

Air Transport Indicators



Brown Bag Lunch Presentation and Discussion

1. February 2006

Heinrich C. Bofinger and Peter Roberts





Why Are Measures and Indicators For Air Transport Needed?

- **To gain understanding of the effectiveness of an air transport network in a given country**
 - Coverage and capacity
 - Internal connectivity (including nodes) & external access (internal connectivity is hard to measure because of lack of data...)
- **To gain understanding of the impact of air transport in economic development**
 - Domestic and international travel
 - Cargo
 - Tourism



Measures, Indicators, and the WDI

- **The WDI currently has three air transport time series, provided by ICAO:**
 - Number of passengers flown
 - Ton-km of air freight
 - Aircraft departures
- **The aim is to find or develop indicators that allow the measurement of the effectiveness and efficiency of air transport, and the impact of air transport on the economy and on economic development.**



Agenda

- **Items to cover today:**
 - ICAO data and availability
 - Measures decided upon so far
 - Infrastructure
 - Air transport activity
 - Charges and prices
 - Administration
 - Finance
 - Safety
 - Security
 - Accident statistics
 - Sample country cases
 - Discussion of indicator development



1. ICAO Data and Availability

- **ICAO collects many additional data points through data collection forms submitted by the 189 contracting states.**
- **However, though the set of data collected by ICAO is comprehensive, the amount of data submitted by the contracting states varies significantly.**



1. ICAO Data and Availability (contd.)

- **There are 10 main forms with various subforms used for reporting:**
 1. **Traffic (commercial air carriers, “Form A”)**
 2. **On-flight origin and destination (collected from carriers, “Form B”)**
 3. **Traffic by flight stage (collected from carriers, “Form C”)**
 4. **Fleet and personnel (collected from carriers, “Form D”)**
 5. **Financial data – commercial air carriers (“Form EF”)**
 6. **Civil aircraft on register (CAAs, “Form H”)**
 7. **Airport traffic (“Form I”)**
 8. **Airport financial data (“Form J”)**
 9. **Air navigation services financial data (“Form K”)**
 10. **En-route services traffic statistics (Form L)**



1. ICAO Data and Availability (contd.)

- **Please see the internal air transport web site for downloadable copies of these forms in .pdf format.**

(“Data & Reference” -> “Reference Documents” -> “ICAO Documents”)



1. ICAO Data and Availability (contd.)

- ICAO publishes the most readily available data often in summarized format, but the underlying details as reported in those forms are not readily available.
- The Bank has received and is going to continue receiving this data at the detail ICAO is collecting at, i.e. the individual entries for each of the forms have been made available to the Bank.



2. Initial New Measures - Capacity

- **Air Transport Infrastructure Capacity:**
Readily available for some countries are
 - Number of seats available
 - Tonnage capacity (aircraft)
- **Airport and air traffic control system capacities are not readily available, partially because they are difficult to measure and depend on a case by case analysis (e.g. Zanzibar taxiways). Limits are usually found only when they are met or exceeded, and depend much on scheduling.**



2. Measures – Air Transport Activities

- **Air Transport Activities: Now readily available for most countries at the Bank are**
 - Domestic air passengers (caveats apply on the data, and may highly underestimate this figure)
 - International air passengers
 - Domestic air cargo (tonnes)
 - International air cargo (tonnes)
 - Domestic mail (tonnes)
 - International mail (tonnes)

This data is reported by international airports and aggregates arrivals and departures. Range: 1999-2003



2. Measures - Air Transport Activities (contd.)

- **Air Transport Activities: also available for some countries are en-route services provided:**
 - Number of international flights
 - Number of domestic flights
 - Number of other flights
 - Total number of flights
- **Some countries also report revenue from en-route charges.** Year 2001 available so far.

The services provided data includes GA flights. So far, only 2001 data is in the hands of the Bank, but the rest is to follow.



2. Measures – Infrastructure Expenditures

- **Air Transport Infrastructure Expenditures are reported on a very limited scale, but those countries that do report give figures for:**
 - Capital investment in airports
 - Maintenance expenditures for airports
 - Contract costs for maintenance of airports (35 countries reporting)
 - Capital expenditures on air navigation services



2. Measures - Availability

- **The measures discussed earlier are easy to distribute through a web site or other means within the Bank in tabular format.**
- **Much of the other data, though available at least for some countries, will require more work to make available in a usable format.**
- **If you need something, just ask the air transport office if it is available.**



3. Accident Data and Statistics

- **On a confidential basis, data has been made available to the Bank on all air transport accidents involving commercial carriers from 1990 to 2004.**
 - The data covers location, reporting country, operator, aircraft, fatalities, and category of mishap/presumed cause.



3. Accident Data and Statistics (contd.)

- **Accident data is helpful in establishing the needs for a region or country.**
 - A country or region with a high accident rate will have trouble finding investors for its air transport industry.
 - Also, a country that is not safe for air transport can suffer by being dropped out of the international air transport system (Categories I and II, for example).
 - Can affect both business and tourism travel



3. Accident Data and Statistics (contd.)

- **Accident data should be treated with much care in its interpretation...**
 - Accidents are rare. Any hypothesis about cause, location, aircraft type, or other pattern needs to be looked at with many data points, i.e. examined over a long period of time, or regionally instead of just looking at one country.



3. Accident Data and Statistics (contd.)

- **Accident data should be treated with much care in its interpretation...**
 - For any logical analysis, all accidents must be matched with the correct traffic number, which can be challenging...



3. Accident Data and Statistics (contd.)

- **Accident data should be treated with much care in its interpretation....**
 - ...for example, the highest number of commercial accidents in the World from 1990 to 2004 have been in the U.S. Of course, the number relative to the amount of traffic flown is the lowest in the U.S. Since U.S. traffic numbers are readily available through many sources, this would be easy to research and analyze. However...

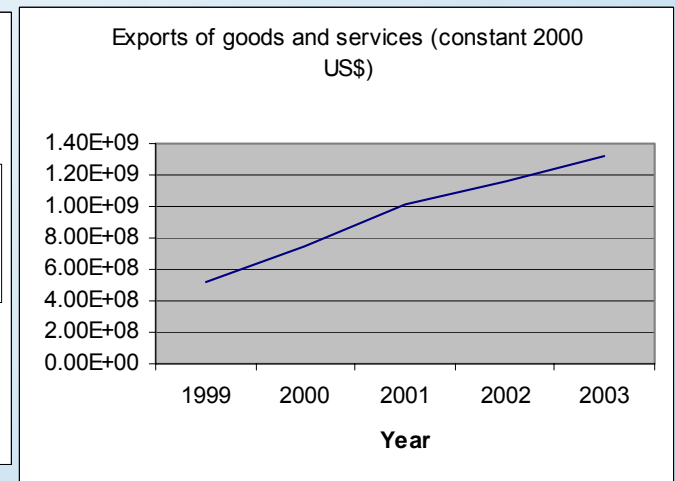
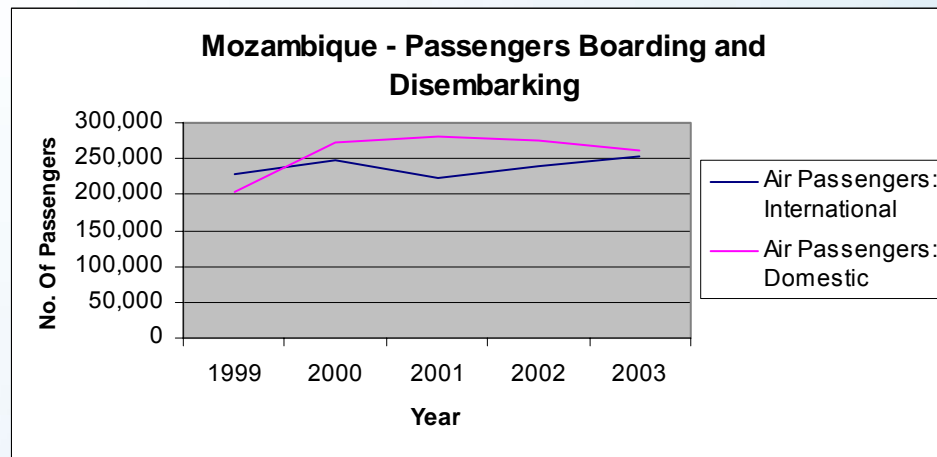


3. Accident Data and Statistics (contd.)

- **Accident data should be treated with much care in its interpretation....**
 - ...one of the aircraft with the highest number of accidents throughout the world between 1990 and 2004 is the Boeing 737-200. This number should be related to the number of hours worldwide the Boeing 737-200 is flown over the same period of time – a number not easily or reliably obtained by looking at the ICAO air transport data in its rawest format.



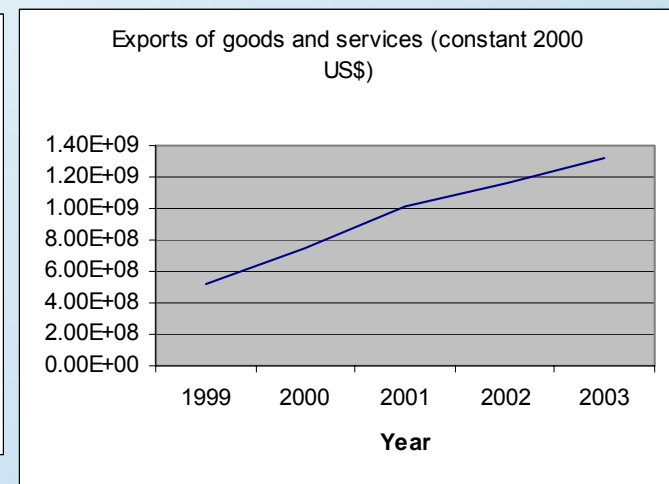
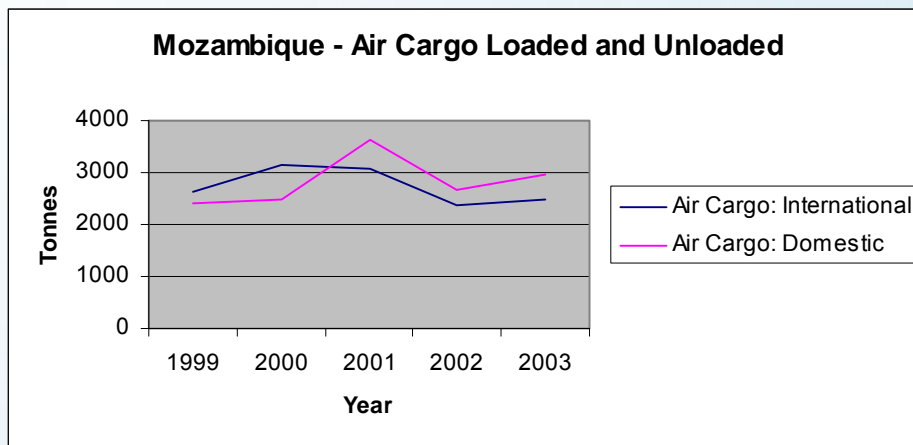
4. Two Sample Countries – Mozambique



Note for this and subsequent slides: Work is in progress in looking at economic links between air transport statistics (such as passenger travel and cargo shipping), and economic indicators.

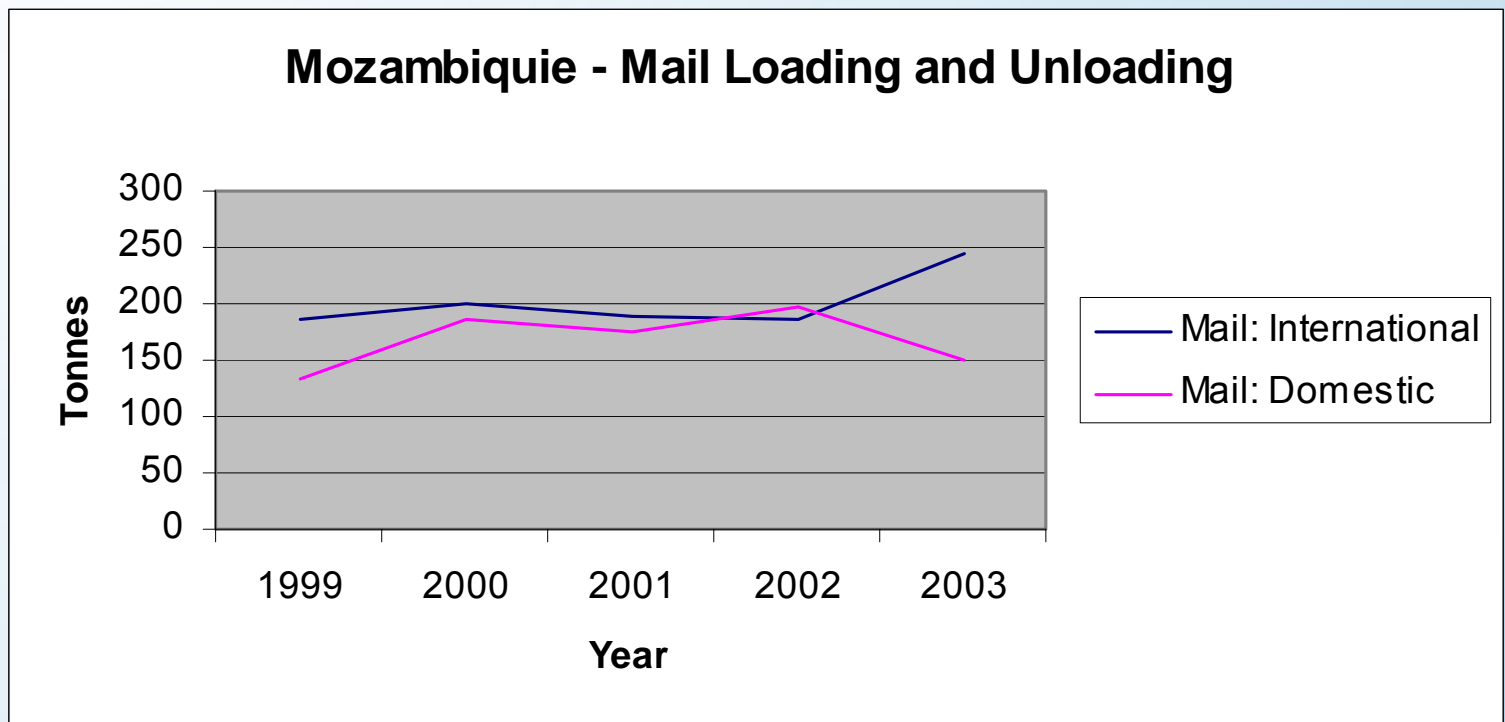


4. Two Sample Countries – Mozambique (Cargo)





4. Two Sample Countries – Mozambique (Mail)





4. Two Sample Countries – Mozambique (Financial)

- No revenues from en-route charges or from airport and approach charges reported in ICAO data.
- Infrastructure investment are not reported either



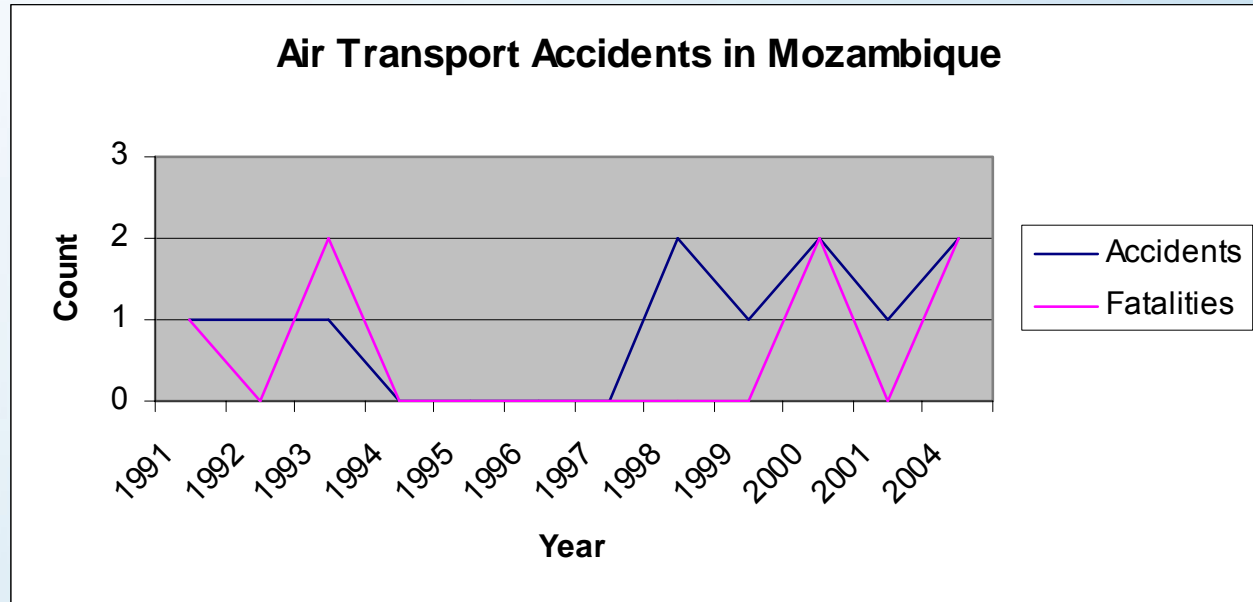
4. Two Sample Countries – Mozambique (Capacity)

- Mozambique reported a seating capacity of 542 seats in 2002, with an average payload capacity of 72 tonnes.
 - Check: An Airbus 320-200 takes between 150 and 179 passengers and has an average payload of about 19 tonnes.
 - The ICAO data does not show how many aircraft are registered.
 - This capacity only reflects the capacity from within Mozambique to meet air travel demand. Much additional capacity is provided by foreign air lines. In the future, a percentage may be calculated relating domestic capacity to the overall capacity provided to the country through internal and external service providers.



4. Two Sample Countries – Mozambique (Safety)

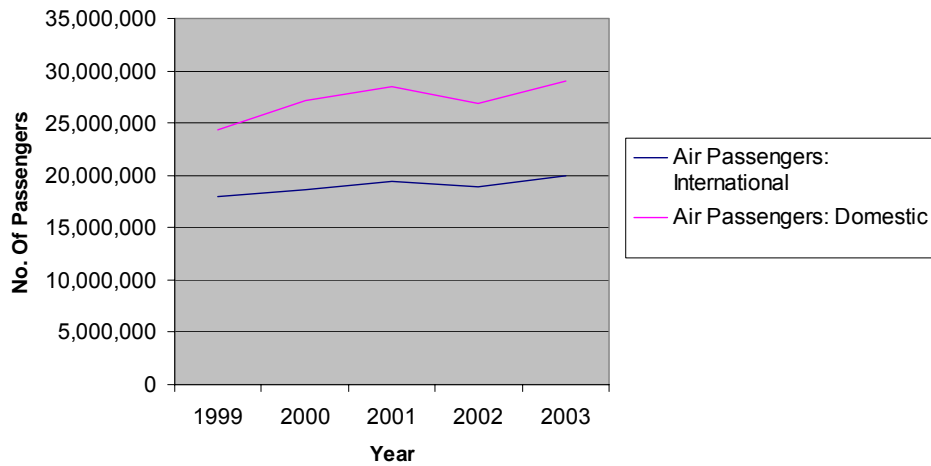
- No route data reported
- Air transport accidents have been.



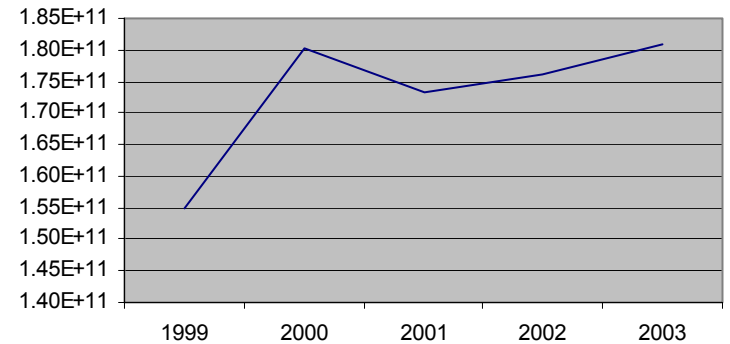


4. Two Sample Countries – Mexico

Mexico - Passengers Boarding and Disembarking

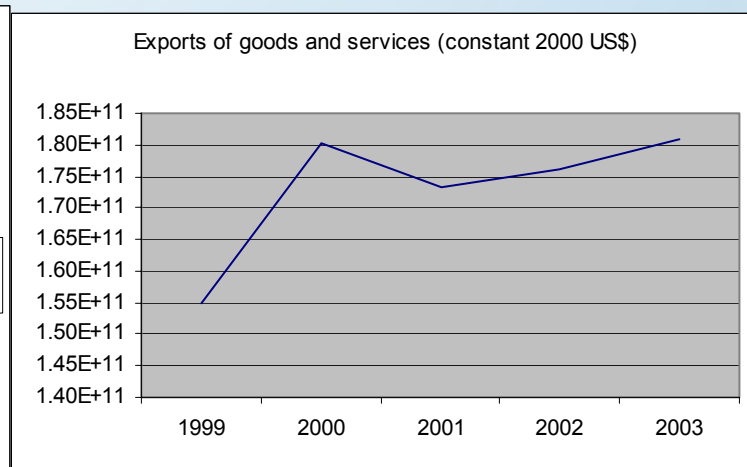
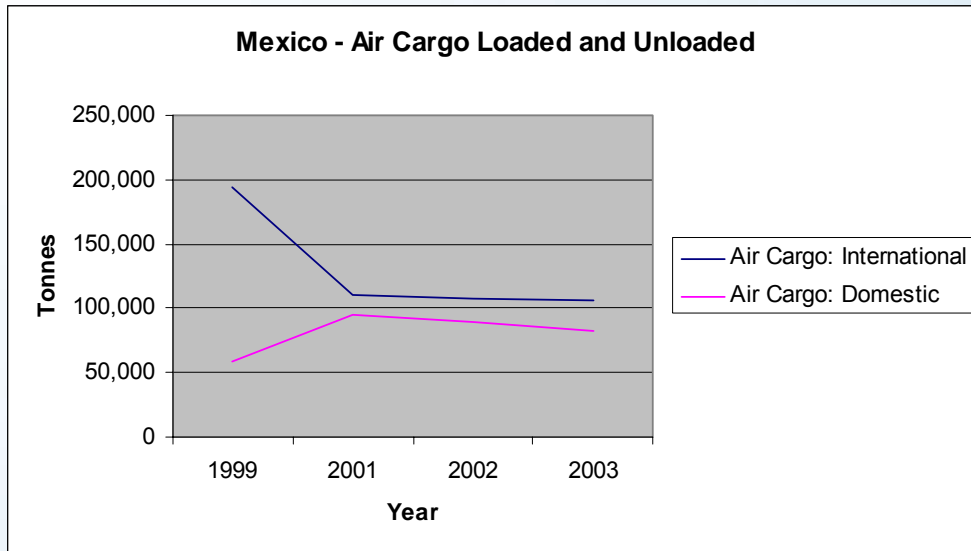


Exports of goods and services (constant 2000 US\$)



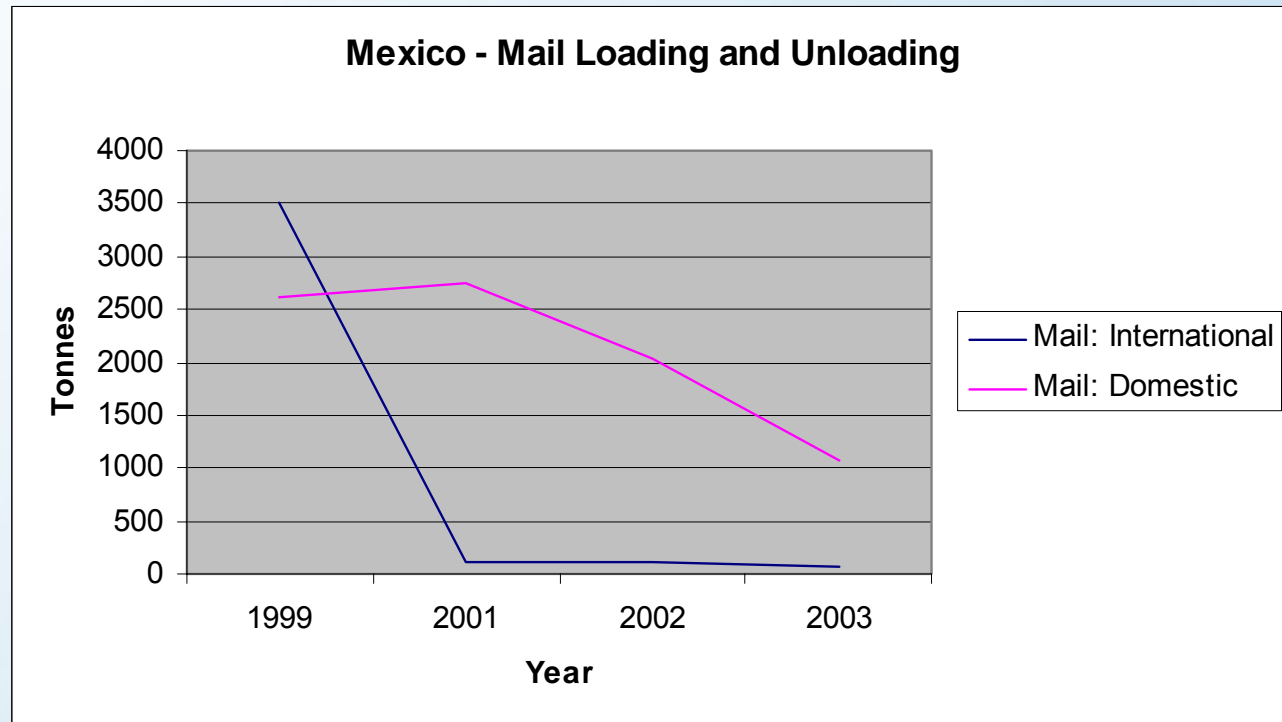


4. Two Sample Countries – Mexico (Cargo)





4. Two Sample Countries – Mexico (Mail)





4. Two Sample Countries – Mexico (Financial)

- Revenues from en-route charges are not separated out from airport and approach charges – so US \$ 193,623,000 in 2001 were for all ANS revenues.
- Infrastructure:
 - Airports: US\$ 47,828,000 capital investments in 2001, with US\$ 66,283,000 in maintenance expenditures.
 - Air Navigation Services: US\$ 12,264,000 capital investments in 2001.



4. Two Sample Countries – Mexico (Capacity)

- Mexico reported a seating capacity of roughly 18,000 seats in its airplanes, with an average payload capacity of 2,030 tonnes (2001).
 - Fact check: A Boeing 737 has a payload of 15.8 tons, and an Airbus 320 of ≈ 19 tons, with a 747 typically having a payload of 62 tons. In 2001, Mexico had 189 two-engine, 43 three-engine, and 9 four-engine jets registered with the CAA. Since two-engine jets can include small regional airliners, and four-engine aircraft can include aircraft much smaller than wide-bodied ones, this figure is above is plausible.



4. Two Sample Countries – Mexico (Passengers Departing)

- **Mexico – most important routes from Mexico – 2003** (limit set arbitrarily to less than 90,000 passengers)

Departure City	Arrival City	Passengers
MEXICO CITY	LOS ANGELES, CA	308,236
MEXICO CITY	HOUSTON, TX	261,664
MEXICO CITY	MIAMI, FL	250,750
GUADALAJARA	LOS ANGELES, CA	244,845
MEXICO CITY	NEW YORK, NY	198,366
MEXICO CITY	CHICAGO, IL	196,917
MEXICO CITY	DALLAS/FORT WORTH, TX	180,989
CANCUN	MIAMI, FL	179,484
MEXICO CITY	MADRID	161,076
MEXICO CITY	PARIS	154,733
SAN JOSE CABO	LOS ANGELES, CA	151,355
MEXICO CITY	ATLANTA, GA	140,218
CANCUN	NEW YORK, NY	138,496
CANCUN	ATLANTA, GA	119,086
PUERTO VALLARTA	LOS ANGELES, CA	104,565
GUADALAJARA	CHICAGO, IL	93,532



4. Two Sample Countries – Mexico (Passengers Arriving)

- **Mexico – most important routes to Mexico – 2003** (limit set arbitrarily to less than 90,000 passengers)

Arrival City	Departure City	Passengers
MEXICO CITY	LOS ANGELES, CA	341,101
MEXICO CITY	HOUSTON, TX	292,070
MEXICO CITY	MIAMI, FL	263,415
GUADALAJARA	LOS ANGELES, CA	259,194
MEXICO CITY	NEW YORK, NY	232,466
MEXICO CITY	CHICAGO, IL	215,618
MEXICO CITY	DALLAS/FORT WORTH, TX	209,322
MEXICO CITY	MADRID	172,574
MEXICO CITY	ATLANTA, GA	168,170
CANCUN	MIAMI, FL	168,053
MEXICO CITY	PARIS	161,314
SAN JOSE CABO	LOS ANGELES, CA	151,612
CANCUN	NEW YORK, NY	133,889
CANCUN	ATLANTA, GA	115,240
PUERTO VALLARTA	LOS ANGELES, CA	102,428
GUADALAJARA	CHICAGO, IL	90,324



4. Two Sample Countries – Mexico (Cargo Routes)

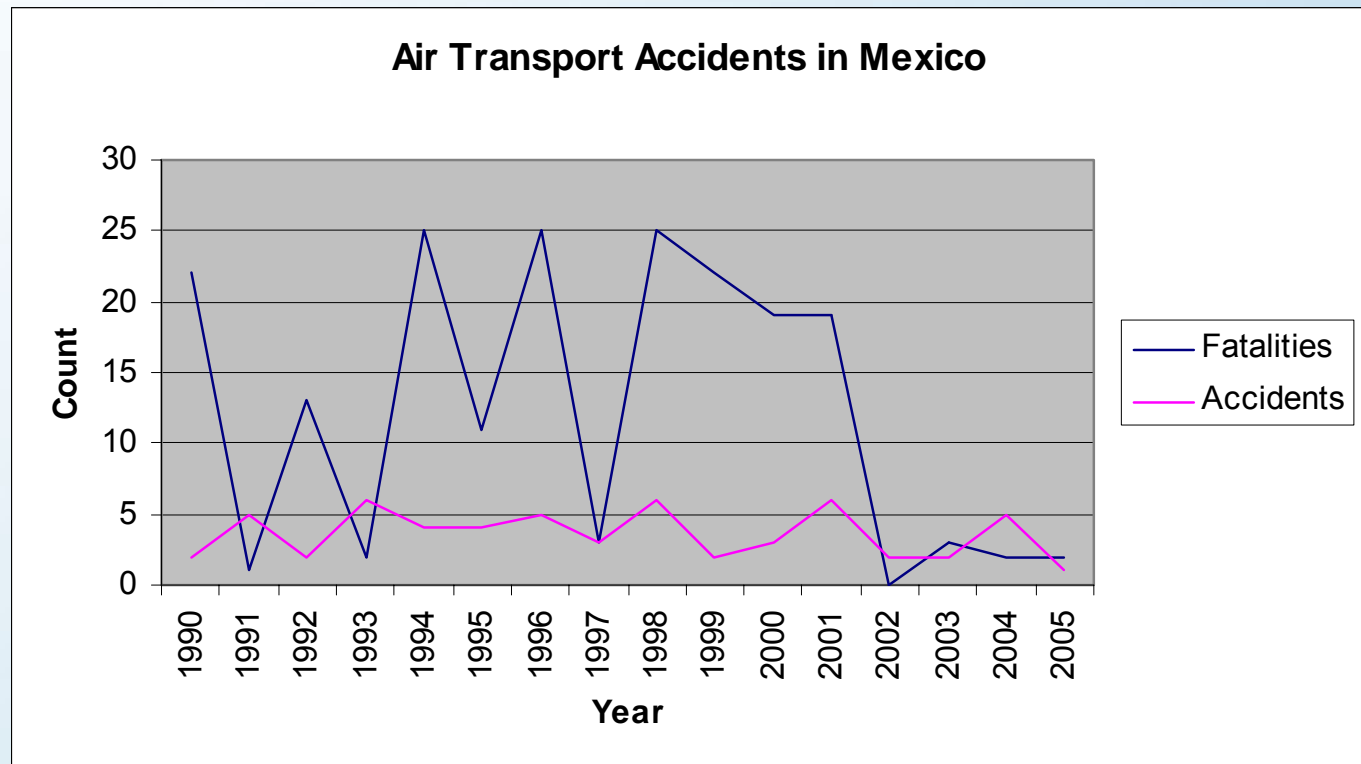
- **Mexico – most important freight routes 2003** (limit set arbitrarily to >800 tons either way)

City	Other City	Tonnes Leaving	Tonnes Arriving
MEXICO CITY	HOUSTON, TX	6065.44	1591.33
MEXICO CITY	PARIS	5813.63	0.00
MEXICO CITY	LOS ANGELES, CA	3787.84	1775.70
GUADALAJARA	LOS ANGELES, CA	3743.70	3093.20
MEXICO CITY	NEW YORK, NY	3615.57	629.53
MEXICO CITY	MIAMI, FL	2665.99	2655.13
MEXICO CITY	SANTIAGO	2242.45	8019.59
MEXICO CITY	SAO PAULO	1808.48	6281.74
MEXICO CITY	CHICAGO, IL	1262.33	601.51
MEXICO CITY	ATLANTA, GA	956.10	350.14
MEXICO CITY	DALLAS/FORT WORTH, TX	928.59	531.65
MEXICO CITY	MADRID	791.14	8529.60
MEXICO CITY	BOGOTA	526.30	1332.92
MEXICO CITY	LIMA	128.31	869.15
GUADALAJARA	SAN ANTONIO, TX	0.00	3250.78



4. Two Sample Countries – Mexico (Safety)

■ Accidents





5. What Next?

- **Statistics – what else should be sought?**
- **Meaningful Indicators – how to interpret and use what has been collected, and how to create benchmarks.**
- **What should be used with economic indicators?**



Thank You!