

Air Cargo, Liberalization, and Economic Development

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I. Introduction

Led by a convergence of aviation, globalization, digitization, and time-based competition, the worlds of commerce and supply chain management are rapidly changing. New economy products (typically small, light, compact, high value-to-weight parts, components and assembled products) are increasingly shipped internationally by air in a fast and flexible manner. In the new speed-driven, globally-networked economy, individual companies are no longer the effective competing units. Rather, competitive advantage resides in networks of globally-dispersed firms whose integrated supply chains move via air. The huge volume of high-value, time-critical products traversing international boundaries by air annually has resulted in air cargo accounting for approximately 40 percent of the value of today's world trade¹.

In order to gain competitive advantage through speedy global supply chain connectivity that air cargo provides, high-tech manufacturers and other time-critical industries are locating at sites around or accessible to major airports. Pronounced indirect development benefits accrue through employment multipliers as local suppliers are established serving these industries. This is driving substantial investment and employment growth in airport regions and their nations as a whole². Since jobs in time-critical

¹ See The Colography Group, *World Cargo Traffic Flow Model*, (2003).

² See K. Button, et al., "High-technology Employment and Hub Airports" (1999) 5 *Journal of Air Transport Management* 1, 53; J. Kasarda, "Logistics and the Rise of the Aerotropolis" (2000) 25 *Real Estate Issues* 4, 43; J. Kasarda, "From Airport City to Aerotropolis" (2001) 6 *Airport World* 4, 42; SRI International, "Global Impact of FedEx on the New Economy", (2001); and R. Hansman & R. Tam, "Air Transportation and Socioeconomic Connectivity in the United States Since Deregulation" online: <http://icat-server.mit.edu/Library/fullRecord.cgi?idDoc=198> (date accessed 30 June 2005)

industries tend to be higher paying than country averages, they raise the income levels of the population, as well.

Building upon a study commissioned by The International Air Cargo Association³ and additional statistical analyses published in the *Journal of Air Transport Management*⁴, this article explicates how air cargo drives economic development. We use both case studies and multi-country statistical models to document the lead role that air cargo plays in the growth of trade, foreign direct investment and GDP and how this role is influenced by air liberalization, customs quality and corruption. The article concludes with implications of our assessments and empirical results for policy-makers and government officials wishing to spur air cargo's positive impact on economic development.

II. Relationship of Air Cargo to Trade and GDP

Air cargo is not just a trade facilitator; it is a trade creator that contributes to the competitive advantage of nations. The causal argument is relatively straight-forward. Air cargo enables nations, regardless of location, to efficiently connect to distant markets and global supply chains in a speedy, reliable manner. Thus, in the new fast-cycle logistics era, nations with good air cargo connectivity have competitive trade and production advantage over those without this capability. Such advantage, as Michael Porter⁵ and others have

³ J. Kasarda, J. Green & D. Sullivan, "Air Cargo: Engine of Economic Development" (paper presented at TIACA Annual General Meeting, April 2004) online: <http://www.kenan-flagler.unc.edu/KI/airCommerce/publications.cfm> (date accessed 7 July 2005)

⁴ J. Kasarda & J. Green, "Air cargo as an economic development engine: A note on opportunities and constraints", (2005) 11 *Journal of Air Transport Management*.

⁵ M. Porter, "The Competitive Advantage of Nations" (New York: Free Press 1990).

documented, is fundamental to economic development, the latter typically measured by gross domestic product (GDP), in the aggregate or on a per capita basis.

A strong statistical relationship therefore exists between levels of air cargo volume and both GDP and GDP per capita. Table 1 presents the coefficients of determination (r^2) highlighting this relationship based on annual measurements between 1980 and 2000. The top numeric row indicates that by knowing either world GDP or world air cargo⁶, one can predict the other with 98 percent accuracy. Since the two evolve jointly and are, in fact, mutually causal, they are highly interdependent. This interdependency holds up well within world regions, as is also documented in Table 1.

TABLE 1
Relationship of Air Cargo to GDP and GDP Per Capita, by World Region, 1980-2000⁷

95 countries reporting	r-square	
	GDP	GDP per capita
World	0.981	0.982
North America	0.973	0.939
Latin America & Caribbean	0.968	0.813
Europe & Central Asia	0.952	0.924
East Asia & Pacific	0.948	0.969
Middle East & North Africa	0.874	0.682
Sub-Saharan Africa	0.818	0.662
South Asia	0.643	0.666

⁶ In this article, we use the term “air cargo” when, in some instances, “air freight” is the actual measure. Typically, air cargo equals air freight plus air mail. In almost all markets, freight is by far the dominant portion of cargo transported.

⁷ World Bank, “World Development Indicators” (New York: World Bank 2002)

A. Air Cargo's Lead Role

When compared dynamically with changes in trade and GDP, air cargo emerges as a growth leader. In the United States, for example, between 1992 and 2002, GDP expanded by 38 percent, trade by 57 percent and air cargo value by 83 percent (in constant 2000 dollars).

Table 2 illustrates the lead role of air cargo in driving Hong Kong's trade between 1992 and 2003. During this time period, air cargo tripled in value, increasing substantially faster than other modes of trade as it pushed Hong Kong's overall trade upward. As a result of its faster growth trajectory, air cargo's percent of Hong Kong total trade value has risen from 17.7 in 1992 to 30.3 in 2003.

TABLE 2

Hong Kong Air Cargo Value and Total Trade Value, 1992-2003⁸

(in Millions of Hong Kong Dollars)

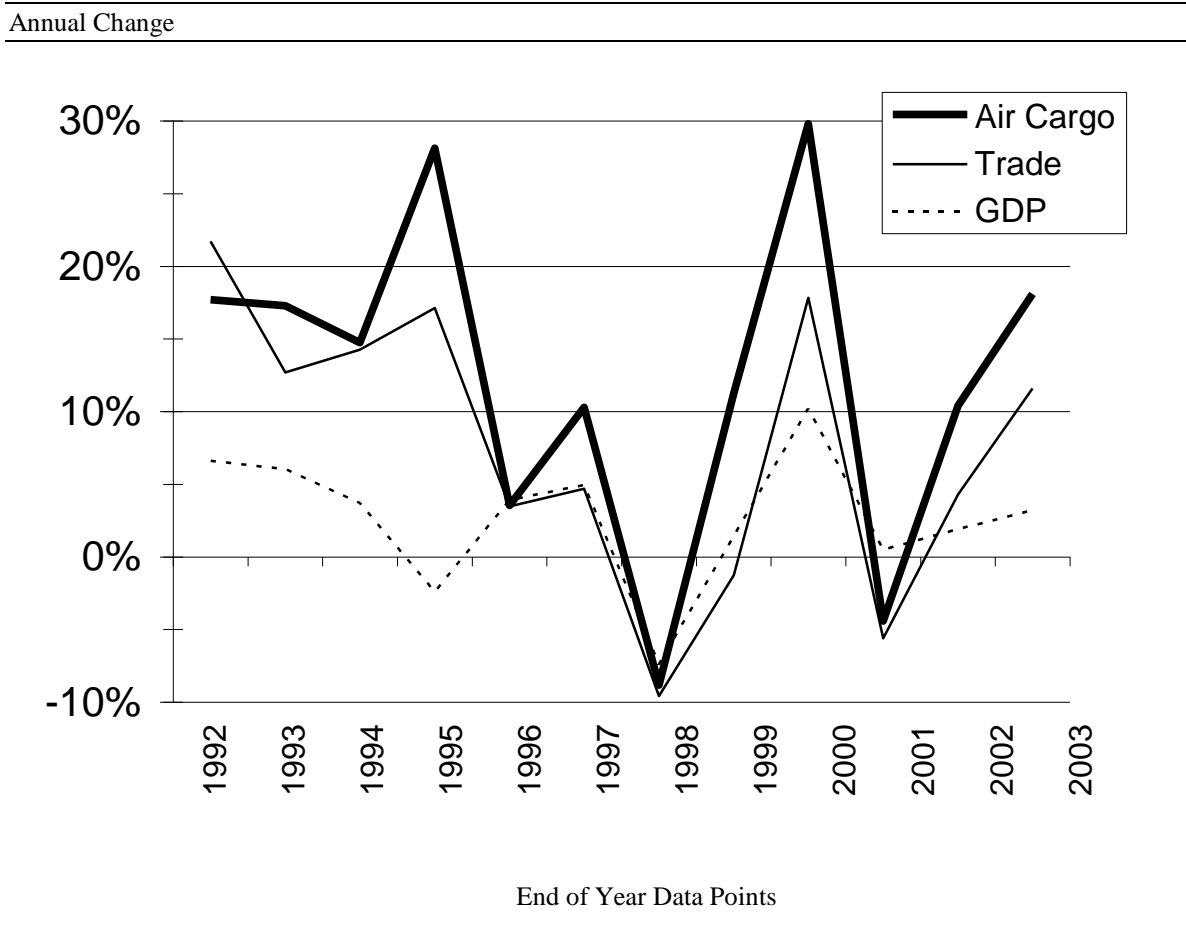
Year	Air Cargo	Trade	Air Cargo % of Trade
1992	\$332 654	\$1 880 248	17.7%
1993	\$390 096	\$2 118 847	18.4%
1994	\$447 627	\$2 420 722	18.5%
1995	\$573 530	\$2 835 248	20.2%
1996	\$593 810	\$2 933 499	20.2%
1997	\$654 855	\$3 071 039	21.3%
1998	\$597 002	\$2 776 741	21.5%
1999	\$664 262	\$2 741 718	24.2%
2000	\$862 160	\$3 230 651	26.7%
2001	\$824 081	\$3 049 181	27.0%
2002	\$909 815	\$3 179 936	28.6%
2003	\$1 074 466	\$3 548 206	30.3%

Both the over time correlation and growth advantage of air cargo to trade and GDP are nicely highlighted in Figure 1. This figure charts Hong Kong's annual percent change in values of air cargo, trade and GDP between 1992 and 2003, using end of year data points. One observes both the spikes and troughs in these factors, roughly paralleling each other, reflecting their over time correlation. Yet, growth in the value of air cargo is more

⁸ "International Air Traffic Statistics at HKIA" online: Hong Kong International Airport <http://www.hongkongairport.com/eng/aboutus/statistics.html> (accessed on 7 July 2005). The Web site only has statistics back to 1998. Earlier statistics can be retrieved directly from the Airport Authority upon request.

pronounced in upswings (e.g. after the 1997-98 Asia Financial Crisis, and after 9/11) and leads trade and GDP growth.

FIGURE 1
 Historical Growth in Hong Kong GDP, Trade and Air Cargo, 1992-2003⁹
 (in Hong Kong Dollars)



Examining longer time periods, growth in trade has substantially outperformed GDP growth; and likewise, air cargo growth has substantially outperformed trade growth. Between 1980 and 2000, GDP grew by 72 percent, trade by 132 percent and air cargo by

⁹ Airport Authority *supra* note 8.

302 percent for 68 countries for which 30 years of data were available on GDP, trade value, and air cargo (See Table 3). For the 30 year period (1970-2000), the air cargo growth advantage is much greater.

TABLE 3
Historical Growth in GDP, Trade and Air Cargo*, 1970-2000¹⁰

68 countries reporting

TREND	GDP	TRADE	AIR CARGO
20-year (1980-2000)	72%	132%	302%
30-year (1970-2000)	154%	355%	1 395%

*cargo measured in ton kilometers, GDP and Trade in constant 2000 US Dollars.

Even with such strong long-term growth, the aviation market in recent years has experienced unprecedented challenges; challenges triggered by turbulence and uncertainty in world events such as the tech bust, terrorism, SARS, and rising jet fuel costs.

Historically, however, air cargo traffic, when subjected to downturns impacting the aviation sector, has typically recovered at a much quicker rate than passenger flows; as it has from the most recent aviation downturn. In fact, air cargo is increasingly being viewed as an important lead indicator of the direction the larger economy will be going. This, together with the substantial role air cargo has played in fostering trade and manufacturing competitiveness, has led policymakers around the globe to ask: Is promoting air cargo service a viable economic development strategy? And if so, what constraints must be overcome to enable the air cargo industry to attain its full economic impact?

¹⁰ World Bank *supra* note 6.

III. Aviation Liberalization and Foreign Investment

Air cargo, of course, does not operate in a vacuum and its economic impact can be contingent on numerous factors, including the country's overall logistics infrastructure as well as the broader commercial and policy environment in which the air cargo industry operates¹¹. We offer three cases, The Philippines, China and Dubai, to illustrate the latter, focusing on aviation liberalization and foreign investment in these countries.

A. The Philippines

In 1995, by executive order, The Philippines' domestic and international aviation sectors were liberalized. This order set the stage for a series of bilateral agreements that resulted in a dramatic expansion of air connectivity and cargo volumes between The Philippines and major markets around the world.

One of the most significant was the 1995 Philippine-U.S. air transport agreement that led to the establishment of FedEx's Asia hub at Subic Bay and, later, UPS's hub at the former Clark Air Force Base¹². This agreement not only substantially increased the number of all-cargo routes that could be operated by U.S. carriers to and from The Philippines, but also provided unrestricted rights for these carriers to: (1) serve other countries from The Philippines; (2) determine capacity on these routes; and, (3) change gauge, allowing the carriers to utilize widebody aircraft on long-haul, high-volume routes and shift to smaller aircraft on shorter, lower-volume ones¹³.

¹¹ See R. Doganis, "The Airline Business in the 21st Century" (New York: Routledge 2001)

¹² Clark Air Base has been renamed Diosdado Macapagal International Airport

¹³ E. Patane, "RP-US Traffic Agreement Reached" *Cargo News Asia* (2 October 1995) 18.

Virtually simultaneously with the signing of this bilateral agreement, FedEx established its Asian hub at Subic Bay. Within months, heavy foreign investment in time-sensitive industries began flowing into industrial parks at and around the air express hub. These included, among numerous others, South Korea's Anam Group, one of the world's largest producers of computer memory chips. Anam invested US \$400 million in its Subic Bay plant that now turns out 50 million chips per month, equivalent to nearly half the production in South Korea. Also from South Korea, Poongsan constructed a \$100 million facility to make components for chip boards. Taiwan's Wistron (Acer's manufacturing subsidiary/spin-off) was attracted to Subic's fast-cycle logistics and rapid response distribution time, investing \$120 million in its computer assembly facility there. Other major microelectronics firms such as Taiwan's TEMIC Semiconductor, Japan's Omran and U.S.A.'s Sanjo Alloy were attracted to Subic Bay for the same reason.

Between 1995 and 2000, 150 firms located around the airport, constituting US \$2.5 billion in commercial real estate investments. During the same period, exports increased from US \$24 million annually to over US \$1 billion annually.

There is an important side-bar to this story. In late 1999, due to heavy pressure from national flag carrier Philippines Airlines (PAL), The Philippines' government retreated from its highly liberalized aviation environment¹⁴. Foreign airline access (aside from FedEx's at Subic which had been locked in) was cut back significantly, and for some countries (such as Taiwan), terminated entirely.

¹⁴ J. Bowen, T. Leinbach & D. Mabazza, "Air Cargo Services, the State and Industrialization Strategies in The Philippines: The Redevelopment of Subic Bay" (2002) 36 *Regional Studies* 5, 451.

Acer, which used a combination of FedEx services at Subic Bay and PAL and Eva (Taiwan) wide-body belly cargo from Manila to Taipei, was forced to cut back its Subic Bay production by 50 percent and reduce employment to its facility there by 1,000.

Taiwan, which at that time was the largest country investor in The Philippines, essentially stopped all new investment and began to shift investment out of The Philippines. By 2001, it was recognized that the liberalization retreat to protect PAL was costing the country's net inward investment dearly and the policy was reversed, along with the ouster of the country's President, Joseph Estrada, who was a close friend of PAL's primary owner, Lucian Tan. With a liberal aviation policy restored, both foreign direct investment and job growth again surged around Subic Bay and Clark Air Base.

B. China

China was slow to liberalize its aviation sector but has been moving quickly in the 21st century. Until 2000, the majority of the airways in China were controlled by the military, which meant that military flights took precedence and civilian traffic was often delayed. A major policy shift resulted in the Civil Aviation Administration of China (CAAC) operating the air traffic control system on major arteries. Internal negotiations with the military also resulted in access to some of the polar air routes across the country, which significantly shortened the flight times between the US and China, saving carriers millions of dollars in fuel costs as well¹⁵.

A study conducted by the US-China Business Council documented the remarkable impact air cargo is having on foreign investment, job growth and GDP in China, and the

¹⁵ E. Keck, "China's Changing Skies", *China Business Review* (March-April 2001), 8.

catalytic role liberalization is playing. The study estimated that by fully liberalizing the air express sector alone, foreign direct investment would increase by 4.8 percent, jobs by 160,000 annually for five years (800,000 total) and GDP by 0.21 percent annually¹⁶. This was likely in the minds of Chinese negotiators when they signed the latest bilateral agreement with the United States in 2004.

The agreement will, by 2011, more than double the number of Chinese cities which US carriers could serve, from four to nine. It will increase the number of weekly frequencies allowed to US carriers from 54 to 249. On the cargo side, it allows for establishment of air express hubs in China by US carriers, unlimited code sharing and the right to fly to all destinations in China and the US. The US Department of Transportation estimates the agreement will not only substantially boost foreign investment and trade between China and the US but also generate \$12 billion in additional revenue for US carriers over the next seven years¹⁷.

The US is but one of numerous nations for which China has liberalized or formed new bilateral air services agreements in recent years. As a result, it has become the world's leader in growth of international air cargo.

While China has many cities that generate trade, two stand out as magnets for foreign investment and economic development and, not surprisingly, these cities have new airports which serve and nurture that development. Guangzhou, in southern China, saw the

¹⁶ US-China Business Council, "The Integrated Express Industry in China" (2003).

¹⁷ A. Zwaniecki, "US Hopes for Open Skies Agreement with China, Official Says," (March 2005) online: US Department of State <http://usinfo.state.gov/ei/Archive/2005/Mar/14-656807.html> (date accessed 6 July 2005).

opening of New Baiyun International Airport in August 2004. Currently capable of handling 1 million tons of cargo annually, expansion has already begun and it is expected that the annual capacity at the end of the decade will be 2.5 million tons. Trade will catch up to capacity soon enough, as the airport moved 631,000 tons of cargo in 2004, up 16 percent from the previous year¹⁸.

New Baiyun International Airport, constructed at a cost of \$2.4 billion, is only 110 miles away from Hong Kong's Chek Lap Kok airport, the second largest cargo airport in the world (following the FedEx hub in Memphis, Tennessee). Still, both airports serve the Guangdong province of China, known as the "factory of the world". More than one third of China's exports come from this province, and it seems likely that China's booming manufacturing sector will provide ample business for both airports in the future, as well as nearby Shenzhen International Airport¹⁹.

Shanghai's growth is likewise mirrored by the growth of its airport, or in this case, airports. Shanghai Pudong International Airport was opened in October 1999. By 2003, it was the 17th largest cargo airport in the world, with 1.2 million tons of annual cargo throughput. Enjoying a 38 percent annual growth rate, Pudong jumped to 1.64 million tons of cargo traffic and became the world's 6th largest cargo airport in 2004. Add in the volume of the older Hongqiao Airport and Shanghai is easily mainland China's largest air cargo hub. Already, the government is expanding operations so that both airports can handle 2.5

¹⁸ R. Barling, "UPS Eyes Two Hubs In China Expansion" *South China Morning Post* (7 April 2005) 2.
¹⁹ "Hong Kong Watches Warily As Huge New Chinese Airport Opens" *USA Today* (5 August 2004) D1.

million tons of cargo by 2007, with a total of 7 million tons of combined capacity planned for 2015²⁰.

Shanghai's commercial vitality and rapidly expanding air connectivity are attracting foreign companies in droves. In January of 2004, Shanghai's Pudong New Area celebrated the arrival of its 10,000th foreign enterprise. These companies, including 180 of the top 500 multinational companies, have invested more than US\$21.6 billion dollars²¹. Currently, UPS is building their Asian hub at Pudong, while FedEx will build a sub-regional hub. Global firms like DuPont, Roche Pharmaceuticals and Honeywell are locating facilities in the Pudong New Area. The Jinqiao Export Processing Zone within Pudong has attracted over 560 Chinese and foreign companies in its 14 year existence. In 2003 alone, 42 companies invested US\$420 million dollars on manufacturing facilities²².

C. Dubai, United Arab Emirates

The leaders of Dubai, one of the United Arab Emirates (UAE), have been visionary in their use of air liberalization to foster investment and development in the emirate. When it became obvious that the oil reserves of Dubai would soon run out, a commitment was made to diversify the sources of income for the emirate. Observing that the emirate's position halfway between Asia and Europe could make it an important stopover point for passenger and cargo traffic, a decision was made in the mid-1980's to grant open skies rights to all countries' passenger and cargo airplanes.

²⁰ "Shanghai To Be Built Into Aviation Hub For Asia" *Finance Wire* (2 November 2004)

²¹ "The 10,000th Foreign Business Launched In Pudong" online: The Official Pudong Website http://english.pudong.gov.cn/news/detail.asp?tableid=t_english_pudong_gov_cn_news&articleid=628 (accessed on 7 July 2005)

²² "Highlights" online: Pudong New Area <http://pudong.shanghaichina.org/20040318.html#2> (accessed on 7 July 2005)

This decision to fully liberalize its skies was, as a rare case, actually endorsed by Emirates Airlines, the flag carrier of Dubai. Not only has Dubai prospered through air liberalization but so has Emirates, which became one of the world's fastest growing and most financially successful airlines.

Open skies likewise put air cargo in Dubai on a rapidly rising trajectory. By 1998, the airport was handling 300,000 tons annually in its Cargo Village, with another 120,000 tons flowing through temporary areas. Since then, cargo growth at the airport has continued its breakneck pace and construction has followed suit. A new Mega Cargo Terminal was planned, with annual capacity at completion in 2018 expected to be 5 million tons of cargo. The first phase of construction will be completed by early 2006. Dubai Airport needs it; they list their cargo capacity at around 900,000 tons but they handled 940,000 tons in 2003 and over 1.1 million tons in 2004²³.

Dubai's airport is within a free trade zone, which makes it even more attractive to companies looking to invest in the emirate. The Dubai Airport Free Zone (DAFZ) has 1.2 million square meters of space for offices, warehouses and distribution centers and manufacturing plants. Its benefits, including 100 percent foreign ownership of companies in the Zone, tax-free status for up to 30 years and no personal income tax, are designed to attract those companies producing high value-to-weight goods and shipping them by air²⁴. There are over 330 companies in the DAFZ, including Bang & Olufsen, Boeing, Chanel,

²³ "DCV Statistics" online: Dubai Cargo Village <http://213.42.52.88/cargo/DCV+Statistics/> (accessed on 6 July 2005)

²⁴ "Investment In Dubai" online: Government of Dubai, Department of Economic Development <http://www.dubaied.gov.ae/main/gn/DubaiEconomy/InvestmentInDubai/> (accessed on 7 July 2005)

Diageo, Johnson & Johnson, LVMH, Mitsubishi, Caterpillar, Porsche, Rolls Royce and Wyeth Pharmaceuticals.

With growth at Dubai International Airport far outstripping capacity, the emirate's leaders have decided to construct a second airport 10 years earlier than planned. The new Jebel Ali International Airport, expected to open in late 2007, will be an example of the Airport City model. It will include clusters of industries in finance, high technology, logistics services and tourism whose needs are connected to aviation. The entire Airport City, when fully built out, will cover 140 square kilometers. The first phase of the Airport City will be Dubai Logistics City, located next to the Jebel Ali Free Zone²⁵.

Consistent with Dubai's liberalized aviation environment, the new airport will allow airlines to self-handle cargo and manage their own terminal space within the Free Zone²⁶. Such policies, when combined with a state-of-the-art multimodal air logistics infrastructure, are expected to boost the airport's annual cargo capacity up to 12 million tons²⁷.

Case studies of other countries such as The Netherlands and Singapore have shown similar spurts in both air cargo and air cargo-liked foreign investment when they liberalized their aviation environments²⁸. It is worth noting that along with aviation liberalization, these countries simultaneously emphasized quick and efficient customs clearance and minimal corruption.

²⁵ "Jebel Ali Airport Project Announced" online: Dubai International Airport <http://www.dubaiairport.com/DIAInternet/About+DIA/Press+Room/Press+Releases/Jebel+Ali+Airport.htm> (accessed on 7 July 2005).

²⁶ P. Conway, "Grand Design at Jebel Ali Links Air, Sea and Land" *Air Cargo News* (24 June 2005) 10.

²⁷ Dubai *supra* note 25.

²⁸ Campbell-Hill Aviation Group and J. Kasarda, "An Analysis of Economic Benefits from Full Liberalization of Integrated Air Express Service in the Hong Kong Special Administrative Region" (1999).

Based on cases such as those above, the International Air Transport Association (IATA), The International Civil Aviation Organization (ICAO), The International Air Cargo Association (TIACA), the United Nations Conference on Trade and Development (UNCTAD) and the Organization for Economic Cooperation and Development (OECD), among other major international aviation associations and trade forums, routinely stress the critical importance of aviation liberalization, along with customs reform and lower corruption for economic development. To date, however, there is limited comparative statistical analysis documenting the impact of these factors, especially liberalization and customs operations. Rather, evidence is typically anecdotal or case-based, like that we have presented, making broader generalizations and conclusions difficult and recommendations to policy-makers less compelling.

IV. The Kasarda-Green Study

Kasarda and Green take an initial step toward rectifying this limitation by assembling and analyzing data for a sixty-three nation sample to model and assess the development impact of aviation liberalization, customs quality and corruption²⁹. Their sample includes those countries for which complete data could be obtained for all key variables. Air liberalization was measured by the number of bilateral air service agreements each of the sixty-three nations reported as of 2000 in the ICAO Database of Aeronautical Agreements and Arrangements.

They present basic correlations between this measurement of aviation liberalization and four pivotal variables:

²⁹ Kasarda *supra* note 3.

- air cargo (TKMs),
- trade per capita,
- GDP per capita, and
- net foreign direct investment (FDI) per capita.

as shown in Table 4.

TABLE 4

Zero-Order Pearson Correlations Between Aviation Liberalization, Cargo Volume and Per Capita Measures of Trade, GDP and Foreign Direct Investment, 2000³⁰

63 countries reporting

	Cargo (TKMs)	Trade per capita	GDP per capita	NetFDI per capita
Liberalization	+ .468**	+ .440**	+ .713**	+ .718**

**significant. at .01 Level

As they hypothesized, all four variables are positively and significantly correlated at the .01 probability level with the ICAO indicator of air liberalization. The two economic development measures (GDP per capita and net FDI per capita) show the highest correlation.

A. Negative Factors Limiting Growth In Trade, GDP and FDI

Whereas these correlations are supportive of the notion that aviation liberalization leads to higher levels of air cargo, trade, foreign investment and economic development, liberalization itself may not be sufficient if other conditions are not present. In many developing countries, corruption and customs inefficiencies play further debilitating roles.

³⁰ Kasarda *supra* note 3.

Customs alone can make or break time-sensitive global supply chains. It is estimated that, on average, 20 percent of goods transit time and 25 percent of costs are spent in/on customs clearance³¹. Even though Customs' primary purpose is to enforce trade policy, intercept contraband, and levy duties and taxes, constraints such as subjective and nontransparent valuation, prolonged delays and holds (both legal and illegal), as well as internal Customs Bureau inefficiencies, serve as serious barriers to fast-cycle logistics and country attractiveness for foreign investment by time-critical manufacturing industries.

To measure a country's customs quality, Kasarda and Green used the 2000 World Business Environment Survey (WBES). The WBES was administered by the World Bank to over 10,000 enterprises spanning 80 countries and one territory. The customs quality measure for the 63 country sample was derived from the following item: "*Rate the overall quality and efficiency of services delivered by your Customs agency.*" The item was measured on a five point scale, from 1, very bad, to 5, very good.

Corruption is a more complex issue that undoubtedly also impacts air cargo development and, to a broader extent, country competitiveness, foreign direct investment and economic growth. Multilateral economic development organizations such as the World Bank³² regularly contend that if widespread corruption remains in a country, other more immediately alterable policy variables will likely have limited development impact. Thus, a country that liberalizes air services and improves customs practices may see little

³¹ OECD, Directorate for Science, Technology and Industry, Division of Transport, *Liberalization of Air Cargo Transport* (2002).

³² World Bank *supra* note 6.

improvement in foreign investment or broader economic development if substantial country-wide corruption persists.

The most comprehensive and widely used indicator of country corruption is one developed by Transparency International (TI). TI produces a composite index based on 16 different surveys of business people and the general public in over 100 countries about their perceptions of corruption there, supplemented by information obtained from country experts. The composite index, called the Corruptions Perception Index (CPI), ranges from 1 (extremely little corruption) to 10 (totally corrupt). Their analysis used the 2000 CPI for each country, applied to the 63-nation sample.³³

B. Specific Effects of Aviation Liberalization, Customs Quality and Corruption

To determine the specific effects of aviation liberalization, quality of customs and degree of corruption, Kasarda and Green used basic structural equation models, regressing all three variables simultaneously and in a step-wise fashion on the two key economic development factors:

- GDP per capita, and
- foreign direct investment per capita.

Table 5 provides the Pearson (zero-order) correlations between liberalization, customs quality and corruption on the one hand and GDP per capita and net foreign direct investment per capita on the other. Tables 6 and 7 present the multiple-regression results.

³³ “2000 Corruption Perceptions Index” online: Transparency International web site, <http://www.transparency.org/cpi/2000/cpi2000.html>.

TABLE 5

Correlation Matrix³⁴

(Pearson Correlation Coefficients)

n = 63

	GDP pc	Net FDI pc
Liberalization	0.713**	0.718**
Customs	0.370**	0.344**
Corruption	-0.821**	-0.810**

**significant. at .01 Level

Table 5 shows that each predictor variable correlates with GDP and FDI in a statistically significant manner in the direction expected. Table 6 describes the effects of each of the three predictors on GDP per capita, controlling for the other two. The b is the unstandardized partial slope measuring the effect of one unit change in air liberalization (one bilateral increase) on GDP per capita, controlling for customs quality and corruption. The effect of each additional bilateral agreement is US\$109 per capita. The t statistic representing the ratio of the slopes (b) to the standard error (s.e.) reveals that each effect is statistically significant in the hypothesized direction.

The adjusted R-square indicates that, in combination, the three variables account for 77 percent of the statistical variance in GDP per capita. When entered in a step-wise fashion, the last column of Table 6 reveals that aviation liberalization contributes 42 percent of explained variance in GDP per capita, customs an additional 11 percent, and

³⁴ Kasarda *supra* note 3.

corruption still further 26 percent of the variance in GDP per capita, beyond that of liberalization and customs quality.

TABLE 6
Multiple Regression of GDP Per Capita on
Liberalization, Customs and Corruption³⁵

Independent Variables	b	s.e.	t	Sig.	R-squared	R-Squared Change
Liberalization	109.0	24.8	4.4	.000	.415	.415
Customs	3343.6	1137.7	2.9	.005	.521	.106
Corruption	-3000.3	370	-8.3	.000	.782	.261
(Constant)	12147.0	3365.0	3.61	.000		

Adjusted R squared = .771, F = 70.62, p = .000, N = 63

Table 7, in the same format as Table 6, shows that foreign direct investment per capita is similarly impacted by aviation liberalization, customs quality and lower corruption. Once more, all three independent variables are statistically significant in the hypothesized direction with aviation liberalization explaining 28 percent of the variance in foreign direct investment per capita, quality of customs an additional 23 percent of the variance (above that of liberalization) and corruption a further 26 percent of the variance, leading to a total of 78 percent of the variance (adjusted R square) in foreign direct investment per capita accounted for by these three factors.

³⁵ Kasarda *supra* note 3.

TABLE 7
Multiple Regression of FDI Per Capita on
Liberalization, Customs and Corruption³⁶

Independent Variables	b	s.e.	T	Sig.	R-squared	R-Squared Change
Liberalization	8.8	1.9	4.65	.000	.280	.280
Customs	299.1	87.1	3.43	.001	.506	.226
Corruption	-223.3	27.5	-8.11	.000	.763	.257
(Constant)	622.55	257.64	2.42	.000		

Adjusted R squared = .775, F = 66.47, p = .000, N = 62

Kasarda and Green’s multiple regression results are consistent with the proposition that aviation liberation, quality of customs and lower corruption each contribute to greater economic development (as measured by GDP per capita and foreign direct investment). However, just as air cargo and GDP per capita are mutually interdependent and causal, so too are the economic development measures and policy (predictor) variables. The authors acknowledge that to determine the exact nature of the strength of the causal relationship in each direction would require time-series data and more sophisticated statistical analysis. Suffice it to say that the empirical relationships across 63 nations referred to above bolster our case studies suggesting that air cargo is an important contributor to foreign investment and economic development. Moreover, aviation liberalization, quality of customs and corruption play significant roles as well, both directly and indirectly.

V. Policy Implications

Government officials, especially those in developing nations where deleterious customs practices and corruption pose barriers to trade and foreign direct investment,

³⁶ Kasarda *supra* note 3.

should take special note of these results. Creating the jobs and tax revenues for these countries to prosper rests in large part on their export-oriented manufacturing industries competing in global markets as well as the country attracting greater foreign investment. Neither is likely to occur if parts, components and finished goods cannot move quickly and efficiently in and out of the country and if corruption raises transaction costs to an unacceptable level.

These officials should likewise take note of the strong positive correlations presented herein between aviation liberalization on the one hand and, on the other, levels of air cargo, trade, GDP and foreign direct investment. To repeat, there are no doubt issues of reciprocal causation involved in at least some of the high statistical correlations reported herein. Yet, the consistency of the correlations, reinforced by evidence from the case studies we summarized, further implies that aviation liberalization leads to increased air cargo flows, greater overall trade, improved GDP and more foreign direct investment. Conversely, a highly restricted aviation policy environment likely results in lower levels of each development factor.

Often, the protection of a national flag carrier is given as the primary reason for limiting foreign airline access or various freedom rights. Such restrictions may well provide some relief to one or a few (i.e., the national flag carrier or carriers), but weaken the country's overall competitiveness by adding large costs in the aggregate to the country's thousands (and in a few cases millions) of other firms. These costs are not only a result of higher shipping fees in a protected aviation environment but also costs resulting from lower supplier and customer connectivity and reduced speed to market.

A general review of bilateral agreements reveals most treat cargo liberalization the same way they treat passenger liberalization, with no consideration of the differences between the two. Only a portion of agreements recognize the importance of air cargo liberalization to modern supply chain management and business competitiveness. In fact, most bilateral and multilateral agreements ignore supply chain practices that have emerged in the past 15 years (e.g., agile logistics, sourcing and sales site optimization, time-definite service, door-to-door delivery). Even the majority of “Open Skies” agreements do not allow seventh freedom rights, domestic cabotage or wet leases from international carriers³⁷.

For example, in 2004 FedEx Express requested a two year extension for a dormancy waiver to keep its five cargo frequencies to Russia, stating it would be “commercially impossible” to operate the flights without fifth freedom rights through Europe. FedEx officials were quoted as saying, “Because the U.S.-Russia air cargo market is underdeveloped, FedEx Express can undertake a commercially viable operation only if it can combine U.S.-Russia traffic with Europe-Russia traffic at its European hub”.³⁸

Air cargo carriers needs can differ considerably from passenger carriers. Backload, for instance, is not nearly as consistent in the air cargo market as it is in the passenger market. Passengers typically fly roundtrip, whereas goods usually terminate at a point of consumption or production; shippers rarely buy roundtrip tickets. Many carriers operate less than profitable backhauls or scramble to find routes allowing a second or third stop to make routes profitable.

³⁷ See R. Doganis, “Liberalization: Past Experiences and Future Steps” (paper presented at the ICAO Worldwide Air Transport Conference: Challenges and Opportunities of Liberalization, March 2003).

³⁸ A. Kim, “FedEx Unable To Fly Cargo To Russia Without Fifth Freedom” *Aviation Daily* (10 February 2004) 4.

Apropos the above, transportation between point A and point B in a hub and spoke manner is not the way modern global supply chains work. They involve multiple nodes that are dynamically linked; ever shifting with global supply and market demand. Flexibility in air cargo service to a country and larger region has become increasingly necessary. In such turbulent circumstances, shippers as well as air cargo transportation service providers must be able to adapt to changing conditions in an agile, rapidly responsive manner. Likewise, products must be able to move into and out of countries in a timely and cost-efficient manner, unencumbered by archaic and often corrupt customs practices that are still prevalent in so many countries today.

All said, countries should view air routes as highways in the sky, a competitive public good every bit as important as surface transportation infrastructure in which huge government investments are made. Under a liberalized aviation environment, numerous new international highways in the sky are possible which markedly improve the speed and accessibility of the nation's businesses to their global suppliers and customers. In so doing, the competitiveness of the nation's businesses will increase, more foreign direct investment will be attracted and economic development promoted.

One poignant analogy to the above comes from the economic development literature where it is shown that those nations that have economically advanced the fastest changed their development strategies from import substitution to export promotion³⁹. Under import substitution policies, foreign imports were restricted or heavily taxed with the

³⁹ See D. Rodrick, "Understanding Economic Policy Reform" (1986) 34 *Economic Literature* 1, 9; and C. Taylor, "The Impact of Host Country Government Policy on US Multinational Investment Decisions" (2000) 23 *The World Economy* 5, 635.

assumption that such protection would enable the nation's indigenous firms to better survive and prosper through servicing domestic markets without the competition of less costly or higher quality foreign imports. Under export promotion policies, trade and markets were liberalized, allowing far more foreign products to enter the country while encouraging domestic manufacturing firms to take advantage of less expensive, higher quality parts and components to assemble goods competitive in export markets. By liberalizing trade, substantial development gains accrued.

Aviation liberalization will likely have similar development outcomes, as the results of this study imply. Yet, we also stressed liberalization does not operate in a vacuum. If customs practices continue to be unresponsive to the needs of the new speed-driven global economy and if corruption remains rampant, aviation liberalization will probably not have its intended positive economic impact. Considerable progress on all three fronts is required in many countries if air cargo is to become their engine for development.

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