AIR CARGO: **ENGINE** FOR **ECONOMIC DEVELOPMENT**

prepared by

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1. 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 40 percent of the value of today's world trade (vs. under 2% by weight).

In order to gain competitive advantage through speedy global supply chain connectivity that air cargo provides, high-tech manufacturers and other time-critical shippers are locating at sites around or accessible to major airports. This is driving substantial investment in airport regions and their nations as a whole. Since jobs in time-critical industries tend to be higher paying than country averages, they raise the income levels of the population, as well.

This paper examines the role that air cargo plays in economic development. After presenting basic empirical relationships between air cargo and both trade and gross domestic product per capita, we document air cargo's lead role in the growth of these two factors. We then turn to evaluating three critical policy levers that can be applied to enhance air cargo's positive impact:

- air service liberalization,
- improving customs quality, and
- reducing corruption.

We statistically model the effects of these three factors on per capita net inward foreign investment and gross domestic product (GDP) per capita in sixty-three countries around the world. The paper concludes with implications of our results for aviation policymakers and government officials wishing to spur air cargo's positive effect on development.

2. RELATIONSHIP OF AIR CARGO TO TRADE AND GDP

The causal link 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 capability have competitive trade and production advantage over those without such capability. Competitive advantage, as Michael Porter[1] and others have documented, is fundamental to economic development. Economic development, in turn, is most often measured by gross domestic (or national) product (GDP).

Apropos the above, there is a well-established statistical relationship between air cargo growth and growth in gross domestic product (GDP). Table 1 presents the strong correlation of air freight* and both GDP and GDP per capita measured annually at twenty-two points in time between 1980 and 2000, for the world and within regions. The coefficient of determination (r^2) means that by knowing either world GDP or world air freight you can predict the other with 98 percent accuracy. Since the two are, in fact, mutually causal, they are highly interdependent. This strong interdependency holds up well across international regions as is also documented in Table 1.

TABLE 1

RELATIONSHIP OF AIR FREIGHT TO GDP AND GDP PER CAPITA BY WORLD REGION, 1980-2000

	r-square	
REGION	**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

N=95

Source: World Bank, "World Development Indicators," 2002.

* In this paper we use the term air freight and air cargo synonymously. This is not to omit mail, which along with freight typically totals air cargo. However, freight is, in all markets, the dominant portion of air cargo transported. In addition, international freight statistical figures were more readily available than mail or cargo figures for this discussion.

AIR CARGO'S LEAD ROLE

Despite its 2001-2003 global downturn, the air cargo industry continues to be an economic growth leader. In the United States, for example, between 1992 and 2002, GDP expanded at 38 percent, trade by 57 percent and air freight 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 Honk Kong's overall trade upward. As a result of its much faster trajectory, air cargo's percent of Hong Kong total trade value has risen from 17.7 percent in 1992 to 30.3 percent in 2003.

TABLE 2

HONG KONG AIR CARGO AND TRADE VALUE, 1992-2003

(IN MILLIONS, HONG KONG DOLLARS)

Year	Air Cargo	Trade	Air Cargo % of Total 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%

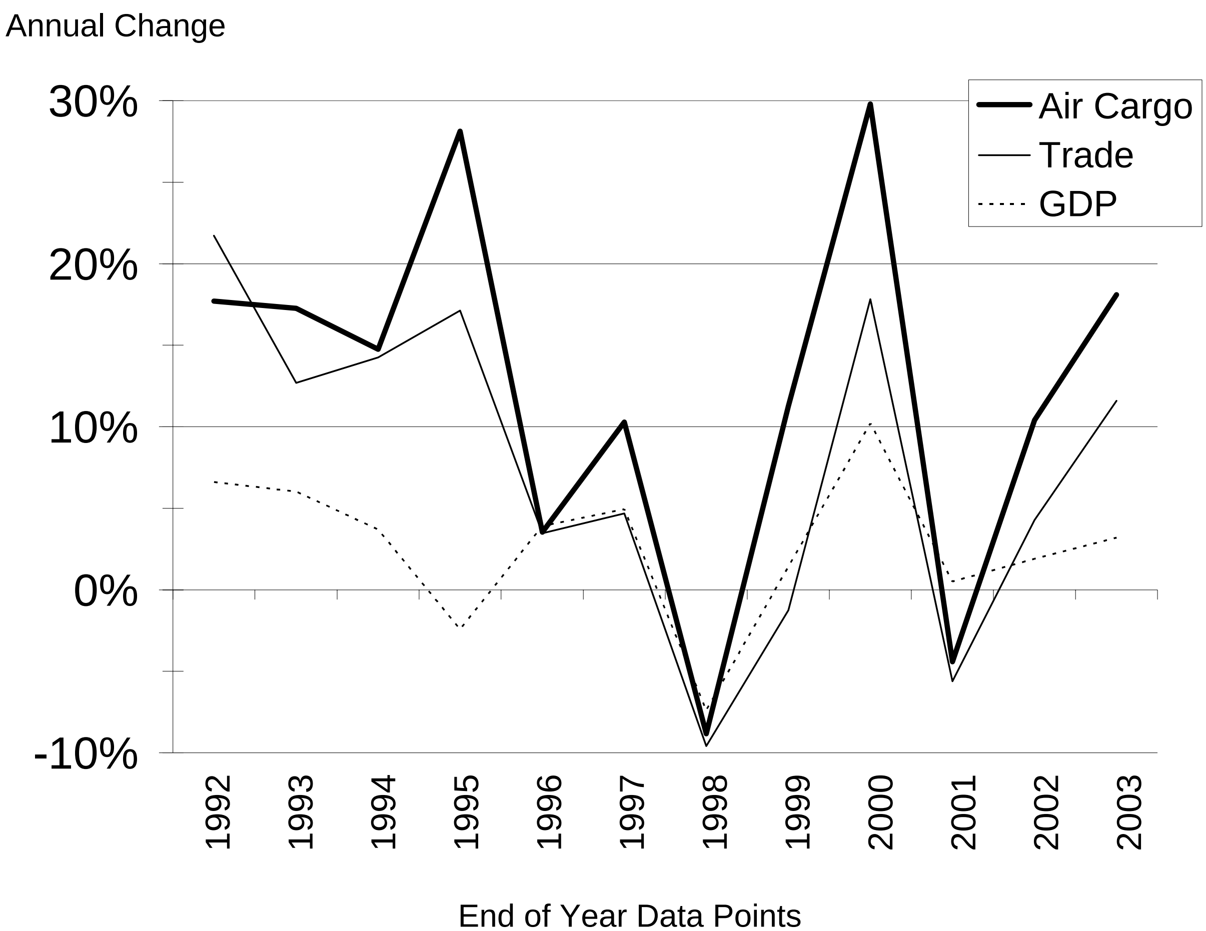
Source: Airport Authority Hong Kong, 2004.

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, roughly paralleling each other, reflecting their over time correlation. Yet, growth in the value of air cargo is more 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 FREIGHT, 1992-2003

(IN HONG KONG DOLLARS)



Source: Airport Authority Hong Kong, 2004.

Looking back over longer periods, growth in trade has substantially outperformed GDP growth; and likewise, air freight growth has substantially outperformed trade growth. Between 1980 and 2000, GDP grew by 72 percent, trade by 132 percent and air cargo by 302 percent for 68 countries for which 30-years of decennial 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 even greater.

TABLE 3

HISTORICAL GROWTH IN GDP, TRADE AND AIR FREIGHT*, 1970-2000

TREND	GDP	TRADE	AIR FREIGHT
20-year (1980-2000)	72%	132%	302%
30-year (1970-2000)	154%	355%	1395%

N=68

**freight measured in ton kilometers, GDP and Trade in constant USD*

Source: World Bank, "World Development Indicators," 2002, and Kenan Institute Center for Air Commerce.

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, SARS, and the war in Iraq. Historically, however, air cargo traffic, when subjected to downturns impacting the aviation sector, has 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 generating 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?

3. AIR CARGO'S CONDITIONING FACTORS

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 operates.

Apropos the latter, The International Air Cargo Association (TIACA), The International Civil Aviation Organization (ICAO), 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, customs reform and lower corruption for economic development. To date, however, there is scant comparative statistical analysis documenting the impact of these factors. Rather, evidence is typically anecdotal or case-based, making broader generalizations and conclusions difficult and recommendations to policy makers less compelling.

We take an initial step toward rectifying this limitation by assembling and analyzing data for a sixty-three nation sample to model the development impact of these three factors. Our sample includes those countries for which we could gather complete data for all economic and policy variables in our models. We commence with a brief discussion of the definition and scale in aviation liberalization, so high on the agenda of international aviation associations. We next present basic correlations between aviation liberalization in the sixty-three nations and, respectively their:

- volume of air cargo,
- trade per capita,
- gross domestic product (GDP) per capita, and
- net foreign direct investment (FDI) per capita.

We then develop structural equation models using multiple regression to measure the unique contribution of aviation liberalization, customs practices, and corruption on our two primary indicators of economic development: GDP per capita and FDI per capita.

THE DEFINITION AND SCALE OF AIR CARGO LIBERALIZATION

For sixty years, liberalization has been a major policy goal in aviation. In 1944, fifty-two nations signed on to the charter creating the International Civil Aviation Organization (ICAO). The following decade, ICAO held a special conference dedicated specifically to liberalization issues in aviation. Since then, nation states have managed to enact over 3,000 bilateral aviation agreements*. In addition, there are numerous subregional (multilateral) agreements covering sets or clusters of countries such as the European Union, Mercosur and the Pacific Islands.

But what is liberalization? Most nation-states recognize what have come to be known as Freedoms of the Air (See Appendix A). Although not often specifically referred to in aviation agreements, these nine so-called “freedoms” shape most country-to-country aviation negotiations.

In broader terms, aviation liberalization is most often characterized as some combination of liberalization of market entry, provision of ancillary services (e.g., ground handling) and trade facilitation.[2] It would be a monumental task to gather and analyze all of the over 3,000 bilateral and multilateral air service agreements that exist. For our analysis, we chose to evaluate current bilateral agreements on file with ICAO for our sixty-three sample shown in Appendix B.

Examination of these bilateral agreements revealed a heavy emphasis on passenger liberalization and its hypothesized effects. For the most part, they have not recognized the difference, and importance, of air cargo liberalization to world trade and economic development.

In particular, most bilateral and multilateral agreements ignore supply chain practices that have emerged in the past 15 years (e.g., agile logistics, network 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 carriers.[3]

* Depending on who you ask, international organizations including ICAO and Organisation for Economic Co-Operation and Development (OECD) put the number of bilateral air service agreements at somewhere between 3,500 and 5,000. Considering nations are slow to register and update agreements with ICAO (ICAO coordinates an international repository of agreements) and ICAO’s current backlog of 1-2 years in posting agreements, no one actually knows how many exist.

For example, in early 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."[4]

Air cargo carriers have different needs than passenger carriers. Backload, for instance, is not as consistent in the air cargo market as it is in the passenger market. Passengers typically fly roundtrip, whereas goods typically 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. Transportation between point A and point B 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.

We observed that most governments have focused their energies on combination carrier (primarily passenger service) liberalization, so the content of most bilaterals and multilaterals reflect this. Nonetheless, since approximately half of all the world's air cargo moves in the bellies of passenger aircraft, the liberalization of air passenger services also liberalizes air cargo services. Moreover, some bilaterals such as the July 2004 China-U.S. Air Services Agreement give considerable emphasis to all-air cargo carrier rights. In short, bilateral agreements are the best measures available for air liberalization.

Table 5 presents the basic correlations for the sixty-three nations in our sample between aviation liberalization (measured by the number of air service and transport agreements of a country as reported in the ICAO's Database of Aeronautical Agreements and Arrangements[5]) and four pivotal variables:

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

TABLE 5

CORRELATION MATRIX

(PEARSON CORRELATION COEFFICIENTS)

	Freight (TKMs)	Trade per capita	GDP per capita	Net FDI per capita
Liberalization	+ .468**	+ .440**	+ .713**	+ .718**

N=63

***significant. at .01 Level*

Source: World Bank, "World Development Indicators," 2002 and Kenan Institute Center for Air Commerce

These correlations measure the statistical relation between air liberalization and each of the above variables indicating the extent to which systematic changes in the value of liberalization is accompanied by systematic changes in the other. It can vary from -1 (perfect negative correlation) through 0 (no correlation) to +1 (perfect positive correlation).

As would be hypothesized, all four variables are positively and significantly correlated at the .01 probability level (99 percent confidence) with the ICAO measure of air liberalization, with our two economic development measures (GDP per capita and net FDI) showing the highest correlation. The latter two strong correlations should not be surprising, given that air services liberalization likely reflects the degree of overall economic liberalization in the countries which has been well documented to be an important catalyst of foreign direct investment and economic development.

Like the relationship between air freight and GDP, there is also reciprocal (two-way) causation at work here. Nonetheless, air liberalization, based on its facilitating effects on country connectivity and resulting passenger and cargo flows, no doubt plays a causal role in fostering trade, economic development and foreign investment.

Whereas these correlations are consistent with the notion that liberalization leads to higher levels of air freight, trade and economic development, liberalization itself may not be sufficient if other conditions are not present. In India, for instance, an open skies policy for air cargo was implemented in the early ‘90s. The policy allowed any foreign airline which meets specific operational and safety requirements to operate scheduled and non-scheduled services to/from any airports in India where customs facilities are available.

However, even with air cargo open skies, India’s air cargo growth barely kept pace with the rest of the world. From 1991-1997, the country reported annual air growth of 120,000 tonnes; from 300,000 to 420,000. Even though this was a 40% increase for the seven-year period, it translates to only 5.7% annual growth; well above world average GDP and trade growth, but somewhat less than world air cargo growth for the same period. By India's own account, poor logistics infrastructure has impeded growth.[6] In many developing countries, corruption and customs inefficiencies play further debilitating roles, issues to which we now turn.

INHIBITORS OF TRADE, FOREIGN INVESTMENT AND OVERALL ECONOMIC DEVELOPMENT

We presented the positive and statistically significant correlations between air liberalization on the one hand and, respectively, air freight, trade, GDP and foreign direct investment on the other, as well as noting contextual caveats. Two factors that the air cargo community and organizations such as the International Chamber of Commerce (ICC) point out as inhibitors of trade, foreign investment, and overall economic development are those we observed: customs constraints and corruption.

Regarding customs, in a 2003 international survey of shippers by The International Logistics Quality Institute, 48% of 800 shippers surveyed said they are extremely concerned with customs practices.[7] 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 clearance.[8] Even though Customs' primary purpose is to enforce trade policy, catch contraband and levy duties and taxes, constraints such as subjective and nontransparent valuation, prolonged delays and holdups (both legal and illegal), as well as internal Customs Bureau inefficiencies, serve as serious barriers to time-critical delivery and country attractiveness for foreign investment and operations by time-sensitive manufacturing industries.

In 2000, the World Business Environment Survey (WBES), was administered by the World Bank to over 10,000 enterprises spanning 80 countries and one territory. The survey utilized a standard core enterprise and fairly uniform survey methodology to generate indicators that allow comparisons across countries. It covers perceptions of the investment climate as shaped by local economic policy; governance; regulatory, infrastructural and financial impediments and public service quality.

The customs measure for our 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 very 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 Bank regularly contend that if widespread corruption remains high in a country, other more immediately alterable policy variables will likely have limited development impact. Thus, in the context of this study, a country that liberalizes air services and improves customs practices may see little or no improvement in foreign investment or broader economic development if substantial country-wide corruption persists or is perceived to exist by both foreign and domestic investors. It is therefore important to examine statistically both the unique and combined effects of aviation liberalization, customs quality and corruption.

A problem, though, is that, given its complexity, the degree of corruption in a country has no direct, straight-forward measure. The most comprehensive and widely used indicator is one developed by Transparency International (TI)[9]. TI has produced a composite index based on 16 different surveys of business people and the general public in each country about their perceptions of corruption there, supplemented by information obtained from country analysts (experts). The composite index, called the Corruptions Perception Index (CPI), ranges from 1 (extremely little corruption) to 10 (totally corrupt). For our analysis, the 2000 CPI for each country was applied to our 63-nation sample[10].

To determine the unique effects of aviation liberalization, quality of customs and degree of corruption on GDP per capita and foreign direct investment per capita, we use the statistical tool of multiple regression. Appendix C presents the technical results, including the simple descriptive statistics and correlations among for the five variables along with the multiple-regression statistics illustrating the unique and combined effects of liberalization, customs quality, and corruption on the two economic development indicators.

In brief, the statistics show that all three predictor (policy) variables correlate with per capita GDP and FDI in a statistically significant manner in the direction expected. The multiple regression results further imply that aviation liberation, quality of customs and lower corruption each uniquely contribute to greater economic development (as measured by GDP per capita and foreign direct investment per capita), and that the positive effects of aviation liberalization remain strong and significant, even after controlling for customs quality and corruption. Likewise, both customs quality and the corruption perceptions index have statistically significant effects on the development indicators, even after statistical controls are introduced for the other two predictor variables. Taken together, the three predictor (policy) variables explain over three quarters of the variance in GDP per capita and net foreign direct investment per capita (as indicated by the Adjusted R^2).

We should note, just as air freight and GDP per capita are mutually interdependent and causal, so too are our economic development measures and our predictor variables. 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, including the difficult task of specifying the appropriate time lags between changes in our predictor variables (e.g., liberalization) and the change in the economic development variables. Suffice it to say that the statistical results presented in this initial comparative analysis of empirical relationships across 63 nations strongly suggest that air cargo is closely associated with economic development and that policy variables such as aviation liberalization, quality of customs and corruption likely play highly significant roles.

POLICY IMPLICATIONS

Government officials, especially those in developing nations where deleterious customs practices and corruption pose barriers to trade and foreign direct investment, should take special note of these results. Creating the jobs and tax revenues for these countries to prosper rests on their indigenous export-oriented manufacturing industries competing in global markets as well as the country attracting much greater foreign direct 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. Again, while there is probably reciprocal causation involved in at least some of the high statistical correlations, the consistency of the correlations likely also indicate 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 less connectivity and reduced speed to market.

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 fully 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 those nations that have economically advanced the fastest have changed their development strategies from import substantiation to export promotion. Under import substantiation policies, foreign imports were restricted or heavily taxed with the 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.

ENDNOTES

1. *"The Competitive Advantage of Nations," Michael E. Porter, New York: Free Press, c1990.*
2. *"Liberalization of Air Cargo Transport" OECD, Directorate for Science, Technology, and Industry, Division of Transport, May 2, 2002.*
3. *"LIBERALISATION: Past Experience and Future Steps," Rigas Doganis, Worldwide Air Transport Conference: Challenges and Opportunities Of Liberalization, ICAO, March 2003.*
4. *"Unable To Fly Cargo To Russia Without Fifth Freedom," Aviation Daily, February 10, 2004.*
5. *"DAGMAR: ICAO's Database of Aeronautical Agreements and Arrangements," ICAO, http://www.icao.int/cgi/goto_m.pl?/applications/dagmar/main.cfm.*
6. *"India's Open Skies Policy on Air Cargo," Worldwide Air Transport Conference: Challenges and Opportunities of Liberalization, ICAO, March 2003.*
7. *"The 2003 Air Cargo Quality Survey," The International Logistics Quality Institute, Air Cargo World, October 2003.*
8. *"Liberalization of Air Cargo Transport," OECD, Directorate for Science, Technology, and Industry, Division of Transport, May 2, 2002.*
9. *See Transparency International web site, http://www.transparency.org/.*
10. *Transparency International, Corruption Perceptions Index, 2003.*

APPENDIX A

FREEDOMS OF THE AIR

First Freedom of the Air
The right or privilege, in respect of scheduled international air services, granted by one State to another State or States to fly across its territory without landing (also known as a First Freedom Right).
Second Freedom of the Air
The right or privilege, in respect of scheduled international air services, granted by one State to another State of States to land in its territory for non-traffic purposes (also known as a Second Freedom Right).
Third Freedom of the Air
The right or privilege, in respect of scheduled international air services, granted by one State to another State to put down, in the territory of the first State, traffic coming from the home State of the carrier (also known as a Third Freedom Right).
Fourth Freedom of the Air
The right or privilege, in respect of scheduled international air services, granted by one State to another State to take on, in the territory of the first State, traffic destined for the home State of the carrier (also known as a Fourth Freedom Right).
Fifth Freedom of the Air
The right or privilege, in respect of scheduled international air services, granted by one State to another State to put down and to take on, in the territory of the first State, traffic coming from or destined to a third State (also known as a Fifth Freedom Right).
ICAO characterizes all "freedoms" beyond the Fifth as "so-called" because only the First five "freedoms" have been officially recognized as such by international treaty.
Sixth Freedom of the Air
The right or privilege, in respect of scheduled international air services, of transporting, via the home State of the carrier, traffic moving between two other States (also known as a Sixth Freedom Right).
Seventh Freedom of the Air
The right or privilege, in respect of scheduled international air services, granted by one State to another State, of transporting traffic between the territory of the granting State and any third State with no requirement to include on such operation any point in the territory of the recipient State, i.e. the service need not connect to or be an extension of any service to/from the home State of the carrier.
Eighth Freedom of the Air
The right or privilege, in respect of scheduled international air services, of transporting cabotage traffic between two points in the territory of the granting State on a service which originates or terminates in the home country of the foreign carrier or (in connection with the so-called Seventh Freedom of the Air) outside the territory of the granting State (also known as a Eighth Freedom Right or "consecutive cabotage").
Ninth Freedom of the Air
The right or privilege of transporting cabotage traffic of the granting State on a service performed entirely within the territory of the granting State (also known as a Ninth Freedom Right or "stand alone" cabotage).

Source: ICAO, "Manual on the Regulation of International Air Transport; Freedoms of the Air," (Doc 9626, Part 4), 1996.

APPENDIX B

NUMBER OF EXISTING BILATERAL AGREEMENTS FOR SAMPLE COUNTRIES IN 2000

Country	Agreements
Argentina	17
Armenia	4
Azerbaijan	3
Belarus	12
Bolivia	16
Botswana	7
Brazil	35
Bulgaria	29
Cameroon	9
Canada	46
Chile	23
China	31
Colombia	11
Costa Rica	12
Cote d'Ivoire	22
Croatia	11
Czech Republic	13
Ecuador	11
Egypt, Arab Rep.	40
El Salvador	2
Estonia	5
Ethiopia	14
France	68
Germany	97
Ghana	25
Hungary	30
India	76
Indonesia	24
Italy	46
Kazakhstan	6
Kenya	25
Lithuania	13

Country	Agreements
Malawi	16
Malaysia	36
Mexico	30
Moldova	16
Namibia	1
Nigeria	20
Peru	15
Philippines	38
Poland	34
Portugal	34
Romania	45
Russian Federation	20
Senegal	31
Singapore	68
Slovak Republic	14
Slovenia	14
South Africa	51
Spain	78
Sweden	72
Tanzania	11
Thailand	49
Tunisia	34
Turkey	7
Uganda	9
Ukraine	10
United Kingdom	108
United States	70
Uzbekistan	38
Venezuela, RB	3
Zambia	10
Zimbabwe	6

source: ICAO Legal Department, 2004

APPENDIX C

TECHINICAL APPENDIX FOR MULTIPLE REGRESSION ANALYSIS

TABLE C-1

SIMPLE DESCRIPTIVE STATISTICS

	Min	Max	Mean	Median	StDev
GDP pc	99	34940	5292	2035	7856
Net FDI pc	-21	2490	296	558	591
Liberalization	1	108	28	20	24
Customs	.63	3.17	1.84	1.8	0.54
Corruption	1.60	9.80	6.84	7.5	2.01

Source: World Bank, "World Development Indicators," 2002 and Kenan Institute Center for Air Commerce

TABLE C-2

CORRELATION MATRIX

(PEARSON CORRELATION COEFFICIENTS)

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

***significant. at .01 Level*

Source: World Bank, "World Development Indicators," 2002 and Kenan Institute Center for Air Commerce

To uncover the unique contributions of aviation liberalization, customs quality and corruption, Table C-3 shows the multiple regression results describing the separate effects of each on GDP per capita, controlling for the other two factors. The b column represents the unstandardized partial slope measuring the effect of one unit change in say liberalization (one bilateral increase) on GDP per capita controlling for customs quality and corruption. The effect of each additional bilateral agreement is $109 dollars per capita. The standard error (s.e.) measures the spread or variance around this regression slope. A ratio of the slope (b) to the spread (s.e.) is the t statistic which indicates statistical significance; the greater the ratio, the higher the statistical significance. Again, each predictor effect is statistically significant in the hypothesized direction.

The adjusted R-square of .771 means that together, the three variables explain 77 percent of the statistical variance in GDP per capita. When entered in a step-wise fashion, the last column of Table C-3 indicates that aviation liberalization contributes 42 percent of explained variance in GDP per capita, customs an additional 11 percent, and corruption still further 26 percent of the variance in GDP per capita, beyond that of liberalization and customs quality.

TABLE C-3

OF GDP PER CAPITA ON

LIBERALIZATION, CUSTOMS AND CORRUPTION

Predictor 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 C-4, in the same format as Table C-3, reveals that foreign direct investment per capita is similarly impacted by aviation liberalization, customs quality and lower corruption. Once more, all three predictor 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 lower corruption a further 26 percent of the variance, leading to a total of 78 percent of the variance in foreign direct investment accounted for by these three factors (Adjusted R^2 = .775).

TABLE C-4

MULTIPLE REGRESSION OF FDI PER CAPITA ON

LIBERALIZATION, CUSTOMS AND CORRUPTION

Predictor 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

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