

行政院國家科學委員會專題研究計畫 成果報告

跨國製造業廠商供應鏈規劃模型與策略之研究—以台灣資  
訊電子業為例

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## 中文摘要

隨著經濟自由化、顧客消費習慣改變、以及產品生命週期愈漸縮短等因素，許多製造業廠商在降低成本、提昇服務水準的考慮下，紛紛調整其原有的供應鏈作業，以期維持企業的競爭力，並獲得經營的最大利潤。本研究之目的即希望藉由對廠商供應鏈調整模式的分析，探討供應鏈的變化趨勢及其對不同型態貨物運輸服務可能造成的衝擊。

首先，本研究選擇台灣地區的資訊電子（跨國）公司進行問卷調查及面訪，深入瞭解跨國公司供應鏈的變化情形、國際分工的原因、及其製造與物流作業調整的作法。根據問卷調查及實際訪談所得資料的分析發現（1）我國資訊電子公司專業化垂直分工及國際分工的情形相當明顯；（2）資訊電子公司供應鏈的調整作法，隨著產品生命週期的不同階段而有所不同；（3）對於貨物運輸服務的需求而言，跨國公司在供應鏈的調整過程中，對速度的要求愈來愈高，換言之，對於空運服務的需求有增加的趨勢，而對海運服務的需求則趨於減少；（4）當跨國公司決定前往海外投資後，設廠地點國際運輸服務的可獲得性，是一項重要的選址考慮因素。

由於跨國公司供應鏈的變化係一漸進式的調整過程，因此，本研究針對跨國公司不同的營運情境，分別構建了多個供應鏈調整模型，供跨國公司進行供應鏈調整時參考。同時，藉由簡例測試驗證了本研究所構建之模型的確具備了正確性與可行性。供應鏈調整模型不但可供跨國公司進行不同規模的供應鏈調整作業，也可分析在不同情境下，跨國公司對於不同型態運輸服務的選擇決策。

本研究發現跨國公司供應鏈的長期調整策略可在空間上採「分散」方式進行調整，而短期策略可在時間上採「推遲」方式進行調整。空間上的調整將影響貨運需求的起點，而時間上的調整則會影響跨國公司對運輸服務的選擇。市場需求波動所引起的問題無關供應鏈作業與活動的調整，建議以引進 IT 技術，增加供應鏈資訊透明度的方式加以克服。有關跨國公司國際分工對運輸產業的影響，本研究亦有討論。此外，本研究並就供應鏈調整對製造業跨國公司、運輸與物流業者、以及政府部門產生之連帶影響，提出因應策略與建議。

**關鍵詞：**跨國公司、供應鏈、物流、運輸服務型態、資訊電子業

## Abstract

Owing to the globalization of industry, the explosion in customer services and product life-cycle compression, most manufacturers have been adjusting the processes and activities of their supply chains to remain competitive and optimize total profit. The aim of this study was to explore the issues surrounding the changes in manufacturing supply chains and the consequential impact on the service pattern of freight transportation.

A questionnaire to survey multinational corporations (MNCs) in Taiwanese information technology (IT) industry was designed and conducted to recognize in detail the changes in supply chains of manufacturers, the trends and causes of the international division of labour, and the susceptible adjustment of manufacturing and logistics strategies. Surveys and interviews led to the conclusions that (1) vertical integration and international division of labour are very conspicuous among Taiwanese IT firms, (2) there are different strategies of supply chain adjustment at various stages of the product life-cycle, (3) with the transformation of the supply chain, manufacturers require swifter transportation services, that is, the demand for air

transportation may increase and the demand for sea transportation may decrease, and (4) once the firms decide on foreign investment, the availability of international freight transportation services becomes one of the major evaluation criterion for factory offshore relocation.

Since the changing of MNCs' supply chain is a step-by-step developing process, this study has proposed some supply chain adjustment models based on various business operation scenarios of MNCs. Those models can be adopted by MNCs to deal with activities and processes arrangement.

A small global supply chain consisting of three vendors, five manufacturing factories, three warehouse centers and three marketplaces was chosen to verify the accuracy and usability of the model. The proposed models could not only adjust the supply chain activities and processes of MNCs, but also analyze the MNCs' choices of transportation service pattern in various scenarios.

In general, this study discovered that the concept of both centralization/diversification in "space" and postponement/speculation in "time" do exist in the supply chain adjustments of the MNCs. MNCs could use the space "diversification" strategy as their long-term supply chain adjustment method and use the time "postponement" strategy as their short-term supply chain adjustment method.

Applying advanced IT technologies to heighten the information transparency of supply chain operation process will improve the demand fluctuation problem. Furthermore, the impacts on freight transportation service pattern caused by MNCs international collaboration as well as the recommendations for the transportation carriers and government are also discoursed in this study.

**Keywords:** multinational corporation; supply chain; logistics; transportation service pattern; information technology (IT) industry.

### 一、緣由與目的

近年來，由於全球經濟環境變化快速，廠商面對的競爭愈來愈激烈，許多廠商都希望藉由適切地調整供應鏈的流程與作業，以強化廠商的競爭力。另一方面，在全球化與自由化的環境下，廠商基於各地要素稟賦 (factor endowment) 的不同而前往海外不同地區設廠生產的情形日漸普遍。在上述主客觀環境的改變下，不但個體廠商運輸需求的起迄點 (O-D) 以及對運具的選擇將改變，整體而言，也可能進一步影響國際間貨物運輸的流向。

由於運輸需求是一種引申需求，在廠商全球分工的過程中，供應鏈的調整究竟將對運輸需求造成何種影響？影響的程度如何？都是令人關切的。

在前述的問題背景與研究動機下，本研究之研究目的：(1) 選擇一具代表性之製造業 (以資訊電子公司為例) 深入分析，並歸納其供應鏈的規劃方式以及各種調整模式；(2) 研擬製造業跨國公司在不同營運環境下，可能面對的各種供應鏈調整情境，並針對各種情境構建供應鏈調整模型；(3) 納入時間因素對企業供應鏈管理與調整的影響，尋求整體供應鏈的最適調整策略；(4) 經由對跨國公司全球化營運環境下供應鏈作業調整方式的問卷調查分析以及本研究所構建的供應鏈調整模型，了解跨國公司對運輸服務型態的選擇及此一選擇對不同運輸服務的影響；(5) 經由數值分析及簡例測試結果，分析模型所隱含的政策意義，以描繪我國運輸相關產業發展的機會與挑戰，並供作運輸業者規劃不同型態的運輸服務以及政府部門進行政策規劃之參考。

## 二、研究內容、成果與討論

### (一) 研究內容

本研究的主要內容，分述如后。

#### 1. 資料蒐集分析與全球化發展之驗證

由於以往對於廠商供應鏈的研究，多囿於實際資料不足，而無法有較深入的討論，且近年來許多文獻均指出廠商的製造與物流活動已朝向全球化發展，因此，本研究首先進行一項產業與廠商供應鏈調查，以蒐集研究所需之各種資料，並以我國廠商的實際運作情形驗證全球化的發展現況。

#### 2. 製造業跨國公司產品供應鏈調整分析

由文獻回顧發現，以往大部分的供應鏈分析偏重在概念性架構的建立，本研究試圖針對跨國公司經營環境中實際面對的情境，分別建構供應鏈調整模型，並據以研析供應鏈調整策略。主要的內容包括：(1) 製造業跨國公司產品供應鏈的組成與作業特性分析；(2) 產業及廠商供應鏈調查；(3) 面對經濟環境的變遷，跨國公司調整供應鏈的概念與作法；(4) 跨國公司供應鏈調整情境分析；(5) 建構跨國公司供應鏈調整模型。

#### 3. 簡例測試

為驗證建構的供應鏈調整模型之有效性與合理性，本研究以一跨國公司為例，進行調整模型的測試，並同時考量供應鏈的成本與時間最小化的問題。

#### 4. 跨國公司供應鏈調整策略及其對不同型態運輸服務之需求

由於供應鏈是否能夠順利運作的關鍵有賴於及時、適量的運輸服務相配合，而跨國公司對不同型態運輸服務的需求也會因為其供應鏈的改變而受到連帶影響，因此，釐清兩者間的關係對於業者及公部門政策之擬定均有極大的意義。此一部份的研究內容包括：產品供應鏈流程與物流活動分析、導入創新科技輔助供應鏈運作的影響、跨國公司供應鏈調整策略、以及供應鏈調整對不同型態運輸服務需求的影響。

#### 5. 跨國公司供應鏈調整之政策意涵分析。

最後，本研究將研擬政府部門以及運輸業者在跨國公司供應鏈調整趨勢下，可採取的因應作法與建議。

### (二) 研究成果

#### 1. 經由調查資料分析，本研究發現我國資訊電子公司的生產活動具有以下幾項特性：

- (1) 廠商的確有國際分工的現象，亦即廠商對其供應鏈中的製造活動的確存在「空間」上的「分散」調整。
- (2) 廠商供應鏈的調整作法會由於產品在生命週期的不同階段而有所差異。
- (3) 廠商供應鏈活動在「空間」上的調整會改變其對運輸服務需求的起迄點，應屬必然。而若廠商採取「時間」上的「推遲」策略，則將改選擇速度較快的運輸服務。
- (4) 一旦廠商決定進行「空間」調整時，設廠地點的運輸服務供給條件會影響其設廠區位的選擇。
- (5) 本研究發現對資訊電子公司而言，運輸成本並不是調整供應鏈的重要考量因素，反而運輸服務的速度成為主要考慮因素。

#### 2. 廠商供應鏈在空間上的「分散」策略，可能減少進出我國的總體貨物運輸需

- 求量，而在時間上的「推遲」策略，則將增加對快速運輸服務型態的需求。
3. 本研究針對跨國公司供應鏈的不同調整情境，分別建構了七個供應鏈調整模型，供廠商依據營運的需求以及公司可用的資源，進行逐步地調整。
  4. 本研究發現廠商的供應鏈具有「週期循環」以及「推拉作用」等兩種特性，兩者俱為供應鏈週而復始運作的動力。惟「供給推力」與「需求拉力」若失去均衡而將形成存貨過剩或存貨不足的情形。
  5. 供應鏈作業具有「可分割性」及「時間調整彈性」的特性。廠商可利用可分割性，依據個別製程的需求而分別尋求最適的製造地點或製造工廠。亦可利用「時間調整彈性」調整「製造作業」與「物流作業」的執行，甚至於調整製程，以尋求規模經濟利益或提昇對顧客的服務水準。
  6. 對於供應鏈需求訊息失真而發生的「長鞭效應」，本研究發現廠商已利用導入新的資訊科技、促使供應鏈上下游供需資訊得以充分流通的方式進行改善。
  7. 本研究建議本國的運輸／物流業者應及早尋求因應對策，成為第三方或第四方物流供應商，或是提供更細緻周到的物流服務。而跨國公司，對不同型態運輸服務的要求愈趨專業，應減少同時從事生產者物流工作而委託專業物流業者處理。
  8. 以往政府部門之經建計畫多進行總體需求的預測，未來亦應釐清本國跨國公司外移以及外國跨國公司帶來的貨運需求，及其對不同型態運輸服務需求的影響。

### (三) 討論

除上述之研究成果外，整體而言，由於本研究係針對資訊電子公司進行調查蒐集資料，相關分析均以資訊電子業為主，後續研究若能針對其它產業進行類似的調查與分析，將有助於尋求一個更一般化的原則，供業者及政府規劃部門參考。其次，實務上，跨國公司調整供應鏈所考慮的因素超過本研究模型所考慮者，在研究資源的限制下，本研究分析結果有其侷限性。未來可嘗試納入更多的決策變數，並輔以決策支援系統或利用系統動態 (System Dynamics) 模擬軟體的應用，讓跨國公司實際進行供應鏈調整時，除了建構模型分析各項設施與產能的配置之外，更能一併考量供應鏈作業在資訊流以及金流方面的其他影響因素，以期獲得最佳的供應鏈調整策略。

此外，建議政府部門在從事公共建設投資規劃時，應從影響廠商實際需求行為的供應鏈基本運作模式分析做起，始能夠有效了解產業需求，推出最大效益的國家建設計畫。

### 三、計畫成果自評 (研究成果發表)

本研究與「跨國製造業廠商供應鏈改變對實體物流之影響—以我國資訊電子業為例 (NSC 89-2415-H-009-004-SSS)」，係連續性研究，研究內容與原計畫相符，已達成預期之目標，研究成果部份已發表或投稿於國內外相關學術期刊，臚列如后。

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