NEXTOR

Assessing the Impact of Aviation on the Economy

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Washington December 10, 1998

Background and Motivation

- Considerable literature on the impact of public capital on productivity and economic growth
- Focus has been on the contribution of highway capital to economic growth, aviation has similar questions!
- Changing view of public capital - investment and management
- How transportation improvements allow us *to do different things and do things differently*.
- **How much to invest, where to invest, how to invest, when to invest?**

Research Questions

- What does the aviation sector contribute to the economy?
- How do strategic transportation networks influence the performance of major economic sectors and industries?
- How does aviation contribute to the efficiency and effectiveness of firms operating in different industries in America?
- How does it affect employment and economic growth for these firms?
- How does investment in aviation affect the nation’s productivity?
- How to model the growth and productivity impacts?

Initial Modeling Approaches

- Three studies to assess the role and impact of aviation
  - **Study 1**: Technological change and economic growth & development
  - calculate accessibility index to capture changes due to technological change

$$I_1^k = \frac{\sum_{i=1}^{10} N_i * C_{ik}}{\sum_{i=1}^{10} N_i}$$

  - The mobility of a link is calculated as a travel time-fare composite
  - Measured before and after changes in aviation technology
  - Index is used in subsequent regressions to assess economic impact

Accessibility Changes with Aviation

Permanent Effect (1958-1967)

URBAN AREA	(I_1) 1958	(I_1) 1967	Δ in I_1	% Δ in I_1
NEW YORK	55.68	44.526	20.03	11.15
WASHINGTON D.C.	65.25	53.8	17.55	11.45
CHICAGO	64.087	52.366	18.29	11.72
DETROIT	68.855	55.409	19.53	13.45
CLEVELAND	67.997	54.313	20.12	13.68
PHILADELPHIA	71.226	55.273	22.40	15.95
KANSAS CITY	99.367	81.98	17.50	17.39
BUFFALO	78.758	61.029	22.51	17.73
BOSTON	81.072	62.772	22.57	18.30
ATLANTA	94.503	75.531	20.08	18.97
MIAMI	115.727	95.943	17.10	19.78
MILWAUKEE	84.723	64.639	23.70	20.08
DALLAS	111.307	89.61	19.49	21.70
ST. LOUIS	89.832	67.706	24.63	22.13
MINNEAPOLIS	100.576	78.447	22.00	22.13
HOUSTON	130.42	98.97	24.11	31.45
LOS ANGELES	145.142	109.153	24.80	35.99
SAN FRANCISCO	156.897	115.857	26.16	41.04
SEATTLE	185.645	136.728	26.35	48.92

Impact of Changes in Access via Aviation

Model 1: Dependent Variable: Increase In State GSP (1958-1967)	
Independent Variable	Coefficient (Standard Error)
Intercept	0.6973 *
	(0.0648)
Increase In State	0.3553 *
GSP (1947-1958)	(0.0924)
Change In I1	**0.0034 ** **
(1958-1967)	(0.0028)
Model F Statistic	8.13
Adjusted R Sq.	0.50
Model 2: Dependent Variable: Increase In Civilian Employment Base Of "Urban Area" (1960-1970)	
Independent Variable	Coefficient (Standard Error)
Intercept	0.1676 *
	(0.0536)
Increase In "Urban Area's"	0.4270 *
Civ. Emp. Base (1950-1960)	(0.1122)
Change In I1	**0.0044 ** **
(1958-1967)	(0.0022)
Model F Statistic	9.21
Adjusted R Sq.	0.47

Aviation in Inter-Industry Economics

- **Study 2:** Using Input-Output models to assess the productivity impact of aviation services
- segregate the effects due to production and consumption of air transportation

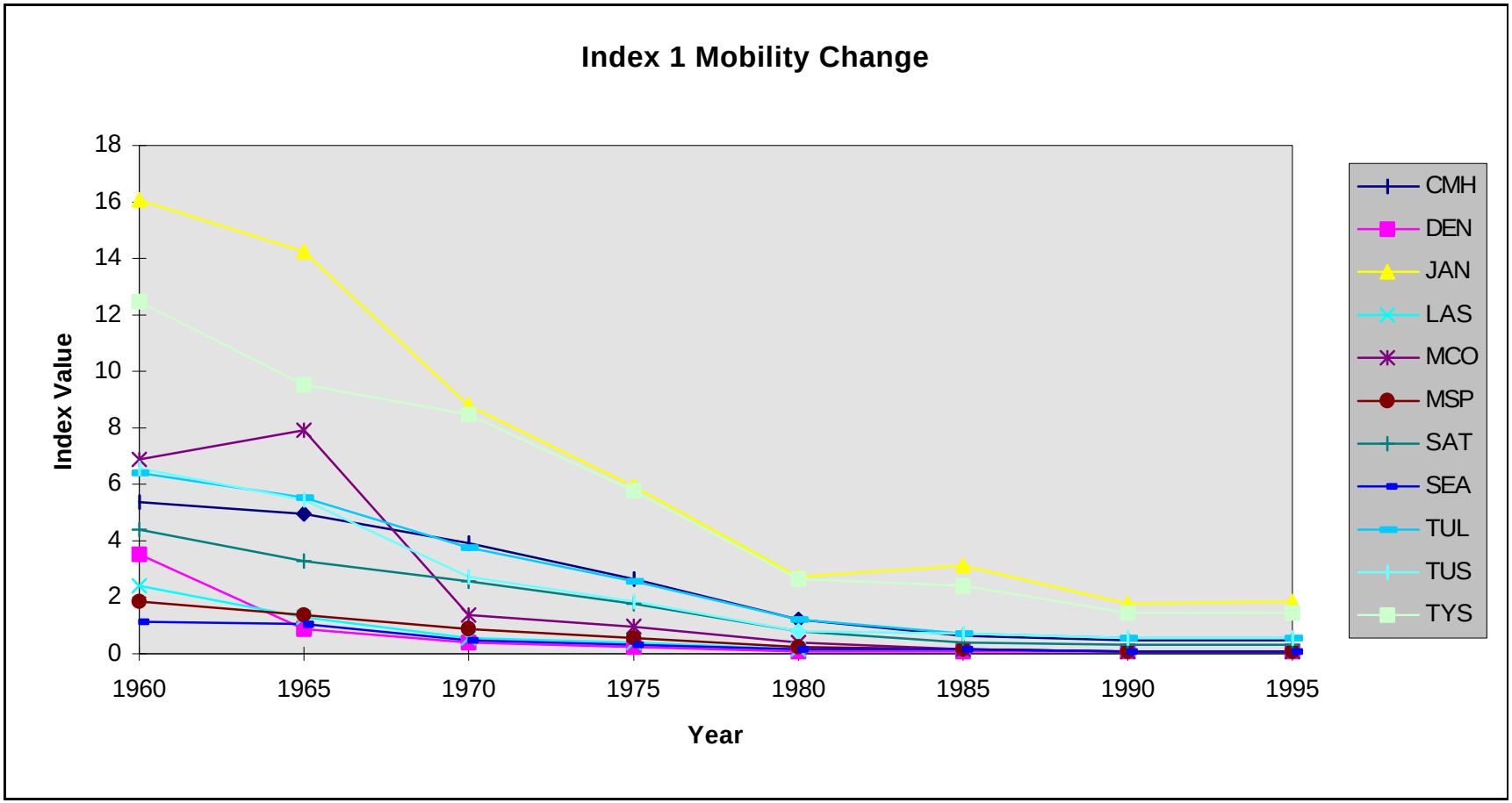
Relative Rankings of Economic Sectors based on Use of Aviation Services

1972 Coeff.	Rank 72	Rank 77	Rank 82	1982 Coeff,	Rank 82	Rank 77	Rank 72
Miscellaneous Services	1	12	13	Holding Companies	1	2	NA
Agricultural Services	2	9	4	Communication	2	NA	20
Federal Civilian	3	4	5	Social Services	3	8	17
Federal Military	4	1	9	Agricultural Services	4	9	2
Business Services	5	7	8	Federal Civilian	5	4	3
Transportation	6	6	7	Educational Services	6	3	9
Nondurable Goods	7	18	20	Transportation	7	6	6
Durable Goods	8	15	15	Business Services	8	7	5
Educational Services	9	3	6	Federal Military	9	1	4
Insurance Agents, Brokers	10	19	17	Wholesale Trade	10	11	13
Health	11	20	NA	Credit Agencies	11	10	12
Credit Agencies	12	NA	11	Motion Pictures	12	13	NA
Wholesale Trade	13	11	10	Miscellaneous Services	13	12	1
Nonmetallic Mining	14	NA	NA	Metal Mining	14	NA	16
Coal Mining	15	NA	NA	Durable Goods	15	15	8
Metal Mining	16	NA	14	Insurance Carriers	16	17	NA
Social Services	17	8	3	Insurance Agents, Brokers	17	19	10
State & Local Government	18	16	18	State & Local Government	18	16	18
Amusement	19	NA	NA	Retail Trade	19	NA	NA
Communication	20	NA	2	Nondurable Goods	20	18	7

Improvements in Air Transportation Infrastructure and Services and Innovations in Recreational Activities, 1955-95

- **Study 3:** examine the enabling feature of air transportation infrastructure and services
- relate the development of recreation service activities to improved transportation services.
- develop index of mobility and regress on income, growth and employment statistics in service sector
- distinguish the productivity impacts and the ‘enabling’ impacts

Impact of Improvements to Aviation on Mobility



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Innovation in Service Industries

$$I^k = (g_o - G_o) - (g_l - G_l)$$

	Time Period							
City	**55/60**	**60/65**	**65/70**	**70/75**	**75/80**	**80/85**	**85/90**	**90/95**
Bozeman	-	-	-	-	1.02	(-0.03)	0.02	0.14
Columbus	(-0.08)	0.20	(-0.17)	(-0.16)	(-0.19)	0.22	(-0.06)	(-0.12)
Denver	0.00	0.15	(-0.13)	0.08	(-0.31)	0.51	(-0.09)	(-0.03)
Honolulu	(-0.01)	0.12	0.18	0.40	(-0.04)	0.04	0.05	(-0.15)
Jackson	0.28	-	-	(-0.13)	0.17	0.05	(-0.38)	0.07
Knoxville	0.02	(-0.17)	(-0.06)	0.19	(-0.20)	(-0.28)	(-0.24)	(-0.05)
Las Vegas	-	-	-	0.19	(-0.23)	0.03	(-0.19)	0.06
Minneapolis	(-0.05)	0.08	(-0.09)	(-0.01)	(-0.26)	0.22	(-0.04)	(-0.06)
Orlando	0.08	(-0.04)	0.06	5.78	(-0.51)	(-0.08)	(-0.11)	0.02
San Antonio	0.02	(-0.03)	(-0.36)	0.10	0.04	(-0.12)	0.14	0.02
Seattle	(-0.02)	(-0.14)	(-0.02)	(-0.05)	(-0.15)	0.12	0.14	0.02
Tucson	(-0.11)	(-0.02)	(-0.21)	(-0.09)	(-0.06)	(-0.06)	0.33	(-0.22)
Tulsa	0.16	(-0.30)	0.18	(-0.03)	(-0.07)	0.05	(-0.33)	(-0.07)

Next Steps

- Develop measures of aviation infrastructure investment and service levels that can be used in a production or cost function
- Revisit the estimation of airline cost functions with measures of the contribution of public aviation capital by type in the cost function to estimate productivity effects
- Develop a general equilibrium model to measure the contribution of investment institutional and management changes to economic growth and competitiveness
- Develop and integrate measures of productivity gains and consumer benefits (fares service choice) from changes to airline and air system management strategies