosion of health care costs, although it is not a new idea. Elderly people tend to spend more money in services and health care than other demographic groups (Fig. 2-12).

According to a 2002 study of the International journal of Epidemiology [125] and Congressional Budget Office projections, [1] Medicare, Social Security and publicly funded long-term care will represent 13.2 percent of the US GDP in 2050 compared to 6.8 percent in 2000.



Note: Miscellaneous include Education, Cash Contribution, Reading, Tobacco  
 Source: BLS / Consumer Expenditure Survey, 2003 / Data compiled by author

Figure 2-12: U.S. Consumer Expenditure by Population Age

## 2.4 Trade

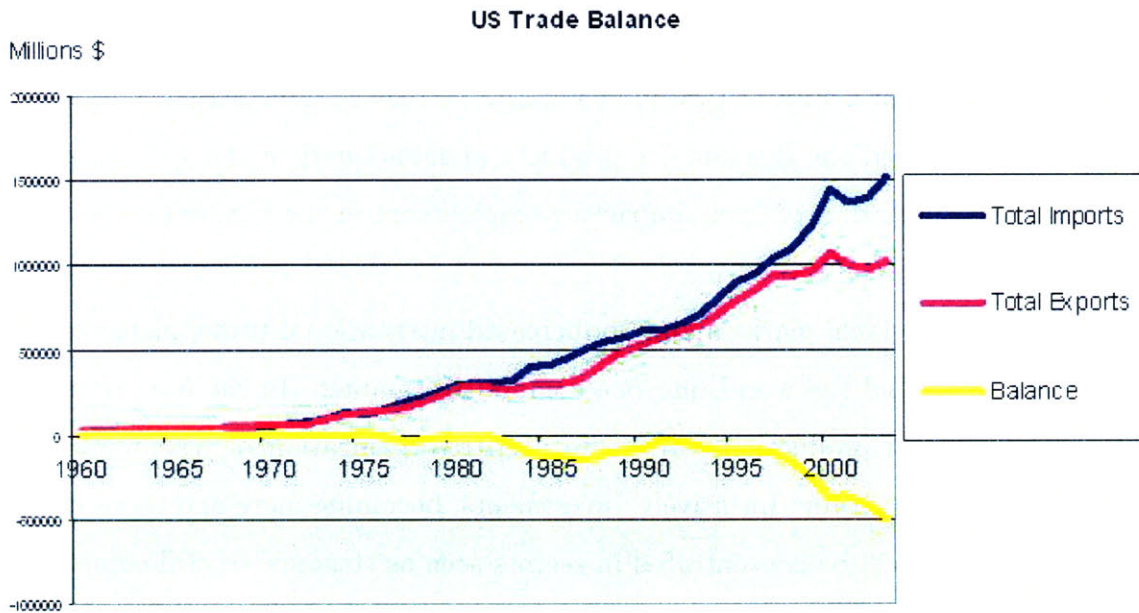
Productivity gains and expenditure shifts from goods to services are two sources of the U.S. manufacturing employment decline. Productivity gains weakened the demand for workers to sustain the level of output, while demand for output has been growing more slowly as a result of smaller goods expenditures. Nevertheless, there has been a recent rise in the number of alternative explanations about why the U.S. manufacturing employment fell, since the approval of NAFTA. One of the most popular explanations during the 2004 U.S. presidential election highlights the recent expansion of the Chinese economy and its exports to U.S. as a key factor, mirroring the spectrum of Mexican imports and other NAFTA related damages during the 1992 presidential election. Indeed, observations on trade data provide insights to evaluate other driving forces on weak U.S. manufacturing employment and growth. Weakened exports and rising imports, lower demand for U.S. output, and thus slow down domestic manufacturing activity. More generally, imports from low labor cost countries created an intense controversy over U.S. trade balance and the impact on employment

in the U.S. manufacturing sector. Imports reduced the demand for goods produced in U.S., resulting in a stall in U.S. job creation. Moreover, the emergence of foreign competitors reduced the demand for products manufactured in the U.S. to supply international demand, negatively impacting employment in the U.S. export sector as well.

The increasingly global markets, due to increased international trade, places companies from all around the world into one competitive market. In the long term, this plunge in national production will create deep re-organization of resources within the manufacturing sector. Intuitively, investments, becoming more and more volatile between sectors, will be concentrated in sectors seen as strategic or still competitive and fall in sectors, where low cost countries are already more competitive. Chapter 5 exposes a more detailed study, at the industry level within the manufacturing sector, to analyze the changes in the U.S. manufacturing sector. Thus, the role of altered trade, productivity gains, changing national demand, and new personal expenditures will be used to explain employment decline and weakened growth in U.S. manufacturing during the last decade.

When U.S. trade data over the last decade is evaluated, the public concerns during the 2004 U.S. presidential election become more understandable. Between 1997 and 2003, the trade deficit grew by 460 percent, ballooning from \$108B in 1997 to \$498B in 2003 (Fig. 2-13). The trade deficit counted for 4.5 percent of the U.S. GDP in 2003 compare to 1.3 percent in 1997.

The explosion of the trade deficit results from simultaneous observable facts. First, imports during this period increased until 2001, before leveling off between 2001 and 2003 (Table 2.4). Imports increased annually by 8.6 percent on average between 1997 and 2003. Second, exports were unusually low over the same time period. Exports increased annually by only 1.5 percent on average between 1997 and 2003. In contrast, exports increased by 7.6 percent on average between 1977 and 2003, and imports by 8.6 percent over the same period. Thus, it appears that the trade deficit is due mainly to an unprecedented low level of exports during the last eight years rather than an abnormally high level of imports.



Source: Bureau of Economic Analysis / U.S. International Transactions Accounts Data

Figure 2-13: U.S. Trade Balance 1960-2003

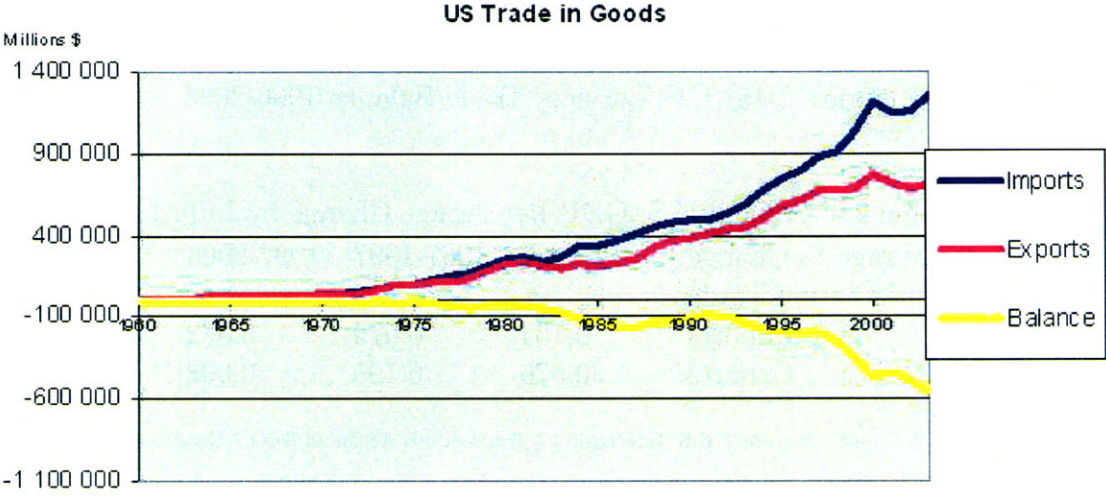
Table 2.4: Annual U.S. GDP Percentage Change by Industry

Annual Average % Change US trade	1977-1987	1987-1997	1997-2003	1977-2003
Imports	10.8%	7.6%	6.4%	8.6%
Exports	8.6%	10.4%	1.5%	7.6%

Source: Bureau of Economic Analysis (BEA) / U.S. International Transactions Accounts Data / Data compiled by author

In 1997, the recessions in East Asia reduced the demand for U.S. exports and consequently, caused a significant drop in the demand for U.S. production. U.S. exports for East Asia accounted for 30 percent of total exports before 1997. Between 1997 and 1998, U.S. manufacturing exports to East Asia declined by 12 percent. Because the total export of goods and services represented 11.9 percent of U.S. GDP in 1997, the Asian impact reduced U.S. output by 0.4 percent. This reduction in demand was offset by increased spending by households and businesses in the United States, supported by lower interest rates on interest-rate sensitive goods, such as automobiles and new homes. Nevertheless, since many Asian currencies declined

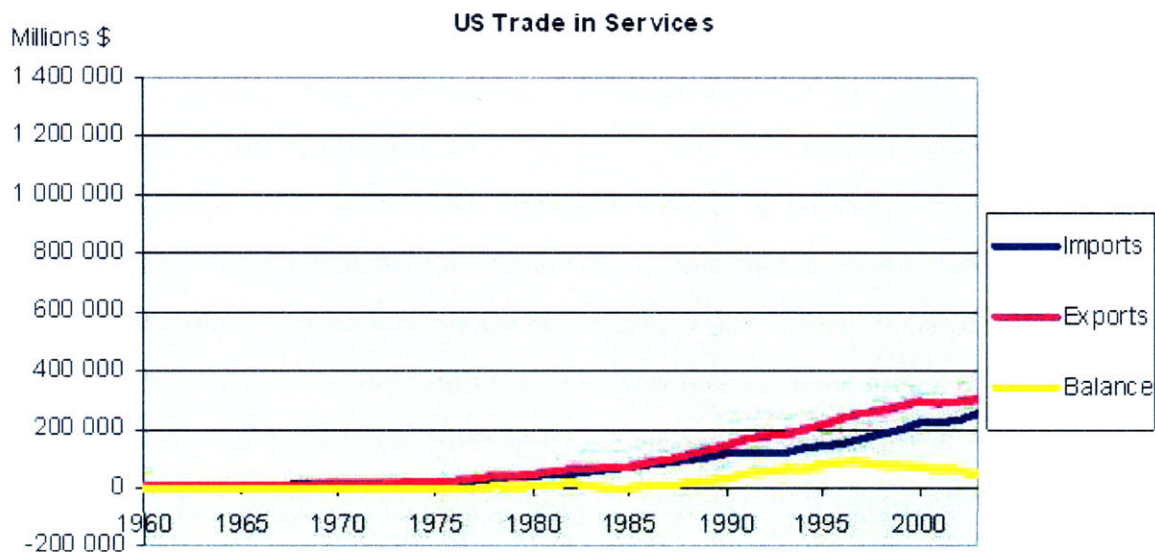
in value relative to the dollar, imported goods became temporarily cheaper than U.S. goods. Thus, the U.S. goods sector experienced a lower demand for exports and an increasing competition from countries with a devalued currency in the U.S. national market, resulting in a lower domestic demand as well. Ultimately, these two phenomena, lower demand for U.S. exports and lower demand in the U.S. due to rising imports, underline the considerable importance of competitiveness for US companies, to assure local market share while maintaining a market share abroad. As presented in the following two figures (Fig. 2-14 and Fig. 2-15), the U.S. trade deficit is derived solely from the goods producing sector. In 2003, U.S. trade deficit in goods accounted for almost 5 percent of the U.S. GDP.



Source: Bureau of Economic Analysis / U.S. International Transactions Accounts Data

Figure 2-14: U.S. Goods Trade Balance 1960-2003

The picture of the U.S. manufacturing sector trade pattern between 1997 and 2003, is even more extreme than that of the U.S. economy as a whole. Between 1997 and 2003, exports grew annually by 0.8 percent on average, compared to 7.1 percent on average between 1977 and 2003 (Table 2.5). During the same period, imports growth remained relatively high at 6.2 percent on average. Indeed, the recent colossal trade deficit in U.S. manufacturing, and U.S. economy overall, resulted from low growth in exports and high increase in imports.



Source: Bureau of Economic Analysis / U.S. International Transactions Accounts Data

Figure 2-15: U.S. Services Trade Balance 1960-2003

Table 2.5: Annual U.S. GDP Percentage Change by Industry

Annual Average % Change	1977-1987	1987-1997	1997-2003	1977-2003
U.S. Manufacturing Trade				
Imports	0.104	0.079	0.062	0.085
Exports	0.076	0.105	0.008	0.071

Source: Bureau of Economic Analysis / U.S. International Transactions Accounts Data / Data compiled by author

In addition to trade volume and growth dynamics, the origin of imports and exports is noteworthy. Indeed, goods imported from low cost countries were traditionally commoditized goods, with low prices and less technologically advanced. These types of imports typically compete with U.S. manufactured goods for national demand. Such imports are called “substitute imports”. On the other hand, imports from developed countries are usually very specific and technologically advanced items that generally, do not compete with U.S. production. This is due to that fact that it is frequently concerned with products only produced in foreign countries, requiring skills or materials only present in foreign countries. Such imports are less directly competitive with U.S. production. These imports are called “complementary im-

ports”.

Theoretically, in the presence of open markets and free international trade, countries will specialize in sectors where they have comparative advantages over other countries. U.S. firms would be expected to specialize in sectors where they are competitive, abandoning markets where foreign competitors are more effective. Therefore, most advanced and industrialized countries tend to compete over similar products, such as high-tech, bio-technology, or nano-technology, whereas low cost countries compete together on low price products and commodity items. Low cost countries would have shattered the U.S. manufacturer of such items, destroying employment in the U.S. manufacturing sector. For instance, apparel imports from China are currently destroying the remaining jobs in the U.S. apparel sector. Chapter 4 will present several commonly accepted international trade models and clarify this dynamic.

Aggregated data of the U.S. manufacturing sector provides a general idea about the change of trade partners' distribution. For instance, in 1989, only 6 percent of U.S. manufacturing imports came from low cost countries (LCC- countries with GDP per capita inferior to 5 percent of U.S. GDP per capita) compared with 21 percent in 2004. Imports from China grew substantially, jumping from 3 percent in 1989 to 16 percent in 2004, accounting for the largest part of the LCC market share gain (Table 2.6).

Table 2.6: U.S. Imports Partners 1989 and 2004

US Imports Partners	1989	2004
China	0.03	0.16
Other LCC	0.03	0.05
Others	0.94	0.79

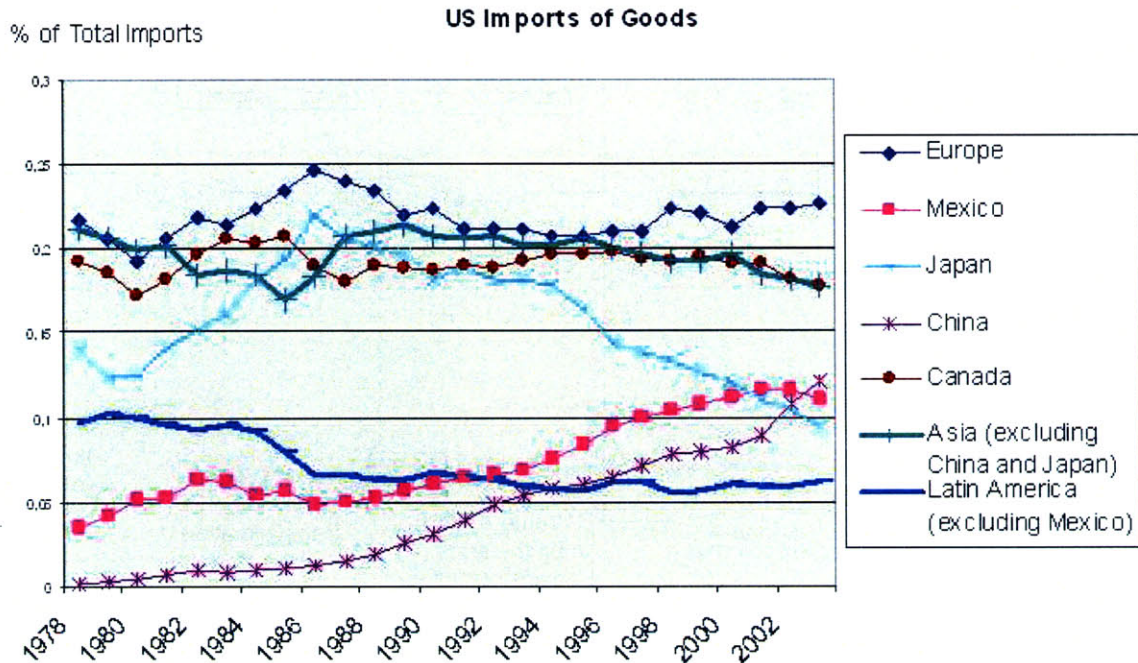
Note: Low Cost Country (LCC) GDP2004 Per Capita = 0.05\*US GDP2004 Per Capita

Source: BLS / the Office of Trade and Industry Information (OTII) U.S. Department of Commerce / Author

The evolution of the distribution of imports between import partners is mainly consistent with theories and ideas developed above. Imports from Europe have remained stable over the last 20 years, oscillating around 23 percent (Fig. 2-16). Since the U.S. and Europe have similar levels of development and technological advance-

ment, imports from Europe might be concentrated in specific goods. For example, the U.S. imports mainly nuclear reactors and machinery, aircrafts, pharmaceutical products, and beverages. From France, beverages account for almost 45 percent of total French exports to the U.S. in 2004; nuclear reactors and machinery, vehicles, and medical instrument from Germany, account for almost 60 percent of total German exports in 2004. The same pattern is observed for Canada: imports have been concentrated in a few sectors, and have remained stable during the last decades. This has been especially apparent following the NAFTA treaty. Imports of vehicles, mineral fuel and oil, wood and machinery accounted for 55 percent of total Canadian exports to the U.S. in 2004.

The simultaneous rise of Chinese and Mexican imports coincides with the decline of imports from Japan, Latin America and recently, other Asian countries. All these countries export mainly machinery, electrical equipment, apparel, furniture, toys and rubber products to the U.S., and are competing on the same market segments. Additionally, Japan and Mexico export a substantial number vehicles to the U.S. The recent increase of Chinese exports to the U.S. corresponded to a decline in imports from Mexico, and other Asian countries. These trends confirm that industrialized countries and less-developed countries have been competing only in their category with other countries at the same level of development. Nevertheless, it is hard to believe this situation will remain stable considering the increasing range, as well as the sophistication, of goods produced and exported, by such countries as China, India or Taiwan.



Source: Bureau of Economic Analysis / U.S. International Transactions Accounts Data

Figure 2-16: U.S. Goods Imports Partners

Although the origin of imports and the level of technological advancement of the country of origin is an important characterization of imported goods, the type of goods imported is a key factor in understanding the tradeoff between the rise of imports and the decline of employment in the U.S.

The end-use category data provided by the Bureau of Economic Analysis can be used to characterize the stage of processing of the goods shipped. In this code system, industrial supplies and materials represent the less manufactured products, such as raw materials, steel, newsprint, and textile yarns. Capital goods are used by firms for both investment (like machinery), and intermediate inputs. For instance, all electrical parts and components are included within capital goods. Finally, consumer goods consist of finished products. Even for consumer goods, there is still some value-added on these goods in the U.S., such as advertising overheads, as well as marketing and product development (Fig. 2-17).

Between 1978 and 2003, the distribution of imports into the U.S. has dramatically changed (Table 2.7). Finite products, such as consumer goods, today represents 26

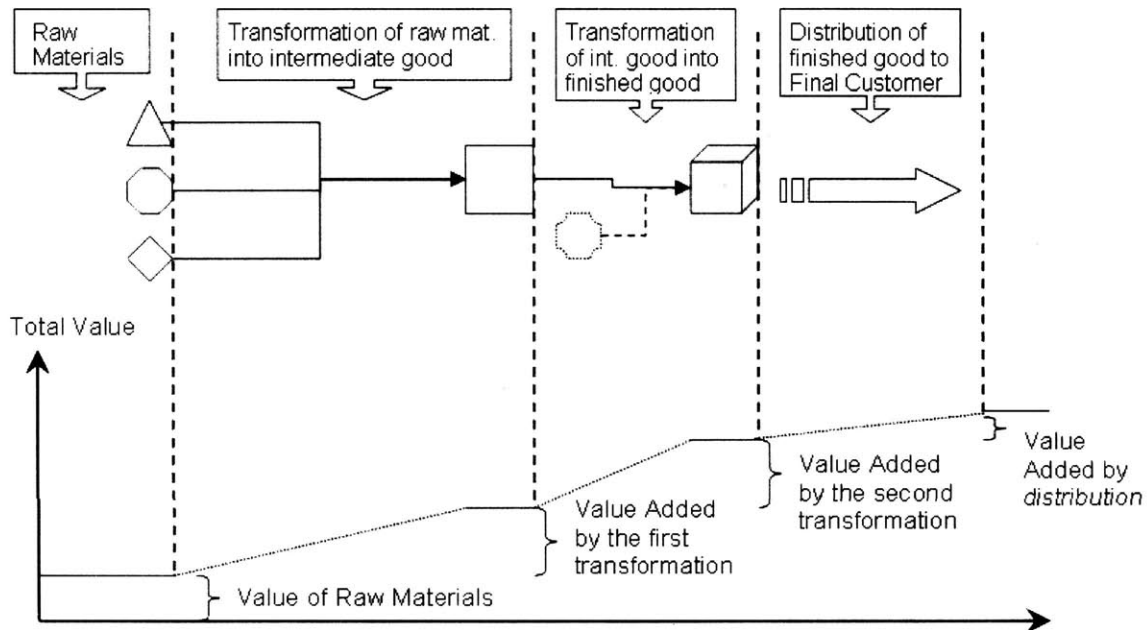


Figure 2-17: Simple Model of Good Production

percent of imports, compared to 17 percent in 1978. In 2003, industrial supplies and materials represented only 25 percent of imports compared to 47 percent in 1978. Thus, the U.S. is importing more goods in an advanced stage of production, including already a finite product, than it used to. This adds less value in the U.S. compared to previously. This change in the composition of imports leads to fewer opportunities for the U.S. manufacturing sector to expand onshore. Whereas the old manufacturing model was to import raw material and intermediate parts from international partners, and then to manufacture the goods in U.S., now a new model of finished goods import is emerging. Between 1978 and 2003, the distribution of U.S. exports has followed the same trends (Table 2.8). The U.S., like other rich countries, specializes in equipment production. Nevertheless, since the price of equipment (relatives to the price of consumption goods) tends to decline over time, due to innovation in technology and productivity gains, such exports distribution for the U.S. is not an assurance of future high employment in manufacturing to support exports and future economic growth.

Changes in import composition and origin may in fact have serious impact on

Table 2.7: Distribution of Imports by End-use Category

Distribution of Imports by End-us Category	1925	1950	1965	1978	1990	2003
Foods, feeds, and beverages	0.22	0.30	0.19	0.09	0.05	0.04
Industrial supplies and materials	0.68	0.63	0.53	0.47	0.29	0.25
Capital goods, except automotive	0.01	0.01	0.07	0.11	0.23	0.23
Automotive vehicles, engines, and parts	0	0	0.05	0.14	0.18	0.17
Consumer goods (nonfood), except automotive	0.09	0.06	0.16	0.17	0.21	0.26
Imports, n.e.c., and U.S. goods returned	0	0	0	0.02	0.03	0.04

Table 2.8: Distribution of Exports by End-use Category

Distribution of Exports by end-us category	1925	1950	1965	1978	1990	2003
Foods, feeds, and beverages	0.18	0.16	0.19	0.18	0.09	0.08
Industrial supplies and materials	0.60	0.45	0.35	0.28	0.27	0.24
Capital goods, except automotive	0.09	0.22	0.31	0.33	0.39	0.41
Automotive vehicles, engines, and parts	0.07	0.08	0.08	0.11	0.09	0.11
Consumer goods (nonfood), except automotive	0.06	0.09	0.07	0.08	0.11	0.13
Exports, n.e.c.	0	0	0	0.02	0.04	0.03

Source: Bureau of Economic Analysis, U.S. International Transactions Accounts Data / Table 2 / Robert C. Feenstra (1998)/ Author

U.S. manufacturing. Moreover, the volume of imports compared to GDP is increasing. Imports in 2003 accounted for 14 percent of the U.S. GDP instead of 9.1 percent in 1977 (Table 2.9). This trend is observed for most of countries in world due to trade liberalization, network and transportation improvement, and specialization and concentration of manufacturing activities. Imports for Germany and France represent 31.8 percent and 24.6 percent of their GDP, respectively, in 2003. Nevertheless, to compare U.S. economy, with the European Union, as opposed to particular European countries, appears more accurate since population, distances, and economy are similar. Then, imports represent only 10.6 percent of the GDP of the E15, slightly less than the U.S.

Imports and exports represent a larger percentage of GDP in 2006 for almost all countries in the world compare to 30 years ago. International competition determines

Table 2.9: Exports and Imports Relative to GDP and Degree of Openness

Exports and Imports relative to GDP	1977	1987	1997	2003
Mexico Exports	10.3	19.5	30.3	28.4
Mexico Imports	10.2	13.4	30.4	30.1
Mexico Degree of Openness	20.5	32.9	60.6	58.5
China Exports	4.3	13.6	23.1	34.3
China Imports	4.0	13.7	18.3	31.8
China Degree of Openness	8.3	27.3	41.4	66.1
France Exports	19.6	19.7	25.5	25.8
France Imports	20.4	20.7	22.5	24.6
France Degree of Openness	40.0	40.5	48.0	50.4
Germany Exports	19.5	22.4	27.9	36.0
Germany Imports	21.8	22.8	26.5	31.8
Germany Degree of Openness	41.3	45.1	54.5	67.7
USA Exports	7.9	7.7	11.6	9.5
USA Imports	9.1	10.8	12.8	14.0
USA Degree of Openness	17.0	18.6	24.4	23.5
E15 Exports			9.8	10.4
E15 Imports			9.2	10.6
E15 Degree of Openness			19.0	21.0

Note: Degree of Openness is defined as Imports plus Exports divided by GDP for each country  
Source: OECD / World Bank Group

the flow of goods in the world, and thus, U.S. companies' level of competitiveness. Chapter 5 will determine if trade changes in volumes, trading partners, or types of products have impacted the development of U.S. manufacturing during the last decade, triggering changes in the employment patterns of this sector overall.

# Chapter 3

## What is Offshoring?

### 3.1 Definition of Offshoring

Offshoring generally describes the practice of investing in production capacity abroad (or “offshore”) to produce goods previously made domestically (or “onshore”). Subsequently, goods are shipped back to the home country to serve the domestic market. This first, strict definition would imply that the company will still build and afterward own the production facilities abroad being used to serve the U.S. market. Nevertheless, in term of company strategy, the decision to locate production onshore or offshore, and the decision to own or not to own the production facilities are not correlated. This thesis does not discuss the ownership decision, usually referred to as the buy-or-build decision or outsourcing, since ownership of production facilities does not impact home employment level by itself, unlike the location of the facilities. Outsourcing defines a process in which a company delegates some of its in-house operation and processes to a third party or subcontractor.

Thus, offshoring will here refer to U.S. companies investing in production capacities abroad to produce goods or services previously made or performed in the U.S. to serve the U.S. market and also to imports of goods or services from foreign suppliers or subcontractors to serve the U.S. market, replacing goods or services previously made in the U.S. by the company itself or a local subcontractor (Fig. 3-1). The goods produced offshore by U.S. companies may be used to supply the U.S. market but

also to supply foreign markets. In the second case, the company is not offshoring its production to serve its domestic market, but is relocating its production capacity to serve local markets abroad. Nevertheless, such relocation of production capacity abroad to serve foreign markets will be accompanied by a destruction of jobs in the U.S. since production capacity is not performed domestically, as formerly.

Since one of the objectives of the present thesis is to evaluate the number of U.S. jobs recently lost through the movement of domestic production capacities abroad, offshoring for U.S. companies will also refer to the movement of U.S. domestic production capacity abroad to produce goods or services to serve both foreign markets and the domestic market. Finally, in the rest of the thesis, offshoring will refer to U.S. companies investing in production capacities abroad to produce goods or services previously made in the U.S. to serve the U.S. market or foreign markets, but also imports of goods or services from non-domestic suppliers to serve the U.S. market and replacing goods or services previously made in the U.S. by the company itself or a subcontractor.

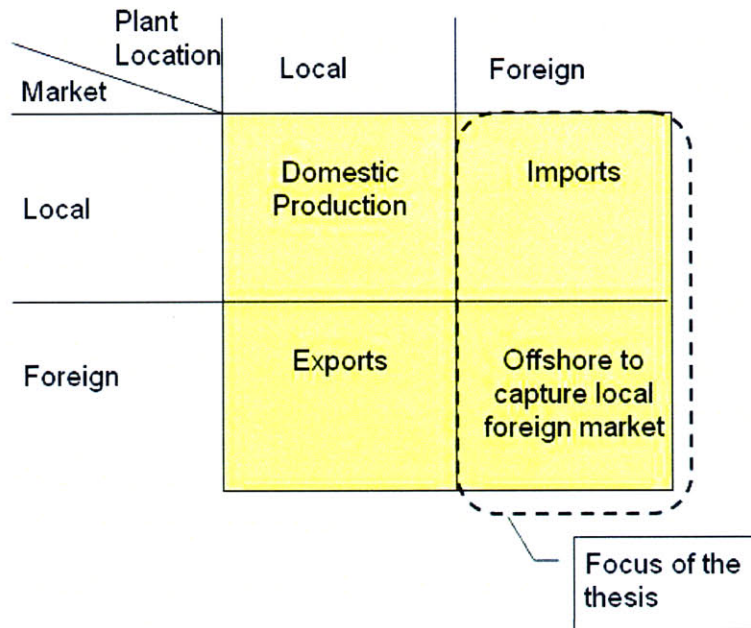


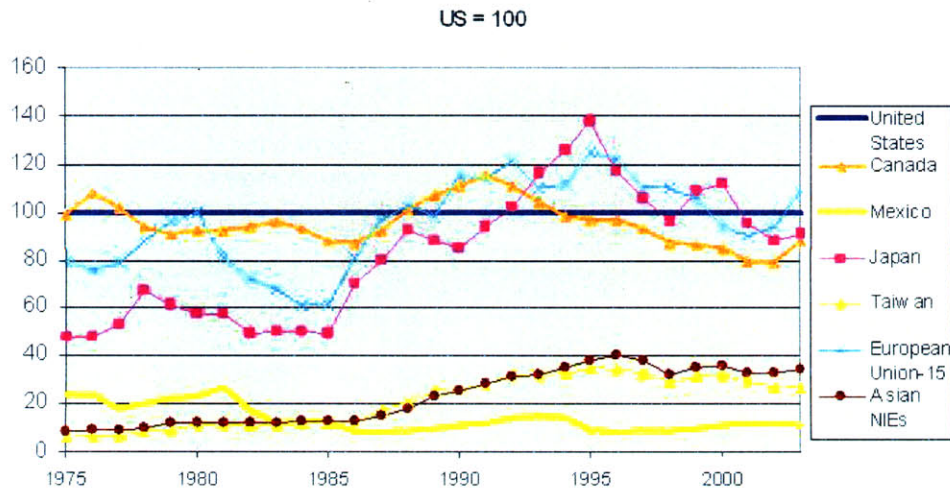
Figure 3-1: Market Location and Facility Location

### 3.2 Drivers of Offshoring Activities

Offshoring is a strategic business decision for companies based on the well-established theories of comparative advantage and international trade. It is more efficient for the U.S. to import goods and services which can be sourced inexpensively from a low-cost supplier and to export to the rest of the world goods or services that U.S. companies can produce onshore more efficiently than competitors abroad. By the same logic, U.S. companies can decide to source a part of their manufacturing process or the whole of their production from a cheaper country for the U.S market. U.S. companies will keep production of products or parts of products only if the production onshore is still competitive. This practice will induce a specialization of U.S. companies in sectors or occupations where they have comparative advantages over foreign competitors, such as technology or labor skills.

As seen above, offshoring is considered as an approach to reduce costs. Labor cost, land and other resource costs are significantly cheaper in such countries as China or India. Moreover, according to data from the Bureau of Labor Statistics, this gap will

remain in Asian countries and Mexico, where the low wage labor supply is seen as almost infinite. Finally, health insurance and pension burden have greatly increased US total labor cost during the last 5 years, and this trend is not expected to stop, making the Asian or Mexican labor force even more competitive (Fig. 3-2).



Source: Indexes of hourly compensation costs in US dollars (US=100) Table 1 / BLS  
<ftp://ftp.bls.gov/pub/special.requests/ForeignLabor/ichccsuppt01.txt>

Figure 3-2: Normalized International Comparisons of Hourly Compensation Costs for Production Workers in Manufacturing between 1975 and 2003 (U.S.=100)

The second main reason for a company to offshore production is to penetrate the local foreign market. Companies are attracted by economies with high growth rate. Companies have already been doing business overseas for several decades and an offshore production presence could reinforce company market share. For instance, Intel Corp. is generating 70 percent of its revenue from outside the United States, though 60 percent of its employees still work in the States. [93]In the future, Intel Corp. will likely relocate a part of its production overseas and those percentages will shift. A local production location allows companies to be closer to their final customer, getting more accurate information about the local demand and being more responsive to change in demand volume or customer taste.

In some cases, like China for example, production within the country is desirable to facilitate domestic selling. Indeed, to get licenses and to follow local content laws,

foreign companies usually have to create a venture with a Chinese company or to produce locally.

Reducing costs is not the only target of offshoring. The quality of the services or products can be increased using a high skilled labor force while being competitive. For example, call centers in India employ bachelor degree workers instead of high school degree workers in the U.S. for a competitive rate. Thus, using foreign affiliates gives companies access to local expertise. Interestingly, a recent study published by the Brookings Institute shows that two-thirds of all the investments American companies make abroad are located in “high-wage” economies of the European Union and Japan, demonstrating that wage differentials are not the only driver of foreign investment and offshoring of activities and that U.S. companies are also searching for specific talent, capability, local specialty or proximity to the local demand. [40]

Whereas benefits from offshoring exist, they are often overestimated by companies. For instance, costs to build capacity offshore are often higher than expected and quality of offshore production can also be disappointing. A 2005 study has polled 5,321 executives across North America and Europe who are considered as buyers of offshored services. [123] The study found that the average cost savings was slightly below 10 percent. Moreover 28 percent of the surveyed companies have experienced higher costs and 25 percent experienced no material savings.

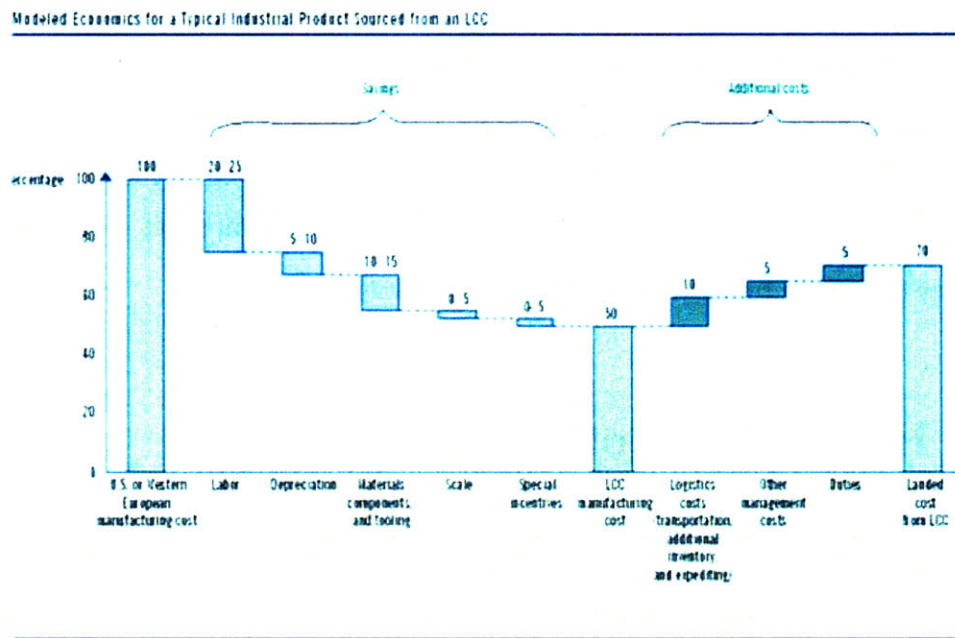
### **3.3 Hidden Cost of Offshoring**

The main driver of offshoring for companies is lower costs. Nevertheless, companies have to consider extra cost related to operation overseas (move-in costs and extra-operating costs) when making such changes. Even if well-established and efficiently managed offshored operations usually make it possible to lower production costs substantially, companies have to consider the hidden cost of offshoring which can offset the benefits of offshored operations.

Move-in costs, related to the establishment of operation overseas, include the cost of selecting a subcontractor (in the case of outsourced offshoring) and new suppliers,

documenting requirements, evaluating the responses, and negotiating the contracts. This entire process can take from six months to a year. Move-in costs also include the cost of transition: it takes from three months to a full year to completely hand the work over to an offshore partner. In addition, companies have to include the cost of layoffs of U.S. employees.

After establishment, companies have to deal with the extra costs associated with transportation, communication, higher inventory, learning curve, quality, warranty claims and business disruption, and travel for executives, engineers and/or sales representatives. According a recent study of the Boston Consulting Group, offshoring can potentially reduce manufacturing production costs by 50 percent. Nevertheless, after re-adjusting manufacturing costs with logistics costs, extra management costs and duties, the offshore production model has the potential to save 30 percent of an onshore production model, far away from the potential 50 percent savings (Fig. 3-3).

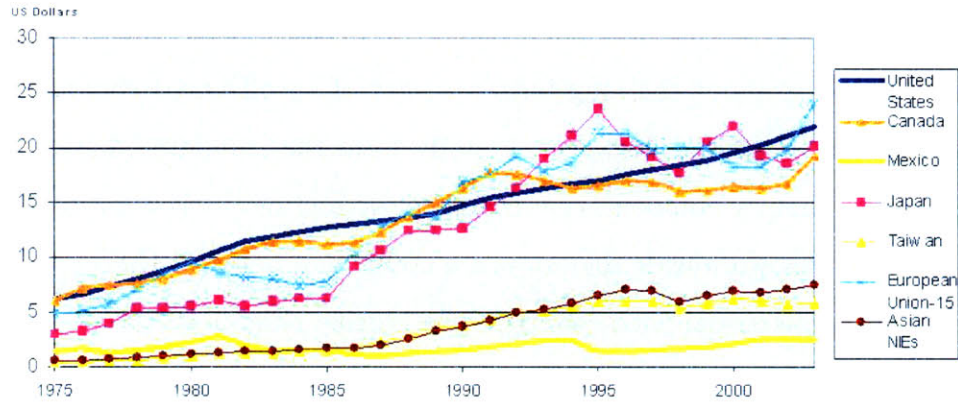


Source: BCG Analysis

Figure 3-3: Modeled Economics for a Typical Industrial Product Sourced from a Low Cost Country

As seen with the previous model developed by the BCG, labor cost counts for

a large part of the production differential cost between U.S. and LCCs. One of the main questions about the long term viability of an offshored company model is the rise of wages in LCCs. However, a study from the Bureau of Labor Statistics, which compares hourly compensation costs for production workers in manufacturing in several countries worldwide, has shown a stable gap between U.S. and LCCs and even a growing differential with countries like Mexico (Fig. 3-4).



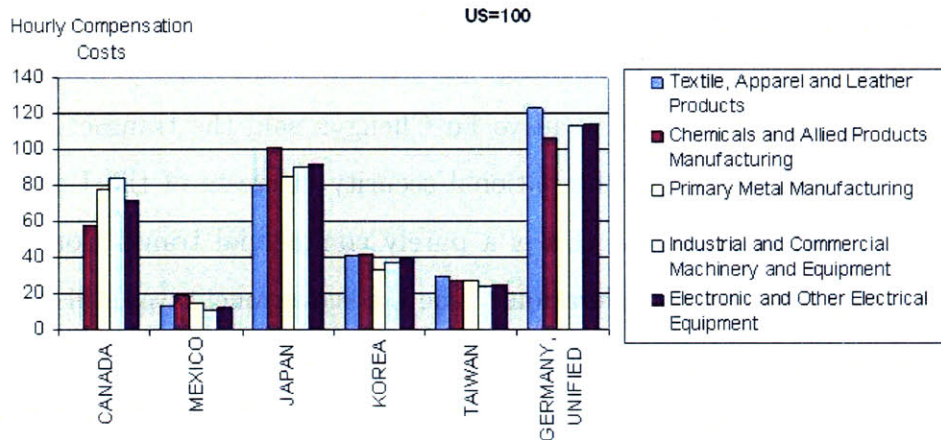
Source: Hourly compensation costs in U.S. dollars for production workers in manufacturing, 31 countries or areas and selected economic groups, 1975-2003 Table 2 / BLS  
<ftp://ftp.bls.gov/pub/special.requests/ForeignLabor/ichccsuppt02.txt>

Figure 3-4: International Comparisons of Hourly Compensation Costs for Production Workers in Manufacturing between 1975 and 2003 (U.S. dollars)

Moreover, the wage differential is consistent across the different manufacturing industries. For instance, wages for production workers in Mexico were around 15 percent of U.S. wages for the five different industrial sectors presented below in 2002 (Fig. 3-5). In 2002, wages in Korea were around 40 percent of U.S. wages for the manufacturing industries presented.

The differential of wages is also found for both less skilled workers and engineers: in electronics, the wage ratio for engineers is about 10:1 between USA and China. China produces an abundant skilled labor force: 350,000 engineers compared to 90,000 in the U.S. every year. [67] Because middle manager wages are also low in Asia, the ratio of managers to staff is much higher. Thus, offshored operations will be run by more middle managers than the equivalent in the U.S. Firms could be motivated to redesign their products to take advantage of low labor cost: a “Design for Offshoring” will need less capital investment, using labor force instead of machines and automated processes. A recent report of the National Bureau of Economic Research confirms that for U.S. affiliates in developing countries, manufacturing activities are half as capital intensive as the same activities in affiliates in the U.S. (capital intensity is measured by property, plant and equipment per worker). [39]

In addition, operations in LCCs could involve some additional costs associated with



Note: Industries are defined using the SIC code system  
 Source: BLS / Hourly Compensation Costs for Production Workers in Manufacturing, 30 Countries or Areas, 40 Manufacturing Industries, Selected Years, 1975-2002 / <http://www.bls.gov/fls/flshcind.htm> / Data compiled by author

Figure 3-5: International Comparisons of Hourly Compensation Costs for Production Workers in Different Manufacturing Industries in 2002 (U.S.=100)

specific risks: currency fluctuations, political instability or intellectual property theft. In some cases, suppliers become competitors. These risks explain the reservations of some companies to offshore their production for strategic products. Moreover, to some extent, the U.S. government might intervene to preserve U.S. expertise in certain strategic sectors, such as military, energy, aeronautics, nano-technology or bio-technology, making offshoring illegal for companies operating in certain markets. For instance, the sale of the IBM laptop division to China's largest PC company Lenovo, has been reviewed and finally approved by U.S. Treasury Department's Committee on Foreign Investments in the United States in 2005. In fact, PC and laptop manufacturing is no longer considered a strategic and crucial manufacturing sector. Most of the production is already done in Asian countries, such as Taiwan or China. It is considered a commodity product. On the other hand, the unsolicited \$18.5B offer by CNOOC Ltd., a major Chinese oil company, to buy California-based Unocal Corp. has forced the chairmen of the U.S. House Resources and Armed Services committees to request President George W Bush to initiate a "thorough" National Economic Council-National Security review of China's growing energy requirement

and the implications for U.S. political, strategic and economic interests. This offer raises many concerns about U.S. energy production and energy security. Even as CNOOC's chairman and chief executive Fu Chengyu said the transaction wouldn't have "any negative impact to the national security interests of the United States, and people need to understand this is a purely commercial transaction, driven by market forces and market considerations," the U.S. government was still far from letting China own strategic U.S. assets. This example highlights the growing influence of Chinese companies in the global market. Chapter 6 will discuss the case of the Chinese fast development and growing influence.

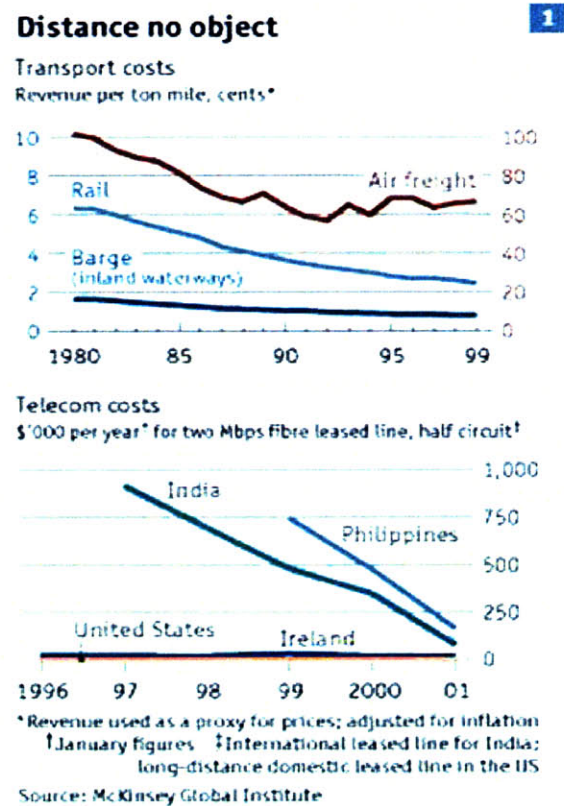
### **3.4 History of Offshoring**

The first wave of offshoring occurred at the beginning of the nineteenth century to capture new markets and avoid high tariffs and other trade barriers. For instance, The Ford Company established operation in the UK in 1930 to avoid trade barriers. [70] Companies started operation abroad to serve the local market at a competitive price. The objective was not to capture a local advantage and then export back to the home market.

Then during the 1980s, a second wave happened to take advantage of enormous wage differentials in the Asian countries: the finished goods were then mainly exported back to the home market. That wave touched labor intensive companies such as textiles and toys.

Since the late 1990s, companies have been offshoring the production of a broad range of goods, from toys, apparel and, electronics to semiconductors and services such as back office work or data processing. Companies are now producing goods abroad to serve the domestic market but also to serve the new market overseas. This recent trend has been supported by external economic and political factors and by manufacturing industry mutations. The continual liberalization of economies and the end of trade barriers or quotas make it possible to invest in production capacity in other countries and ship goods abroad without excessive duty. Meanwhile, improvements

in transportation and communication technologies support the growth of demand for flows of goods and information (Fig. 3-6).



Source: The Economist: "A World of Work", Nov 11th 2004

Figure 3-6: Transportation Costs and Telecommunication Costs

Within the manufacturing industry, a rapid adoption of global standards in the company has allowed firms to break down more easily their operations into independent segments, which could be outsourced and offshored, while still being manageable. [85] Companies can be broken into two groups following different organizational models (Fig. 3-7). First, companies can be vertically integrated, owning and controlling the whole sourcing, production and distribution of products. Companies, such as Samsung or Sony, have decided to build their entire strategy on the full integration of design, development, manufacturing, marketing and after-sales services of their products. In this case, the company will operate all the manufacturing stages but distribution is usually done by retailers for consumer products. Second, companies

can be specialized, focusing only on one part of a manufacturing process or a single part of the entire supply chain. For instance, the American television manufacturer Brillian owns the display technology used in the television distributed under its name. Nevertheless, the design and the development of the electronic part and chips are done in India by Wypro. Then OEMs such as Flextronics, Solectron or Celestica produce TVs in China or elsewhere at low cost. After-sales services are performed by an Indian call-center in Bangalore. [18]

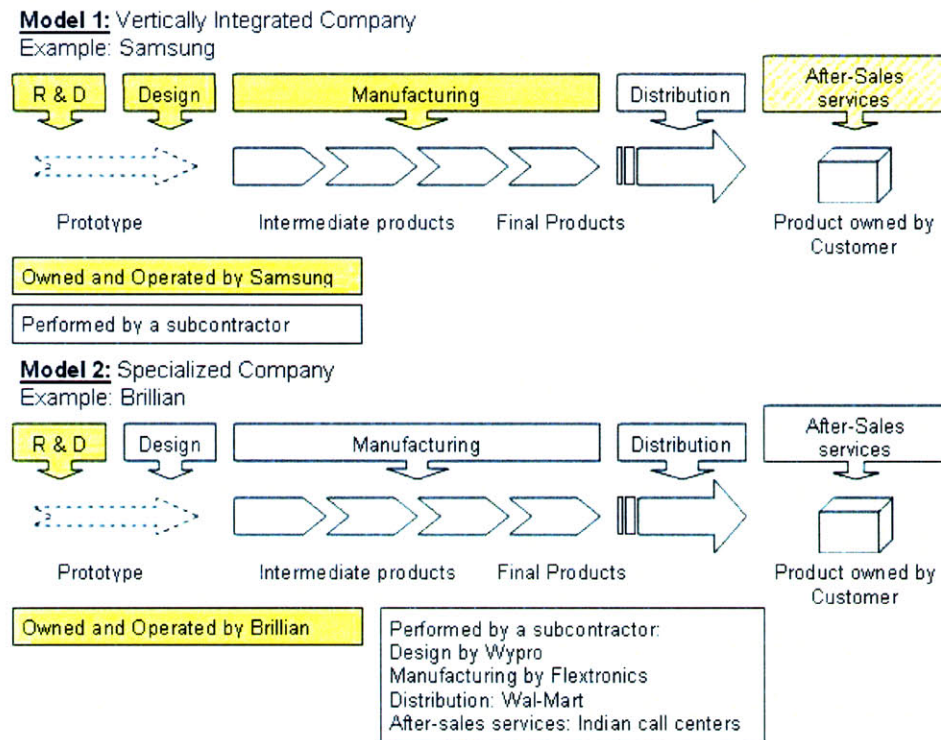


Figure 3-7: Simple Company Models

In the footwear industry, U.S. companies such as Nike or Reebok have specialized in certain activities for many years. They mainly focus on design, marketing and distribution while manufacturing is outsourced to numerous suppliers in different Asian countries.

Using the same industry to present the two structures, Dartmouth economics professor Douglas Irwin explains that “fifty years ago, Detroit’s River Rouge plant sucked in iron and coal at one end and spat out an automobile at the other. Now auto firms outsource component parts from a vast array of domestic and foreign suppliers.” [75]

Automakers and suppliers both specialize in one specific segment of the whole car production process.

Finally, company organizational structures, vertically integrated or specialized, refer mainly to the issues of ownership of operations by the company. Indeed, both organizational structures will allow companies to develop a coherent and efficient strategy of locating the different stages of their supply chain.

On one hand, the specialization of different agents creates favorable circumstances for offshoring. The standardization of manufacturing processes and interfaces between parts, allows companies to easily and quickly outsource a part of their supply chain. The suppliers select the best location to manufacture their parts, while companies can focus on their competitive or strategic activities onshore. On the other hand, the vertical integration of operation allows the company to develop a global sourcing strategy by locating its different production stages appropriately to optimize the whole company supply chain. The trend toward modular design makes offshoring easier for companies. A piece of a supply chain can be easily offshored to reduce overall production cost while minimizing impact on the rest of the supply chain since the production steps are already clearly broken down.

Additionally to specialization at the firm level, Hummels, Rapoport, and Yi's study shows that world goods production has become more specialized at the nation level, with countries focusing on different stages of the production process and then shipping intermediate goods to other countries for further processing. [72] These empirical results are fully supported by the classic theories of international trade such as absolute advantage theory and comparative advantage theory, discussed in Chapter 4.

### **3.5 The Old Paradigm of Trade-related Job Losses**

Over the years, studies and analysis have refuted the idea of the substitution of U.S. manufacturing jobs by offshored activities. The U.S. jobs were not "exported" to low cost production sites. Instead, the employment competition occurs mainly between offshore affiliates in countries at the same level of development.

For instance, Lael Brainard and David A. Riker (1997) [82] analyzed data from the Annual Survey of U.S. Direct Investment Abroad (Bureau of Economic Analysis), including all firms whose parent industry is in the manufacturing sector, over a ten-year period ending in 1992. They found that, although employment at affiliates in developing countries is very sensitive to wages in other developing countries, parent employment responds very little when foreign affiliates wages fall. For instance, when wages in Mexico decrease by 10 percent, U.S. parent employment falls 0.17 percent, while affiliates in other developing countries, such as Malaysia, lay off 1.6 percent of their workforce. The results suggest a vertical separation of activities to take advantage of wage differentials, with affiliates in developing countries performing the activities that are most sensitive to labor costs. Another example comes from the textile industry: when quotas on baby clothes and soft luggage ended in 2002, China's export of baby clothes to the US increased by 826 percent and luggage imports increased fivefold. [9] In the same period, production in Thailand, the Philippines, Indonesia and Mexico dropped by half. Indeed, domestic industry employment and overseas affiliate employment are complementary, but not negatively correlated. For instance, between 1979 and 1989, total U.S. manufacturing employment shrank 10 percent and during the same period total overseas affiliate employment shrank 14 percent. [110]

Nevertheless, this old paradigm remains valid as long as production in low cost countries is complementary with U.S. domestic production. If low cost countries start producing parts or products usually manufactured by U.S. companies domestically, U.S. employment will be hurt. During the last decades, the pattern of imports has changed in the U.S. According to data from the Bureau of Economic Analysis (BEA), the U.S. is importing more goods at intermediate and finished stages of processing compared with raw materials (Table 3.1 and Table 3.2).

The data indicates that products are being imported into the U.S. at increasingly advanced stages of processing, which suggests that U.S. firms may have been substituting away from these processing activities at home. According to Robert C. Feenstra (1998) the changes in the imports suggest a plausible shift of produc-

Table 3.1: Distribution of U.S. Imports by End-use Category

Distribution of Imports by end-use category	1925	1950	1965	1978	1990	2003
Foods, feeds, and beverages	0.22	0.30	0.19	0.09	0.05	0.04
Industrial supplies and materials	0.68	0.63	0.53	0.47	0.29	0.25
Capital goods, except automotive	0.01	0.01	0.07	0.11	0.23	0.23
Automotive vehicles, engines, and parts	0	0	0.05	0.14	0.18	0.17
Consumer goods (nonfood), except automotive	0.09	0.06	0.16	0.17	0.21	0.26
Imports, n.e.c., and U.S. goods returned	0	0	0	0.02	0.03	0.04

Table 3.2: Distribution of U.S. Export by End-use Category

Distribution of Exports by end-use category	1925	1950	1965	1978	1990	2003
Foods, feeds, and beverages	0.18	0.16	0.19	0.18	0.09	0.08
Industrial supplies and materials	0.60	0.45	0.35	0.28	0.27	0.24
Capital goods, except automotive	0.09	0.22	0.31	0.33	0.39	0.41
Automotive vehicles, engines, and parts	0.07	0.08	0.08	0.11	0.09	0.11
Consumer goods (nonfood), except automotive	0.06	0.09	0.07	0.08	0.11	0.13
Exports, n.e.c.	0	0	0	0.02	0.04	0.03

Note: Industrial supplies and materials: raw materials, as steel, newsprint, textile yarns. The capital goods are used by firms for both investment (like machinery) but also are used as intermediate inputs (for example, all electrical parts and components are included within capital goods). The consumer goods consist of finished products, but there is still value-added on these goods in the US, such as for advertising, marketing and product development  
Source: Bureau of Economic Analysis, U.S. International Transactions Accounts Data / Table 2 / Robert C. Feenstra (1998) / Author

tion overseas. [48] Pierre Biscourp and Francis Kramarz (2003), studying the period between 1986 and 1992, conclude that imports of intermediate and finished goods impact employment in industrialized countries more than imports of raw materials. [37] Feenstra and Hanson (1997) find that imported inputs increased from 5.7 percent of total intermediate purchases (domestic intermediates inputs + imports) in 1972, to 8.6 percent in 1979, and 13.9 percent in 1990. As shown in the previous tables (3.1 & 3.2), finished goods imports are growing rapidly, which will continue to impact U.S. manufacturing employment for the next several decades.

Imports of raw materials or first stage parts, which still needed processing onshore in the U.S., are not necessarily hurting the U.S. manufacturing sector since imports

are usually used to supply the domestic production. In many cases there will be additional value added by American firms. An example is the Barbie doll (Tempest 1996) [115]: raw materials (plastic and hair) are obtained from Taiwan and Japan, then assembled in Indonesia, Malaysia or China. China supplies the cotton used for dresses. The production cost is \$2 (35cents Labor, 65cents cost of materials, \$1 transportation between LCCs). The doll is sold for \$10 in the U.S., of which Mattel earns \$1. The remaining \$7 cover transportation, marketing, wholesaling and retailing in the U.S., which is the value added domestically. Thus, even with a largely offshore model, the majority of value added still comes from onshore activities, such as marketing and distribution.

However, according to 2003 data, the U.S. is now importing an increasing amount of finished goods such as consumer goods or automobiles. Such imports have two negative impacts on U.S. employment. First, these imports compete directly with domestic production for the U.S. market, reducing U.S. domestic demand for goods manufactured in the U.S. Second, these imports do not require further processing in the U.S. and so, do not create subsequent employment in the domestic manufacturing sector. Chapter 5 will evaluate trade-related job loss due to increasing imports.

### **3.6 Which Industries Are the More Vulnerable?**

A recent study by The Boston Consulting Group has shown that in 2002, the imports from Low Cost Countries (LCCs) counted for approximately \$6 billion, equivalent to 11 percent of the total U.S. consumption. Overall, imports have been growing 12 percent faster than the domestic sales and all the industrial sectors have experienced growth of imports. [65]

The study classifies industries in four categories. First, the “Moving early industries” category defines industries which historically import a large part of the onshore consumption. These industries already have a large numbers of overseas suppliers and a large part of their production capacities abroad. It includes industries as footwear and audio and video equipment. The overseas expansion of these industries is almost

stable (only 2 percent of net growth imports from LCCs). In the future, offshoring will continue but job losses will be limited because the American companies have already largely moved their production offshore, and the remaining onshore production is in other organizational segments (distribution, marketing) or niche markets (See example of the apparel industry in chapter 5). For example, Nike employs 75,000 people in Asia (only a few hundred of these are actually employees of the company) and only 2,500 employees in the U.S. mainly in design and marketing occupations (Tisdale, 1994) which are expected to stay in the U.S. [116]

The second category is composed of the “Growing faster industries.” It characterizes industries with a high imports penetration rate and which are already largely located in LCCs such as the computer equipment industry. Such companies move to Asia to use a low-cost and highly skilled workforce. Technology advancement and educational improvement in LCCs allows companies to produce a broader range of products offshore at the same level of quality and complexity as domestic production. Thus, companies are importing more products from LCCs. Moreover, such countries as China have a high growth internal market for high technologies, creating new opportunities for sales there, allowing an even more rapid development of these industries in LCCs (suppliers, distribution, and technologic cluster), making offshore production more efficient. Job losses are expected to occur in the U.S. in the future for these industries.

The third category is the “Up and coming” industries. It refers to the industries with a low penetration rate of imports from LCCs but a high growth, such as measuring and controlling devices. These industries still have an important part of production onshore but are more and more taking advantage of LCCs’ manufacturing capabilities. The category is composed of industries which produce technologically more advanced and complex products, usually requiring high capital investment.

The last category refers to “Globalizing slowly” industries. This category is composed of industries remaining onshore. These industries could remain onshore for different reasons. Some industries produce bulky and relatively low value products such as construction materials. Other industries have to produce domestically because of lo-

cal content legal requirements, such as the motor vehicle industry. Some industries which require technical skills that LCCs do not have and would not acquire easily also remain onshore. Another reason for U.S. companies to keep manufacturing operation is IP protection. For example, the Minnesota-based company, Hutchinson supplies the suspension assemblies used in computer disk drives. Most of its customers and competitors are in Asia, but the company still wants to produce in the U.S. because of the availability of domestic highly skilled labor and IP protection. [29] Finally, some strategic industries such as energy or military industries remain in the US for obvious security reasons.

The first factor which influences the offshoring decision for U.S. companies is the level of capability of foreign suppliers and the skills of the foreign labor force overseas to handle activities previously done domestically. Thus, apparel, textiles and toys manufacturing activities, which require low technology and low labor skills, have been performed in LCCs for years. To most U.S. manufacturers, low cost Asian countries have always been synonymous for low quality, low efficiency and low productivity. However, since the late 1990s, Asian countries have made substantial progress in quality and technology. Electronics, computer and electrical equipment have experienced the largest recent shift to overseas location, particularly in Asia (37 percent of firms announcing a shift in 2002 and 2001, predominantly large multinational OEMs such as GE, GM, Ford, Mattel, Motorola, Intel, LaCrosse, Lexmark, Samsonite, Dell, International Paper, Rubbermaid). [124] According to a recent study of an American consultant, Asian companies can now offer comparable or even superior performance for a larger range of products across almost all industries. [67] Indeed, one U.S. electronics company has tripled its productivity since moving operations to China and at the same time, cycle times and defect rates have fallen. For instance, China and Taiwan have developed world-class design expertise in such specific areas as wireless chips, electronic devices, and software development. In the electronic industry, offshore production which began with simple printed circuit board assembly (labor intensive activity), moved on to more complex products and now competes in the semi-conductor market (an industry which needs multi-billion dollar wafer facilities).

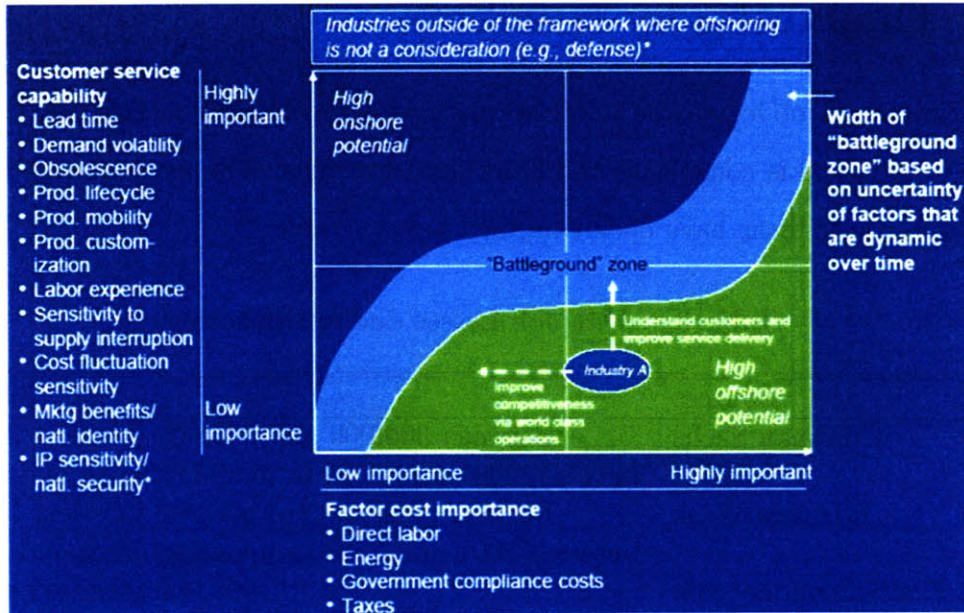
The president's Council on Science and Technology has recognized "that offshoring has created a deep sense of anxiety in the IT community that our nation is not just losing the manufacturing capacity of 'commoditized' products, as has occurred in the past, but also high-value-added manufacturing and services that the U.S. has long dominated." [93]

The lack of high technologic capabilities in Asian LCCs has been considered as a limitation to offshore U.S. production for years. On the other hand, the current catch up of Asian LCCs technologic competences with U.S. companies is becoming a new constraint for offshoring by raising crucial IP protection questions.

### **3.7 Which Types of Jobs Are the Most Vulnerable?**

Jobs can be separated in three categories as defined by Giraud (1995). [58] First, the "protected jobs" category defines jobs which cannot be offshored because of their nature (i.e. catering, health care, etc.). Second, the "competitive jobs" category includes U.S. workers who cannot be offshored because of comparative advantages linked to their U.S. location. Comparative advantages linked to U.S. location include, for instance, jobs which require technical skill or use specific infrastructures which do not exist overseas. Competitive jobs can also be found in companies that use a particular supply chain organization or require proximity with customers and so, presence in the U.S. Another comparative advantage linked to the location is the brand power of "made in the U.S." For instance, Fender or Harley Davidson are building their whole brand image on their U.S. origin. Third, the "exposed jobs" category characterizes all types of jobs which could be performed offshore competitively as well as in the U.S. The last category mainly includes labor intensive industries jobs or low skilled jobs. As seen in section 3.6, low cost countries have raised their manufacturing capabilities, allowing them to expand the range of products they can produce. Today, they can produce goods from almost the entire range of U.S. indus-

tries. The U.S. manufacturing sector will have to create jobs in the first and second categories to absorb the workers who belong to the last category. For the manufacturing sector, manufacturing costs and workforce wages are not the only element to take into account to evaluate the viability of employment in a particular industry. Other factors, different from production cost and wage differential, have to be taken into account to identify a competitive job or an exposed job. Thus, McKinsey has created a graphic to characterize zones where onshore production is appropriate and zones where offshore is suitable along two dimensions: customer service capability and factor cost importance (Fig. 3-8). Customer service capabilities include lead time, demand volatility, product obsolescence, product lifecycle, product mobility, product customization, labor experience, sensitivity to supply interruption, cost fluctuation sensitivity, valuation of national identity, and IP sensitivity. Companies or industries which build their comparative advantage on these dimensions will be more likely to locate their operation onshore. In fact, their competitive advantage is their location, close to the demand. Factor costs include direct labor, energy, government compliance costs and taxes. Industries or companies which compete uniquely on low price will tend to offshore their production in countries where production costs are lower. In the second part of the Chapter 5, a series of case studies will discuss the key variables to consider when locating production.



Source: McKinsey Company

Figure 3-8: The Factors Which Determine the Location Decision

In the future, U.S. companies and industries will provide jobs in the U.S. if they can compete on advantages linked to the location. Using the McKinsey figure, it will require competing more on customer service capability than on production costs. For example, competing on lead time will give a competitive advantage for onshore production that offshore production cannot fight without carrying a lot of inventory. Then, U.S. companies can compete on variability: by offering a larger range of products, they can force their competitors that use offshore production to carry a lot of inventory for a lot of products, making their margin smaller and then offsetting the production cost gap. Moreover, shipping product from China still takes a couple of weeks via sea transportation. With high oil prices, it is unlikely that air transportation costs will decrease in the future. Thus, the last and unconquerable advantage of U.S. onshore production is no longer technology or access to an unmatched skilled labor force, but it is being located in U.S., close to the customers.

### 3.8 Offshoring by Numbers

The estimates of job losses due to offshoring have always been controversial. The first source of numbers is consulting and banking companies. The most quoted forecasts released by these firms have been compiled below (Table 3.3).

Table 3.3: U.S. Job Losses due to Offshoring

Sources	Estimates
Goldman Sachs	Between 300,000 and 500,000 jobs lost annually between 2001 and 2004 in manufacturing and services
Business Week	Between 400,000 and 500,000 jobs lost annually between 2001 and 2004 in manufacturing and services
Mark Zandi Economy.com	995,000 jobs lost annually between 2001 and 2004 in manufacturing and services
Gartner Inc.	500,000 jobs lost in the IT sector since 1997
Forrester Research	Forecast of the loss of 3.3 million jobs in services between 2003 and 2018
Goldman and Sachs	Forecast of the loss of 6 million jobs in services and manufacturing between 2003 and 2013
Bardhan & Kroll	UC-Berkeley Estimates of 14.1 million jobs subject to offshoring in services

Note: Date compiled by Author

Such projections are subject to considerable uncertainty due to the lack of information about the methodology used by these firms to build these figures but also because these studies rely heavily on expert judgment rather than large surveys. [55] In addition, companies' offshoring strategy might be affected by political events, such as protectionist legislation in the United States or geopolitical events.

These estimations (around 100,000 jobs lost annually because of offshoring) have to be compared with the number of jobs annually created and lost every years in U.S. (around 30 million).

To identify reasons for layoffs, the Bureau of Labor Statistics (BLS) provides the Mass Layoff Survey (MLS). This national survey collects information on reasons for long-term job destruction on a quarterly basis. Questions on job loss related to the movement of work were added to the MLS program in January 2004 by the BLS.

According to data from BLS, of the 239,361 private sector “nonfarm” workers who were separated from their jobs for at least 31 days in the first quarter of 2004, the separations of 4,633 workers were associated with the movement of work outside of the country, counting for less than 2 percent of job losses (Table 3.4).

Table 3.4: MLS Program, Separations by Selected Employer Action, First Quarter 2004

Mass Layoff Separation, first quarter 2004	Job loss	% of Total
Total, private nonfarm sector	239361	1
Total, excluding seasonal and vacation events	182456	0.76
Total with movement of work	16021	0.07
Overseas Relocations	4633	0.02
Within company	2976	0.01
Different company	1657	0.01
Domestic Relocations	9985	0.04
Within company	8191	0.03
Different company	1794	0.01

Source: BLS / Extended Mass Layoffs Associated with Domestic and Overseas Relocation, First Quarter 2004 / Table 1 / <ftp://ftp.bls.gov/pub/news.release/reloc.txt>

The BLS data also expose the different reasons for layoffs: only 1,182 of job separations are due to import competition and only 219 of them are associated with movement of work (either a domestic relocation or overseas relocation) (Table 3.5).

From 2001 to 2004, for the U.S. private nonfarm sector, the BLS data would suggest a loss of approximately 113,000 jobs due to imports competition and overseas relocation compare to respectively between 300,000 to 500,000 according to a Goldman Sachs evaluation and between 400,000 and 500,000 according to a Business Week study (Table 3.6). The data published by the BLS suggest that imports competition and overseas relocation have counted for only 2 to 3 percent of total separations in the U.S. private nonfarm sector between 1996 and 2003.

Table 3.5: Reason for Layoff, First Quarter 2004

Reason for Layoff, first quarter 2004	Job loss	Associated with movement of work	% of Total Separation
hline Total, private nonfarm	239361	16021	1.00
Automation	(1)	(1)	-
Bankruptcy	8422	0	0.04
Business ownership change	4217	512	0.02
Contract cancellation	4238	(1)	0.02
Contract completed	51795	(1)	0.22
Environment-related	0	0	0.00
Financial difficulty	15755	2394	0.07
Import competition	1182	219	0.00
Labor dispute	21293	0	0.09
Material shortage	(1)	0	-
Model changeover	(1)	0	-
Natural disaster	0	0	0.00
Plant or machine repair	(1)	0	-
Product line discontinued	1675	(1)	0.01
Reorganization within company	26982	8736	0.11
Seasonal work	56478	(2)	0.24
Slack work	16999	291	0.07
Vacation period	427	(2)	0.00
Weather-related	1382	0	0.01
Other	11004	3410	0.05
Not reported	15656	0	0.07

Note: (1) data do not meet BLS or state agency disclosure standards (2) The questions on movement of work were not asked

Source: BLS / Extended Mass Layoffs Associated with Domestic and Overseas Relocation, First Quarter 2004 / Table 2 / <ftp://ftp.bls.gov/pub/news.release/reloc.txt>

Table 3.6: Separations due to overseas relocation and imports competition between 1996 and 2004, U.S. private nonfarm sector

Mass Layoff, private nonfarm	Total Sep.	Sep. due to overseas relocation	Sep. due to imports competition	Share of sep. due to overseas relocation and imports competition
1996	948122	4326	13476	0.019
1997	947843	10439	12019	0.024
1998	991245	8797	18473	0.027
1999	901451	5683	26234	0.035
2000	915962	9054	13416	0.025
2001	1524832	15693	27946	0.029
2002	1272331	17075	15350	0.025
2003	1216886	13205	23734	0.030
2004	993899	*	8064	-

Note: \*The MLS program discontinued the collection of "domestic relocation" and "overseas relocation" as standard reasons for layoff beginning with data for the first quarter 2004. Extended mass layoff data report on establishments which have at least 50 initial claims filed against them during a 5-week period and where the employer indicates that 50 or more people were separated from their jobs for at least 31 days.

Source: BLS / Mass Layoff Statistics (MLS) Program / <http://data.bls.gov/labjava/outside.jsp?survey=ml>

A second source of numbers for job losses due to offshoring is empirical studies. Hufbauer and Wong (2004) estimates that imports increase has displaced 422,000 jobs annually between 1990 and 2003. [71] Baily and Lawrence estimates that trade caused the loss of between 85,000 and 197,000 manufacturing job per year between 2000 and 2003. [32] Such a difference between numbers from the BLS, banking or consulting firms and empirical studies underlines the complexity of evaluating the numbers of jobs lost due to offshoring. Chapter 4 exposes international trade theories to get a better understanding of the trade off between import level and domestic employment.



# Chapter 4

## Economic Theories

*“The benefits from new forms of trade, such as in services, are no different from the benefits from traditional trade in goods. When a good or service is produced at lower cost in another country, it makes sense to import it rather than produce it domestically. This allows the United States to devote its resources to more productive purposes”. The Council of Economic Advisers [98]*

*“Outsourcing is a particular type of international trade. We are used to trade in goods, but trade in services has expanded recently, made possible in large part by advances in telecommunications. Like all forms of international trade, outsourcing benefits an economy overall, though there are also short-term costs as workers are displaced. These costs are real, and the President has policies to help ease the transition – to help people find jobs. But overall, expanding trade is good for economic growth and for American living standards”. N. Gregory Mankiw [88]*

### 4.1 Absolute Advantage Theory: Adam Smith

The logic that free trade could be advantageous for countries is based on the concept of absolute advantages in production. Adam Smith wrote in *The Wealth of Nations*, “If a foreign country can supply us with a commodity cheaper than we ourselves can make it, better buy it of them with some part of the produce of our own industry, employed in a way in which we have some advantage.” [111] The idea here is straightforward and

instinctive. If a country can produce some set of goods at lower cost than a foreign country, and if the foreign country can produce some other set of goods at a lower cost than the first country can produce them, then clearly it would be best for the first country to trade their relatively cheaper goods for the other's relatively cheaper goods. In this way both countries can gain from trade. This analysis implies that countries should concentrate on industries in which they are the low-cost producer.

## 4.2 Comparative Advantage Theory: The Ricardian Model

The Ricardian model provides the simplest setting to illustrate comparative advantage and the gains from trade in a general equilibrium setting.

### 4.2.1 Assumptions

The production of goods uses only one input, such as labor, with constant returns to scale. This assumption means that the technology in each country and each sector is entirely determined by the labor requirement per unit of output. Moreover, labor is assumed to move freely between the sectors of a country, but not between countries. These assumptions imply that wages must be the same in both sectors but do not have to be the same in the two countries.

### 4.2.2 Model

This theory can be illustrated with a simple example: two countries (1 and 2) that manufacture two goods (A and B). It is assumed that the only production factor is labor ( $L^1$  and  $L^2$ , respectively).  $Q_A^1$  and  $Q_B^1$  represent country 1's production of goods A and B (respectively,  $Q_A^2$  and  $Q_B^2$  for country 2). The unit labor costs ( $a_n^1, a_n^2$ ) for producing the two goods are given in Table 4.1.

The total labor supply constraints are:  $a_A^1 Q_A^1 + a_B^1 Q_B^1 \leq L^1$  and  $a_A^2 Q_A^2 + a_B^2 Q_B^2 \leq L^2$  and are expressed graphically in Fig. 4-1.

Table 4.1: The Ricardian Model: Unit Labor Requirement

Country	Good A	Good B
1	$a_A^1=20$	$a_n^1=10$
2	$a_A^2=25$	$a_n^1=50$

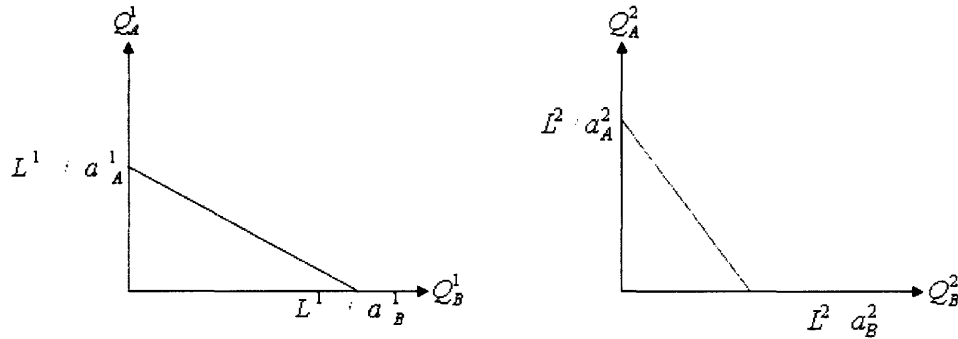


Figure 4-1: The Ricardian Model: Labor Supply Curve

The absolute values of the slopes are  $a_B^1/a_A^1$  and  $a_B^2/a_A^2$  and they represent the respective costs of good B in terms of good A for each nation. A country has an absolute advantage in good A when  $a_A^1 < a_A^2$  and a comparative advantage in good B when  $a_B^1/a_A^1 < a_B^2/a_A^2$ . Here, country 1 has absolute advantage in both goods and a comparative advantage in good B, and country 2 has a comparative advantage in good A.

Next, a numerical example is used to illustrate that both countries will benefit from the specialization. It is supposed that both countries have 100 units of labor. Before trade, it is assumed that  $Q_A^1 = 4$ ,  $Q_B^1 = 2$ ,  $Q_A^2 = 2$ , and  $Q_B^2 = 1$ . After specialization,  $Q_A^1 = 2$ ,  $Q_B^1 = 6$ ,  $Q_A^2 = 4$ , and  $Q_B^2 = 0$ . If Country 2 exports 2 units of good A in exchange for 2 units of good B, both are strictly better off.

In general, the gains from trade arise because of the possibility of separating consumption from production. Under autarky, the market clearing constraint requires that consumption equals production for each good. Under trade, the market clearing constraint requires that world production equals world consumption for each good. The market clearing constraint under trade is therefore weaker than the market clearing constraint under autarky. Trade weakens a constraint, and therefore leads to the possibility of welfare gains.

### **4.2.3 Conclusions and Limitations**

The model shows that trade is not a zero-sum game and that, under appropriate conditions, it is possible for both countries to gain from trade.

Moreover, this model underlines the important role of technology differences in explaining trade and in creating gains from trade. Nevertheless, in the real world, countries tend to export goods when they have lower opportunity cost of production than other producers.

Furthermore, a limitation of the Ricardian model is that it does not directly address the relationship between trade and the distribution of income. The Ricardian model tends to suggest that the biggest gains from trade come from trade between countries with very different relative technologies specializing in different goods. Yet, trade data show that developed countries usually trade with countries with similar technologies. In addition, if a country has enough resources to supply the world market and sufficient technological advantages to be the most efficient producer in all goods, such conclusions are not sustainable. This is one of the central concerns in the ongoing debate over offshoring. China, for example, has a nearly infinite labor resource, and is tending to gain productivity and technologies in more and more sectors. Thus, to remain prosperous, the U.S. has to redistribute its economic efforts to sectors where comparative advantage still exists.

## **4.3 Trade and Income Distribution: The Specific Factors Model**

Even if trade is seen as a mutually beneficial process, some nations (including the U.S.) have protected particular economic sectors by establishing tariffs, quotas, or other trade barriers. Though international trade is good for the country as a whole, distribution of income within the country may be dramatically impacted. The main reasons are: first, some resources, such as labor, cannot move instantaneously and without cost from one industry to another; second, industry demand for production

factors differs from one industry to another. Thus, international trade often hurts some groups within the country, at least in the short term.

Paul Samuelson and Ronald Jones developed the specific factors model (using works of Viner on the Ricardian model) to incorporating income distribution.

### 4.3.1 Assumptions

In the specific factor model, the authors consider three factors of production: labor, capital, and land. Labor is a mobile factor that can move between sectors, but other factors are specific and can be used only on the production of one good (Fig. 4-2).

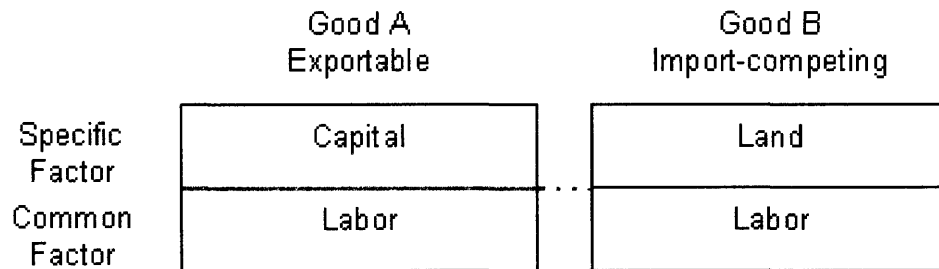


Figure 4-2: The Specific Factors Model: One Economy Model

**One Economy** In the Ricardian model, the production possibility frontier is linear since only one movable production factor is assumed. If more workers are used to produce good A, fewer workers will be available to produce good B. Production quantities are linearly correlated according to respective productivities (Fig. 4-3).

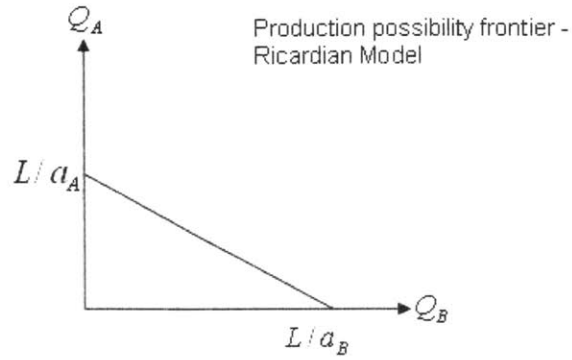


Figure 4-3: The Specific Factors Model: Production Frontier

With the specific factor model, if a factor is increased (labor) and the other factor remains constant (land or capital), there will be diminishing returns. Adding a worker will dilute the capital invested among more workers, making the addition of a worker less productive than previously. To illustrate this phenomenon, the marginal-product of labor (MPL) curve, which represents the additional output produced by adding one more person-hour, can be plotted (Fig. 4-4). (See in Appendix B-1 a use of the MPL curve).

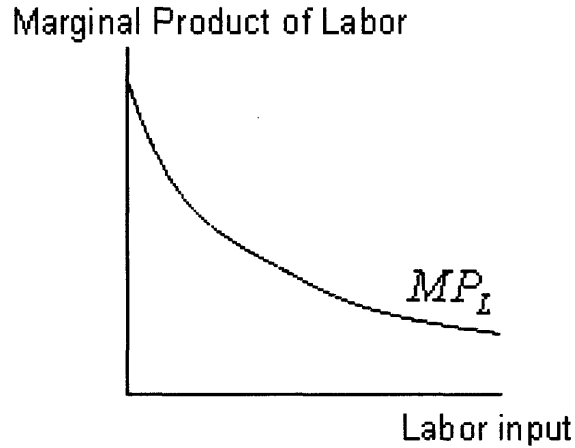


Figure 4-4: The Specific Factors Model: Marginal Product of Labor Curve

Thus, in the specific factors model the production possibility frontier is a curve which reflects diminishing returns to labor in each sector (Fig. 4-5).

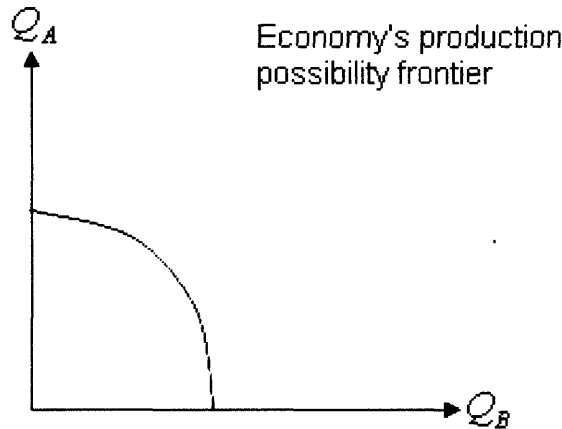


Figure 4-5: The Specific Factors Model: Production Frontier

### 4.3.2 Model

The split of the labor force between the two sectors depends on the demand and supply on the labor market. Because of diminished returns, at some point, hiring a new employee will cost as much as the added value produced by this employee. The value of labor's marginal product (equal to the value produced by adding a new employee) is equal to  $MPL_A * P_A$  for good A ( $P_A$  is the price of one output of good A), which will be equal to the wage rate of labor,  $w$ . Likewise, the value of labor's

marginal product is equal to  $MPL_B * P_B$  for good B. In this model, labor is assumed to be freely mobile between sectors. Thus, wages of the two different sectors will equalize:  $MPL_A * P_A = MPL_B * P_B = w$ . Since the total amount of labor is limited, we can plot the following illustration of the allocation of labor. The model assumes that firms choose an output level to maximize profit, taking prices and wages as given (Fig. 4-6).

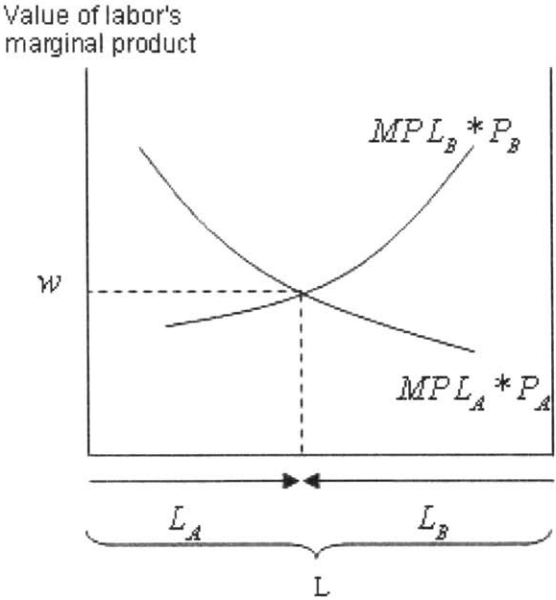


Figure 4-6: The Specific Factors Model: The Value of Labor’s Marginal Product

If  $P_A$  increases, a new curve of  $MPL_A * P'_A$  for good A is obtained (Fig. 4-7).

Thus, labor has shifted from manufacturing of good B to manufacturing of good A. Because the price of good A is higher, more workers can be hired and profitability can be maintained (value of labor’s marginal product equal to wage). Thus, the relationship between relative output and relative price of each industry can be drawn; it corresponds to the relative supply curve RS. On the same graph, a relative demand curve RD can be added (Fig. 4-8)

**Two Economis and Trade** The relative demand is assumed the same in the two countries; if both countries face the same relative price, they will consume goods in the same proportion. Thus, incentives for international trade come from differences in

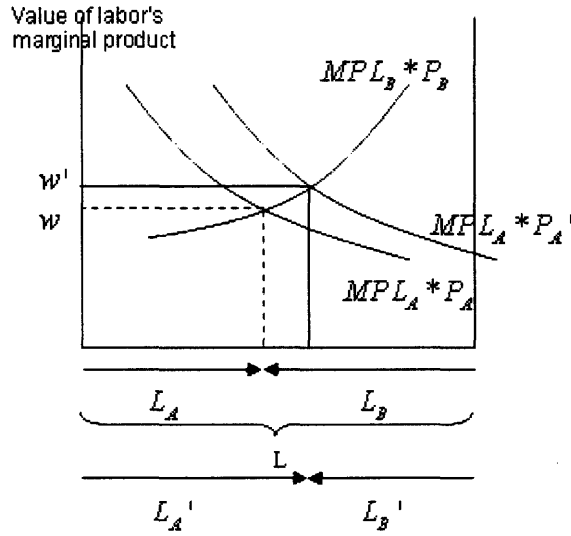


Figure 4-7: The Specific Factors Model: Price Change

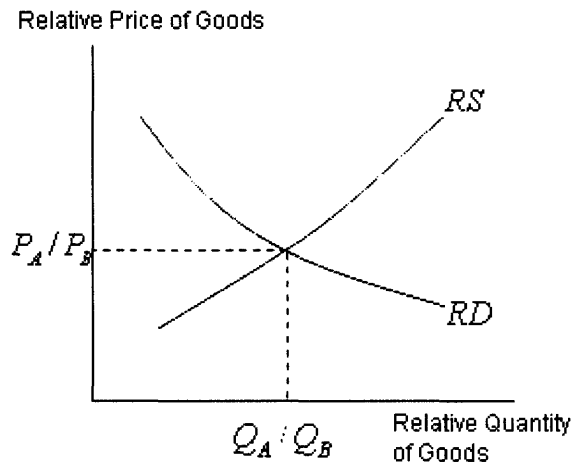


Figure 4-8: The Specific Factors Model: The Relative Supply Curve

relative supply. Differences in relative supply could come from different technologies or differences in resources. Country 2 is assumed to have a larger supply of capital than country 1. With trade, the relative price of goods in both countries will converge (Fig. 4-9).

Indeed, trade has lowered the relative price of good A for country 1 and increased it for country 2. In country 1, a decrease in the relative price of good A leads to a rise in consumption of this good. Moreover, because the relative price of good A decreases, labor shifts from the good A sector to the good B sector and the output of the good B sector rises. Before international trade, both countries were producing

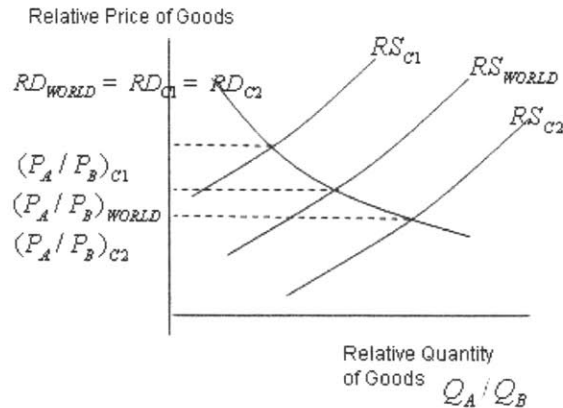


Figure 4-9: The Specific Factors Model: International Trade and Price Convergence

the domestic demand for each good. Now country 1 becomes an importer of good A and exporter of good B. Country 2 starts importing good A and exporting good B.

### 4.3.3 Conclusions and Limitations

Using this model, Samuelson and Jones show that factors specific to export sectors in each country gain from trade, while factors specific to import-competing sectors lose. International trade shifts the relative price of goods. Trade as a whole produces overall gains which could compensate, in theory, for losses. Landowners or capital-owners will benefit from trade, while the impact on labor will be ambiguous.

Governments usually prefer to compensate losers rather than to influence trade by setting up barriers considering that multiple other changes such as technological evolution or consumer preference changes will, in any case, impact income distribution. Indeed, factors specific to use in the export sector in each country gain from trade, while factors specific to the import competing sector lose (extension of Stolper Samuelson Theorem). The effect of trade on mobile factors is ambiguous (gain or loss).

Moreover, the assumption that any of the production factors can move between industries is very strong. In reality, labor cannot be displaced easily and quickly between industries. Then, a short-term negative impact on employment is expected.

## 4.4 Resource Differences and Trade: The Heckscher-Ohlin Model

If labor were the only factor of production, as the Ricardian model assumes, comparative advantage could arise only because of international differences in labor productivity. In the real world, a country's resources play an important role in trade. A realistic model should take into account such other factors of production as land, capital, and mineral resources. In the following model, differences in resources are the source of trade through two dimensions: the relative abundance of factors of production and the relative intensity with which different factors of production are used in the production of different goods. This model is referred to as the Heckscher-Ohlin model or the factor-proportions theory.

### 4.4.1 Assumptions

There are two countries (1 & 2), using two factors of production, capital and labor, to produce two goods (A & B). These two inputs are in limited supply. The model assumes full employment, which means it assumes that trade has no effect on the aggregate number of jobs.

Production functions are assumed identical in both countries and production functions in both countries display constant returns to scale. One of the commodities is capital-intensive, the other is labor-intensive. Both nations have identical tastes. Perfect factor mobility exists within each nation but not between nations.

### 4.4.2 Model

The model is a simple example of countries producing good A and good B, using labor and land with the following expressions:

$T$  =economy's supply of land

$L$  =economy's supply of labor

$w$  =wage rate per hour of labor

$r$  = the cost of one acre of land In each sector, the producer will face, not a fixed input requirement, but a trade-off between production factors: it can decide to use more labor and less land to produce the same amount of goods A. For example, if land rents are low and wages are high, the producer will choose to use relatively little labor and a relatively more land. The input choice will depend on the ratio of the two factor prices,  $w/r$ , for each good. The following curve shows the relationship between  $w/r$  and the land-labor ratio for good A and good B (Fig. 4-10).

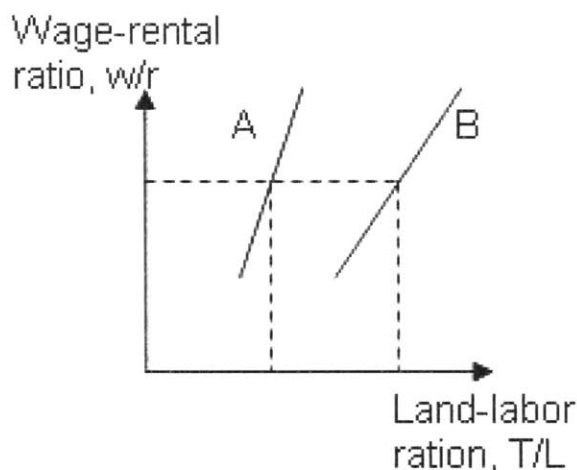


Figure 4-10: The Heckscher-Ohlin Model: Resources Intensity

According to the figure, for any  $w/r$  ratio, goods B production will require a higher  $T/L$  ratio. We say that goods B production is land-intensive. On the other hand, good A production requires a lower  $T/L$  ratio; production of good A is said to be labor-intensive.

Now, two countries (1 and 2) are assumed to have similar relative demand for goods A and B and similar relative price for the two goods. Moreover, both countries have similar technology: a given amount of land and labor yields the same output of goods in both countries. Then, the only difference is in their resources: country 1 is assumed to have a higher ratio of labor to land than country 2. Thus, country 1 is labor-abundant and country 2 is land-abundant. Since good A is more labor-intensive, country 1 tends to specialize in the production of good A; country 1 will produce a higher ratio of goods A to goods B. Trade leads to a convergence of relative prices.

Therefore, in the absence of trade the relative price of goods A would be lower in country 1 and the relative price of goods B higher. According to the Heckscher-Ohlin model, under balanced trade, a country will be a net exporter of the services of its abundant factors and a net importer of the services of its scarce factors. The model allows factor prices to adjust to maintain full employment and therefore can cause changes in income distribution as a consequence of trade(Fig. 4-11).

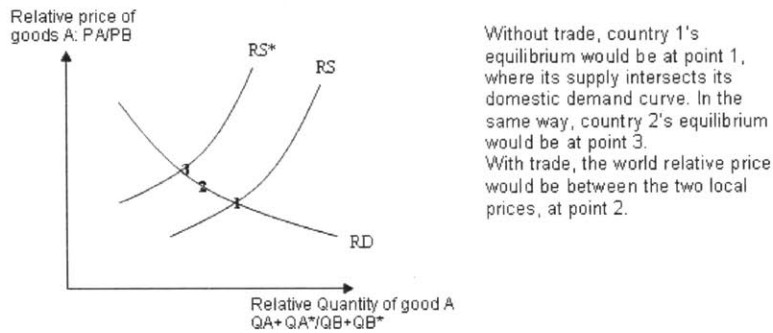


Figure 4-11: The Heckscher-Ohlin Model: Relative Supply Curve

### 4.4.3 Factor Price Equalization

One of the implications of the Heckscher-Ohlin model is the “Factor-price equalization theorem.” Without trade, labor in country 1 would earn less than in country 2 and land would earn more. Moreover, without trade, labor-intensive goods 1 would be cheaper in labor-abundant country 1 than in country 2. Thus, when countries start trading goods, the relative prices of goods and the relative prices of labor and land converge. Therefore, if two countries start out with similar technology and skills but different wage rates, trade between them will reduce wages in the high-paying country and increase wages in the low-paying country until, eventually, workers in both places end up earning the same amount. This conclusion is true if both countries produce both goods, technologies are the same, and trade equalizes the prices of goods in the two countries.

Table 4.2: Leontief Paradox: US 1947 Data

	Data for 1947	Imports	Exports
Capital (million dollars)	\$3,091,339		\$2,550,780
Labor (million person-years)		170	182
Capital-labor ratio	\$18,184		\$14,015

#### 4.4.4 Leontief Paradox

In 1953, Leontief published a very famous empirical study to test the Heckscher-Ohlin model with U.S. data. Leontief used the 1947 input-output table of the U.S. economy. He aggregated factors into two categories, labor and capital. Then, he estimated the capital and labor requirements to produce one million dollars' worth of typical exports and imports in 1947 (Table 4.2).

Professor Robert Baldwin did another test with U.S. data for 1962 (Table 4.3).

Table 4.3: Leontief Paradox: US 1962 Data

	Data for 1962	Imports	Exports
Capital (million dollars)	\$2,132,000		\$1,876,000
Labor (million person-years)		119	131
Capital-labor ratio	\$17,916		\$14,321

At first glance, the results from both tests are counter-intuitive. It appears that U.S. imports tend to be more capital-intensive than U.S. exports. Nevertheless, other results from Baldwin's study tend to support the Heckscher-Ohlin model. Baldwin compares qualitative factors of production workers. Imported goods appear to be goods needing a less skilled labor force. Indeed, the U.S. might be exporting goods with innovative technologies which could be less capital intensive but which require a skilled work force and innovative entrepreneurship (Table 4.4).

Table 4.4: Leontief Paradox: Work force skills level

	Data for 1962	Imports	Exports
Average years of education per worker		9.9	10.1
Proportion of engineers per worker		0.0189	0.0255

#### **4.4.5 Conclusions and Limitations**

This model shows that owners of a country's abundant factors gain from trade, but the owners of scarce factors suffer loss. Moreover, the assumption that the entire world has the same production function would mean that the entire world has the same productivity (output per person hour and capital per output ratio). This is obviously untrue. Moreover, an industry could be labor-intensive in a country and capital-intensive in another country. Agriculture, for instance, is capital-intensive in the U.S. and labor intensive in Asia.

It is hard to imagine that difference in resources alone can explain the features of international trade. In fact, it is highly probable that technology plays an important role.

### **4.5 The Standard Trade Model**

The standard trade model tends to generalize the three models just discussed (the Ricardian model, the specific factors model, the Heckscher-Ohlin model). This model shows that an improvement in a country's terms of trade (the relative price of a country's exports on the world market) increases its welfare. In contrast, relative growth in the price of imported goods will increase the capability to produce import-competing goods and thus improve a country's terms of goods.

### **4.6 Bhagwati, Panagariya, Srinivasan (2004)**

Bhagwati et al. (2004) [36] have recently studied the impact of trade on offshore purchasing of arm's-length services (services that do not require geographical proximity of the buyer and the seller), and its effects on national output, wages and distribution of income. They found that effects on jobs and wages from outsourcing of such services are comparable to those from conventional trade in goods. The authors present three different models.

### 4.6.1 Model 1

This model assumes one good which is produced with two factors of production, labor and capital. The authors assume that an innovation allows the country to buy the services of labor abroad at a lower fixed wage (Fig. 4-12 - see details in Appendix B-2). In this model, outsourcing is beneficial for capital owners but hurts local labor income. Thus, a policy which compensates losers, such as workers, could create a win-win solution for both parties.

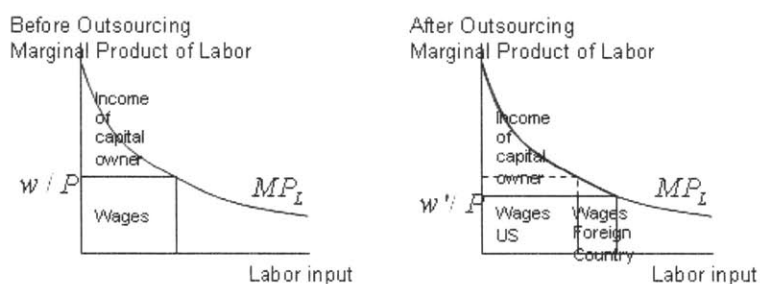


Figure 4-12: Model 1: Marginal Product Curve and the Distribution of Income

### 4.6.2 Model 2

The authors consider a two-good, two factor of production model using a Specific Factors Model. There are a sector-specific factor and a production factor common to both goods (Figure 4-13).

	Good A Import-competing	Good B Exportable
Specific Factor	Land	Capital
Common Factor	Labor	Labor

Figure 4-13: Model 2: Good Ressources Requirements

The country trades in the world market and a technological innovation makes outsourcing possible. Therefore, labor can be outsourced and bought abroad at a lower wage (see details in Appendix B-3). At this new wage, Bhagwati et al. assume an excess demand for labor satisfied through outsourcing. The graphs below show

the situations before and after outsourcing. Thus, according to the new distribution of income in the two graphs below (Fig. 4-14 and 4-15), a decline in the labor wage for both local sectors happens simultaneously with a rise of income for capital and land owners.

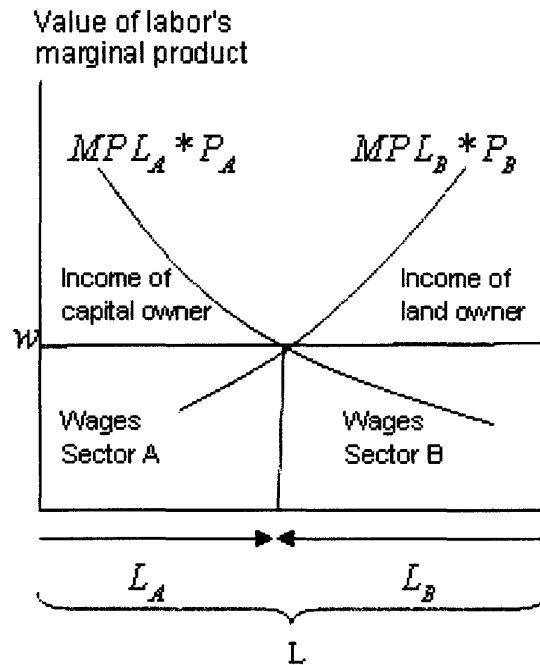


Figure 4-14: Model 2: Income Distribution Before Offshoring

Even If the terms of trade are assumed to be fixed, outsourcing remains profitable. Subsequently, if trade in final goods changes, outsourcing enlarges the output of the exportable good beyond the demand for it. Now it will cost more in terms of exports to buy the same amount of imports, reducing benefits from outsourcing.

### 4.6.3 Model 3

In model 3, the authors present a three-good, two-factor model where the third good is not tradable. Then, the authors suppose that the third good becomes tradable at a lower price due to an innovation. The production of good 3 may disappear, releasing resources for production of goods 1 and 2. Since the price of good 3 has declined, owners of both factors increase their buying power in terms of that good.

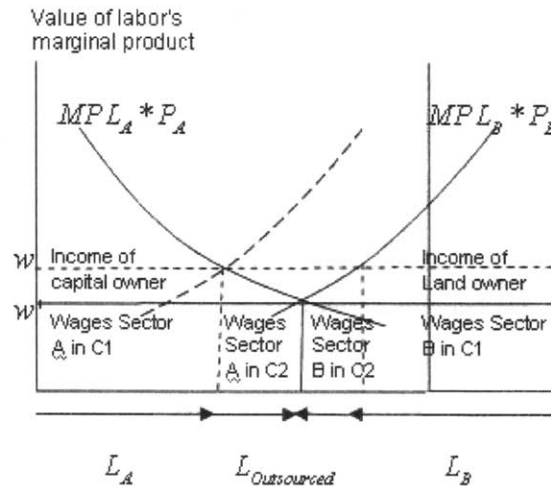


Figure 4-15: Model 2: Income Distribution After Offshoring

#### 4.6.4 Conclusions

In the first model, outsourcing benefits are not shared by all actors: outsourcing benefits capital owners but penalizes workers. In the second model, outsourcing may again provide overall benefits but domestic workers will lose. In the last model, the authors conclude that all actors will gain after workers and resources make the transition from the third sector to other industries.

On the one hand, the authors have used these models to show that the expansion of skills abroad embedded in goods that the U.S. already imports is beneficial, since it makes the imported goods even cheaper. On the other hand, when imports for an activity performed domestically increase, net gains are expected for capital owners (the unmovable factor) and losses are expected for local workers, who are now competing with foreign workers. The last model suggests that outsourcing is likely to shift jobs between sectors and occupations. There is no guarantee that the jobs created will be better than the jobs lost.

### 4.7 Samuelson (2004)

In 2004, Paul Samuelson published a trade model considering two countries (USA and China) and two goods (1 and 2) following a Ricardian model. [105] In this study,

Samuelson assumes China's labor productivity is one-tenth that of the U.S. At the same time, China's labor force is ten times larger. Initial Ricardo-Mills analysis shows that geographical specialization and fair free trade double each country's autarky real income. Secondly, Samuelson simulates that China quadruples its labor's productivity, through technical improvement, in good 2, which is the good China is exporting to the U.S. The new equilibrium allows the U.S. to import good 2 at a lower price. China also raises its real net national product. These conclusions are consistent with traditional trade theories. Finally, Samuelson studies the case where China improves its productivity in good 1, in which the United States previously had a comparative advantage. Applying Ricardo-Mills arithmetic, the U.S. may experience permanent losses in per capita real income. Losses can even totally offset gains from trade over an autarky situation.

In the first case, technical improvement leads to benefits for both countries, but in the second case, only China gets benefits from it, while the U.S. is permanently hurt.

## 4.8 Discussion

These models assume that workers who lose their jobs can find other ones fairly easily. In the real world, workers may suffer from displacement. They may experience cuts in wages, or even unemployment, if they do not have sufficient skills to find a job in another sector. Governments often respond to labor displacement by allocating special funds to retrain and replace workers laid off because of imports competition. Such models clarify the causes of income inequalities in the U.S. economy. Developing countries used to have comparative advantage in raw materials, such as mining or agricultural products, because of abundant resources in land or mines. Between the 1970s and the 1990s, the newly industrializing economies (NIEs), such as South Korea or China, started improving productivity and expanding their manufacturing industries (Table 4.5).

NIE started exporting to the U.S. goods such as apparel or shoes whose production is intensive in unskilled labor, an abundant production factor for the NIE.

Table 4.5: Composition of Developing Country Exports

Percent of Total	Agricultur	Mining	Manufacturing
1973	30	47.5	22
1995	14	22.5	62.5

Concurrently, demand for unskilled labor in the U.S. has decreased. The U.S. has experienced an increase in the inequality of wages during this period, since unskilled workers came into competition with NIE workers.

On the other hand, production of certain goods is becoming more capital-intensive and may involve external economies and diseconomies. In many cases, capital has replaced labor in producing goods to the extent that the former labor is obsolete: many countries with high unemployment and fertile lands now import agricultural goods from the United States. From the review of these international trade models, we can envisage that offshoring may be positive for the U.S. economy, ultimately increasing aggregate profits. Nevertheless, the new distribution of income resulting from international competition may not be a win-win game; it could lead to displacement of workers from certain sectors. The U.S. capital owner and consumer may be the only beneficiaries of the new situation, as a consequence of sourcing labor at a lower price offshore or onshore and lower prices of import-competing goods. It appears at the least to be vital for the U.S. to remain competitive in enough sectors to provide enough well-paid jobs to manufacturing workers displaced from highly import-competing sectors such as electronics devices and appliances or apparel.

Nevertheless, whereas offshoring can be assimilated to international trade, and explored using economic theories, the company case studies analyzed have shown that companies' reasons to offshore for are often specific to their products and customers, without necessarily following trends predicted by international trade theories. It has become apparent that the offshoring decision is more specific to a certain product, customer or company, than a universal rule within a particular industry. Thus, two companies competing in the same industry might have different location strategies. The next chapter analyzes offshoring strategy through business case studies.

## Chapter 5

# How Are Trade and International Competition Impacting Employment in the U.S. Manufacturing Sector

*“ The loss of jobs over the past three years is attributable largely to rapid declines in the demand for industrial goods and to outsized gains in productivity that have caused effective supply to outstrip demand.” Greenspan [10]*

The number of jobs in the manufacturing sector peaked in 1979, yet the share of employment in the manufacturing sector began its decline after World War II (Fig. 2-2). Needless to say, the decline of the employment in manufacturing sector is not a new phenomenon and international figures in other advanced economies such as Germany or UK, show that decline is not only occurring in the U.S. economy (Fig. 2-4). However the recent shortfall in manufacturing employment during the 2001 recession created a surprising debate about the contribution of manufacturing activities to the prosperity and the competitiveness of the U.S. Suddenly, manufacturing goods domestically appeared as a strategic activity. Indeed, with regards to the long decline in manufacturing employment in U.S. and other advanced economies and the respective

long term performance of these economies, the recent noise about job shortage in manufacturing could appear odd. It illustrates the “fear” of many U.S. workers with regard to a rapidly changing world economy and a new competition era after the 9/11 events and the burst of the internet economy bubble.

The apprehension of U.S. workers since 2001 is likely the result of series of coincident, short term dynamics as well as long term trends.

To clarify the short term dynamics, it is pertinent to look at the recent dynamics in the U.S. economy since 2001. After 9/11 and the burst of the internet bubble, the U.S. economy went through a severe recession. At that time, no new technologies emerged to replace the not-so-promising internet economy. Imports of traditional manufactured goods from China and other low cost countries kept growing and resulted in new imports and trade deficit records month after month. In this context, all jobs became a vital asset for the U.S. The presidential campaign, at that time, was an excellent circumstance for the media to raise public awareness of offshoring. The media started publishing stories about relatively new phenomenon at this time, the move of white collar jobs abroad, especially to such countries as India. Media coverage on such a new trend was expected, but it was surprising to observe an increasing number of stories related to manufacturing jobs offshored to low cost countries which has been a common trend for American companies for decades in order to benefit from wage differentials and to capture new markets abroad. Companies and CEOs, participating in offshoring operations were suddenly viewed by many as public enemies and even stigmatized by popular TV-shows like “Exporting America” by Lou Dobbs on CNN.

The confusion about the real impact of offshoring and international trade on U.S. employment resulted from the absence of governmental statistics. Indeed, the lack of robust official numbers directly assessing the impact of offshoring on U.S. employment has made possible the unrestrained speculation by researchers, consulting firms or journalists about the number of jobs lost. In this case, the absence of statistics has been more prejudicial than having “bad” statistics by giving the opportunities for all the parties to interpret and present the situation in their own way. In this context

and with this attention on manufacturing in low cost countries, companies started feeling pressure from their stakeholders to consider incorporating a “Chinese plan” even if it was not always pertinent for their strategy. [20]

Nevertheless, along with these short-term events, this recent succession of events resulted from long-term economic changes and corporate strategy mutations. U.S. companies have been using plants abroad since the beginning of the 20th century to capture wage differentials, special technology, skills, raw material or new markets. The recent development of IT tools to support production abroad and the standardization of design and manufacturing processes along with the fast development of manufacturing capabilities abroad make the manufacturing in low cost countries possible for most goods. More recently, the intense use of communication tools has made the transfer of data easier and has reduced the necessity for face to face exchanges. By reducing the need of physical presence these tools have open opportunities for workers abroad to perform tasks that used to be done domestically. The most well-know examples include X-ray reading by doctors in India or outsourced call centers and accounting services.

Lately, more functions in more industries have been subject to offshoring in low cost countries, such as research and development in China for software companies or design activities in the semi-conductor industry in Taiwan. Ironically, in certain case, like IT programmers, offshoring in India has helped U.S. companies to match the extra-demand from the Y2K problem. The domestic workers were not able to respond to this temporary extra-demand. In the long-run, this momentary situation proved that the contractors abroad were able to provide high quality services for relatively low cost. [95] In a time when anti-immigration laws are reinforced and working visa quotas are historically low, it appears that it is becoming more difficult to move people where the demand is than to move the demand where the workers are. All these recent trends have contributed to the current fear that any jobs, white collar job or traditional manufacturing job, could be performed properly abroad for a fraction of the domestic price.

This chapter will present a rational approach to measure the phenomenon of

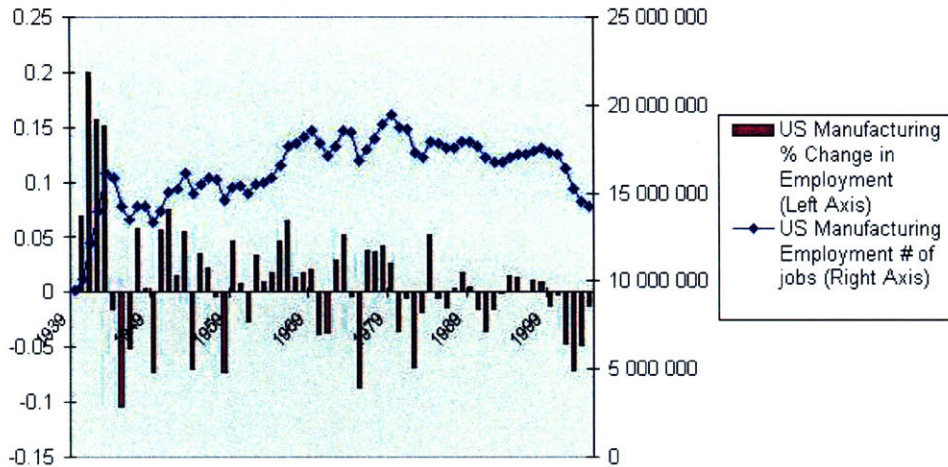
offshoring and will present a framework to clarify how companies make the offshoring decision based on several case studies and the current trends in U.S. companies' offshoring decisions.

The turn of the 20th century has marked the new integration of an increasing number of developing countries in the global economy as new suppliers, new manufacturers, new services providers, and new consumers but also as new competitors for market share in the U.S. and anywhere else. For instance, the next chapter will show how a country like China is not only looking for manufacturing products designed and developed by American firm in the U.S. to serve U.S. market but also tries to acquire and develop technology and scientific knowledge to build its own research and design capabilities and be able, someday, to compete with European and American companies in a broad range of products.

## **5.1 Recessions and Employment: Is the Current Trend Structural or Cyclical?**

As seen in Chapter 2, the U.S. manufacturing sector share in U.S. total employment has declined steadily since 1945. Nevertheless the absolute number of jobs in the manufacturing industry has been remarkably stable during the 35 years between 1965 and 2000, oscillating between around 17 million and 19 million jobs (Fig. 5-1). The variation was even smaller after 1987, with the number of total job in manufacturing being stable around 17 millions. However, the situation has dramatically changed in 2001. From 2001 to 2006, the U.S. manufacturing sector has lost around 2.9 million jobs.

This abrupt decline in employment may result from general down turn of the U.S. economy during a recession or structural mutation resulting in losses of jobs. In the case of job losses due to a recession, the manufacturing industry is supposed to lose job while the whole economy goes down and recover when the economy starts getting better. In the case of structural changes, the manufacturing industry will eventually

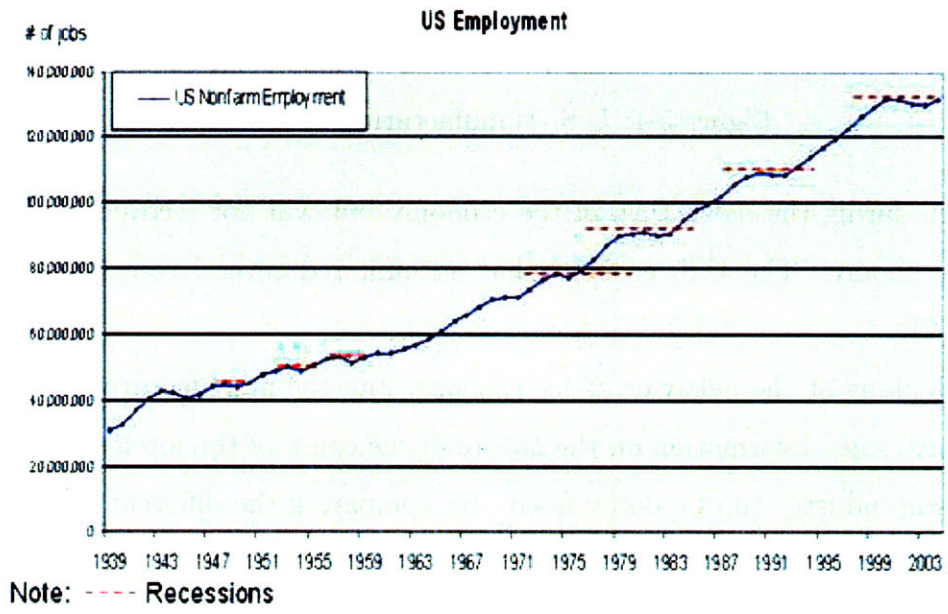


Source: BLS - Current Employment Statistics (CES) Program

Figure 5-1: U.S. Manufacturing Employment

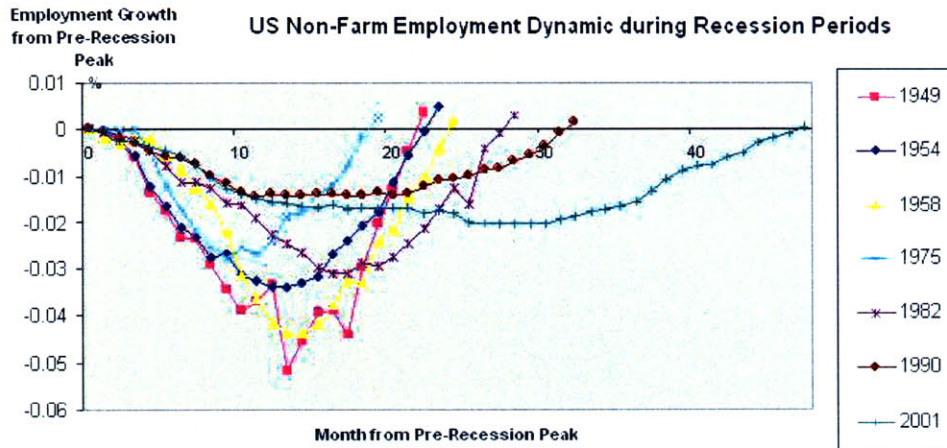
lose jobs during the down turn of the economy but will not recover along with the whole economy. The U.S. economy has encountered several recessions since 1945 (Fig. 5-2).

By looking at the behavior of the economy and the manufacturing sector during recessions, some information on the nature of the cause of the job losses in the manufacturing industry can be determined. By comparing the different recessions since 1949, it appears that job losses during recessions are becoming “flatter”: it takes a longer period for the economy to recover the initial level of employment prior to the recession and at the trough of the recession, the economy loses less jobs (Fig. 5-3).



Source: BLS - Current Employment Statistics (CES) Program

Figure 5-2: U.S. Employment and Recession Periods



Note: t=0 is defined as the pre-peak in employment level before the recession  
 Source: BLS - Current Employment Statistics (CES) Program

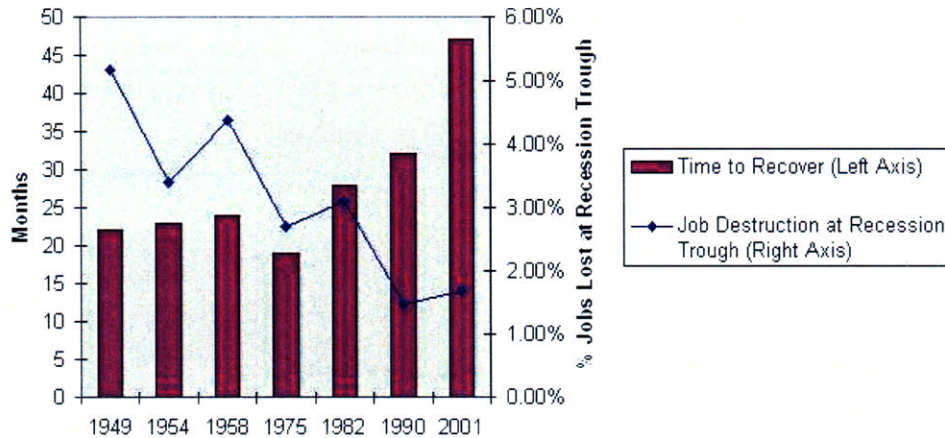
Figure 5-3: U.S. Non-farm Employment Dynamic during Recession Periods

In contrast with most previous recessions, where job growth following the trough was very strong, the recovery after the 2001 recession has been dramatically weak, forcing economists, and politician to talk about a “jobless recovery.” Finally the pre-recession job level has recovered after 47 months compare to 25 months on average for the previous recessions (Table 5.1 and Fig. 5-4). The percentage of jobs lost on average during the 2001 recession has been lower and at the recession trough the job loss has been relatively less significant than during the previous recessions, with 1.67 percent of jobs lost at the trough.

Table 5.1: Recession Effect on U.S. GDP Employment

Recessions	Time to Recover Previous employment level	Avg. Employment Change Per Month During Recession	Job Destruction at Recession Trough
1949	22	0.60%	-5.18%
1954	23	0.32%	-3.39%
1958	24	0.39%	-4.37%
1975	19	0.32%	-2.69%
1982	28	0.27%	-3.10%
1990	32	0.11%	-1.47%
2001	47	0.10%	-1.67%

Note: The third column shows the average employment change per month during the recession. Job changes are counted positively during the declining and recovery phases by considering the absolute change.

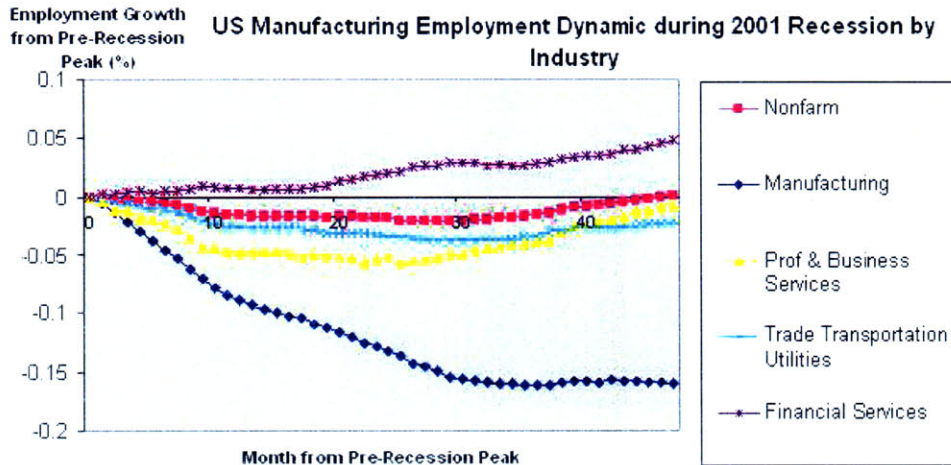


Source: Current Employment Statistics (CES) Program

Figure 5-4: Recession Effect on the U.S. Manufacturing Employment

The different economic sectors, such as manufacturing or services, followed different trends during the post-recession recovery. Many reasons can be invoked to explain the recent downturn of the U.S. employment, but as explained before, by looking at the pattern of employment by industry during recession and recovery periods, job flow fluctuations can be differentiated into two main categories: cyclical adjustment or structural adjustment. Thus, Erica L. Groshen and Simon Potter, two economists of the Federal Reserve Bank of New York, underlined that during the last recession job losses have been mainly due to structural changes and not cyclical, comparing job creation during recession and recovery (Appendix C-1). [64] It appears that during the last recession, the manufacturing sector was losing jobs before and after the recovery of the economy, suggesting that this sector was structurally declining. At the same time, the financial services sector has been growing through the recession period, suggesting that this sector has been structurally growing (Fig. 5-5).

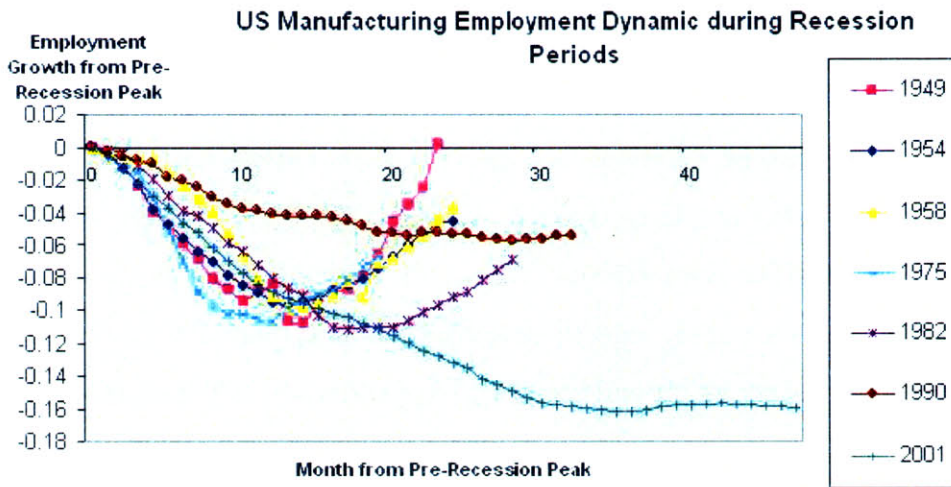
By comparing the pattern of employment in the manufacturing industry during the different recessions, the job-less recovery presages that the jobs lost in this sector might be caused by structural changes such as productivity gains, offshoring or permanent decline of some manufacturing industries, and not only a temporary decline in the demand due to the economic recession. Contrary to the previous recessions, jobs in manufacturing sectors might have been lost permanently during the period



Source: BLS / CES Program

Figure 5-5: US Employment Dynamic during the 2001 Recession by Industry

from 2001 to 2006 (Fig. 5-6).



Source: BLS / CES Program

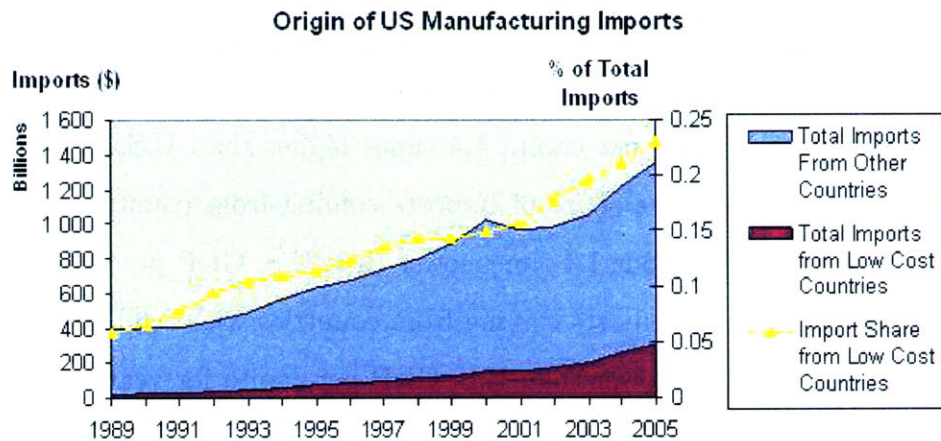
Figure 5-6: US Manufacturing Employment Dynamic during Recession Periods

Section 5.3, develops a model to assess the weight of the different factors that have been influencing employment in the U.S. manufacturing sector between 1997 and 2005. The factors can be temporary, such as the decline of domestic demand due to recession, or structural such as increase of productivity or change in trade balance due to offshoring and foreign competition.

## 5.2 U.S. Manufacturing Imports

After the adoption of NAFTA, many U.S. politicians and labor unions pointed out the risk of job losses in the US economy due to massive imports from Mexico. Ten years later, for a lot of observers, NAFTA has mostly benefited the U.S. and Canada by opening large new markets for exports and by leveraging opportunities to access a nearby low cost pool of workers. [114]

The recent explosion of imports from Asian countries and the adhesion of China to the WTO in December 2001 have revived the debate. Two trends have been particularly concerning: along with the increase of the volume of imports, the origin of the goods imported has shifted increasingly to low cost countries (See Table C-1 in Appendix C). In fifteen years, from 1990 to 2005, imports of goods has increased threefold, reaching \$1,674B in 2005. During the same period, the US trade deficit in goods has increased sevenfold, reaching \$781M in 2005. Simultaneously with this trend, goods have been imported more from low cost countries: while imports from low cost countries represented 6.7 percent of total imports in 1990, imports from LCCs represented 23 percent of goods imported in the U.S. in 2005 (Fig. 5-7).



Note: Low Cost Country (LCC) GDP2004 Per Capita = 0.05\*US GDP2004 Per Capita / GDP: Current US \$ Per Capita

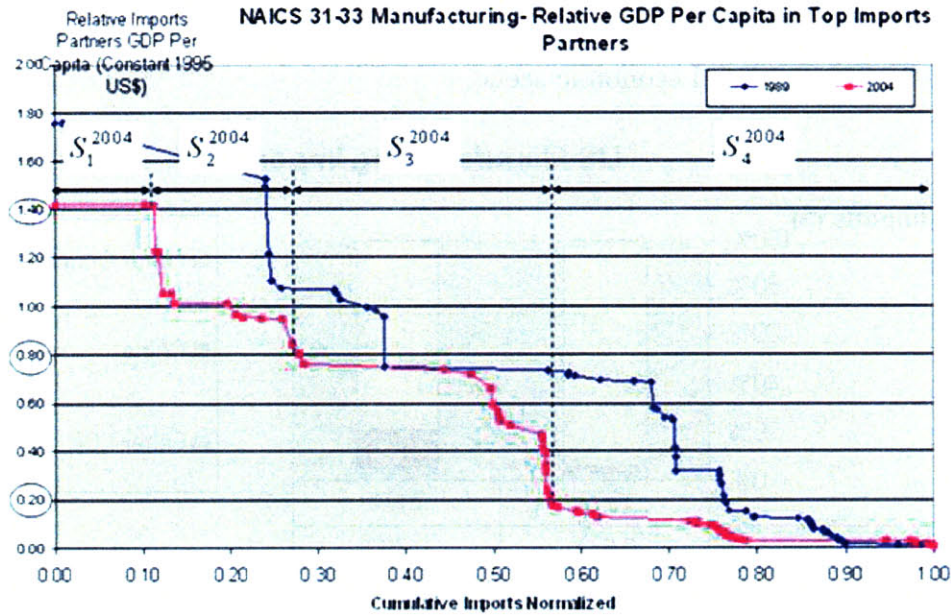
Source: The Office of Trade and Industry Information (OTII), Manufacturing and Services, International Trade Administration, U.S. Department of Commerce

Figure 5-7: Origin of U.S. Manufacturing Imports

Looking at the average GDP per capita of the exporting countries relative to the

U.S. level helps to identify countries corresponding to the LCCs or high cost countries.

As show by the figure 5-8 below, the demography of the countries exporting manufacturing goods to the U.S. has been fairly stable between 1989 and 2004 except for countries with a very high relative GDP per capita ( $>1.4 \times$  U.S. GDP per capita) and LCCs, which represent countries with an average GDP per capita less than 5 percent of the U.S. average GDP per capita. It appears that the U.S. are importing 11 percent of their goods in 2004 from countries with an average GDP per capita 1.4 fold higher than the U.S. level, compared to 24 percent in 1989. At the same time, imports from countries with an average GDP per capita inferior than 5 percent of U.S. GDP per capita have reached 44 percent in 2004 compare to 24 percent in 1989. This phenomenon has occurred in all the manufacturing sectors at different degree (Appendix C-3). This trend can be illustrated by plotting cumulative curve of imports shown below. On the abscissa-axis, imports are ranked then aggregated according to average GDP per capita of the exporting country. The ordinate-axis represents the average GDP per capita for a given exporting country relatively to the average U.S. GDP per capita. The graph presents the curves for 1989 and 2004 using constant 1995 U.S.\$ and normalized imports volume, making graphical comparison more accurate (Fig. 5-9 - See Table C-2 in Appendix C).  $S_1^i$  represents the share of imports coming from countries with a GDP per capita 1.4 times higher than U.S. GDP per capita for year  $i$ .  $S_2^i$  represents the share of imports coming from countries with a GDP per capita 0.8 times higher but 1.4 times lower than U.S. GDP per capita for year  $i$ .  $S_3^i$  represents the share of imports coming from countries with a GDP per capita 0.2 times higher but 0.8 times lower than U.S. GDP per capita for year  $i$ .  $S_4^i$  represents the share of imports coming from countries with a GDP per capita 0.2 times lower than U.S. GDP per capita for year  $i$ .

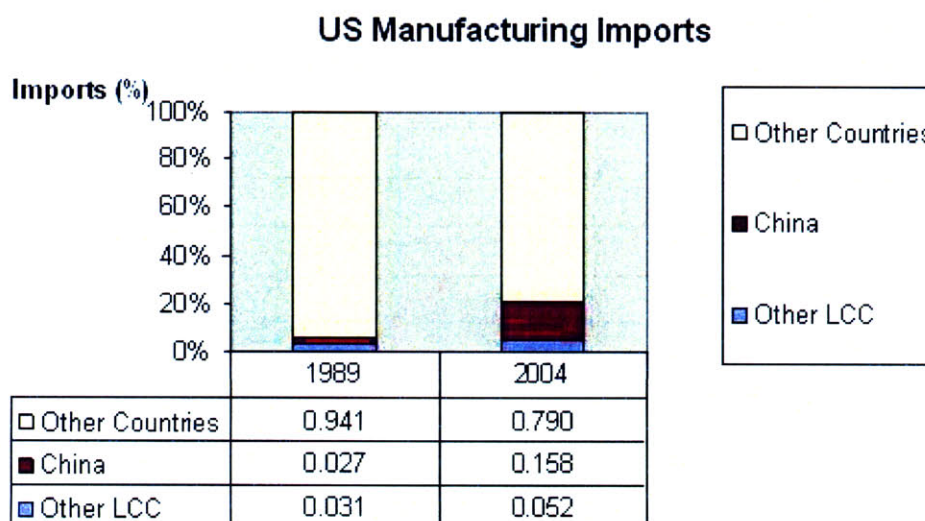


Note: Relative Imports Partners GDP Per Capita = Partners GDP Per Capita / US GDP Per Capita  
 $S_k^{2004} = \sum_{j \in E_k} Imports_j^{2004} / \sum_{All\ Countries} Imports^{2004}$  with  $k \in [1; 4]$   
 $E_1$  represents countries with GDP Per capita  $> 1.4 * US$  GDP Per Capita  
 $E_2$  represents countries with GDP Per capita  $< 1.4 * US$  GDP Per Capita and  $> 0.8 * US$  GDP Per Capita  
 $E_3$  represents countries with GDP Per capita  $< 0.8 * US$  GDP Per Capita and  $> 0.2 * US$  GDP Per Capita  
 $E_4$  represents countries with GDP Per capita  $< 0.2 * US$  GDP Per Capita  
Source: World Bank

Figure 5-8: Profile of Imports Partners

The comparison of the 1989 and 2004 curves shows clearly two trends. First, US GDP per capita has been growing faster than some of its traditional trade partners' one. Second, imports increasingly come from countries with very low GDP per capita. The second trends can be explained by two distinctive reasons: the low cost countries are exporting goods that used to be exported to the U.S. from countries with a higher level of development and the low cost countries are now exporting goods than used to be produced in the U.S. Both these trends happened simultaneously since the volume of export and the share of goods coming from LCCs have both grown faster than the U.S. economy and the exports from other countries. By looking at the countries of origin of U.S. Manufacturing imports in details, one can see that China is mainly responsible of this new situation. Whereas imports from other low cost countries have risen form 3.1 percent to 5.2 percent of the total US manufacturing imports, imports from China have exploded from 2.7 percent to 15.8 percent of the total US

manufacturing imports (Fig. 5-9). Chapter 6 will examine the new role played by China in the international economic scene.

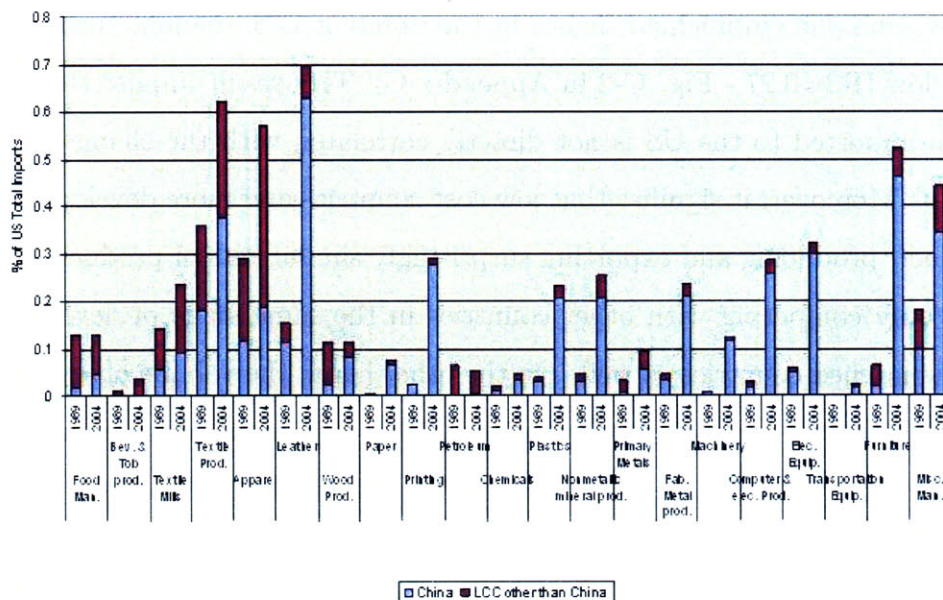


Source: The Office of Trade and Industry Information (OTII), Manufacturing and Services, International Trade Administration, U.S. Department of Commerce

Figure 5-9: U.S. Manufacturing Imports Share from China and Other Low Cost Countries

Imports from China have increasing in all sectors in volume and share except for food manufacturing, wood products and petroleum and coal products. Increases have been particularly important in the apparel and textiles industries and in the nonmetallic mineral industry, primary metal, machinery and computer and electronic product sectors. More globally, whereas imports from LCCs accounting for more than 20 percent of total US imports only in the apparel and textile product mills industries in 1989, in 2004 imports from LCCs represented more than 20 percent of total U.S. imports in the textile mills (23 percent), textile product mills (62 percent), apparel (57 percent), leather and allied products (69 percent), printing and related support activities (29 percent), plastic and rubber products (23 percent), nonmetallic mineral products (25 percent), fabricated metal products (23 percent), computer and electronic products (28 percent), furniture (52 percent) and miscellaneous manufacturing (44 percent) sectors (Fig. 5-10).

To capture this trend with one indicator, the average GDP per capita of importing



Note: Low Cost Country (LCC) GDP2004 Per Capita = 0.05\*US GDP2004 Per Capita  
 Source: BLS / the Office of Trade and Industry Information (OTII) U.S. Department of Commerce

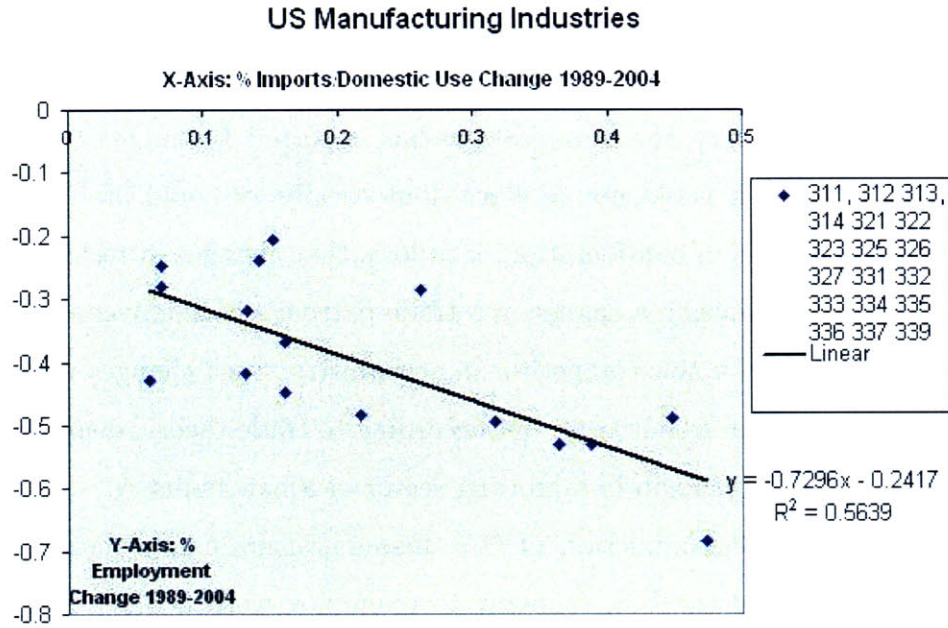
Figure 5-10: U.S. Manufacturing Imports Share from China and Other Low Cost Countries by Industry

partners is computed for each manufacturing industry (Table C-3 in Appendix C). This number represents the GDP per capita of a virtual country which will be the unique exporter for a given industry to the U.S. and is given by the sum of the GDP per capita of each exported weighted by the respective share of exports with U.S. For instance, the average GDP per capita of exporting countries for the apparel sector was \$7,677 in 1989 compare to \$5,479 in 2004. On the other hand, for Chemicals, it was \$23,071 in 1989 and \$26,080 in 2004. For the U.S. manufacturing sector as a whole, the average GDP per capita of exporting countries passed from \$20,282 in 1989 to \$17,546 in 2004, which correspond respectively to 78 percent of the U.S. GDP per capita in 1989 and only 54 percent in 2004.

Thus, two strong trends are identified: first, the explosion of imports as compared to the growth of the U.S. domestic use in all U.S. manufacturing sectors; second, the change in the mix of countries exporting to the U.S. It has been argued by economists that both trends account for recent job losses in the U.S manufacturing sector. However, the correlation between the change in the average GDP per capita of exporting

countries, and the employment losses in the different U.S. manufacturing industries is fairly low ( $R^2=0.27$  - Fig. C-2 in Appendix C). This result implies that the origin of goods imported to the US is not directly correlated with the change in U.S. employment. Moreover, it signifies that low cost countries and more developed countries are, in fact, producing and exporting surprisingly similar sets of products. Countries are not only competing with other countries in the same stage of development but with mismatched countries as well. On the other hand, the volume of imports is relatively highly correlated to job losses in production employment in US manufacturing industries ( $R^2=0.56$ , Fig. 5-11). According to this data, as the ratio of imports to domestic use increased, employment of production workers decreased. This relationship sustains the hypothesis that offshoring and trade will impact US manufacturing employment. This is strengthened by the fact that the strong correlation with employment workers (Fig. 5-11) is strong, while the correlation with total employment (including production workers as well as other occupations) is weak ( $R^2=0.20$  - Fig. C-3 in Appendix C). This result confirms that import levels affect production activities but not other activities, thus demonstrating that production activities are offshored, while headquarters, R&D, marketing or human resource activities remain domestic.

While offshoring and imports play an important role in job losses in manufacturing, other factors are also present. First, the domestic consumption, defined as domestic use, will directly influence the demand for manufacturing goods. Therefore, the level of imports and the level of domestic production output, effect domestic employment. A second factor contributing to manufacturing job loss is the decrease in exports due to U.S. manufacturer competitiveness and the economic situation overseas. Weak exports will result in job losses or decreased job creation. Finally, productivity, which has been one of the main causes of wealth creation during the last century, has also resulted in employment decline and employment redistribution in the U.S. manufacturing sector. The combination of these factors along with offshoring and imports, explain the job decline in the U.S. manufacturing sector. A model is developed in the next section to evaluate the influence of each factor on employment,



Note: Petroleum and Coal Products excluded  
 Source: The Office of Trade and Industry Information (OTII), Manufacturing and Services, International Trade Administration, U.S. Department of Commerce

Figure 5-11: U.S. Manufacturing Industries Employment and Imports Changes

during the period of 1997 to 2004.

### 5.3 Model

U.S. manufacturing has been declining in its employment share of the U.S. economy since the end of the Second World War. Since 1979, it has also declined in absolute number of jobs. Simultaneously, U.S. domestic consumption of both manufacturing goods and imports has matched or outpaced the growth of the GDP. This demonstrates a paradox: a growing demand with shrinking numbers of workers to supply manufacturing goods. It has been widely explained by a continual rise in productivity over time. Demand for manufacturing goods has not grown rapidly enough to offset the increase in the productivity of this sector. This has resulted in a decline in the relative demand for manufacturing and a relative decline of manufacturing goods prices. This trend is common of developed economies, and even of some developing economies, and it is widely identified and accepted by economists. However, this ex-

planation does not address all the issues at play. The significant role of international trade in the manufacturing employment profile must also be included. Since the end of nineteenth century, the United States has imported raw materials and specific products that it either could not produce domestically, or could produce, but at a higher cost. With this in consideration, it follows that changes in technology, wages or political regimes, causing a change in a trade partner's economy could potentially lead to the creation of a new competitor in an industry. Such changes will affect employment in the U.S. in a short-run, but according to trade theory, displaced workers will ultimately find a new job in a growing sector or a new industry.

Nevertheless, the recent reduction in U.S. manufacturing employment brings into question the ability of the U.S. economy to re-employ workers that have been displaced by trade shifts. It appears that now, U.S. workers have to compete against a growing pool of low-wage workers in an increasing range of products, activities, and industries. Further, recent job losses have resulted from the confluence of several factors and not only the increase in imports. Since 1997, U.S. exports stagnated in the aftermath of the Asian financial crisis, while U.S. imports increased rapidly as the economy boomed. Until 2001, the spurt of domestic demand could absorb the increase in imports. However, the decline in exports and increase in productivity combined to cause a slowdown of manufacturing employment. After 2001, domestic demand dropped, exports remained weak, and imports, after slowing down for 2 years, began to rise once again, resulting in a precipitous trend towards job decline across all manufacturing sectors (Table 5.2).

Baily and Lawrence recently estimated the number of the job dislocations that trade and electronic offshoring caused between 2000 and 2003. The results show that the weakness in U.S. payroll employment since 2000 was not the result of either a flood of import goods, or a flood of services. [32] Rather, it can be attributed to an inadequate growth in domestic demand in the presence of strong productivity growth and along with weaker exports (mainly due to the high U.S. dollar). Following the framework developed by Baily and Lawrence, the relative impact of trade, productivity gains, and domestic demand in U.S. manufacturing on employment shifts between

Table 5.2: U.S. Manufacturing Industries

Name	NAICS Code	Percent Change Employment	Percent Change VA	Percent Change Imports	Percent Change Exports	Percent Change Domestic Use
Food and beverage and tobacco products	311, 312	-0.248	0.712	1.710	0.650	0.880
Textile mills and textile product mills	313, 314	-0.531	0.060	2.165	2.413	0.271
Apparel and leather and allied products	315, 316	-0.761	-0.287	1.682	1.329	0.814
Wood products	321	-0.205	0.856	3.015	0.232	1.486
Paper products	322	-0.418	0.143	0.766	0.930	0.162
Printing and related support activities	323	-0.428	0.294	1.803	0.985	0.321
Petroleum and coal products	324	-0.262	0.377	2.305	1.983	0.872
Chemical products	325	-0.494	0.938	4.141	1.855	1.354
Plastics and rubber products	326	-0.238	0.850	2.380	2.900	0.884
Nonmetallic mineral products	327	-0.280	1.012	1.831	1.582	1.129
Primary metals	331	-0.485	0.226	1.274	1.012	0.535
Fabricated metal products	332	-0.318	0.555	2.145	1.783	0.662
Machinery	333	-0.488	0.256	1.610	1.306	0.349
Computer and electronic products	334	-0.685	0.405	2.569	1.724	1.093
Electrical equip., appl., and components	335	-0.531	0.246	2.768	1.795	0.678
Motor vehicles, bodies and trailers, and parts	336	-0.447	0.900	1.614	1.489	1.228
Furniture and related products	337	-0.287	0.624	4.553	2.414	1.266
Miscellaneous manufacturing	339	-0.368	1.348	2.233	3.139	1.463
Manufacturing	31-33	-0.195	0.554	2.067	1.561	1.463

Note: Domestic use is defined as Value added plus imports minus exports  
 Source: BLS / the Office of Trade and Industry Information (OTII) U.S. Department of Commerce

1997 and 2003 can be estimated. [32]

To first approximation, the percent change in employment in each industry ( $e_i$ ) corresponds to the percent change in domestic production output in this industry ( $q_i$ ), minus the percent change in productivity over the period ( $v_i$ ):

$$e_i = q_i - v_i \text{ Equation (1)}$$

Thus, if productivity was similar in 2003 to the level in 1997, an increase in output of 2 percent would be translated mechanically to an increase in employment by 2 percent. On the other hand, if total volume of output increases by 2 percent, but productivity of workers increases by 2 percent, the number of jobs in the industry would not change. For each industry  $i$ , the domestic production in industry corresponds to the value added by the domestic use plus the value added due to exports minus the value added due to imports (Fig. 5-12).

Domestic employment (E in Fig. 5-12) corresponds to the work force required to produce the domestic output. Domestic production ( $Q_i$ ) and imports ( $M_i$ ) equalize

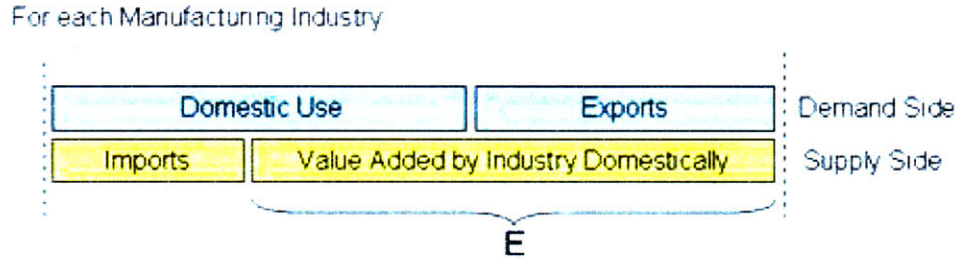


Figure 5-12: Correspondence Between Domestic Employment, Domestic Use, Exports and Imports

the demand side corresponding to domestic use ( $D_i$ ) and exports ( $X_i$ ). For each industry:

$$Q_i = D_i + X_i - M_i \text{ Equation (2)}$$

Finally, change in domestic employment will be affected by change in domestic production. For instance, if imports increase while demand remains constant, domestic production is expected to shrink (see examples in Fig. C-4 in Appendix C). Thus change in domestic employment is equal to the weighted sum of change in domestic use ( $w_d d_i$ ), change in exports ( $w_x x_i$ ) minus change in imports ( $w_m m_i$ ):

$$q_i = w_d d_i + w_x x_i - w_m m_i \text{ Equation (3)}$$

$$\text{with } w_d = D_0/Q_0; w_x = X_0/Q_0; w_m = M_0/Q_0$$

Rewriting Equation (1) using the expression shown in Equation (3), it appears that the percent change of employment for each industry is a function of the percent change of productivity, the percent change of value added due to domestic use, the percent change of value added due to imports and exports expressed by:

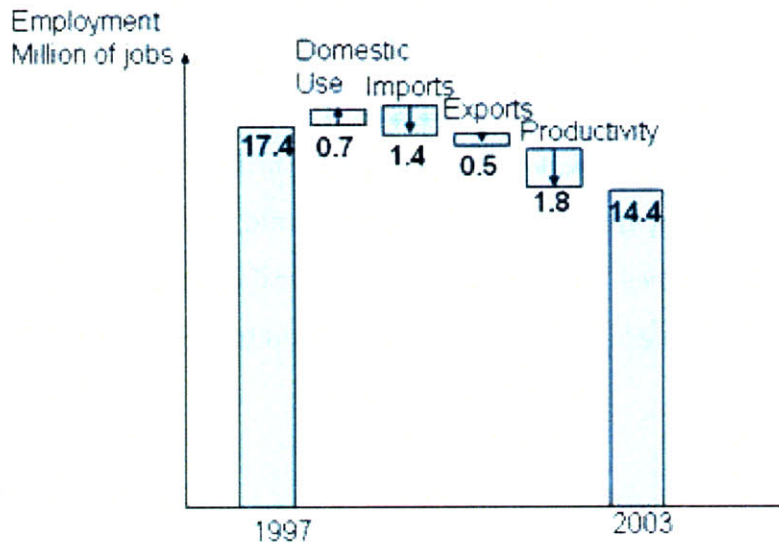
$$e_i = w_d d_i + w_x x_i - w_m m_i - v_i \text{ Equation (5)}$$

Effects due to trade are estimated by using the summary 1997 input-output tables, the most recent that are available at a sufficient disaggregated level, and not by using directly imports and exports data since a particular industry might embody imports, as intermediate inputs, from another industry. For example, when an automobile is exported from the U.S., it will include inputs such as steel, electronics. Thus, imports of automobile might have an impact on the employment in the auto-industry

but also on other industry which might have supplied the production of automobiles domestically.

The calculation is carried out at the NAICS 3-digit aggregation level. After aggregation at the sector level, the dynamics of employment in the U.S. manufacturing industry between 1997 and 2003 is shown in Figure 5-13. Between 1997 and 2003, the growth in domestic demand generated about 0.7 Million jobs. During the same period, growth of imports displaced 1.4 Million jobs, while declining exports eliminated 0.5 Million jobs. Finally, increase of productivity had eliminated 1.8 Million jobs (Fig. 5-13 and Table 5.3).

### US Manufacturing Employment Dynamic 1997 - 2003



Source: BLS / The Office of Trade and Industry Information (OTII), Manufacturing and Services, International Trade Administration, U.S. Department of Commerce

Figure 5-13: U.S. Manufacturing Employment Dynamic 1997-2003

Around 195,000 jobs were lost annually between 1997 and 2003 because of increase of imports, which correspond to 1.3 percent of the 15 Millions jobs lost every year by the U.S. economy (balanced by an equally sized creation of new jobs). In addition, this method might overestimate the impact of increase of imports on U.S. manufacturing employment. For instance, imports will be used to supply high domestic demand when the economy is at full employment - as it was in 2000. Moreover, increase

Table 5.3: Summary of the Results

	Jobs	Percent of 1997 Employment
Employment in 1997	17,402,000	1
Impact Domestic Use	693,495	0.04
Impact Imports	-1,361,343	-0.08
Impact Exports	-474,017	-0.03
Impact Productivity	-1,810,135	-0.10
Employment 2003	14,450,000	0,83

Source: BLS / OTII

of imports in sectors which are already largely relying on imports, like apparel or furniture sectors, will not directly destroy existing jobs in U.S. but will replace jobs that could have been created in resulted to a higher domestic demand and constant level of imports. Offshoring of operations will count for only a fraction of imports and finally only for the fraction of jobs displaced. As seen, productivity has played the first role to reduce employment in U.S. manufacturing. Moreover, in absence of offshoring and increasing imports, productivity would have reduced jobs which would not have been displaced. In the next parts, several case studies are developed to understand how companies decide to use offshore production location to leverage advantages over there.

## 5.4 Case Studies

### 5.4.1 The Case of the U.S. Apparel Industry

**The Industry** The characteristics of the apparel industry, low capital requirements and labor intensity, make this industry a good candidate for offshoring. The apparel industry is one of the four segments involved in the production of garments. At the top of the supply chain, there are the fiber producers. The second segment is the textile industry, which manufactures raw fiber into textiles. Then the apparel manufacturers cut and sew the textiles into clothes. At the end of the supply chain, the retailers distribute the apparel to customers. Traditional garment manufacturers

are engaged in all the steps of production: product design, raw material sourcing, the production of garments, and distribution of finished goods. The companies often offshore the sewing, the more labor-intensive part of the process, or the whole of the manufacturing processes. They can use their own facilities or subcontractors' capacity overseas.

Productivity gains in the apparel industry have been limited since automation is particularly difficult to implement. The variety of fabrics, complexity of the assembly process, and short life cycle of products, requiring adaptation of manufacturing processes and tools, have prevented the apparel industry from automating. Therefore, between 1989 and 1993, the apparel industry spent only \$924 per worker for investment in new plants and equipment; during the same period, the textile industry spent \$4,269. [96]

**Wage Differential** The low wages in LCCs are the main incentive for companies to offshore their production: the labor force is extremely inexpensive and accustomed to being involved in these activities. In traditional manufacturing countries, hourly wages are between \$0.25 in Indonesia and \$2 in Mexico (See Fig. C-5 in Appendix C), compared to \$9.10 in the U.S. (See Table C-4 Appendix C). Moreover the wages in most LCCs have been stable for the last ten years. The capital investment requirements are low and numerous subcontractors are already set up in these countries. The companies who use subcontractors overseas are often criticized for the bad working conditions. Companies are concerned about the bad publicity that can be triggered by scandals from offshoring and consequently are taking actions and conducting audits to monitor working conditions overseas and lower the negative impacts of controversies so as to protect, for a long-term, this vertical integration and business model. [74] Inspections are realized in plant owned by the companies but also at suppliers' facilities.

**Trade Agreements** Until recently, the textile and clothing industries were the only major manufacturing sectors not regulated by the General Agreement on Tariffs

and Trade (GATT). A succession of trade agreements set up a widespread system of quotas between exporting countries and the main importers. In 1962, the Long-Term Arrangement Regarding International Trade in Cotton Textiles and Substitutes (LTA) was created.

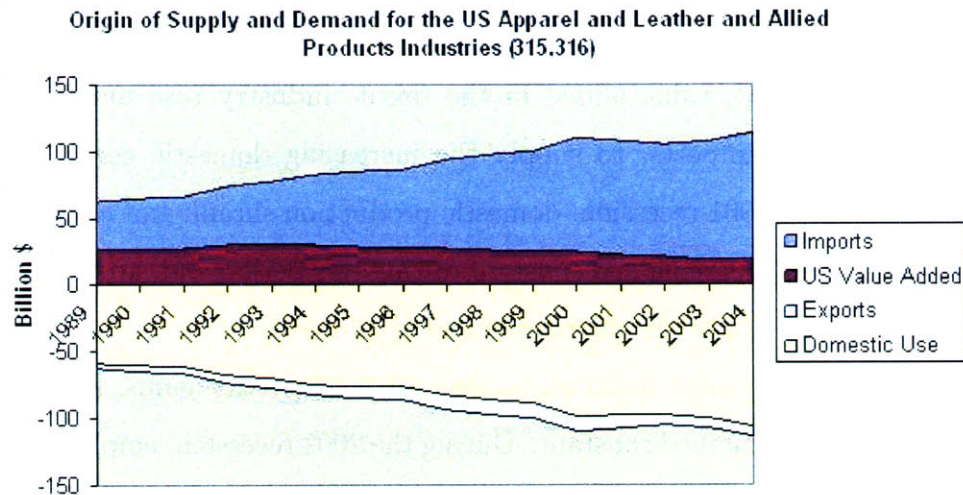
In 1974, the Multifiber Arrangement (MFA), sometimes referred to as the Multifiber Agreement, was accepted by the United States, Canada, and Europe. It extended the LTA to materials other than cotton. It set quotas for the amount of textiles and apparel that other countries could export to these countries, so as to minimize market disruptions in developed countries, while permitting some growth in textiles and apparel exports from developing countries. The MFA was seen as a protectionist measure intended to prevent the loss of textile and garment industry jobs in the U.S., Canada, and the EU to LCCs. At the end of 1994, MFA was supposed to terminate but was finally extended for 10 more years, as allowed by the GATT. At that time, the Agreement on Textiles and Clothing (ATC) was introduced to secure the removal of MFA restrictions and quotas allocated unilaterally by Canada, Norway, the United States and the EU. In 2005, the MFA expired, as anticipated in the Agreement on Textiles and Clothing (ATC), and the quotas of the MFA were eliminated and tariffs significantly reduced.

In addition, trade is also highly distorted by regional trade agreements. For instance, Chapter 98 of the Harmonized Tariff Schedule of the U.S. (formerly item 807) allows goods assembled offshore to be re-imported with a tariff charged only on the value added by foreign labor. This agreement allows manufacturers to lower production costs by avoiding most tariff taxes, while still taking advantage of foreign low-wage production: fabric is cut in the United States, but assembled abroad. The Caribbean Basin Initiative (CBI) allows apparel assembled abroad from fabric produced domestically to re-enter the United States with a partial duty exemption. In 2004, NAFTA was fully phased in, eliminating barriers to trade between the U.S., Mexico, and Canada. Under the NAFTA agreement, there are no duties for apparel cut in the U.S. and assembled in Mexico.

All these arrangements are influencing the U.S. work force. The end of MFA quotas

is considered by U.S. manufacturers as to be a major threat to the national production and protectionism might be needed in the short term to assist the adaptation of the industry. [9] For instance, in China's protocol of accession to the WTO, a clause allows trading partners to impose temporary quotas on China until the end of 2008. In May 2005, the United States imposed quotas on seven products.

**Evolution of Imports and Employment in the Textile and Apparel Industries** According to the US International Commission, half of the total productive capacity in the apparel industry has shifted from developed countries to LCCs over the last three decades. [44] Since 1993, the increase of domestic demand has been totally balanced by imports. Between 1993 and 2004, imports more than doubled, and since 1993, the value added by the U.S. apparel industry has declined (Fig. 5-14).

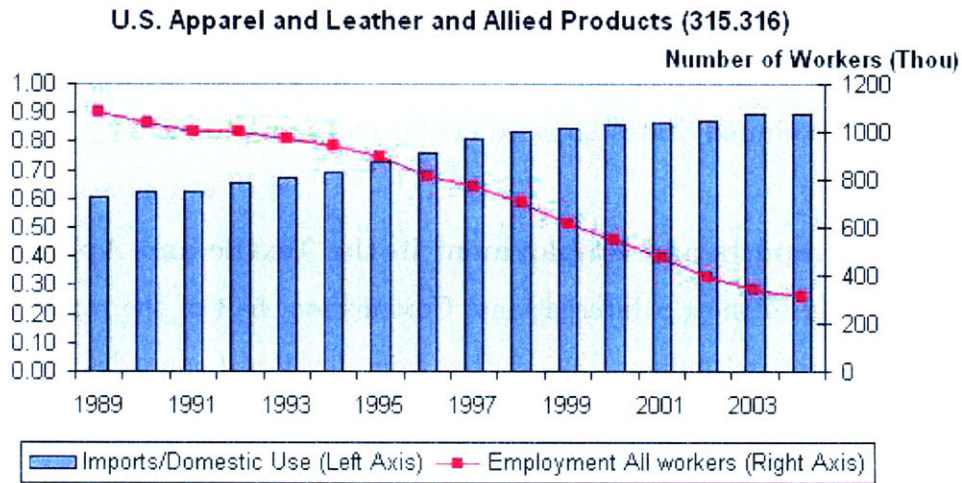


Note: Demand Side: Domestic Use + Exports / Supply Side: Imports + US Value Added  
 Source: Office of Trade and Industry Information (OTII), Manufacturing and Services, International Trade Administration, U.S. Department of Commerce

Figure 5-14: Supply and Demand Origin in Apparel and Leather and Allied Products Industries in the US

Consequently, the portion of domestic consumption supplied by imports has risen from 61 percent in 1989 to 90 percent in 2004 (Fig. 5-15). Over this period, employment has fallen from 1,077,000 jobs in 1989 to 313,000 jobs in 2004. Jobs have been

lost mainly because of the explosion of imports replacing domestic production after 1993.



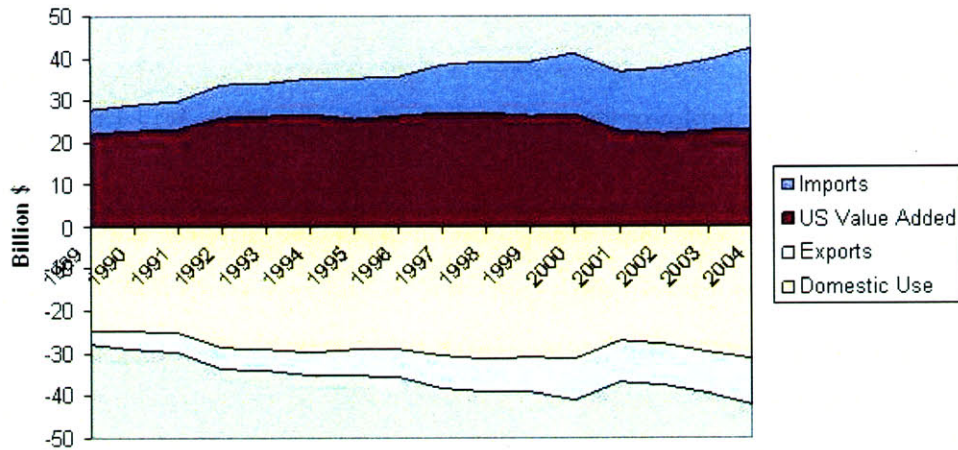
Source: Office of Trade and Industry Information (OTII), Manufacturing and Services, International Trade Administration, U.S. Department of Commerce

Figure 5-15: U.S. Employment in Apparel and Leather and Allied Products Industries

On the other hand, value added in the textile industry rose until 2001, along with the increase of imports, to supply the increasing domestic consumption and exports. During the 2001 recession, domestic production shrank and never recovered. Simultaneously, imports remained constant during this period and, after 2003, started increasing again to supply the strong demand (Fig. 5-16).

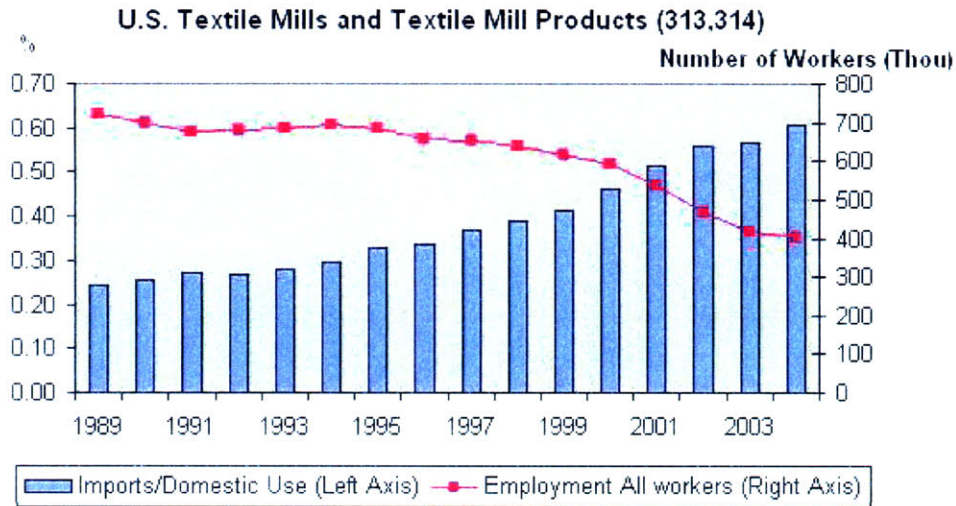
Until 2000, employment declined because of productivity gains, since the value added domestically remained constant. During the 2001 recession, employment shrank rapidly while imports exploded and domestic production declined. Between 2000 and 2004, the textile industry lost one-third of its jobs, declining from 613,000 jobs in 2000 to 402,000 jobs in 2004 (Fig. 5-17).

**Origin of Supply and Demand for the US Textile Mills and Textile Mill Products Industries**



Note: Demand Side: Domestic Use + Exports / Supply Side: Imports + US Value Added  
 Source: Office of Trade and Industry Information (OTII), Manufacturing and Services, International Trade Administration, U.S. Department of Commerce

Figure 5-16: Supply and Demand Origin in Textile Mills and Textile Mill Products Industries in the U.S.



Source: Office of Trade and Industry Information (OTII), Manufacturing and Services, International Trade Administration, U.S. Department of Commerce

Figure 5-17: Employment in Textile Mills and Textile Mill Products

Macro-economic figures thus show that in both the apparel and the textile industries, imports have played the main role in the recent decline in employment. According to this picture, employment in the U.S. will be declining in tandem with the increase of imports.

The following two companies' cases will present the trade-off between location decision and employment.

**Case 1: Gildan Activewear Inc.** Gildan is a Canadian apparel company with products for sale in the Canadian, U.S., and European sportswear markets. The apparel manufacturing sector is the fourth-largest industry in Canada with U.S.\$ 10 billion in sales per year.

Gildan's supply chain is designed to take advantage of location particularities. The highly automated textile plants owned by the company are in Canada, since textile plants use lots of energy, and Canadian's hydroelectricity is relatively inexpensive. Cotton is imported from the U.S. since it is generally subsidized and consequently cheaper. Then fabrics are cut and sewed in the Caribbean, Honduras, or Mexico, where the labor force is inexpensive (Honduran wages are one-fifth of Cana-

dian wages). Trade agreements, such as NAFTA, allow the company to re-import the finished product into Canada or to export it to the U.S. without having to pay taxes. Out of a total of 9,000 employees, 5,500 are Honduran and only 1,300 work in Canada. [4]

**Case 2: American Apparel** American Apparel is a US apparel manufacturer with around 2,000 workers. The company does not use any subcontractors overseas for its manufacturing operations and has its own plant in Los Angeles. This organization gives the company a shorter supply chain that allows for immediate response to trends as well as changes in demand. For instance, the company has the ability to cut off an item that is stagnating on the shelves. According to Dov Charney, founder of American Apparel, the proximity to the market enables the company to react more quickly. Marty Bailey, VP for operations, defines the factors of success for manufacturing and selling T-shirts in the U.S. as being quality, market focus, and ability to turn product quickly. The flexibility of the operation allows the company to turn a sketch into an actual garment for sale in stores within five days, versus 90 days for operations relying on offshored production.

The supply chain is easily managed because all the operations are located on the same sites. The proximity of the production facility makes possible small-quantity manufacturing which can be easily and quickly executed. The company can use more market tests to determine which items will be top-sellers. This competitive advantage offsets the labor wages differential according Dov. Charney. The onshore production allows the company to keep lower inventory and so reduce inventory obsolescence risks, a common source of losses in this industry. [76] The proximity of operations allows the company to manage the production more efficiently and the demand can be integrated quickly into the production plan and to manage a broad range of SKUs. The company carries now 10,000 SKUs. The workers offer also flexibility on volume capacity: within months, the factory went from 30,000 garments a day to 90,000.

The company is profitable and does not plan to move production overseas to serve the U.S. market. [62]

**Evolution of the Industry** The end of quotas is perceived as a threat for the U.S. apparel industry. It is certain that some jobs in U.S. will move to LCCs in the future. According to a Bureau of Labor Statistics study, the apparel sector is expected to lose more than 200,000 jobs between 2002 and 2012. [35] Companies as Levis Strauss Inc, which closed its last U.S. manufacturing sites in 2004 and is moving its Spanish plant to Poland and Turkey in 2005, will remain the most widespread business model in this industry.

Nevertheless, the example of American Apparel shows us that the U.S. apparel industry could keep activities onshore by offering flexibility and quick response. For instance, the U.S. apparel industry has maintained low import penetration rate for some garments, such as dresses. Because dresses are high fashion items, the market is best served by producers who can respond rapidly to changes in demand.

U.S. apparel manufacturers can make domestic production competitive if they build their competitive advantage on proximity to market. Introducing new products weekly, designing smaller batches of products and offering a broader variety of design is possible if manufacturing capacity is located close to the demand. Such a strategy would allow the company to keep less inventory for each SKU and then to carry more SKUs while keeping a reasonable total inventory. The fast introduction of new designs, keeping up with current fashion trends, makes products more attractive.

Savings on logistics costs and, higher attractiveness of products make a domestic production model competitive with the vertically integrated model that uses offshore producers. Each model has advantages and will be used according to the needs of the companies. Using manufacturing capacity gives production cost advantages while being in the U.S. gives the opportunity to the company to follow closely the new trends and changes in demand. Gildan is going to invest in a new knitting, bleaching and cutting facility in the Dominican Republic. At the same time, American Apparel will still compete on the American market with onshore production. The company is considering investing overseas to conquer new markets and then, reproducing the same onshore model there.

The following section presents the case of a French semiconductor firm. This exam-

ple will illustrate the trade off between production costs, productivity differential and location of demand. In this example the company is moving part of its operations in Asia to be located closer to a growing share of its customers, balancing lower worker productivity by lower wages and quicker response to changes in demand.

### 5.4.2 The Case of a European Semi-Conductor Firm: STMicroelectronics

**The Industry** The semi-conductor industry requires large capital investments to manufacture short life cycle products. Capital is used to buy expensive high-tech machines used in the manufacturing processes. This industry requires, also, a highly skilled labor force. The semiconductor sector is dominated by American companies, such as Intel, TI, Motorola, and by Asian companies, such as NEC, Toshiba, Hitachi and Samsung Semiconductor (Fig. 5-18). STMicroelectronics is one of the only European semi-conductor manufacturers. On the demand side, the usual markets for

1980 \$B Sales		1990 \$B Sales		2002 \$B Sales				
1	TI	1.581	1	NEC	4.322	1	Intel	23.99
2	Motorola	1.111	2	Toshiba	4.202	2	Samsung	8.73
3	Philips	935	3	Motorola	3.539	3	TI	6.50
4	NEC	787	4	Hitachi	3.516	4	STMicroelectronics	6.35
5	National	747	5	Intel	3.171	5	Toshiba	5.88
6	Toshiba	629	6	Fujitsu	2.599	6	NEC	5.53
7	Hitachi	622	7	TI	2.574	7	Infineon Technologies	5.36
8	Intel	575	8	Mitsubishi	2.108	8	Hitachi	4.90
9	Fairchild	566	9	Philips	1.955	9	Motorola	4.76
10	Siemens	413	10	Matsushita	1.826	10	TSMC	4.66

Note: WSTS: World Semi-Conductor Trade Statistics  
Source: ICInsights, 2003

Figure 5-18: Principal Semi-Conductor Manufacturers

semiconductor products are composed by audio and video equipment and computer equipments. These industries are largely concentrated in Asia. The audio and video equipment industry has been traditionally located in Asia since the manufacturing processes in this industry were very labor intensive in the past. Similarly, the computer equipment industry is concentrating its operations in Asia taking advantage of

an inexpensive skilled labor force, the proximity of suppliers and new consumers, and a strong governmental support of high tech investments.

**A New Strategy** In 2004, STMicroelectronics launched a new plan, to reduce its production costs. At least half of its European and U.S. 6-inch wafer manufacturing capacity will either be upgraded to the 8-inch technology or moved to the company's 6-inch wafer plant in Singapore. The semiconductor industry has experienced rapid change, as a result of cost reduction required by pricing pressure. For a 6-inch wafer plant, the production cost is distributed as follows: 20 percent for the paying off for machines, 40 percent for the labor force (workers, technicians and production engineers) and 40 percent for the raw materials and operating costs. In Singapore, wages for low skilled workers are 5 to 7 times lower than European wages, and wages for engineers are 3 to 5 times lower. Moving operation to Asia divides the labor cost by 4 and so reduces the total production cost by 30 percent, making production of product using old processes still profitable for the company.

Companies which are using offshoring as a way to reduce production costs can also try to increase productivity to achieve their goal. For instance, the 6-inch wafer technology can to be replaced by new-generation 8- and 12-inch wafer technology. Each technician then operates a machine which produces a wafer which is two times larger, reducing the production cost per chip. STMicroelectronics has invested \$200 million/year during the last three years to enlarge its 8-inch plant in France. The company is also investing in a new 12-inch plant for RD and advanced products located in Europe as well as in a 12-inch new plant in Italy and France (these investments are valued to \$3 Billion).

STMicroelectronics is not the only semi-conductor firm using a combination of offshoring and new technologies and productivity gains onshore to define the most coherent strategy to lower production costs. A recent article in The New York Times reports that Intel has constructed four factories in the United States over the last five years. Eight-inch production has been upgraded to 12-inch silicon wafers, and the size of the transistor has been reduced to a mere 90 nanometers. Using the same

Table 5.4: Growth Rate of Selected Countries

	GDP (2002 est.)	GDP Real Growth Rate (2002)
USA	\$ 10,450,000,000,000	2.4
China	\$ 5,989,000,000,000	8.0
Japan	\$3,651,000,000,000	0.2
India	\$2,664,000,000,000	4.3
Germany	\$ 2,160,000,000,000	0.2
France	\$ 1,558,000,000,000	1.2
United Kingdom	\$ 1,528,000,000,000	1.8
Korea, South	\$ 941,500,000,000	6.30
Canada	\$ 934,100,000,000	3.3
Mexico	\$ 924,400,000,000	0.7
Indonesia	\$ 714,200,000,000	3.7
Thailand	\$ 445,800,000,000	5.3
Taiwan	\$ 406,000,000,000	3.5
Philippines	\$ 379,700,000,000	4.4

Source: CIA "The World Factbook"

work force, production on larger wafers is 2.5 times more efficient. "We do not stay in America to optimize employment; we stay to improve productivity" Mr. Mulloy, an Intel spokesman, said. [119]

Moreover, STMicroelectronics' main customers are in the process of shifting their own production to Asia. In order to reduce delivery time and to insure fast delivery to its customers, STMicroelectronics is moving some of its production capacity in Asia.

**The Location Decision** The relocation to Asia allows STMicroelectronics to lower its production costs also to be close to its customers. Its Asian customers will not only sell these products for the emerging Asian markets but will also subsequently re-import products embedded with STMicroelectronics' chips to Europe.

Asian countries are experiencing high growth rates (Table 5.4), and selling on these markets is crucial for most of the global high tech companies. Local production will help them to penetrate these markets and simplify the supply chain by bringing them closer to their customers and suppliers. Moreover, in market like China, manufacturing locally is highly encouraged by government to have access to the home market.

Companies are moving production capacity closer to the demand, to manage their

inventory more closely by reacting more quickly to the changes in the demand. The industry is expecting more relocation to Asia to shorten supply chain and to leverage wages differential. For instance, Intel Corp. is generating 70 percent of its revenue from outside the United States, though 60 percent of its employees still work in the States. Intel Corp. is planning to relocate a part of its production overseas and those percentages will shift. [93]

## 5.5 Productivity and Offshoring

Thus, there is no significant difference between jobs lost because of new technologies or work processes and those lost because of trade: all of those job losses are a painful but necessary part of a larger process of innovation and productivity increases that is a source of new wealth and rising living standards. [41] Actually, one can argue that offshoring is better since it raises the living standards overseas, creating new customers for U.S. companies' products. The Washington post illustrated the impact of productivity on U.S. manufacturing sector: "In one striking example of the impact of rising productivity on the workforce, a quarter of a century ago it took General Motors 454,000 workers to build 5 million cars and trucks. Today it takes 118,000 workers to make the same number of vehicles." [7] Michael Arndt and Adam Aston noted in BusinessWeek in 2004 that since 1997, the productivity of U.S. factories has increased at a 4.6 percent annual average rate, but high tech and automobile sectors accounted for pretty much the entire increase in U.S. manufacturing output since the middle of the 1990s. [31] For instance, whereas 1997 total manufacturing output is up by 19 percent, according to the Federal Reserve, by taking out automotive and high-tech sectors, output in the rest of manufacturing has only grown by less than 1 percent over the past seven years. When an industry has a low productivity growth rate, it signals that this industry is maturing. Consequently, prices decrease, innovation becomes less fertile and processes are standardized and well-know by the U.S. competitors, as well as competitors abroad. With lower expected profits, manufacturers cannot justify the investment for new equipment. At this point, Chinese

Table 5.5: Productivity Gain and job Losses

Industry	Growth in Output per employee, Annual Avg, 1997-2003 - percent	Employment Change, 1997-2003 - percent
Fabricated Metal Products	1.3	-31,8
Furniture	1.3	-28,7
Printing	1.3	-42,8
Food manufacturing	1.4	-24,8
Electrical Equipment	1.9	-53,1
Paper	1.9	-41,8
Primary Metals	2.1	-48,5
Manufacturing Sector	4,6	-19,5

Source: BLS / Federal Reserve / BusinessWeek

manufacturers can buy the same machines to produce similar quality products at a lower cost than American manufacturers. Therefore, industries with low productivity gain might encounter more severely decrease of employment due to imports competition than other industries (Table 5.5).

As shown by the semiconductor case study, U.S. firms can keep their production capacity in the U.S. as long as productivity allows them to reduce the production costs and to keep attractive benefits while competition increases. When gains in productivity are insignificant, companies often see offshoring as the way to reduce even more their production costs. In both dynamics, domestic employment shrinks. The following section will show how U.S. companies can change the rule of the game to make production in the U.S. financially attractive.

## 5.6 Framework If Location Decision

After presenting first the existing frameworks developed by consultancies to rationalize the location decision process, the following section builds a new framework to identify the conditions to make manufacturing activities onshore competitive.

### 5.6.1 Existing Frameworks

In a recent paper, Diana Farrell, Director of the McKinsey Global Institute, McKinsey and Company's think tank, structured and summarized the findings of a global research effort in this consultancy firm. [30]

Using the analysis of four different industries, the study determines the factors which influence the decision for a company or an industry to offshore its activity (Table 5-19). These factors are subdivided into three groups: production factors, regulation, and organizational factors. By assessing the level for the different factors, a particular industry or company would be able to evaluate the pertinence of using an offshoring strategy.

The first industry described is the consumer electronics industry. This industry is under pressure to cut prices and to introduce new products quickly. U.S. manufacturer are focused on marketing, selling and distributing the products rather than on designing, sourcing and manufacturing the machines. Manufacturing components or machines abroad appears coherent due to the actual labor intensity of this industry, the standardization of the products, and the few trade barriers.

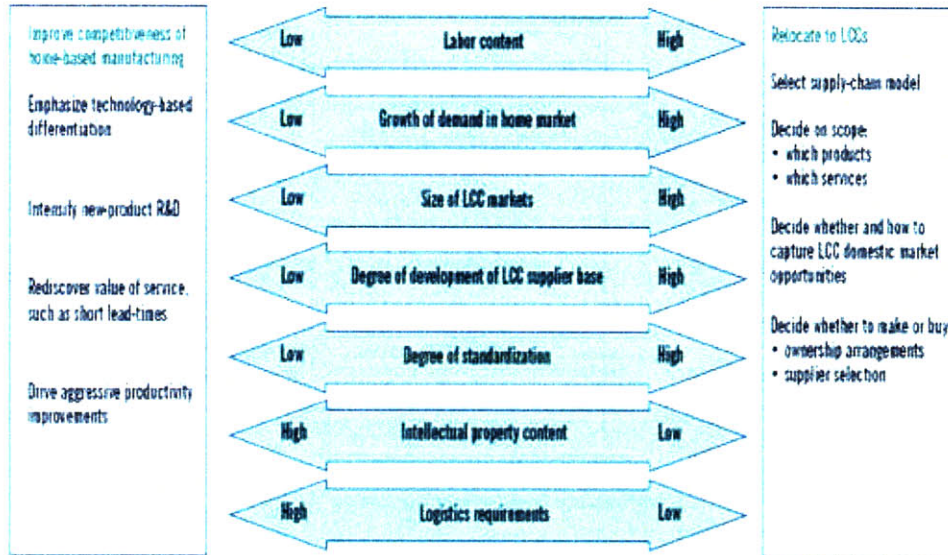
On the other side of the spectrum, the study presents the steel industry. This industry is capital intensive, with a low share of labor costs, high tariffs and a relative high shipping cost. It is unlikely to expect the steel industry to replace domestic production with imports in the short term unless one these constraints changes dramatically.

Production	Regulation	Organization
Relocation sensitivity: <ul style="list-style-type: none"> <li>• Bulk-to-value ratios</li> <li>• The ease to ensure quality standards</li> <li>• Obsolescence of product</li> <li>• Volatility of the demand</li> </ul> Location-specific advantages <ul style="list-style-type: none"> <li>• Labor intensity</li> <li>• Skill requirements</li> <li>• Natural-resources intensity</li> <li>• Economies of scale</li> <li>• Economies of scope</li> </ul>	<ul style="list-style-type: none"> <li>• Tariffs</li> <li>• Quotas</li> <li>• Require foreign companies to enter into joint ventures with local companies</li> </ul>	<ul style="list-style-type: none"> <li>• Internal management structures (try to give up some responsibility for the migrated positions)</li> <li>• Incentive systems (realign management incentives with global and not local, performance metrics)</li> <li>• unionization</li> </ul>

Figure 5-19: Factors Influencing the Offshoring Decision

The Boston Consulting Group, has also developed a framework to present the key criteria to determine the products to manufacture in LCCs and the products to produce domestically. The firm has identified seven relevant dimensions: labor content, growth of demand in home market, size of LCCs market, degree of development of LCC supplier base, degree of standardization, intellectual property content, and logistics requirement (Fig. 5-20). For instance, a product with high labor content, high growth of demand in home market, high demand in the proposed manufacturing LCC, high degree of development of the LCC supplier base, low sensible intellectual content and low logistics constraints is the perfect candidate for offshore production in LCCs.

Technology and innovation are traditionally seen as the key to create sustainable employment in the manufacturing sector in the business literature. “America has survived import waves before, from Japan, South Korea, and Mexico. The assumption has long been that the U.S. and other industrialized nations will keep leading in knowledge-intensive industries while developing nations focus on lower-skill sectors” wrote Pete Engardio in Business Week in 2004. [47] With the rapid technological catch up of China, it is hard to believe that U.S. will be able to build its competitive advantage only on this dimension. “What is stunning about China is that for the first



Source:BCG Analysis

Figure 5-20: Key Criteria to Determine the Products to Offshore to LCCs

Table 5.6: Production Cost Differential between the U.S. and China

Industry	Price Gap US-China - Percent	Data
Machine Mold	Up to 50	XCel Mold
Networking Equipment	Up to 30	3Com
Bedroom furniture	40	Universal Furniture
LCD TV	30	SVA America
Crepe Paper	45	Seaman Paper

time we have a huge, poor country that can compete both with very low wages and in high tech,” says Harvard University economist Richard B. Freeman. As seen in Chapter 3, it is hard to believe that the U.S. would remain the knowledge economy and China the subcontracted manufacturers. Considering the production cost differential (Table 5.6), and the rapid convergence of LCCs and U.S. manufacturing capabilities as well as knowledge, American companies have to find new dimensions that will allow them to create sustainable domestic employment in the future.

## 5.6.2 New Framework

The offshoring decision is a three steps process. In the first step, the company defines its specific functions and its specific products to outsource or to perform in-house. During the second step, the company identifies the appropriate locations to setup the different phases of the operations. Finally, in the last step, the company aggregates the decision of the first two steps and maps its entire supply chain.

**1st Step: Functions and Products to Outsource** In a manufacturing context, six major functions can be identified: R&D, design, Manufacturing, distribution, marketing, and after-sale services. A company can decide to focus on one or several functions depending on its resources, skills, and experience. The functions that the company decides to keep in house will be performed either onshore or offshore as selected in the second step. Core competencies are defined as the competencies or a particular functional area that create the company's competitive advantage, by generating high margin, differentiating its products from competitors. In other words, these are the reasons for the customer to buy their product. For instance, Nike's core competencies are mainly design and marketing. They are not very involved in the manufacturing process beside the selection of the subcontractors. Dell is not building its competitive advantage on R&D or on inventive design but it has on a perfect control of its supply chain. The example of the Ipod illustrates the importance of focus on core competencies. Apple is buying Ipod's hard-drive from Samsung and the product is assembled in China while new customers are attracted primarily by the design of this MP3 player that has been developed in California, USA.

In fact, some argue that companies should focus and invest only on their core competencies, and should potentially outsource all the other functions.

**2nd Step: Defining the Optimal Location** After selecting the functions that the company wants to keep in-house, a particular location strategy for each product is defined. If the company decides to outsource a step of its supply chain, the selected contractor will follow the same type of analysis. In the rest of this step, we can as-

sume that the company will perform everything in-house, since the ownership of the operations does not affect the location decision.

The location decision is not a macro-economic decision. Two companies in the same industry can have very different location strategies, as seen in the case study of the apparel industry in the previous section. The location decision is specific to each company, for each product, depending on the different final-customers. For the manufacturing function, three dimensions are considered to evaluate the opportunity to offshore the production of a particular product (Fig. 5-21). First, the company has to look at the product's characteristics, such as technology and manufacturing capability requirements, cost structure and the position in the its life cycle. The distribution and transportation costs also depend on the characteristics of the product. Second, the company has to evaluate the environment of the products, which refers to the market attributes and the specific regulations for this product. Market attributes are composed of competitors' strategy, variability of the demand, and characteristic of the product life cycle. Finally, the location decision is directly linked to the characteristics of customer behavior, which is defined by its willingness to wait, its sensitivity to "Made in the USA" label and its predisposition to follow trends.

Products Characteristics	Environment	Customer characteristic
<ul style="list-style-type: none"> <li>- Technology</li> <li>- Manufacturing capability requirement</li> <li>- Cost structure               <ul style="list-style-type: none"> <li>Labor cost</li> <li>Raw materials</li> <li>Distribution/transportation</li> </ul> </li> <li>- Product life cycle position</li> </ul>	<ul style="list-style-type: none"> <li>- Market characteristics               <ul style="list-style-type: none"> <li>Competitors</li> <li>Product life cycle</li> <li>Demand variability</li> </ul> </li> <li>- Regulations               <ul style="list-style-type: none"> <li>Environmental constraints</li> <li>Legal Issues</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- Lead time – willingness to wait</li> <li>- Demand volatility</li> <li>- "Made in the USA" sensibility</li> </ul>

Figure 5-21: Criteria to Determine the Location of the Production Steps of a Product

By defining for each product which functions to keep in-house and among them, which functions to perform in the U.S., the company can create an optimal solution for its set of products. The following figure presents a virtual case of the strategy of company that produce four different products, which a specific location strategy for

each of these products (Fig. 5-22).

**Offshoring Strategy at instant  $t^*$**

























Products	Functions					
	R&D	Design	Marketing	Manufacturing	After Sale	Support functions
Company XYZ						
Product A						
Product B						
Product C						
Product D						

Figure 5-22: Example of the Location Strategy of a Company with a Set of 4 Products

The location map depends on the features of the products as defined previously and the attributes of different countries. Until recently, only the manufacturing function was concerned by offshoring. An onshore location was chosen to ensure IP protection and quality of products, to access to specific manufacturing capabilities and skilled workers, to perform operation nearby the R&D and design teams, to be located close to the customers and the supplier and to preserve the domestic origin of the product (“Made in the USA”). Onshore production had to support higher wages, making production cost higher. On the other hand, the offshore location allowed companies to reduce production costs. However, producing offshore exposed the company to low quality manufacturing processes, political and monetary instability, fluctuating importing taxes, lack of efficient infrastructures, and a weak IP protection system (Fig. 5-23).

The recent improvement of developing countries’ manufacturing capabilities has changed the criteria to determine the optimal location for production. First of all, countries such as China or India are now able to perform almost any kind of activ-

Location of Manufacturing Function / The Old Paradigm					
	R&D	Design	Manufacturing	Distribution	Support Functions
	On-Shore			Offshore	
Pros	<ul style="list-style-type: none"> <li>• Proximity to R&amp;D and Design</li> <li>• IP Protection</li> <li>• Proximity to Customers/Suppliers</li> <li>• Manufacturing Capabilities</li> <li>• Skilled Labor Force</li> <li>• High Quality Product</li> <li>• Manufacturing Capabilities</li> <li>• National Identity ("Made in US")</li> </ul>			<ul style="list-style-type: none"> <li>• Operating Cost</li> </ul>	
Cons	<ul style="list-style-type: none"> <li>• Operating Cost – Wages</li> </ul>			<ul style="list-style-type: none"> <li>• IP Protection</li> <li>• Quality of Products</li> <li>• Manufacturing Capabilities</li> <li>• Political &amp; Monetary instability</li> <li>• Importing taxes</li> <li>• Infrastructures</li> <li>• Low density of suppliers</li> </ul>	

Figure 5-23: The Old Paradigm of the Offshoring Decision

ity, from R&D and design to support functions and of course, manufacturing. Since product quality disparity, manufacturing capability and labor force skill level were the main sources of onshore location advantages, the convergence of low cost countries capabilities with U.S. onshore performance has changed some of the reasons to use onshore or offshore plants today. Onshore location insures feedback from manufacturing teams and design teams, guarantees a stronger IP protection, and allows the company to manufacture its products nearby the demand and some suppliers. On the other hand, onshore production costs are rising due to the increase in health care costs, retirement plan burden, and environmental constraints. The distance to some of the suppliers and customers is becoming higher with the development of markets abroad and the move of some suppliers in low cost countries. Advantages of onshore production are shrinking whereas disadvantages are emerging, making offshore location even more competitive. Manufacturing costs are lower due to a cheap work force, improvement of the productivity and higher concentration of suppliers and support

activities. Offshore location gives access to a growing local demand in Asia and allows companies to be close to a large pool of available talents. On the other hand, IP protection remains weak in Asian countries, disruptions due to terrorism or epidemics are possible and the time to reach domestic market remains high since Air transportation is still too expensive for most of the products. Moreover, relying on imports from abroad exposes U.S. companies and more generally, the U.S. economy to trade wars in the future (Fig. 5-24).

Location of Manufacturing Function / The New World					
	R&D	Design	Manufacturing	Distribution	Support Functions
	On-Shore			Offshore	
Pros	<ul style="list-style-type: none"> <li>• IP Protection</li> <li>• Distance to Customers/Suppliers</li> <li>• Feedback from manufacturing</li> <li>• National Identity</li> </ul>			<ul style="list-style-type: none"> <li>• Operating Cost</li> <li>• Distance to Customers/Suppliers (Proximity to new potential markets)</li> <li>• Find new talents</li> </ul>	
Cons	<ul style="list-style-type: none"> <li>• Operating Cost Wages / Health care / Retirement plan</li> <li>• Environmental Constraints</li> <li>• Distance to Customers/suppliers</li> <li>• Not allowed to serve customers in certain countries (ex: China)</li> </ul>			<ul style="list-style-type: none"> <li>• IP Protection</li> <li>• Distance to domestic Customers</li> <li>• Disruption by terrorism</li> <li>• Trade War (ex: Quota)</li> </ul>	

Figure 5-24: The Offshoring Decision Factors Today

Depending on the characteristics of its products, a company will decide to locate the production sites in different countries. A range of solution exists, from pure offshore to pure onshore (Fig. 5-25). With the standardization of manufacturing process and the modularization of the design of an increasing number of products, it is now possible for companies to finely calibrate their location decision for each product and for each step of the manufacturing process, taking advantage of onshore or offshore specificities at each step of the production process. For instance, a company can de-

side to manufacture the first step of the manufacturing process of one of its product in China, if it involves low IP content and high labor intensity or if it can benefit from the proximity of some suppliers, such as electronic components producers. Subsequently, the company can ship the semi-finished product to another location, such as Mexico, or in the U.S. to terminate the manufacturing process. By splitting the manufacturing process into independent stages located in different location, the company can potentially optimize the global production cost, delivery time and protect the IP of its products.

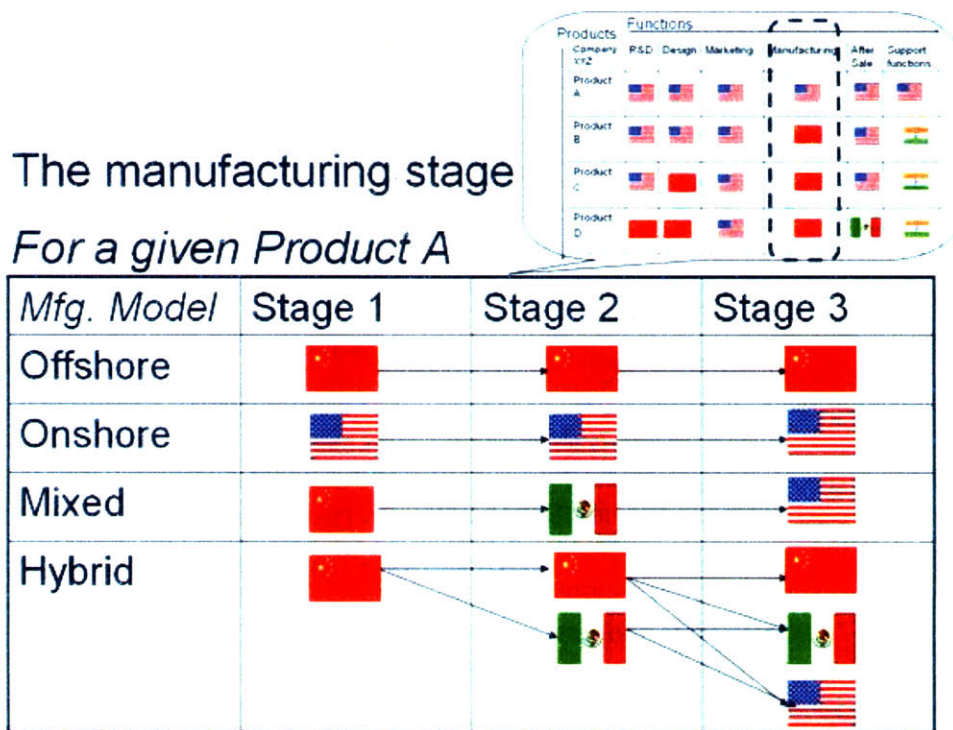


Figure 5-25: Production Location Possibilities

After analyzing all its products, the company has to combine the individual solution of each product to obtain an optimal solution for the set of products. At this stage, the company is trying to aggregate the capacity requirements for each country and to develop a coherent allocation of activities between the different locations. Steps involving the same technology will tend to be located in the same plant, and multiple locations can be used to perform the same process step in order to reduce the company exposure to supply disruption (See Product D in Fig. 5-26). At this point,

the company also has to consider the location of its existing production capacities.

**The manufacturing stage – For a given set of Products**

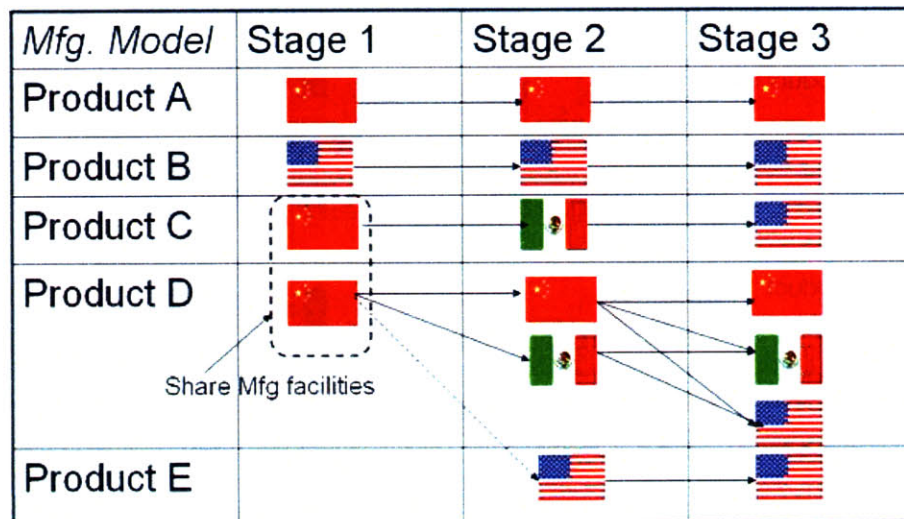


Figure 5-26: Production Facilities Possibilities

The company has obtained the map of the production sites location necessary to produce its set of products.

**3rd Step: Mapping the Supply Chain** Finally, after deciding where to locate its operation and which business model to use for each segment of the supply chain, and each manufacturing process step for each product, the company can represent the location and ownership of its entire operation (Fig. 5-27).

Therefore, it is clear now that the offshoring decision is not a macro-level decision and that any location strategy is pertinent at a particular instant *t*. When political or economic situations change in a particular country, the optimal location strategy, for a product or for the whole company, can be altered.

U.S. companies that use this strategy to judiciously locate their operations are trying to maximize their margins, to improve their market share domestically or abroad, to preserve IP, or in other words, to build sustainable competitive advantages. Thus, optimizing employment in manufacturing activities domestically is not the objective of this process. As described recently in an article from *The Economist*, American or European companies are increasingly transnational. They employ workers from all

## Supply Chain Mapping

Products	Functions					
	R&D	Design	Marketing	Manufacturing	After Sale	Support functions
<b>Company XYZ</b>						
Product A						
Product B						
Product C						
Product D						

Note: The house icon represents in-house activities, the contract icon represents outsourced activities

Figure 5-27: Company's Optimal Location and Ownership Architecture

over the world, sell products in all continents and receive investment from abroad. The old saying, "What is good for GM, is good for America" is no longer true. [25] U.S. companies are in quest of high return on investment (ROI) and sustainable competitive advantages for their global investors, and do not undertake the duty to supply manufacturing jobs to U.S. workers.

## 5.7 The Future of U.S. Manufacturing

When looking at solutions to provide employment to manufacturing workers who lost their jobs because of imports competition and offshoring, the same ideas are constantly proposed. To supply new jobs for blue collar workers, the U.S. economy has to create new opportunities in export industries, create new industries, and re-train blue workers to perform new jobs in services, warehousing or logistics. Nevertheless, the future success of these different solutions is relatively uncertain. Export industries are not necessary growing fast enough to absorb more employees, and they are usually building their domestic expansion on productivity gain rather than on increasing

the number of employees. The newly created industries, such as biotechnology or nanotechnology-based industries, will not necessarily require a large number of blue collars workers and are still in an experimental stage. Finally, re-training manufacturing workers to perform service jobs requires large financial expenditure for the government, the willingness of the worker to perform a new activity and often implies a cut in its salary. [120]

The common belief that laid-off manufacturing workers that re-train will find jobs with higher value-added is generally not confirmed. [81] Thus, investing heavily in education and re-training will be only a part of the solution and the different parties have to accept that most of the workers will not become engineers or doctors and might be forced to accept lower pay for service jobs.

In order to reduce the unemployment period and the wage cut for laid-off workers, and to reduce the governmental investment to re-train workers, it appears that the best solution is to create manufacturing-like jobs, which require the same skills manufacturing workers already have. Some of these new jobs might be in services, but most of them can be created in the current domestic manufacturing sector.

By comparing the pros and cons of offshore and onshore locations (see Fig. 5-24), it appears that the two most important variables are the “skills requirements” and the “distance pressure.” The skills requirements” refer to the manufacturing capabilities, labor force skills and technological knowledge needed in a given industry to perform the production of a good. The “distance pressure” refers to proximity to the demand and to the suppliers. It is directly correlated to inventory cost, transportation cost, lead time and delivery time. For instance, a company can decide to compete on variety and in order to carry a reasonable amount of total stock, might have to forecast the demand very well. The best way to improve the forecast is to produce the goods as close as possible from the time when the demand is realized. The distance factor relates to this necessity to be close to the demand to create the company’s comparative advantage on product variety. The graph below represents the map of the optimal location given the distance pressure and the skill requirements of a given product (Fig. 5-28). For instance, the production of newspaper requires low skills but

the distance pressure is very high, since a new edition has to be delivered everyday day and has to be published and distributed the same day. The newspaper will be produced in the U.S. In contrast, for certain high tech materials used in the fabrication of satellites the distance factor is very low, but the strong skill requirements make manufacturing in China impossible. Such products are likely to be produced mostly in the U.S.

*The Situation*

**Distance Pressure**

---

<b>Skill Requirements</b>		China, Thailand <small>Toys</small>	Mexico <small>Automobile</small>	USA <small>Newspaper</small>
		India, Russia, Taiwan <small>Semiconductors, Electronic Components</small>	Canada	USA
		EU, USA <small>Nuclear Plants, Satellite</small>	USA	USA

Figure 5-28: Optimal Location Depending on Skills Requirements and Distance Factor Levels

Maximizing the employment in the U.S., companies can increase the skill requirements of their products. Investing in R&D might lead to more complex products that will have to be produced in the U.S if the technology is not mastered by low cost countries. Nevertheless, the current trend is the opposite: China and India are catching up very fast on the technology side and are investing heavily in R&D. Moreover, the objective of U.S. companies is not to maximize the domestic employment. If IP protection is sufficiently reinforced in Asian countries, U.S. companies will be tempted to develop or relocate their most advanced technologies in Asia to benefit from wage differential. Thus, domestic manufacturing employment will not necessarily benefit from heavier investment in R&D (Fig. 5-29).

On the other hand, distance pressure can be increase by strategies such as the in-

production of products with shorter product life cycles, the increase of the variety of products and variation or by designing products that require after sales services that have to be performed onshore. To achieve such objective onshore, companies will have to use such strategies as postponement strategy or mass customization. Moreover, the company will protect its IP, and protect itself from disruption inherent to the use of offshore facilities. As said by the Economist, “The logistics of shipping goods over long distances remain complicated and inexact. For example, the V6 car engines that Toyota sends from Nagoya in Japan to Chicago take anywhere between 25 and 37 days to arrive, forcing the car company to hold costly stocks.” [16] Such an approach appears promising since customers are increasingly sensitive to customized products, a large variety of products and are not willing to wait for all products.

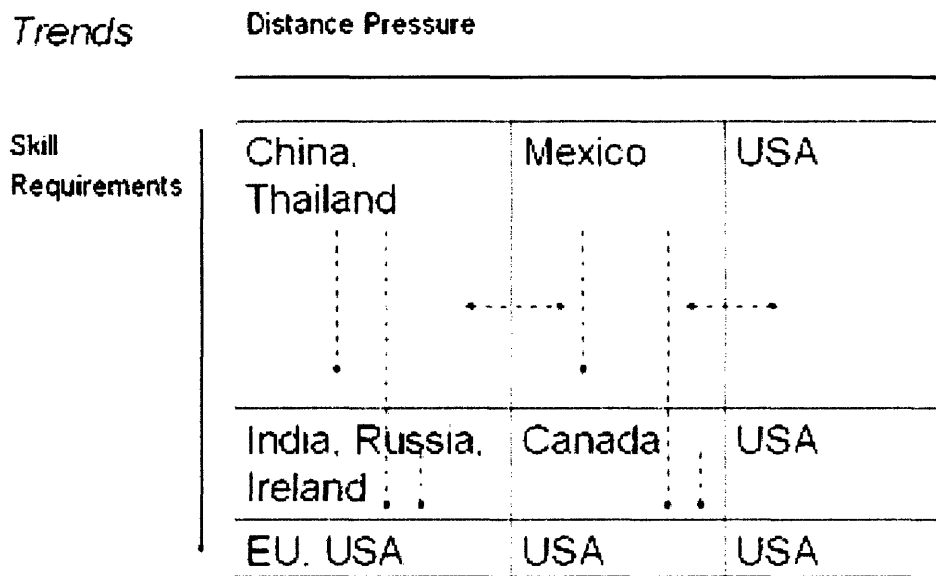


Figure 5-29: The Trends in U.S. Manufacturing Activities

The previous figure shows that the development of high-tech manufacturing capabilities will tend to reduce the number of jobs in the U.S. On the other hand, the trends on the distance pressure dimension are more uncertain. The introduction of faster transportation modes or the digitalization of certain products can reduce the distance pressure and consequently the employment in the U.S. For instance, the increasing electronic distribution of newspapers reduces the requirement of domestic

production since editing work can be easily perform in India and then distributed to American consumers via a web service. Air shipments can be an easy yet expensive way to use offshore location while being marginally impacted by distance pressure. Nevertheless, not all products can be replaced by a digital equivalent and air shipment is still too expensive for a lot of products, making the distance pressure a potentially sustainable dimension for U.S. companies to focus on to insure domestic employment. The recent rise of oil price is also a new source of concerns for companies that rely heavily on Asian sourcing, reinforcing the distance pressure.

Finally, it appears that rather than a single way for U.S. companies to locate and manage their operation, there is a large spectrum of strategies and organization to maintain some manufacturing activities in the U.S. and then to provide manufacturing jobs to blue collar workers. It is possible to imagine a supply chain where the first steps of the manufacturing process, which involve low IP content and low variance will be performed in low cost countries to benefit from low wages and then the last steps of the process will be performed locally to better match the final demand and to incorporate sensible technologies. Furthermore, since more countries are involved in the company's strategy, the optimal location map might change more often along with economic or political changes domestically or abroad. The location strategy has to be adapted to these changes and to reduce the risks for the company: relying on operations in countries where changes might be hostile and are more difficult to predict expose the company to severe disruption. Manufacturing onshore will always be the safe solution for critical products and sectors. The next chapter will explore in more details the recent fast growth of the Chinese economy and the birth of this new manufacturing competitor. Chapter 7 will show how American companies have to develop new processes to manage operations relying more heavily on international sourcing through the case study of the implementation of RFID system in Wal-Mart stores.

# Chapter 6

## China, an Increasingly Attractive Spot for American Companies

*“China already resembles the US in building a dynamic, open economy that generates enormous opportunity and attracts students, immigrants, and investment from around the world”. [2]*

### 6.1 China, a Growing Power

Flextronics, an electronics manufacturer, will increase its manufacturing capacity in China by more than 40 percent in 2006. Since 2000, the company has cut its U.S. production from \$37 billion to \$27 billion while doubling their China output to \$31 billion. [47] This company is increasing its capacity in China to support the growing demand for electronics equipment worldwide. Flextronics makes such items as cell phones and video game systems in China. [12] Flextronics is not leading the way but just following the common trend of moving production to low cost countries and especially China. Companies are starting businesses in low cost countries mainly to reduce production costs and to find new market opportunities. Sourcing cheap raw materials, intermediates or finished goods makes companies more competitive and allows them to expand their global market share, to capture new markets locally, and to increase their margin. [6] Among low cost countries, China appears, to many

observers, to be the ideal spot to be to capture all low cost countries' comparative advantages. In addition to providing low labor cost and efficient manufacturing infrastructures, China has three advantages: a relative abundance of natural resources; a potentially huge domestic market; and a virtually unlimited supply of labor, contrary to the Asian NIEs (Chinese Taipei, South Korea, Singapore and Hong Kong) and ASEAN-4 countries (Thailand, Malaysia, Indonesia and the Philippines). [126] Therefore, output has expanded at an average rate of nearly 10 per cent per year –and total exports at 17 per cent per year– during the last decade. Indeed, China's share of global manufacturing could grow from about 7 per cent in 2005 to about 25 per cent in 2025 according to experts. [91]

Recently, the cheapest and the biggest low cost country has decided to change its behavior toward the world: the entrance of China in the WTO marks a new turn in the history of this country and the impacts of this decision could disturb the stability of the manufacturing sector worldwide.

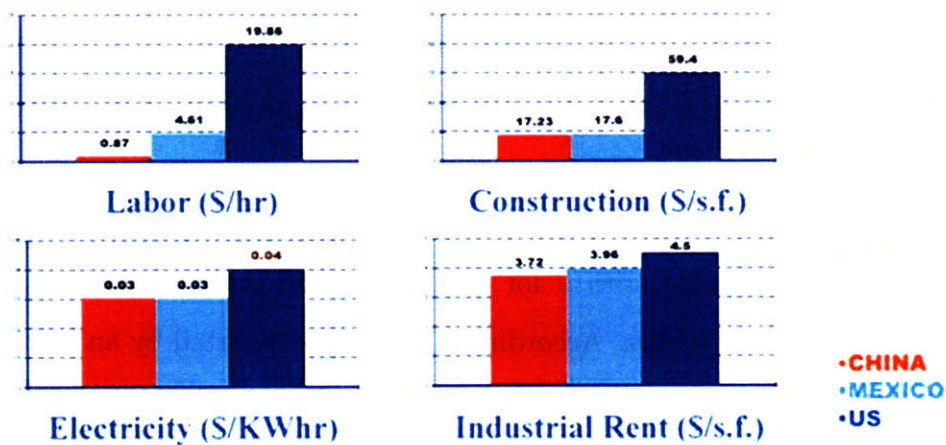
## **6.2 Competitive Advantages**

### **6.2.1 Labor Force and Utility Costs**

Like other Asian low cost countries, China has currently a very inexpensive labor force. Contrary to Asian NIEs, who experienced a shortage of labor since the mid 90s, creating strong pressure on the economic growth, the almost unlimited supply of labor in China will assure a consistently cheap labor force. Indeed, the massive flux of China's rural labor force to manufacturing jobs is likely to moderate any increase in low-skilled wages in the coming years. [19] Nevertheless, recent reports from UBS and Goldman Sachs present evidence that this assumption might change in the near future, especially for semi-skilled workers and in certain regions of the country. [33] Labor shortage in coastal regions might make China less cheap than such country as Vietnam. Workers currently have a lack of interest in unions but more social protections might be claimed in the future. To be competitive and attractive for

companies, government tends to depoliticize companies and to bring in professional management. There is no job security and, firms can expand or contract their labor force as required, allowing companies to deal with a high variable demand during uncertain economic periods. [42]

On the other hand, utility costs, such as construction, electricity, water or sewer costs remain highly competitive (Fig. 6-1 & Figure D-1 in Appendix D). It is hard to predict if China will be able to support such an intense growth in the future, but specialists already predict that the supply of energy will be problematic in the future.



Source: EIU & Fantas Analysis

Figure 6-1: Comparative Production Costs

### 6.2.2 Large Domestic Market

In the past, western companies moved operations overseas to capture low cost production advantages, but today, companies are increasingly considering the possibility of penetrating new markets.

Currently, China’s market accounts for over 14 percent of the global business for multinationals such as Motorola, over 12 percent for Nokia and some 10 percent for Ericsson, which has increased its production floor space massively since 2004. [5] China is the world’s largest market for such items as refrigerators and mobile telephones, third largest for electronics, fourth largest for chemicals and fifth largest for

automobiles. It is becoming an unavoidable market for many companies. China's population, which creates a potentially colossal domestic demand, permits economies of scale even without exports to western countries. For instance, if we consider a potential annual demand for vehicles of one million, which represents only 0.3 percent of the total number of families, China can support several "scale-efficient" plants (a vehicle manufacturing plant's minimum efficient scale of about 0.2 million units per year). China's firms experience economies of scale at plant level but also at industry level according to OECD experts. Economies of scale at industry level means that the productivity of a firm depends on the size of the industrial sector to which the firm belongs. The effect is known as Marshallian external economies and describes gains due to flow of news, ideas between firms, and improvement of suppliers of raw materials or intermediate goods.

However, knowing when the Chinese consumption will really explode, sustained by the rise of wages, remains critical for companies who invest in infrastructure and distribution network in China. According to statistics reported by an American consultant, per capita private consumption is projected to rise from US\$451 to US\$732 from 2004 to 2009 for consumer goods. More and more companies understand that China, which is an amazing country to manufacture products, could be also a remarkable country to sell these products. Examples are not difficult to find: according to a recent published report, Sony intends to expand its sales in China to \$4 billion this year. "Clearly, China has become a very important part of our global operation, not just for the U.S, the China market itself is growing very fast" says Mr. Clancy, Senior Vice President of Corporate Communications for Sony Electronics. [100] Therefore, to take advantage of the market potential of China, all consulting firms encourage multinationals to build Chinese businesses as opposed to just doing Chinese sourcing. China should be considered as a part of their overall manufacturing system and they should sell in China with a local brand and a local reputation. China's GDP is projected to average 7.8 percent growth over the next five years (2 times greater than U.S., OECD and world averages).

### 6.2.3 Positive Political Change

The Chinese government used to manage firmly all aspects of the country life, including economics and corporate governance. Nevertheless, some major policy reforms have occurred since the beginning of the 1990s, changing the country's business climate. For instance, a more flexible trade policy has totally changed the manufacturing sector in China. In 1978 China's trade was influenced by central planning, which covered 100 percent of exports; by 1992, that number was only 15 percent. [84] Planners' preferences did not correspond with comparative advantage, giving priority to exports of capital-intensive goods. [53] Such strategy was supposed to encourage the development of high-tech and capital intensive industries. After abolishing central planning, the share of capital-intensive manufactures in total exports fell from 50 per cent in 1975 to 35 per cent in 1980 and then to under 20 percent by 1990, while the share of labor-intensive manufactures rose from 36 percent in 1975 and 39 percent in 1980 to 74 percent in 1990 (See Table D-2 in Appendix D). OECD has approved the vast government effort to make business more attractive in China, resulting in several major changes: the reduction of direct administrative control over trade, decentralization of national foreign trade businesses, de-licensing, and reduced protection of the home market through tariff reduction. In 2006, Chinese economic institutions were similar to the capitalist Asian model and China's trading partners. The government refuses to create institutions with "Chinese characteristics." [104] Consequently, the share of state-owned enterprises in total industrial sales declined by half in the past 6 years. Today, in many sectors, firms can be wholly-owned by foreign companies without local partners (except in sectors considered nationally important, such as airlines, telecom, and electric utilities). The last major changes resulted from the WTO entry:

- average tariffs were cut to between 7 percent and 9 percent
- import quotas and licenses will be removed progressively by 2006
- all export subsidies were eliminated immediately
- reduction in FDI restrictions (technology transfer, local content, etc)

Along with internal political changes, the Chinese government has reinforced legislation for Western companies to make manufacturing in China attractive. China provides low-cost land, low import duties and tax breaks. For instance, one corporation has declared to have build a virtually cost free plant as a consequence of several subsidies. [113] Another instrument is the creation of more than 500 special economic zones where the infrastructure facilitates fast set-up of businesses.

After making its territories attractive for US companies and its national production competitive for exports, China cannot keep its currency at the current level. Indeed, the Chinese government is likely to revalue the currency before 2007. [78]

## 6.2.4 Manufacturing Specialization

As a result of continual foreign investment in manufacturing capacity in the Pearl River Delta of Guangdong Province and Yangtze River Delta, China is becoming the world's "factory floor." [77] China manufactures 20 percent of the world's steel, 15 percent of its ships, 18 percent of apparel and textiles, and 75 percent of toys, which are traditional offshore industries. [89] China is also moving up the value chain, producing more than 50 percent of the world's cameras, 30 percent of air-conditioning and TVs, 25 percent of washing machines, and 20 percent of refrigerators. In 2006, China has increased its market share in such areas as electronics (Chinese exports market share of US electronics market increase from 9.5 percent in 1992 to 21.8 percent in 1999), or computers (Chinese exports market share of PC world production increased from 4 percent in 1996 to 21 percent in 2000) (See Fig. D-2 in Appendix D).

As espoused by Seki, the structure of industry of a nation wishing to build solid manufacturing capabilities has to be multi-layered and complex. The manufacturing industry can be viewed as the superposition of three different layers: the industry-supporting fundamental technologies; industries based on high technologies; and industry with assembly technologies. [107]

**Fundamental Technologies** In small and rural township, enterprises will grow to develop such fundamental technologies in the twenty-first century as forging, plating, heat treatment, painting, machining, pressing, plastic molding, and other process technologies. China is acquiring these fundamental skills by manufacturing more and more different products for international companies, primarily as a subcontractor. Today, even if companies are able to manage traditional manufacturing processes in China, the quality is occasionally insufficient. Nevertheless, there are no real barriers that will prevent China from acquiring a level of quality similar to the European and U.S. standard in the future.

**High Technologies** The special or high technologies, focusing on new product development, are usually developed by large private corporations abroad but more and more companies are operating R&D in China. The Chinese local market attracts international companies and creates incentives for local companies to supply their own market. For instance, Intel, with 2,400 employees in China, will have invested more than \$1 billion by the end of 2006, hiring top Chinese engineers for development work. First, Intel has followed its customers in China who were lowering their production costs by moving production in China to supply US market. Then the company has increased its production to meet the local demand but also to supply exports cheaply. China has become the largest consumer of mobile phones in the world and is expected to surpass the United States as the biggest buyer of personal computers in six years. “The quality of work here is equivalent to any of the work we do around the world,” said Intel China President Wee Theng Tan. [69]

**Assembly Technologies** In the middle layer between the fundamental and high technologies are the intermediate technologies linking the two like the assembly technology. It is a traditional feature of the manufacturing sector in China: Chinese companies have been assembling every kind of product for years (See Fig. D-3 and Table D-2 in Appendix D). Chinese assembling companies are costly effective and very efficient. Moreover, companies operating in China can cut capital costs by using

the local competitive advantage and skills: companies replace expensive machinery with inexpensive labor. One leading manufacturer of large kitchen appliances is using manual material handling instead of conveyors in its Chinese factories. Usually firms achieve quality comparable to that at home, but at lower cost.

Companies should think about the virtues of using China for some of their manufacturing to remain competitive. Some consultants from an American firm think that as many as 15 percent to 20 percent of industrial products now made in the United States – together with their associated jobs – will migrate to China and other low cost countries during the coming years: China is cheap and local companies are able to produce any kinds of product from high tech chips to footwear. Dave Arland, Thomson vice president of U.S. corporate communications and government relations said “China is becoming the manufacturer for the whole world. You have to find a way to harness that, or watch your competition run away from you” after strategic partnership with Chinese manufacturing giant TCL.

### **6.3 Weaknesses**

Even though China is creating a strong and competitive manufacturing tool supported by a modern political agenda, few problems still exist.

For instance, China is usually criticized for the limitation of its financial structure or its attitude toward environmental questions. [94] As seen in the previous part, China’s labor force is inexpensive and capable to manufacture a broad range of product. Thus, the real China’s stake is to convince companies that China is a sustainable place to manufacture product and do business assuring the basic requirement to make companies trustful:

- Protection of intellectual property
- Availability of competent suppliers for raw materials, intermediate goods or finished goods
- Existence of an efficient distribution network

### 6.3.1 Intellectual Property

Innovation is one of the most important competitive advantages for a company. Creating new products or new processes, companies can make a high margin contrary to old products where prices are usually low because of competition and its commoditization. Thus, intellectual property is a key question for a lot of companies producing items with high tech content.

Some consultants think protecting intellectual property is still possible but it requires continued, aggressive, locally-focused efforts and it can be done to a sufficient degree that is worthwhile in China. The paradox is that laws to protect intellectual property and patterns exist in China but the government does not give the impression that they are really concerned with this matter. Nevertheless, the situation seems to change. To attract activity with high value added, such a research center, and more advanced technologies, China has started reinforcing patent recognition and intellectual property. [22] This step is fundamental to transform the economy toward high margin activities. “We couldn’t just follow the Chinese way, the old way, of doing manufacturing and competing on labor costs” says Frank Deng, CEO of Netac Technology, an USB memory devices Chinese producer. “That is OK in the short term, but we didn’t think it was the right way for the long term. We didn’t want to be a follower but be a leader.” In fact, China might start reinforcing IP to protect its own innovation, which will, subsequently benefit the U.S. and European manufacturers. Ironically, Netac became recently the first Chinese company to sue an American one for patent infringement. [24]

### 6.3.2 Suppliers Network

**Sourcing from U.S. and Europe to Product in China** While classic offshore products such as televisions or copiers can easily cost 30 percent to 50 percent less to make in China than in the developed nations, for other more sophisticated items, such as particular high tech products needing special intermediate goods to be assembled, the production cost could be significant. Nichicon, a Japanese high-technology

capacitors manufacturer, estimates that the overall cost advantage can be as little as 10 percent for some of its products after including additional costs to source the raw materials and intermediate goods needed in the manufacturing processes. Companies should consider three elements when setting up operations in China:

- Without efficient local suppliers, companies have to import of components, generating extra costs such as import duties and shipping expenses, and increasing the risk of supply chain disruption.
- Chinese suppliers may not be able to catch up foreign parts suppliers with a technological lead for decades.
- The poor performance of many Chinese suppliers could oblige companies to educate suppliers and create new standards in order to raise the country's overall quality of supply or even ask western suppliers to move production in Asia (like in the automotive industry).

Naturally, the availability of local suppliers with sufficient performance on delivery and quality varies according to industry and manufacturing tradition. For example, in electronics, a large fraction of parts are supplied by local suppliers : in its large mobile phone plant in Shanghai, the German electrical goods company Siemens, sources 75 percent of the value of components from inside China, which has had a big effect on reducing costs.

On the other hand, the world's second biggest maker of construction machines, Komatsu, is still producing excavators 5 per cent more expensive in China than in Japan, as a result of the extra costs associated with shipping key components to China that are not available locally, according to Masahiro Sakane, chief executive. It is a similar story at Volkswagen, where Bernd Leissner, head of its Chinese arm, says production costs in China "are still higher than abroad." [90]

Moreover, China's diverse raw material and intermediate input markets such as steel, coal and plastics will therefore face significant challenges in responding to industrial growth rates. Similar difficulties can be expected for infrastructure inputs such as

electricity, telecommunications and transportation, if appropriate pricing and hard budget constraints are not introduced, according OECD experts.

**Sourcing Finish Goods from China to Supply U.S. Consumption** Generally, the retailing industry has neglected the opportunity to source product directly from producers in low cost countries: only 3 percent of the \$850 billion in goods procured by North American and Western European retailers in 2002 was sourced directly from low-cost countries such as China. Usually, imports are handled by third-party agents according to a study from a leading consultant.

To source goods directly from Chinese suppliers, retailers use typically two intermediaries: a Chinese export-trading company and an importer in the retailer's home market. This process eliminates a large part of potential margin. To increase benefits of sourcing in China, retailers are opening offices in China to eliminate one or both middle men by buying directly to the producers. In 2003, Wal-Mart Stores bought \$15 billion worth of Chinese goods, nearly all through its purchasing office in China. In the same year, the French hypermarket operator Carrefour purchased \$1.5 billion of goods directly from that country.

However, annual operating expenses for a 40-person office could be estimated at \$3 million to \$5 million in all during the first year or two. As the office increases its purchasing volume, additional personnel, including senior expatriate managers with expertise in specific product categories, will be required, but it is an easy way to capture all benefits from sourcing in China. [99]

### **6.3.3 Logistics and Distribution**

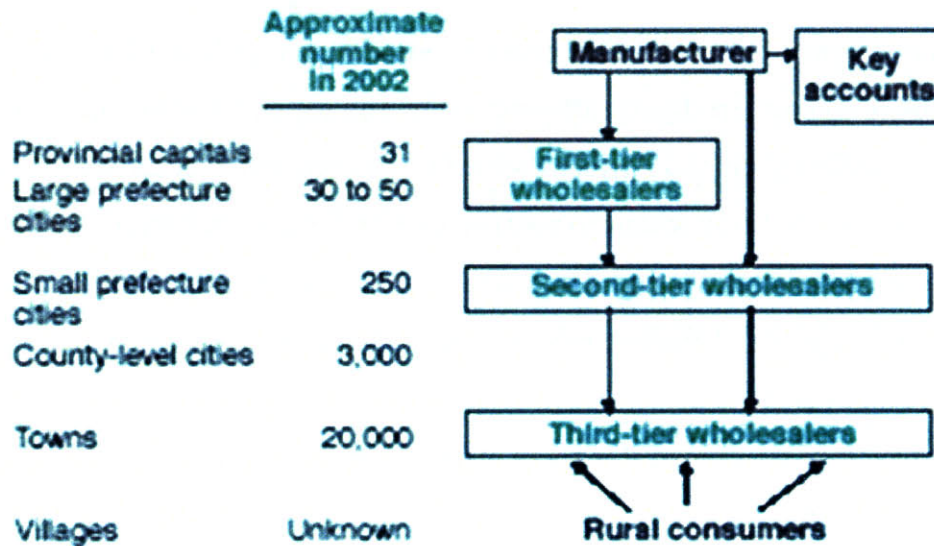
Although China is commonly perceived as the best spot to lower production costs, its large territory and primitive infrastructure make it difficult to move and distribute products fast and cost-effectively. "China's supply chain costs are higher than virtually anywhere else in the industrialized world, commonly amounting to 30 percent-40 percent of wholesale prices," says Vince Calarco, chairman of Crompton, an American chemical firm. [73] A part of savings realized by lower production cost in Chinese

manufacturing are offset by additional logistics expenditure. For instance, it can cost as much as 50 percent more to transport goods within China than it does in North America or Europe due to China's outdated and inflexible freight distribution systems. It is partially explained by a highly fragmented Chinese trucking industry, whose average size of a trucking "fleet" is two vehicles. Moreover, a restrictive licensing system complicates the situation: China is made up of 33 provinces, with carriers only licensed in certain provinces. For example, a carrier not registered in a particular province must transfer their goods to one who is licensed, making transportation inefficient and time-consuming. Companies could consider moving goods by rail, which is cheaper but presents other challenges such as longer lead time or limited capacity due to colossal passenger traffic. [117] Furthermore, transportation stakes are taking a most important part in companies' concerns due to changes in the allocation of production sites: business traditionally located along the coast is moving further inland as development increases, raising significant logistics questions. [87] Nevertheless we could expect some improvement in logistics for the coming years:

- China is planning 200,000 kilometers of new roads by 2005.
- Restrictions on foreign ownership within the trucking transport sector ended in 2004.
- China will spend \$42.7 billion in railroad network infrastructure improvements in the next few years, and its network should be completely open to foreign investment in 2006.

Today, most of companies do not have enough experiences in China to build an efficient supply chain, integrating the relevant local players. It is obvious that companies will have to invest heavily in the future to improve their supply chain in China. The limited competition, in such area as warehouse, tends to increase prices and lower service level, with local companies less customers-oriented. The situation will remain problematic for the coming years because of the high cost and inefficiency, but we could expect improvements in the whole supply chain as several global 3PLs have an expanding presence in China, offering adequate logistics services.

As seen before, companies also target China as a prospective manufacturing location to be close to potential huge new markets for almost any kinds of products from intermediate goods to finish goods. To take advantage of this new market, companies have to find an efficient way to serve customers, in a country where the distribution sector is lacking (Fig. 6-2).



Source: BCG Analysis

Figure 6-2: The Chinese Wholesale Channel Structure

A major American consulting firm considers that Chinese distributors are less focused on sales and services, are limited to order taking, stock keeping and physical delivery and have few IT capabilities. Consequently, to sell products in China could be less profitable than originally expected.

Nevertheless, companies have to keep track of the evolution of the situation: joining the WTO, China agreed to allow foreign companies to enter the wholesaling market, initially in joint ventures. In addition, modernization seems to take place in the retail sector. [17] Hypermarkets are becoming increasingly present, serving customers more directly and taking sales away from traditional retail outlets that have been served by Chinese wholesalers, allowing US companies who invest in China to capture directly new customer without expensive intermediaries. [3]

### **6.3.4 Management Resource**

The human resource, as seen in the first part, appears to be large for labor but the story is completely different for managers and even grey workers (experienced technician). Companies are experiencing trouble finding middle and senior managers. Addy Lee, managing partner in China for Amrop Hever, an international human resources firm, says: “even though there are thousands of young engineers emerging from Chinese universities every year, the country’s manufacturing boom has not been going long enough to have produced sufficient senior and experienced people, typically aged 35-45 and with a good management record in western-style businesses”. Because it is very important to know whom to partner with in China, such experienced managers are one of the critical resources in a strategy of production in China. They are the only people capable of finding robust supply chain organizations built on trustable suppliers and distributors.

The following section illustrates these observations through a case study in the automotive industry.

## **6.4 Case Study: Automotive Industry in China**

US car manufacturers, as well as their European competitors, have decided to take advantage of China. Historically a major manufacturing industry and technological innovator in U.S., the automotive industry is not considering producing car fully in China to serve the U.S. market. Domestic labor agreements, productivity disparity, lack of experience of the Chinese work force in the automotive sector, and logistics constraints such as transportation cost, and lead time, make production in the U.S. the conventional model to serve the domestic market. Therefore, foreign companies, such as Toyota are often using American plants to supply American customers.

Nevertheless, companies use China in two ways. First, they create joint-venture in China to penetrate the Chinese market. Second, they are pushing their US-suppliers to start operations in China to reduce the overall production costs for the U.S. assembly.

### 6.4.1 Operations in China

According to the OECD, the demand for vehicles is expected to increase from 1.2 million cars and trucks in 1994 to between 3 and 6 million in China by 2010, becoming the fifth largest market worldwide. All companies have understood the necessity to be present in this growing market. Even if current household consumption is still embryonic, companies can already consider making cars dedicated to local market due to the scale of the country.

However, the current political position is not very advantageous, since the entry into the automotive industry by foreign companies is highly restricted. Foreign companies have to be associated with a local manufacturer to produce in China and cannot own more than a 50 percent stake of any Chinese auto manufacturer. Indeed, Chinese market is still dominated by inefficient state-owned manufacturers and their foreign partners.

Cars produce by these joint venture are usually sold under the foreign partner's brand. The joint-venture is typically forced to source a large part of the raw materials and intermediate goods need in the assembly from suppliers in US. As mentioned in the previous part, many Chinese suppliers are inefficient state-owned companies. As a result, Chinese consumers pay 30 to 40 percent more, on average, for autos produced by state-owned companies than do consumers in Japan, the United States, and Western Europe for comparable models. The joint-venture model looks like a method to subsidize inefficient state enterprises, and the government is pressed to drop the requirement that foreign automakers enter into joint ventures with local companies. [54] On the other hand, this strategy has allowed the Chinese manufacturer to acquire technologies and manufacturing processes in only few years. Chinese car makers, after having assimilated methods, knowledge and experience from their joint-venture with world class U.S. car maker and European companies, will be able to create their own cars at a decent level of quality before 2010.

American companies believe that opportunities to sell American cars on the Chinese market make the current investments and the transmission of capabilities to Chinese

partners, and soon competitors, worth it. Ford Motor Co.'s China-based joint venture agreed to buy a second assembly site to build Ford and Mazda vehicles. [92] Following the same trend, the French manufacturer Peugeot is to invest about \$780 million, doubling the capacity of its car manufacturing in China to 300,000 units per year. [11]

## 6.4.2 Chinese Procurement

Since U.S. manufacturers are not considering using offshore production to supply the U.S. domestic market, they consider another strategy to capture Chinese advantages. They start exercising pressure on their suppliers to make them move their production overseas. The case of Superior Industries International Inc., a big aluminum-wheel maker in California, illustrates this trend. This company has refused for years to move its production offshore because of the average quality of Chinese raw material and the apparently complicated logistics of shipping thousands of rims. Then the company has changed its mind when its main customers General Motors Corp. and Ford Motor Co., with whom Superior does 85 percent of its \$840 million a year in business, urged them to decrease prices and match Chinese wheel suppliers. "It's presented very simply; this is the price we are getting for this product. You either match that or the auto maker will look elsewhere" reports President Steve Borick. To close the gap with Chinese manufacturer Superior has two solutions:

- to cut its profit margins and to keep production in U.S.
- to move operations in China

The company has finally chosen to offshore its production. Companies as GM and Ford are using Chinese auto-parts suppliers as global "benchmark" prices for quality and price on many components (such as electric-wire cables, radios, speakers, small motors, and even brakes, suspensions and aluminum wheels). For instance, Delphi Corp. has found savings of as much as 40 percent by shifting production to China. On the employment side, analysts are emphasizing the risk of the disappearance of

U.S. jobs in the parts industry in the future. Today, less than 5 percent of the components Ford uses to build vehicles in North America come from offshore, says Ford Spokesman Paul Wood. At GM, only one-tenth of 1 percent of materials and parts the company uses in North America come directly from China says Tom Wickham, a GM spokesman. [108] In the future, most of car manufacturers are planning to source more from LCCs. China is acquiring skills and expertise very quickly through the development of its own automotive industry, and auto part supplier will have to grow to supply the Chinese car industry as well as the U.S. manufacturers looking for cost reduction. With the maturation of high quality part supplier in China, Gm and Ford might finally look like Dell, sourcing low cost standardized parts from low cost producers in China and only assembling the car onshore to minimize logistics costs.

## 6.5 Conclusion

This case study underlined numerous aspects of doing business in China focusing on the following points:

- China is potentially a huge market for American companies
- Manufacturing in China could lower production cost efficiently
- Logistics and Suppliers could be limiting factors of cost saving
- Political decisions can change the features of manufacturing in China very quickly

China appears as a must-play place for any global company according to David Michael, a BCG vice president based in Beijing. Companies will probably need to sell or to produce in China or to do both in the coming years because most of companies will compete with Chinese companies, or with others who are seeing the Chinese potential.

Evidently, companies will not offshore all sort of products and they will keep certain production onshore. Some highly complex products requiring specific suppliers or

products with a variety of designs and options and products likely to have variable demand will probably stay in U.S. Today, China is supplying such products as electronics, auto components, and cars. For auto parts, companies will probably consider the option to operate in Mexico to manage efficiently just-in-time inventory.

However, the crisis of employment in the U.S. manufacturing sector might interfere. With the growing importance of China, U.S. might respond with hostility to the attack on their textile, clothing, footwear and other affected industries in order to protect domestic employment. The US furniture industry is a good example. China's share of the U.S. market for wooden bedroom furniture has increased dramatically to 27.8 percent in mid-2003, up from 10.3 percent in 2000. In the same period, U.S. manufacturers' share of the domestic market fell to 42.7 percent from 59.8 percent. American manufacturers started producing furniture in China in the 1990s in an effort to reduce costs. Today retailers start dealing directly with the Chinese manufacturers. US manufacturers are lobbying for duties up to 100 percent to protect their business and insure artificial competitiveness of a local production. [102]

Companies will follow cost reduction plans and re-organization of the supply chain to minimize cost, to assure robust supply and to develop and manufacture competitive products. [49] Moreover, the Chinese economy will be an engine of growth and efficiency for the rest of the world given its need for goods and services, creating opportunities for the most competitive companies worldwide. Jobs, lost in manufacturing in the developed world will be replaced by new jobs to supply the Chinese consumption. China spends most of the money earned from exports on imports from rich economies. Thus, China experienced a \$78.7 billion trade deficit in February 2004. [14]

Finally, China will affect the world economy by changing relative prices for end customers. For instance, average prices of shoes and clothing in America have fallen by 30 percent in real terms since 1995. Consequently, US consumers will have the opportunity to spend more money on other products or services, some of which embed American labor.

# Chapter 7

## Wal-Mart: Implementing Innovative IT System to Support Global Sourcing

*“By figuring out how to exploit two powerful forces that converged in the 1990s - the rise of IT and the explosion of the global economy - Wal-Mart has dramatically changed the balance in the world of business.” Hedrick Smith, 2006 [66]*

### 7.1 Wal-Mart and The U.S. Retail Industry

In 2003, Wal-Mart was the Fortune’s most admired company, and the world’s biggest corporation. [121] Its sales reached US\$285.2 billion in 2005 and 138 million customers every week visited one of its 3,800 facilities in the United States or one of its 2,400 stores abroad. The company employs 1.6 million workers worldwide.

In the low inflationary U.S. context, it has been difficult for manufacturers to exert pricing power. As a result, prices for household consumption have remained fairly stable and low. Americans customers are highly price-sensitive, while looking for high-quality products. [79] They usually pay more attention to convenience, quality, low price, and availability than to brand name. Thus, most retailers are now focused on reducing costs and carrying low-price items. Some others will try to offer higher

quality products or compete on merchandising, customer service, store ambience, and peripheral services. Wal-Mart is betting that it can offer all of these: low prices for all products, including high-end products and fashionable items, while providing numerous peripheral services and high customer service.

Wal-Mart founded its strategy on “everyday low prices” for all categories of items. To be able to support its vision, the company had to improve all facets of its model. First, the company has improved tremendously its own operation by leveraging its knowledge in supply chain management and in information technology. Before any other retailers, Wal-Mart understood the power of a tight monitoring of its logistics and the importance of investing heavily in these areas. Its current effort in the Radio frequency identification (RFID) technology is one more proof of its focus and lead in logistics and IT. Second, its size gives the company an unrivaled bargaining power with every supplier. Wal-Mart systematically puts commodity-products manufacturers in direct competition to get the lowest price possible. Thus, even a brand like Procter and Gamble, which carries products that Wal-Mart has to carry to satisfy its customers, is losing its bargaining power since Wal-Mart alone is distributing a fifth of its production. Indirectly, the pressure of Wal-Mart has forced its suppliers to improve their own operations in order to provide the same item, or higher quality items, for a lower price. Third, since the mid-1990s, the company has begun to more intensively use sourcing from low cost countries for a larger range of products. That is often an easy way to rapidly get products for a lower price. Finally, Wal-Mart can also use the availability of suppliers in low-cost countries to bargain with U.S. suppliers. Even without using suppliers from China, for instance, Wal-Mart usually can make its U.S. producers align their prices with the Chinese prices. Subsequently, U.S. companies will have to increase their productivity, and often to offshore their operations to remain profitable and meet the low prices demanded by Wal-Mart’s customers.

Currently it is hard to believe that the customer’s belief in the possibility of getting high-quality products at a low price will change. Wal-Mart or Target in the U.S. and Aldi and Lidl in Germany have demonstrated to customers that high quality and low

prices can come together. Indeed, a majority of U.S. customers already believe that apparel sold at discount stores is as good quality as that sold in department stores, according to a survey by Retail Forward. [21]

## 7.2 Sourcing and Selling Globally

In 2000, Lakewood Engineering & Manufacturing Co., a U.S. fan manufacturer located in Chicago, opened a factory in Shenzhen, China. About 40 percent of its products now are made in China, including most heaters and desktop fans, whereas before 2000 all of its production was made in the U.S. In China workers earn 25 cents an hour, compared with \$13 in Chicago. Wal-Mart sells the fans assembled in Chicago from components made in China at \$10 compared to \$20 in the mid 1990s. Before going offshore, Lakewood tried to meet Wal-Mart's low price target by improving its productivity through automation. Despite the fact that productivity increased the company finally had to offshore a part of its production to meet the low prices that Wal-Mart asked. By putting all suppliers in competition, Lakewood had no choice but to lower its manufacturing costs, since another U.S. or Chinese supplier would have met Wal-Mart requirements to get the contract.

This example illustrates the current dilemma of doing business with Wal-Mart. To get access to the premier distribution channel in the U.S., manufacturers have to supply products at very low prices, forcing them to find new ways to be profitable. Wal-Mart is the biggest customer of most of the American icon brands such as Disney, Procter & Gamble, Kraft, Revlon, Gillette and Campbell Soup (Table 7.1). It is the biggest seller of such products as DVDs, groceries, toys, apparel, dog food, detergent, jewelry, sporting goods, videogames, socks, bedding, or toothpaste in the U.S. Wal-Mart is also the biggest film developer, optician, private truck-fleet operator, energy consumer, and real estate developer in the U.S. (Table 7.2).

Thus, "Wal-Mart has reversed a hundred-year history that had the retailer dependent on the manufacturer," comments Nelson Lichtenstein, a professor at the University of California, Santa Barbara. [59] Now the manufacturer has to do the

Table 7.1: Example of U.S. brands' percentage of sales to Wal-Mart

	% of Company's Sales to Wal-Mart
Tandy Brands Accessories	39%
Clorox	23%
Revlon	20%
RJR Tobacco	20%
Procter & Gamble	17%

Table 7.2: Wal-Mart's U.S. Market Share for Some Products

	Wal-Mart's U.S. Market Share
Dog food	36%
Disposable diapers	32%
Photographic film	30%
Toothpaste	26%
Pain remedies	21%

Source: Economy.com, Sec Filings, A.C. Nilsen

bidding of the retailers. In 2002, 7.5 cents of every dollar spent in any store in the United States was in a Wal-Mart store. [50] Thus, U.S. companies have to adapt their operations to meet Wal-Mart requirements. The improvements can come from better supply chain management or from gains in productivity. Nevertheless, at some point, the offshoring solution looks like the only way to be profitable in the "Wal-Mart world." For instance, Newell Rubbermaid, the largest producer of consumer rubber products in the United States, has shut down 69 out of its 400 U.S. facilities, and fired 11,000 workers since January 2001 to open production facilities in low-cost countries. According to Mark Heaseldon, equity research director at Associated Trust & Co., "to be able to meet the demands from key customers, like Wal-Mart ... [Rubbermaid has] to become competitive in price, shifting about 50 percent of production to low-cost countries." [51]

In 1997, MasterLock, after 75 years making locks in Milwaukee, opened a factory in Mexico. Today, it makes just 10 percent to 15 percent of its locks in Milwaukee—its 300 employees there mostly make parts that are sent to Nogales, where there are now 800 factory workers. For years, MasterLock was able to justify slightly a higher price

for its lock, but as the price difference with imported locks from China increased and the quality of the products started converging, Wal-Mart put pressure on the U.S. manufacturer to lower its price. Randall Larrimore, a former CEO of MasterBrand Industries, the parent company of Master Lock declared: “Everyone was willing to pay more for a Master Lock. But how much more can they justify? If they can buy a lock that has arguably similar quality, at a cheaper price, well, they can get their consumers a deal.” Finally, in 2000, Wal-Mart decided to drop MasterLock’s products to switch to an offshore supplier.

Thus, Wal-Mart has two main ways to leverage offshoring advantages: the company can force its traditional domestic suppliers to move their production offshore, or it can directly source products from local suppliers in low-cost countries (LCC). The next section will describe in detail the strategy of Wal-Mart in China, by far its main foreign supplier of consumer goods. Rather than using foreign countries only to source cheaper products, Wal-Mart is also setting up operations in numerous countries to capture new markets. While Wal-Mart still generates around 80 percent of its sales in the U.S., its international operations are growing faster than the domestic market. [27] The company is currently focusing its efforts on the markets with the highest potential. There are around 200 countries in the world and the largest 25 represent 80 percent of the global GDP. Companies generally focus on a few countries which are the most profitable and offer the biggest growth potential for the future. [101] In line with this approach, in 2006, Wal-Mart operated in only 15 countries. For instance, the company is the largest retailer in Mexico and has shown particular interest in Central America and Asia (Table 7.3).

Some countries have understood the importance of being part of the Wal-Mart supplier portfolio to gain access to the best distribution channel in the U.S. [13] For instance, in 2004, the Indian government decided to set up an inter-ministerial committee to assist Wal-Mart in sourcing goods from the country. Wal-Mart was sourcing \$2 billion annually from India at that time.

Sourcing an increasing portion of its goods from Chinese suppliers or from U.S. companies manufacturing in low-cost countries has an important impact on Wal-Mart’s

Table 7.3: Number and Location of Wal-Mart Stores

	2000	2002	2005	% Change 2000-2005
Global	4093	4485	5289	29.2%
U.S.	3055	3289	3702	21.2%
International	1038	1196	1587	52.9%
Mexico	478	570	679	42.1%
United Kingdom	240	254	282	17.5%
Canada	168	196	256	52.4%
Brazil	18	22	149	727.8%
Germany	95	95	91	-4.2%
Puerto Rico	15	17	54	260.0%
China	8	19	43	437.5%
South Korea	5	11	16	220.0%
Argentina	11	11	11	0.0%

Source: Wal-Mart Stores, Annual Report 2005, p. 53

supply chain. By relying more on offshore locations, Wal-Mart has a longer and riskier supply chain. For instance, the 12 percent to 14 percent projected increase in container traffic, due to the lifting of quotas on Chinese apparel, is generating a lot of concerns among retailers. [61] One option can be to use other locations that do not require shipping to the West Coast to source products. Some clothing manufacturers are looking back to Mexico and Central America, destinations that they were starting to abandon, attracted by the lower Asian wages. Another strategy can be the use of alternative routes: Gap Inc., which relies heavily on factories in Asia and Latin America, has the flexibility to redirect its shipments to alternate ports, says spokeswoman Amy Lund. Insuring shipping also means insuring delivery on time. In 2005, fearing congestion and port labor problems, Wal-Mart and other big box retailers decided to get a part of the goods for the Christmas season earlier and the ports were backed up by early summer. Some manufacturers have to follow the same strategy in order to get their shipments on time. For instance, Hot Kiss Inc., a Los Angeles manufacturer of teen clothing, is placing orders two to three weeks earlier, since it is experiencing two weeks of delays in West Coast ports. In this case, the strategy is more risky, since this manufacturer competes on a fashion market, where trends can change quickly, and make products obsolete. The company has decided recently to look at onshore

production sites to reduce this risk. By opening a new 20-acre distribution center in Oklahoma and announcing a plan to open another distribution center in Indiana, Wal-Mart is also looking to hedge its sources of supply to avoid congestion in West Coast ports.

Finally, using offshore production tends to be one of the foundations of the Wal-Mart strategy to sell low-cost products to its customers domestically and to penetrate new markets. At the same time, relying on suppliers located overseas is generating uncertainty and risks of disruption in its supply chain. In order to mitigate these risks, the company can use multiple sourcing locations and improve the monitoring of its supply chain and the supply chain of its main suppliers. The recent vast effort toward the implementation of RFID technology will undoubtedly give the company more supply chain visibility, if the whole system is successfully implemented. After looking at the Case of Wal-Mart in China, Wal-Mart's RFID plan will be outlined.

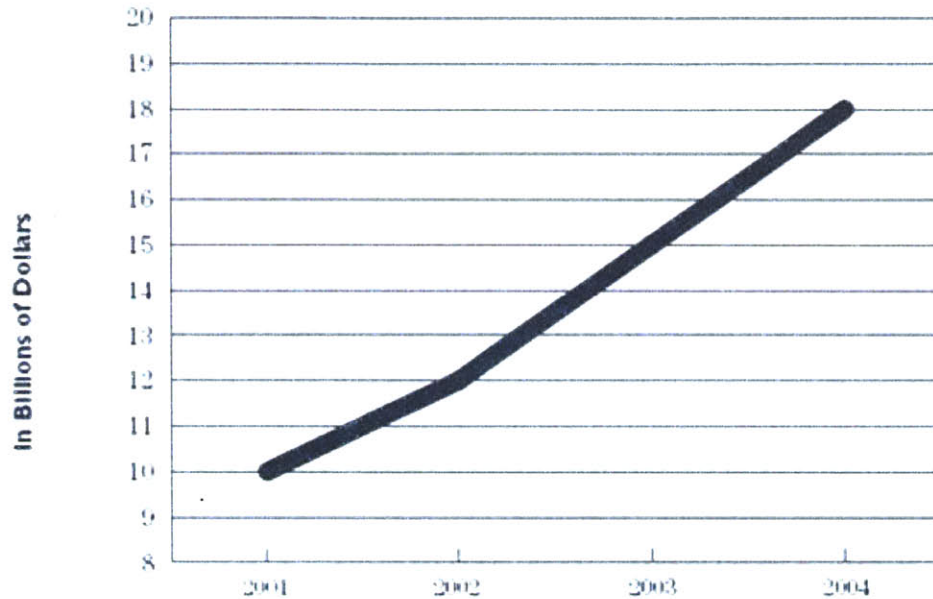
### **7.3 The Example of China**

In 1995, Wal-Mart declared that it imported no more than 6 percent of the products it sold in the U.S. [43] Eight years later, in 2003, a study from the retail consulting firm Retail Forward estimated that 50 percent to 60 percent of the items sold in Wal-Mart's U.S. stores were imported. In fact, sourcing from suppliers located in low-cost countries has irremediably increased under the pressure of imports coming from China.

Whereas Wal-Mart imports data are not released publicly by the company, newspapers have lately been publishing estimates. It is estimated that Wal-Mart's goods imports from China accounted for approximately \$18 billion in 2004 (Fig. 7-1). [83] That would make the company the fifth-ranking importer of Chinese goods, ahead of nations such as Germany or England in 2003, representing roughly 10 percent of U.S. imports from China. Half of its imports are coming from Wal-Mart's direct sourcing from Chinese suppliers and the other half coming through its other suppliers. [15] In fact, the origin of products is often hard to track and the opacity of the firm on the

subject makes it hard to evaluate accurately the real proportion of products sold in the U.S. stores that have been manufactured in China. Thus, it is not surprising to find almost nothing but imported products in some categories of item, such as electronics, apparel and tools, in the U.S. Wal-Mart stores.

### Wal-Mart Imports from China, 2001–2004



Source: Fast Company-12/03, Forbes-2/04, Bloomberg.com-12/05

Figure 7-1: Wal-Mart Imports from China, 2001-2004

“China is the largest exporter to the U.S. economy in virtually all consumer goods categories. Wal-Mart is the leading retailer in the U.S. economy in virtually all consumer goods categories. Wal-Mart and China are a joint venture,” says Duke University professor Gary Gereffi. [28] Looking at Wal-Mart’s worldwide database of suppliers, it appears that around 80 percent of the 6,000 factories supplying Wal-Mart are located in China.

Wal-Mart is looking at China to find sourcing opportunities to supply its U.S. stores but also to establish its presence in a promising and already emerging market. Whereas the company counted only about 200 employees in China in 1995, Wal-Mart employed 26,000 workers in 2005 and is expected to reach 40,000 by the end of 2006. [118] The company now operates 43 Supercenters in China and has two

distribution centers (DCs) supplying them. Wal-Mart is planning to open a third one in Shenzhen in 2006. Operating in China has forced the company to adapt its strategy to the particularities of this country. Wal-Mart is mainly sourcing locally in China to sell on the Chinese market since many items have to be bought locally through state-approved vendors. Wal-Mart has buying agents in every city and 90 percent of the market is in local brands. Moreover, moving goods from one city to another often requires the approval of local officials, making inter-store transfer or conventional regional distribution strategy poorly suitable at this time.

Finally, doing business in China has been a win-win arrangement for Chinese suppliers and Wal-Mart. Wal-Mart has been able to access a new market and to source products more cheaply, while Chinese suppliers are getting access to millions of customer through Wal-Mart's distribution network and are dramatically improving their operations to meet Wal-Mart's operating requirements. [103] For instance, many Chinese suppliers have started using Wal-Mart's online portal, Retail Link, in the same way that suppliers in the U.S. do, to communicate electronically with the retailer. Wal-Mart has also understood very early the crucial importance of securing an educated and talented workforce in its stores. The company is training its best employees in China and sending them to the U.S. to attend the Walton Institute. Wal-Mart's China operations have a 16 percent employee turnover rate, the lowest of any operation worldwide, and far below the 40 percent in the U.S.

Thus, through its presence in China, Wal-Mart has been able to leverage low-cost raw material supplies, modern factories, developing infrastructure such as highways and ports, and a friendly government to sustain its "everyday low prices" strategy. But, as a consequence, the company is incurring new challenges by relying mostly on suppliers located abroad or U.S. suppliers manufacturing abroad. Insuring an efficient execution of its operations along a longer supply chain appears as vital to get the benefits from sourcing cheaply in China. Yet, the causes of disruption can be multiple and Wal-Mart has to develop a new set of instruments to make sure that its supply chain will be robust enough to rely mostly on suppliers located abroad. One of the solutions might be the implementation of a global RFID system within its own

supply chain and its suppliers' supply chain to track goods from the manufacturers to the customers.

## **7.4 RFID: Wal-Mart's Next Competitive Advantage**

### **7.4.1 Wal-Mart IT System 1.0**

Wal-Mart is building its strategy on a few key principles: using its bargaining power to get products at a cheap price from suppliers in the U.S. or abroad and managing its supply chain as efficiently as possible to reduce its costs and be able to offer to its customers low prices on a vast range of products. Through a constant emphasis on cost reduction and supply chain control, the company has been able to monitor, at an unmatched level, the flow of goods from the factory floor to the store shelf while reducing shipping and inventory costs. "Wal-Mart has done an amazing job as a logistics company in a way that the average person doesn't appreciate," says Robert Mittelstaedt, director of Wharton's Aresty Institute of Executive Education. "It is a common misperception that Wal-Mart's ability to keep prices low stems primarily from its size and resulting clout with suppliers." [8]

To be successful in the consumer business, the retailer has to collect a vast quantity of data about products and inventory flow as well as consumer behavior. By integrating this information as quickly as possible, the retailer is able to manage its supply chain efficiently to respond to changes in demand or disruption of supply. Indeed, creating efficient monitoring systems that are able to collect relevant data in real time, and to leverage this massive flow of information in order to create an objective picture of the supply chain and the demand that will subsequently be used by managers to make the most intelligent decisions at a given instant, is becoming the true competitive advantage of successful retailers.

Wal-Mart optimized the architecture of its distribution system very early: it was among the first retailers to cluster stores around a distribution center, to centralize

purchases from key vendors and to engage in cross-docking to speed up inventory movement. [79] Its second step to reduce its operating cost was to add an efficient IT system to its supply chain to share real-time information between the stores and the DCs and with suppliers. Inside the company, each store is connected, via a secure private network, to the company's headquarters in Arkansas, making the company able to track the sales volume of each item at each store. [68]

Consequently, the company can reorder products, or drop non-selling products. Thus, Wal-Mart is able to monitor closely its consumers' behavior and rapidly adjust merchandise mix and pricing in order to maximize revenue. With its suppliers, Wal-Mart shares its sales data through a web-based service, Retail Link, that allows the company and the suppliers to monitor what products are selling and where they are selling. [122] Inside of its warehouses, Wal-Mart is relying on automation and computerized inventory management to move items faster and to reduce its stocks. More than any other retailers, Wal-Mart is building part of its competitive advantage on its capacity to collect, transform, and distribute information within the company as fast as possible to reduce its operating costs and to maximize its revenue by responding quickly to demand changes. Wal-Mart's recent commitment to implement RFID technology, reinforces the company objective to create the largest and the most efficient distribution network. "At the end of this year, they will end up operating in I think it is 117 distribution centers across the United States" said Mike Duke, Executive Vice President, President and CEO of Wal-Mart Stores Inc. "This year there will be over 5 billion cartons of merchandise processed through this gigantic, powerful network across the U.S.", he added. The implementation of RFID appears to be a promising solution to improve Wal-Mart's operations.

#### **7.4.2 Wal-Mart IT System 2.0**

"Like Linda [former Wal-Mart CIO], I view RFID as a strategy that offers tremendous competitive advantage," said Rollin Ford, Wal-Mart's new executive vice president and chief information officer, who previously served as the company's executive vice president of logistics and supply chain. In April 2006, Ford reaffirmed that both

logistics and information systems were at the center of Wal-Mart's competitive advantage. [26] RFID will certainly be the next driver of improvement.

RFID has existed since World War II. For a long time, applications were limited to local uses due to a strict RF regulatory environment. Such "niche applications" included work-in-process tracking, fish and livestock identification, livestock feed station control, electronic garage door openers, high way vehicle identification, railcar and locomotive identification and tracking.

Lately, groundbreaking work in ultrahigh frequency (UHF) transponders and in encoding methods to minimize memory requirements, along with the reduction of tags costs, have made the technology more attractive. Finally, the adoption by the United Code Council and EAN International, the two main overseers of bar code standards, of the Electronic Product Code (EPC) as the standard to identify tags, has set up a common platform to implement a global system. All these innovations have made this technology accessible and easy to use for a broad range of applications, thus providing a wide variety of applications across different sectors. Reducing handling and labor costs, saving time, reducing errors and waste, and tracking goods automatically, are among the benefits of implementing an RFID system. According to a report published in 2005 by The Aberdeen Group, a supply chain research firm, sixty percent of the interviewed senior managers at nearly 250 companies from around the world, said that RFID has great potential for their companies. [60]

**The Wal-Mart's Mandate** In 2003, Wal-Mart asked its 100 top suppliers to start putting EPC tags on cartons and pallets shipped to three distribution centers in the Dallas/Ft. Worth area by January 2005. Wal-Mart's pilot program began in 2005 with 100-plus suppliers tagging pallets and cases destined for 500 stores and five distribution centers, with the goal of tracking inventory and cutting down out-of-stocks losses. The initiative included 100 top suppliers and an additional 30 volunteers. [56] By January 2007, Wal-Mart plans to add 500 more stores, and up to 500 more manufacturers, to its current system. At this time, Wal-Mart's RFID tagging system will be operating in 1,000 stores and will be supported by 600 suppliers. [112]

To allow suppliers to ease into the use of this new technology, Wal-Mart is not requiring them to label 100 percent of their SKUs. In the companies that have implemented RFID use, suppliers instead had to evaluate their product mix and business cases to determine the best clients for RFID. This resulted in some suppliers tagging approximately 2 percent of their SKUs and others tagging 100 percent. The average supplier is currently tagging 65 percent of their SKUs.

Nevertheless, the implementation of a global RFID system early in the maturing cycle of this technology is raising multiple technical issues.

**The Technology** The main components of an RFID system are tags, readers, and software. The tags are fixed to a product package—a box or a pallet. Then, the readers are placed at strategic locations to monitor the flow of goods. They can be fixed or transportable by human or vehicle. Finally, software programs are used to collect the data from the tags, correct the information, store it in databases and send it to the appropriate clients within the company, or to its suppliers and distributors.

**The Regulation** RFID, like other wireless technologies, is becoming standardized. In the beginning, systems were usually user or manufacturer specific. To allow companies, suppliers and third parties to share information and to use the same hardware and infrastructure, a set of standards had to be developed.

First, because RFID systems use the ISM, unlicensed bands, tags and readers must meet the FCC's regulations defined in the U.S. Code of Federal Regulations (CFR). Second, the International Organization of Standardization / International Electrotechnical Commission (IOS/IEC) in Geneva has defined many RFID standards: the 13.56-MHz tags are 14443 and 15691/15692/15693 standards and a UHF standard is designated 18000, while lower-frequency tags are defined by the 10536 standard. Finally, EPCGlobal regulates the electronic product code industry and sets standards. The Class 0 (read-only) and class 1 (one-time programmable) were used as the first-generation standards.

The new standard, the Gen 2 UHF tag and reader standards, has been developed by

over 60 worldwide companies to create and promote a comprehensive international standard. The Gen 2 standard, adopted in 2005 by Wal-Mart, specifies operation in the 868- to 956-MHz range with ASK backscatter modulation. It includes a 96-bit code with a 16-bit cyclic redundancy check (CRC). It can read at a range of up to 25 ft depending on the antenna and the environment.

**Tags & Readers** There are two types of tags: passive and active tags. Wal-Mart has mandated the use of passive tags. Whereas, active tags include power to run applications independently, passive tags do not. Instead, the reader's antenna emits radio energy that the passive tag's antenna receives and uses to power its chip. The information contained in its memory is exchanged, and the reader can then send the data to the IT system. RFID tags store a unique identifying number instead of a printed bar code, which is shared by several item of the same SKU. In Gen2 standard, the identifying number is the Electronic product code (EPC), a 96-bit code created by the Auto-ID Center. [80]

The makeup of a tag is fairly simple: the tag consists of a single chip with an EEPROM containing the ID number, and a radio transceiver or transponder. Readers do not need a line-of-sight (LOS) scan, and scanning can be automated and executed continuously, thus cutting costs and human reading errors. A single reader can read multiple tags at the same time. New tags also contain anti-collision solutions, to allow the simultaneous scan of multiple tags. Many available schemes can prevent such collisions. One solution consists of a time-division multiplexed arrangement, assigning each tag a time slot in which to transmit. Another solution consists of an access scheme, where a tag waits a randomized amount of time before transmitting. The reader, or interrogator, is a higher-power transceiver that uses a larger antenna to integrate the tags. In order to scan a passive tag, the reader and the tag must be relatively close. The typical range is several inches, but it depend on the frequency of operation as well as the antenna size. It can range from a few centimeters to twenty feet. Nevertheless, the UHF frequency of 915 MHz defined by the new Gen 2 standard provides a longer reading range than previously possible.

Finally, the cost of the poses a large barrier to implementation. Passive tag prices have dropped over the years from a few dollars each to around 10 cents if purchased in large quantities. Companies, such as P&G, ship more than 20 billion units annually. Paying \$0.05 per tags compared with the standard \$0.001 cost for bar code tagging translates into a large investment for the shipper. In spite of this, RFID experts are confident that the price of tags will continue to decrease, and companies will be able to leverage more value from the use of RFID tags than from bar codes, ultimately making the investment profitable. “To get to the sub-nickel level, it’s going to have to be completely printed—printed antenna, printed chip, with a printed label—all done on one piece of equipment in one pass. That will come some day in the future, probably 10 years down the road. At that point, we’ll see Wrigley’s chewing gum using RFID,” said Bob Zaccone, vice president of Graphic Solutions International in Burr Ridge, IL.

Currently, Wal-Mart is experimenting with UHF Gen 2 passive tags for its cases and pallets. The RFID labels vary in size—generally from 2x4 inches to 4x6 inches. The recent tests executed by the company have shown that UHF Gen 2 tags can be read in water and on metal, removing two important reasons for using HF tags over UHF tags.

**The Infrastructure** By implementing an RFID system along its supply chain, a company has to manage a tremendous amount of data, generated by RFID readers. The companies thus need to create a new network strategy to support the volume of RFID data in their existing systems. For instance, Wal-Mart could potentially generate as much as 7.7 million terabytes of data a day if it scanned every tagged item in all of its U.S. retail stores. [60]

To handle this excessive flood of data from RFID readers, companies need to ensure that they have enough bandwidth. Bob Delaney, director of industry solutions for Sun Microsystems, says that at the pallet and case level, RFID tracking is projected to cause data traffic to increase up to tenfold. For industries that do not want to track item at the item level, it appears that gigabit Ethernet networks will be suitable.

Ultimately, the implementation of optical fiber 10-Gbit Ethernet systems will be the panacea to RFID system tracking of individual items.

**Data Integration** Finally, after having tagged the products, scanned the tags and transferred the data using the appropriate network, the company must leverage the information via efficient middleware. Recently released software allows companies to sort out and use the data collected through their RFID system, with existing application software packages from companies like Oracle and SAE. According to Steve Brown, executive vice president of Marketing and Business Development at Acsis, a middleware publisher, middleware makes an RFID system function on a real-time basis by allowing critical tracking data to be available almost immediately. [52] Such software collects, stores, filters, aggregates, and normalizes the data. Consequently, the clean data is transferred to the company's logistics software, where data is analyzed and used to make decisions.

**The Results** Wal-Mart's intends for RFID to improve productivity, reduce checking time and freight handling, thus making its in-store employees more available for customer service and floor re-stocking.

In November 2005, the University of Arkansas published the first study tracking improvements in Wal-Mart's supply chain after the implementation of RFID strategy. The study was conducted over 29 weeks, comparing 12 stores using RFID tags and 12 stores that were not. A crew scanned all of the out-of-stocks every day over the 29-week period. From this study, it appears that Wal-Mart has experienced a 16 percent reduction in shelf out-of-stocks in stores using the RFID technology as compared to the baseline stores. Indeed, the current focus for improvements due to the implementation of RFID technology is on improving operations occurring in-stores between the aisle and the backroom. The revolution is that when an item is removed from the shelf and sold, the company automatically generates a "pick-list". Thus, the company is able to know if a worker has actually picked up the item to restock it. According to the study, tagged items are restocked three times faster than non-

tagged items, and the result is a reduction in out-of-stock by 16percent. Even if the study does not reveal the level of increase in sales due to tagged items being properly re-stocked, the company has admitted that the result is most certainly positive.

The company is now sourcing generation two tags for about \$0.10 in quantities of 50,000 or more. In 2005, the company received tagged products from 130 suppliers, representing over 280,000 tag pallets compared with only 450 a year ago. The company has received over 5.2 million cases that were tagged in their stores and DCs, realizing more than 48 million EPC reads. [23]

In the next step, Wal-Mart will also benefit from improvements in their suppliers' implementing RFID. [38] Wal-Mart's suppliers can also expect several benefits from RFID, such as higher visibility of end-to-end supply chain, better control of stocks and deliveries, and better protection against theft and counterfeiting.

Retailers have tried to reduce out-of-stock situations by keeping inventory at various stages of the supply chain. However, having the right amount of inventory only occurs when it is located at the right place at the right time. The ultimate goal of RFID is to allow manufacturers and retailers to align product fabrication and distribution with real-time shelf-specific demand, thus reducing safety stock inventory, inventory relocation, inventory obsolescence, material handling costs, and stock-outs.

**The Next Challenges** The next challenge will be to convince suppliers that RFID is not creating benefits only for their distributors, but that it can tremendously improve their operations as well. It is not surprising to see some Wal-Mart suppliers only adding an RFID label when the product is ready to ship. For these companies, the use of RFID only adds an additional cost without generating any benefits. According to Stephen Schwartz, RFID systems architect for Intermec, "Most suppliers don't have the IT systems ready to accept (or take advantage of) the serialization issue. Think back to the costs associated with Y2K. This has far greater impact if the supplier wants to go beyond a 'slap-and-ship' scenario and actually use the serialization data for production tracking, recall issues, inventory control, etc. If you create billions of items each year, where will the serial numbers come from?" [97]

According to Kara Romanow, research director for AMR Research, Wal-Mart's suppliers spent an average of between \$1 million and \$3 million each to implement RFID. "The \$1 to \$3 million is pretty much for whatever they needed to comply, but at the bare minimum. It did include all the hardware and software, as well as the tags and readers, but they only did it for a few products and only in one limited geography in most cases," Ms. Romanow said. [57] To generate value from the implementation of RFID, companies must invest in the infrastructure—tags, readers, the middleware, and the integration to ERP systems. Further, they must decide how to use the data now available through the RFID system. In order to generate payback, companies must move from a compliance model to an efficiency model, where data newly collected is integrated into the decision-making process of the company.

By pushing its suppliers to adopt RFID technology, Wal-Mart has allowed the emergence of best practices to adopt RFID. First, companies should start with limited trials to define the best hardware for their environment. Second, trials of increasing complexity and scale will determine if the selected system is suitable. Third, the company must adapt its processes with the RFID technology in order to make its implementation smoother. Finally, the company must learn to take advantage of the data in order to improve its management and the performance of its supply chain. According to the results obtained from Wal-Mart's main suppliers, it appears that implementing RFID has been a two- to three-year learning curve from initial plans to advanced pilots. The creation of international standards and the experience gained by RFID tag and reader manufacturers, software developers and IT consulting firms, will reduce the implementation time and cost in the future. Although many challenges still exist, RFID is a promising direction not only for Wal-Mart, but also for the vast majority of retailers.

## **7.5 The Future of the Wal-Mart World**

Wal-Mart is following its plans of perpetual improvement in its supply chain by reducing its operating costs, expanding its operations and developing a state of the

art IT system. Researchers at the McKinsey Global Institute estimate that 4 percent of the growth in the U.S. economy's productivity from 1995 to 1999 was due to Wal-Mart alone. Thus, Wal-Mart is not only increasing its productivity, but it also forcing its competitors and its suppliers to become more efficient in order to keep up.

In the context of free-market economy, Wal-Mart's quest for low prices will result in the decline of domestic manufacturing for a large range of products, thus reducing U.S. manufacturing employment. Wal-Mart essentially sells commodities and low fashion products. For such products, "U.S. consumers aren't willing to pay even a little extra for a 'Made in America' label" said H. Lee Scott Jr., Wal-Mart Chief Executive. Thus, it appears that customers are the main winners. A study by Global Insight estimated that Wal-Mart's direct and indirect effects on the rest of the retail industry led to a 3.1-percent decline in overall consumer prices between 1985 and 2004, resulting in an economy of \$2,329 per household. [21] The Global Insight study emphasized that Wal-Mart's efficient use of capital and labor in its distribution and inventory system is, by far, the aspect of Wal-Mart's business that has contributed to the decline in consumer prices. As expected, the study also noted that Wal-Mart was more capital-intensive than its competitors. The growth of the company generates jobs directly visible to customers as well as logistics and IT positions in the backrooms, DCs, and warehouses everywhere in the U.S. While some jobs in the supply sector are lost, due to improvement in their productivity or offshoring, other jobs are simultaneously created through the product distribution process in the U.S. For the opening of its new store in Evergreen Park, Wal-Mart received 25,000 applications for 325 openings. [109] Earlier this year, the company received 11,000 applications for about the same number of positions for its new store in Oakland, California. On average a full-time non-management position is paid \$10.99 an hour. It would not be surprising that some of its applicants were manufacturing workers laid off from Wal-Mart's suppliers.



# Chapter 8

## Conclusions

As written recently in *The Economist*, there is no significant difference between jobs lost because of new technologies or work processes and those lost because of trade: all of those job losses are a painful but necessary part of a larger process of innovation and productivity increases that is a source of new wealth and rising living standards. Although offshoring does eliminate jobs, it also yields important benefits, decreasing costs. The process of competition ultimately passes the resulting cost savings on to consumers, which then spurs demand for other goods and services. We could predict a positive impact translate into economic growth. This statement is compatible with the Chairman of the Council of Economic Advisers', N. Gregory Mankiw, recent declarations that offshoring is "the latest manifestation of the gains from trade."

However, as underlined by Alan Greenspan, "there is always likely to be anxiety about the jobs of the future, because in the long-run most of them will involve producing goods and services that have not yet been invented."

For the service industry, the key factor is no longer whether a job requires high skill or high capital investment, but whether a job can be "routinized", or broken down into repeatable steps that vary little from day to day. A recent study from a research group at UC Berkeley, lists the common attributes of jobs outsourced: no face-to-face customer servicing requirement, high information content, work process is telecommutable and internet enabled, a high wage differential with a similar occupation in the destination country, low setup barriers, and low social network requirements. [34]

Examples of these business functions include software programming and design, call center operations, accounting and payroll operations, medical records transcription, paralegal services, and software research and testing. As compared with protected jobs that require face-to-face contact, flexibility, creativity and lifelong learning, outsourced jobs are easy to replace with a clever piece of software, or to hand over to low-paid workers outside the U.S. [45] For manufacturing jobs, the analysis detailed in Chapter 5, demonstrates that the key dimension in determining whether a job will likely remain in the U.S, is no longer the level of technology required to manufacture the product, but rather its sensibility to distance—the so called distance pressure. If American companies cease competition for low prices per quality or technology content, to criteria that require a shorter supply chain, than manufacturing in the U.S. is advisable. Furthermore, when looking at the tremendous growth in China, and the aspiration of the Chinese government to be both the manufacturing subcontractor for American and European companies, as well as a science and technology leader of its own right, it is apparent that it is becoming vital for the U.S. to maintain manufacturing expertise onshore, in order to ensure future independence, vis--vis, from China.

Moreover, manufacturing is also an important step in the innovation process, and not performing this activity onshore can lead to a decreased linkage of information and feedback from manufacturing, which would become a handicap for long-term development.

The competition with China will be one of the next major challenges for American companies, who are quickly losing their technologic edge. Chinese companies are investing heavily on R&D, and are focused on acquiring IP to speed up their development process. This can be seen most pointedly in the invitations by the Chinese government to foreign automobile manufacturers to join with Chinese manufacturers in order to have access to China. In this way, the Chinese government has encouraged the formation of the Chinese automobile industry in just a few years. However, the expansion of the Chinese economy is not necessarily all bad news for the U.S., as long as American companies are able to capture some of the market share in China

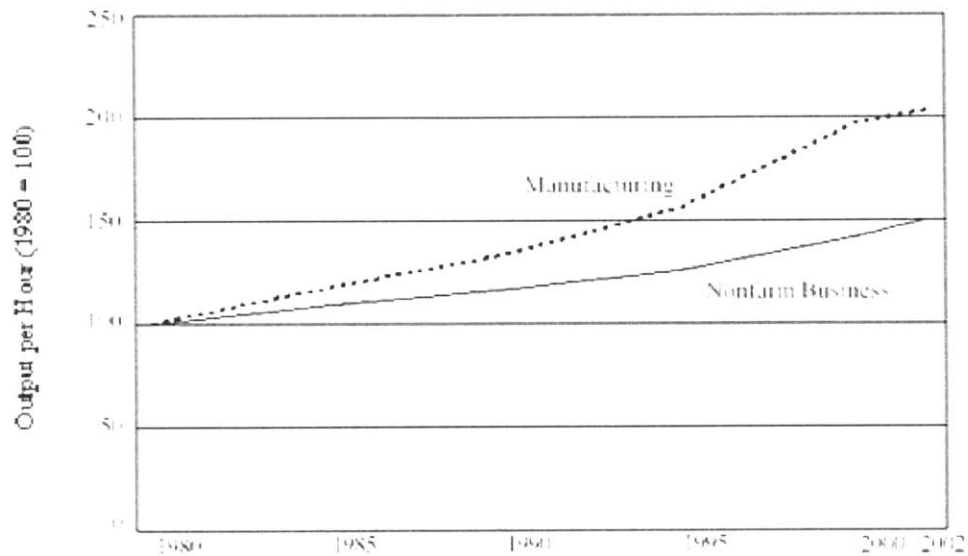
through clever investment in Chinese companies with high potential.

Finally, China's infrastructure will begin to look more like the U.S. as people ask for a higher quality of life, better health care protection, better working conditions and, at some point, better jobs. Thus, production costs in China will move to approximate American costs. Eventually, American companies will have to adapt their supply chain to integrate these changes. In conclusion, to remain competitive, American companies must develop flexibility within their supply chains such that they will be able to change the location of the manufacturing and Research Centers without impacting their entire supply chain. This must be done by developing systems to evaluate new risks of locating steps of their supply chain in multiple countries, and reducing their exposure to disruption.



# Appendix A

## Appendix from Chapter 2



Source: Statistical Abstract of the United States, 2003

Figure A-1: U.S. Productivity Growth



# Appendix B

## Appendices from Chapter 4

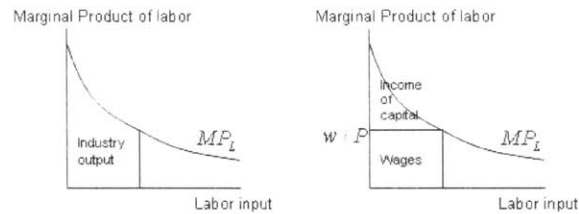
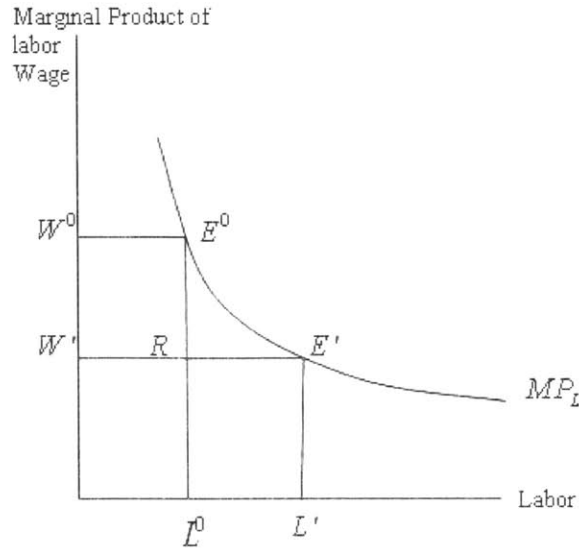


Figure B-1: Specific Factors Model: the Marginal Product Curve and the Distribution of Income



Source: Bhagwati, Jagdish, Arvind Panagariya and T.N. Srinivasan (2004)

Figure B-2: Model 1: Gains from Outsourcing in a one-good Model

The  $MP_L$  curve represents the marginal product of labor, given the fixed endowment of capital in the economy. The marginal product of labor is the addition to output generated by adding one more person-hour.

Before sourcing abroad, the area  $OW^0E^0L^0$  is the wage bill. The return to capital is the area under the  $MP_L$  curve and above  $W^0E^0$ . After innovation, the country buys the services abroad at the fixed wage  $W'$ . The country pays the rectangle  $E'L'L^0R$  for labor sourced abroad. Domestic labor receives  $OL^0RW'$  and capital the area under the  $MP_L$  curve and above  $W'E'$ . The triangular area  $E^0RE'$  is the net gain from outsourcing. The rectangle  $W^0E^0RW'$  is the income of labor redistributed to capital. Thus capital gains  $W^0E^0E'W'$  when workers lose  $W^0E^0RW'$ .

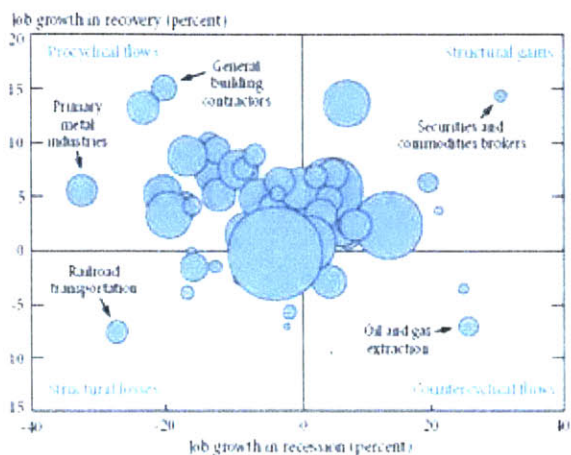




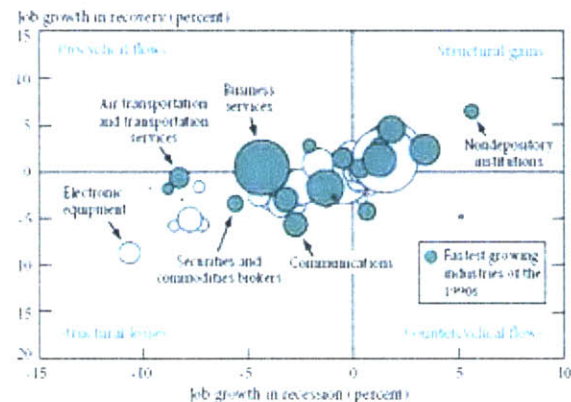
# Appendix C

## Appendices from Chapter 5

Job Adjustments by Industries during the Recession and Recovery of the Early 1980s



Job Adjustments by Industries during the 2001 Recession and subsequent Recovery



Note: To determine whether the job adjustment during recession is structural or cyclical authors have compared the direction of job flows during the recession and the following recovery. If an industry gains jobs during recovery and loses jobs during recession (or the opposite), the job adjustments is considered as cyclical. If, instead, job outflows of industry remain the same during recession and recovery, the job adjustment is classified as structural. Tables above represent data for all SIC-industry for early 1980s recession and 2001 recession. Whereas to recession in early 1980s where most US industries have come across cyclical job adjustment, during the 2001 recession, job adjustment has been structural for most of US industries.

Source: Erica L. Groshen, Simon Potter: "Has structural change contributed to a jobless recovery?" Volume 9, Number 8, Current issues in economics and finance, Federal Reserve Bank of New York, August 2003

Figure C-1: Recessions and Employment Changes

Table C.1: List of Low Cost Countries

Bangladesh	Ethiopia	Mongolia	Swaziland
Benin	Gambia	Morocco	Syrian Arab Republic
Bhutan	Georgia	Mozambique	Tajikistan
Bolivia	Ghana	Burma (Myanmar)	Tanzania; United Republic of
Burkina Faso	Guatemala	Nepal	Togo
Burundi	Guinea	Nicaragua	Uganda
Cambodia	Guinea Bissau	Niger	Ukraine
Cameroon	Guyana	Nigeria	Uzbekistan
Central African Republic	Haiti	Pakistan	Vanuatu
Chad	Honduras	Papua New Guinea	Vietnam
China	India	Paraguay	Yemen
Comoros	Indonesia	Philippines	Zambia
Democratic Republic of Congo	Jordan	Rwanda	Zimbabwe
Congo	Kyrgyzstan	Samoa	
Cote d'Ivoire	Lao People's Democratic Republic	Sao Tome and Principe	
Djibouti	Madagascar	Senegal	
Dominican Republic	Malawi	Sierra Leone	
Egypt	Mali	Solomon Islands	
El Salvador	Mauritania	Sri Lanka	
Eritrea	Moldova; Republic of	Sudan	

Note: Low Cost Country (LCC) GDP2004 Per Capita = 0.05\*US GDP2004 Per Capita / GDP: Current US \$ Per Capita

Table C.2: Imports Origin

Industry		1989				2004			
Name	NAICS	S1	S2	S3	S4	S1	S2	S3	S4
Food manufacturing	311	0.023	0.124	0.433	0.420	0.018	0.098	0.524	0.360
Beverages and tobacco products	312	0.011	0.399	0.490	0.100	0.004	0.386	0.380	0.230
Textile mills	313	0.160	0.120	0.400	0.320	0.060	0.100	0.400	0.440
Textile product mills	314	0.058	0.092	0.250	0.600	0.012	0.038	0.130	0.820
Apparel	315	0.010	0.010	0.430	0.550	0.005	0.065	0.110	0.820
Leather and allied products	316	0.005	0.025	0.430	0.540	0.002	0.028	0.110	0.860
Wood products	321	0.003	0.020	0.707	0.270	0.001	0.064	0.655	0.280
Paper and paper products	322	0.020	0.107	0.753	0.120	0.040	0.137	0.653	0.170
Printing and related support activities	323	0.130	0.120	0.630	0.120	0.020	0.140	0.450	0.390
Petroleum and coal products	324	0.005	0.085	0.350	0.560	0.005	0.115	0.460	0.420
Chemicals	325	0.180	0.300	0.410	0.110	0.100	0.450	0.310	0.140
Plastics and rubber products	326	0.220	0.130	0.390	0.260	0.110	0.100	0.390	0.400
Nonmetallic mineral products	327	0.140	0.150	0.410	0.300	0.130	0.340	0.250	0.280
Primary metals	331	0.130	0.170	0.450	0.250	0.030	0.100	0.360	0.510
Fabricated metal products	332	0.190	0.180	0.350	0.280	0.150	0.260	0.490	
Machinery	333	0.390	0.240	0.270	0.100	0.250	0.230	0.250	0.270
Computer and electronic products	334	0.380	0.070	0.300	0.250	0.120	0.120	0.150	0.610
Electrical equipment and appliances	335	0.230	0.120	0.270	0.380	0.080	0.120	0.160	0.640
Transportation equipment	336	0.360	0.150	0.410	0.080	0.210	0.170	0.400	0.220
Furniture and related products	337	0.008	0.102	0.350	0.540	0.002	0.038	0.250	0.710
Miscellaneous manufacturing	339	0.170	0.110	0.330	0.390	0.050	0.160	0.190	0.600
Manufacturing Sector	31-33	0.240	0.130	0.390	0.240	0.110	0.170	0.280	0.440

Note: Relative Imports Partners GDP Per Capita=Partners GDP Per Capita / US GDP Per Capita

$$S_k^{2004} = \sum_{j \in E_k} Imports_j^{2004} / \sum Imports_{AllCountries}^{2004} \text{ with } k \in [1; 4]$$

$E_1$  represents countries with GDP Per capita > 1.4 \* US GDP Per Capita

$E_2$  represents countries with GDP Per capita < 1.4 \* US GDP Per Capita and > 0.8 \* US GDP Per Capita

$E_3$  represents countries with GDP Per capita < 0.8 \* US GDP Per Capita and > 0.2 \* US GDP Per Capita

$E_4$  represents countries with GDP Per capita < 0.2 \* US GDP Per Capita

Source: Data Compiled by Author / BLS / the Office of Trade and Industry Information (OTII) U.S. Department of Commerce

Table C.3: Imports Origin

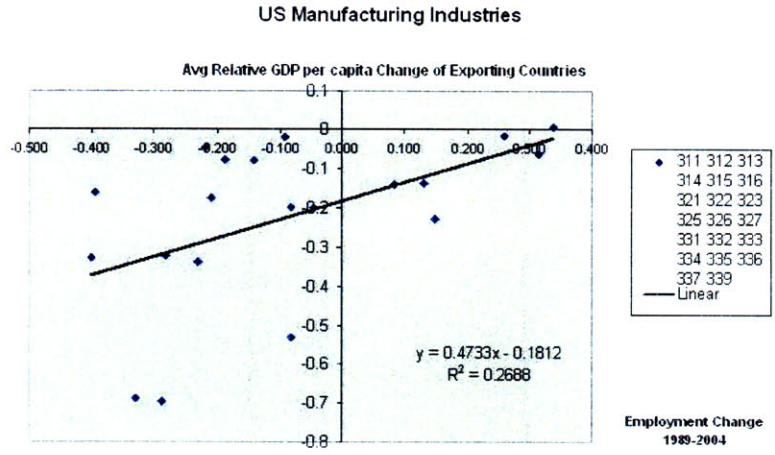
Industry Name	Per Capita (1995 \$US) NAICS	Avg. GDP		Avg. GDP Percent Change 1989-2004	Relative Avg. GDP Per Capita		Employment Percent Change 1989-2004
		1989	Per Capita (1995 \$US) 2004		1989	2004	
Food manufacturing	311	12 521	16 755	0.34	0.48	0.52	0.007
Beverages and tobacco products	312	19 894	21 549	0.08	0.76	0.66	-0.140
Textile mills	313	16 370	15 035	-0.08	0.63	0.46	-0.530
Textile product mills	314	9 018	5 453	-0.40	0.34	0.17	-0.160
Apparel	315	7 677	5 479	-0.29	0.29	0.17	-0.697
Leather and allied products	316	6 717	4 505	-0.33	0.26	0.14	-0.686
Wood products	321	14 583	18 375	0.26	0.56	0.57	-0.017
Paper and paper products	322	19 200	22 032	0.15	0.73	0.68	-0.228
Printing and related support activities	323	20 178	15 976	-0.21	0.77	0.49	-0.174
Petroleum and coal products	324	9 316	15 497	0.66	0.36	0.48	-0.260
Chemicals	325	23 071	26 080	0.13	0.88	0.80	-0.137
Plastics and rubber products	326	19 363	17 597	-0.09	0.74	0.54	-0.019
Nonmetallic mineral products	327	17 355	22 801	0.31	0.66	0.70	-0.062
Primary metals	331	18 843	14 502	-0.23	0.72	0.45	-0.338
Fabricated metal products	332	18 907	16 246	-0.14	0.72	0.50	-0.078
Machinery	333	27 391	25 162	-0.08	1.05	0.77	-0.197
Computer and electronic products	334	22 462	13 448	-0.40	0.86	0.41	-0.329
Electrical equipment and appliances	335	17 573	12 632	-0.28	0.67	0.39	-0.321
Transportation equipment	336	26 233	25 050	-0.05	1.00	0.77	-0.199
Furniture and related products	337	10 228	8 318	-0.19	0.39	0.26	-0.078
Miscellaneous manufacturing	339	15 283	11 939	-0.22	0.58	0.37	-0.047
Total Man		20 282	17 546	-0.13	0.78	0.54	-0.255

Note: the Avg. GDP per capita measures correspond to the GDP per capita of a virtual country which would represent the unique exporter to the US for each industry

US GDP per capita in 1989 (1995 \$US) = 26,053

US GDP per capita in 2004 (1995 \$US) = 33,736

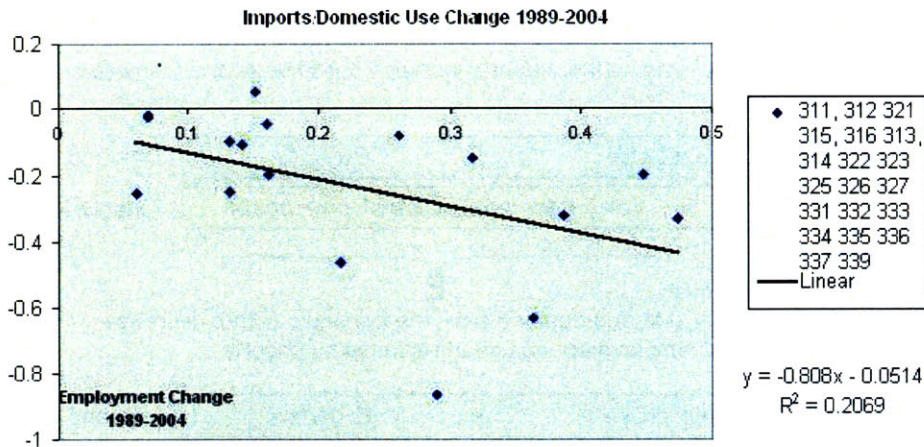
Source: The Office of Trade and Industry Information (OTII), Manufacturing and Services, International Trade Administration, U.S. Department of Commerce



Note: Petroleum and coal products sector has been ignored due to the unusual characteristics of this industry  
 Source: The Office of Trade and Industry Information (OTII), Manufacturing and Services, International Trade Administration, U.S. Department of Commerce

Figure C-2: Employment Change and Exporting Countries GDP per capita Change

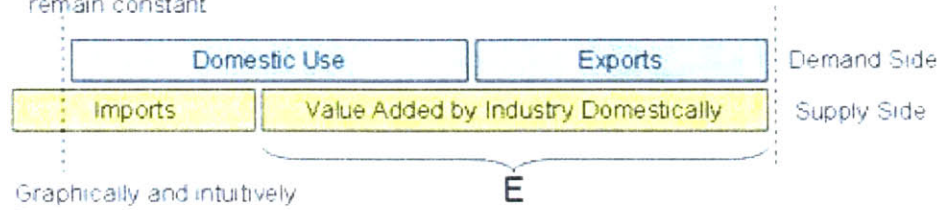
### US Manufacturing Industries



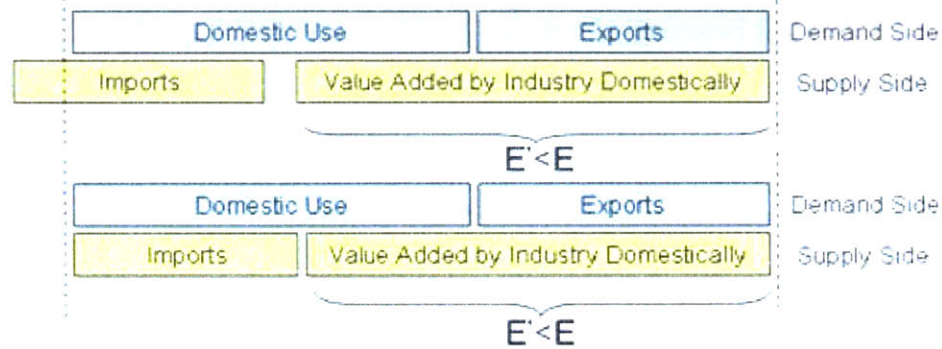
Note: Petroleum and coal products sector has been ignored due to the unusual characteristics of this industry  
 Source: The Office of Trade and Industry Information (OTII), Manufacturing and Services, International Trade Administration, U.S. Department of Commerce

Figure C-3: US Manufacturing Industries

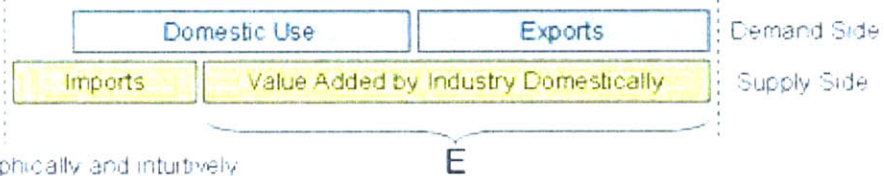
**Example 1:** We imagine that Imports increase but Exports and Domestic Use remain constant



Graphically and intuitively  
To balance the supply side and demand side, the domestic output decrease  
In this case, domestic employment has been replaced by imports



**Example 2:** We imagine that Domestic Use decrease but Exports and Imports remain constant



Graphically and intuitively  
To balance the supply side and demand side, the domestic output decrease  
In this case, domestic use decline has destroyed domestic jobs

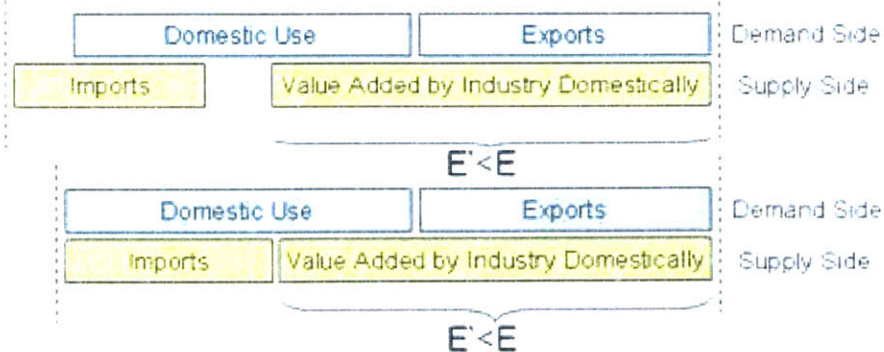
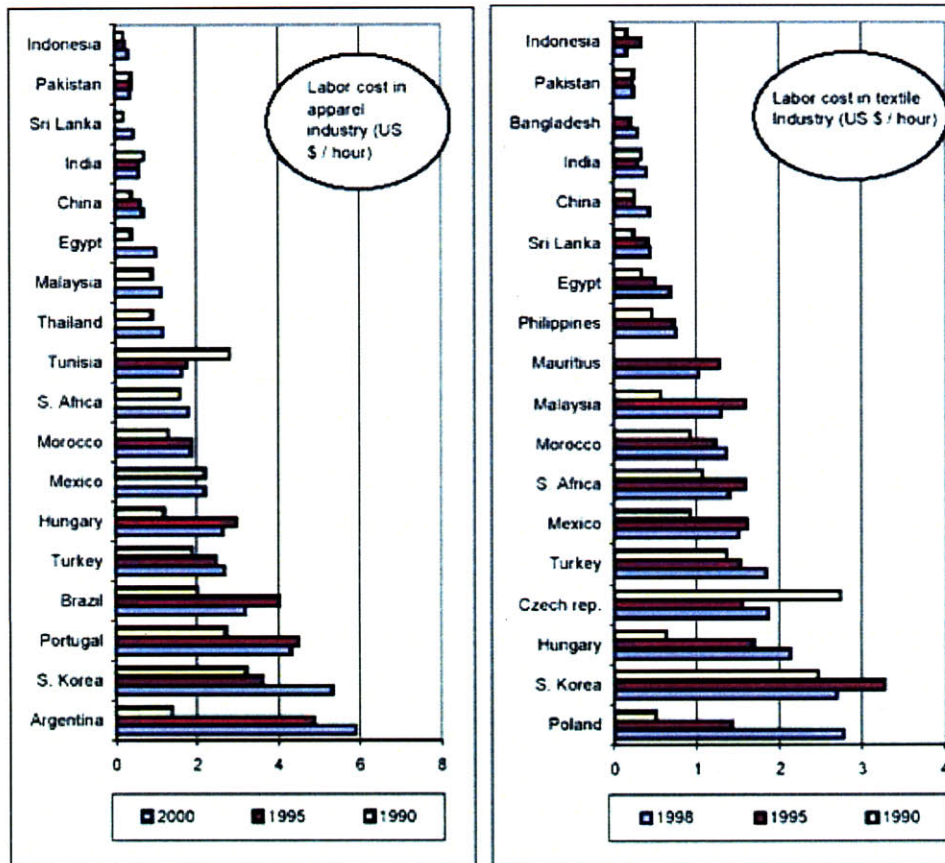


Figure C-4: Demand and Supply



Source: World Bank

Figure C-5: International Labor Cost Comparison in the Apparel and Textile Industries

Table C.4: Apparel U.S. Wages

Industry Segment	Weekly	Hourly
Total, private industry	\$506	\$14.95
Apparel Manufacturing	334	9.10
Apparel knitting mills	382	10.08
Accessories and other apparel	348	9.41
Cut and sew apparel	324	8.89

Source: BLS / <http://www.bls.gov/oco/cg/pdf/cgs007.pdf>

# Appendix D

## Appendices from Chapter 6

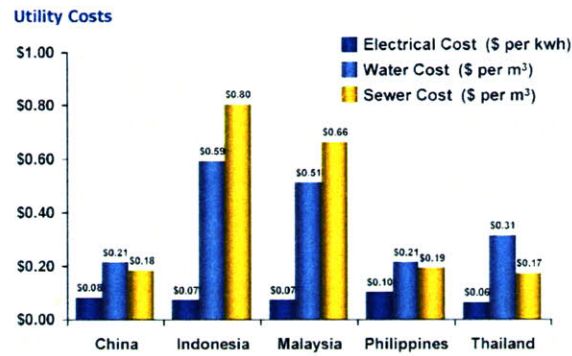


Figure D-1: Recessions and Employment Changes

Table D.1: China's total exports and imports by groups of commodities

	1978	1980	1985	1990	1993
Exports					
Agriculture-intensive	36.1	26.3	21.7	12.5	9.2
Capital-intensive	15.2	15.6	12.8	26.7	28.8
Labour-intensive	31.1	30.2	35.4	50.9	56.8
Textile and Clothing	19.8	20.8	27.0	37.8	40.0
Mineral-intensive	17.0	27.3	28.8	9.4	4.7
Imports					
Agriculture-intensive	29.0	33.8	10.8	16.3	10.7
Capital-intensive	59.0	52.8	73.3	60.5	72.1
Labour-intensive	4.2	8.1	9.7	16.0	12.7
Textile and Clothing	1.7	4.3	5.2	9.3	9.5
Mineral-intensive	7.0	4.2	5.1	5.1	6.5

Note: Textile and Clothing are part of labour-intensive products

Source: UN trade data, International Economic Databank, the Australian National University

**Output of Selected Manufactured Goods, Index,  
1998=100, 1995, 1998 and 2001**

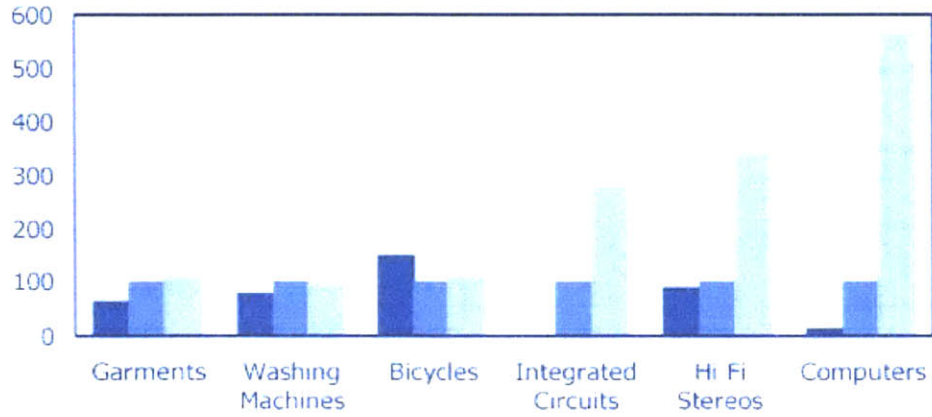


Figure D-2: Output of Chinese Selected Manufacturing Goods

## Imports From China / Top 20 Commodities

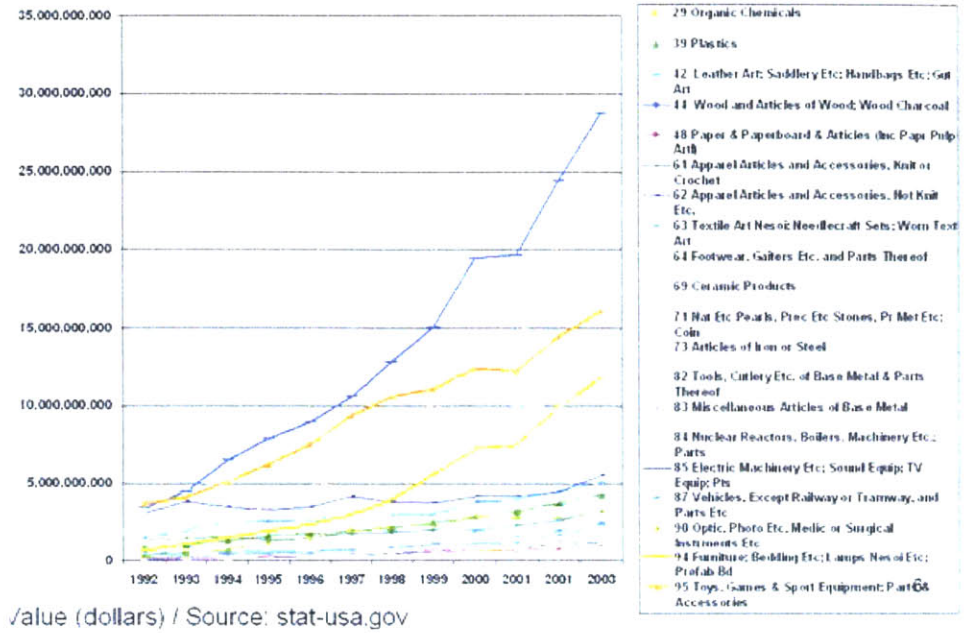


Figure D-3: U.S. Imports from China

Table D.2: Export Value by Major Categories: January - May 2004

Commodity	Jan-May	This Time Last Year	Increase in Percent
Machinery and electronic products	11,358,529	7,875,945	44.2
High-tech products	5,726,162	3,569,457	60.4
Automatic data processing	2,089,148	1,265,147	65.1
Equipment and components			
Accessories of garment and dress	2,079,864	1,720,899	20.9
Yarn, fabric and products	1,262,955	1,018,511	24
Spare parts for automatic data processing equipment	856,056	626,900	36.6
Footwear	568,742	492,873	15.4
Wireless telephone, handset or vehicle mounted	490,218	240,587	103.8
Furniture and parts	404,384	287,895	40.5
Integrated circuit and micro-electronics components	402,138	220,557	82.3
Components of TV, radio and telecommunication equipment	393,689	262,522	50
Plastic Products	350,478	286,698	22.2
Video tape recorder and reproducer	267,067	178,230	49.8
Travel goods and bags	237,611	201,125	18.1
Toys	196,148	191,033	2.7
TV sets (incl. CKD)	178,308	98,713	80.6
Steels	192,350	120,920	59.1
Sound Recorder, Player, Receiver	163,686	130,203	25.7
Auto Parts	147,939	90,256	63.9
Static Converter	145,087	101,143	43.4
Lamps and Lanterns, illuminating equipments and similar products	147,331	123,030	19.8
Aquatic Products	138,725	112,013	23.8

Note: Unit: US\$10,000

Source: Chinese Ministry of Commerce <http://english.mofcom.gov.cn/article/200406/200406002358571.xml>



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