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An Analysis of the Effects of Affordable Airfares Programs on Wichita Area Employment

Methodology

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The dataset used consists of annual data from 50 mid-sized metropolitan statistical areas with major commercial airports across the continental United States from 1999 to 2013. The dataset includes measures of air traffic, employment, population, real GDP per capita, real personal income per capita, and several measures of the business and tax environment[1] for each metropolitan area. Additionally, an indicator variable for the presence of a low cost carrier that was attracted by incentives and an indicator variable for the presence of airport incentives were included.

The airport traffic data are from the Passenger Boarding Data system, extracted from the Air Carrier Activity Information System, which provides annual data of enplanements at commercial airports in the United States. When multiple large airports are present in the same metropolitan area, the sum of those airports' traffic was used. The population data for the metropolitan statistical areas (MSAs) are the U.S. Census Bureau's annual population estimates for 1999 to 2013, using the 2013 definitions of the metropolitan statistical areas from United States Office of Management and Budget. The 2013 population of the metropolitan areas in the dataset range from 414,079 to 1,902,404, using the 2013 population estimates from the U.S. Census Bureau. The annual employment data in the dataset are the Bureau of Labor Statistics' Current Employment Statistics estimates of total non-farm employment for each metropolitan area. Real GDP per capita and real personal income per capita data are from the Bureau of Economic Analysis (BEA)[2].

The indicator variable for airport incentives was coded as a one for the years in which the incentives were paid to the air carrier, and zero in all other years[3]. Incentives programs that were in place during the time period of the study were identified through a search of the related literature and news media[4]. The indicator variable for the presence of an incentive-attracted low cost carrier was coded as a one for the period in which the low-cost carrier was present, if that low-cost carrier received incentives when it originally entered that market.

To estimate the overall effects of airfare incentives on employment, the model specification and control variables were based on Jan Brueckner's 2003 study, *Airline Traffic and Urban Economic Development*. Following Brueckner, cross-sectional regression estimation of the effect on air traffic on employment was originally considered, but a panel regression estimation approach was used to be able to control for time invariant city characteristics and national business cycles, as well as providing a larger pool of data in the sample. The model is designed to capture all contemporaneous effects of changes in air traffic on total non-farm employment in the MSA. First, a panel regression of air traffic on incentives and other

[1] An indicator variable for right to work status, the highest marginal individual income tax rate, and the highest marginal corporate tax rate were used as proxies for the overall tax and regulatory climate in each city.
[2] Real GDP per capita at the metropolitan area level is only available dating back to 2001. Personal income per capita is available for the full period of the dataset, 1999 to 2013.
[3] If the incentives began or ended in the middle of a year, then the variable was coded as a fraction representing the portion of the year the incentives were in effect.
[4] If any airport's incentives programs that attracted a low-cost carrier were not identified, the estimators for the effect of incentives or incentives-attracted carriers would then underestimate their true average annual effect on airport traffic.

control variables was estimated to determine the effects of airfare incentives on overall air traffic in the area. Then, a panel regression of employment on air traffic and control variables was estimated to determine the effects of variations in air traffic on employment.

For the panel regression of airport traffic on incentives, MSA and year level fixed effects were included to control for time-invariant local variation and national-level trends. The indicator variable for the presence of a low-cost carrier that had been attracted by incentives was used to measure the effect of incentives on airport traffic in the MSA[5]. Real personal income per capita was used to control for potential MSA-specific business cycle conditions[6], and additional controls for the local business conditions and regulatory climate of the MSA were also included in the regression. MSA population was also included as a control in the regression. The standard errors of the regression were clustered at the MSA level in order to correct for correlation in the unobserved component within each MSA's observations over time. The model specification is as follows:

$$\begin{aligned} Log(MSA\_Airport\_Traffic_{it}) &= \beta_0 + \beta_1 \log(MSA\ population_{it}) + \beta_2 Right\_to\_Work_{it} + \beta_3 Corp\_Tax\_Rate_{it} \\ &+ \beta_4 Personal\_Tax\_Rate_{it} + \beta_5 Real\_Income\_Per\_Capita_{it} \\ &+ \beta_6 Incentives\_Attracted\_Carrier + \sum_{i=1}^{50} \delta_i MSA_i + \sum_{t=1999}^{2013} \alpha_t Year_t + \varepsilon_{it} \end{aligned}$$

For the panel regression of total non-farm MSA employment[7] on airport traffic, MSA and year level fixed effects were again used to control for time-invariant local variation and national-level trends in the dependent variable. The key independent variable of interest was airport traffic, which included all airport traffic at all major airports in the MSA region. Controls for population, local business conditions and the local regulatory climate were also included. In the primary specification, real personal income per capita in the MSA is used to control for fluctuations in the local business cycle. The standard errors were again clustered at the MSA level. The model specification is as follows:

$$\begin{aligned} Log(MSA\_Employment_{it}) &= \beta_0 + \beta_1 \log(MSA\ population_{it}) + \beta_2 Right\_to\_Work_{it} + \beta_3 Corp\_Tax\_Rate_{it} \\ &+ \beta_4 Personal\_Tax\_Rate_{it} + \beta_5 Real\_Income\_Per\_Capita_{it} \\ &+ \beta_6 \log(MSA\_Airport\_traffic_{it}) + \sum_{i=1}^{50} \delta_i MSA_i + \sum_{t=1999}^{2013} \alpha_t Year_t + \varepsilon_{it} \end{aligned}$$

[5] An additional indicator variable measuring only the presence of incentives paid in a given year in an MSA was used in additional regressions, and the effects on traffic were similar. Based on our robustness testing, the increased air traffic was estimated to persist even after the incentives were paid if the low-cost carrier continued to serve that airport.

[6] Additional regressions were performed using no control for local business conditions or real GDP per capita as the control for local business conditions, and the results were similar.

[7] Total non-farm employment was broken down into its components, service employment and goods-producing employment, for additional regressions, and the overall estimated effects on employment were similar. The service employment regression yielded statistically significant results, while the goods-producing employment regression was statistically insignificant, indicating that any employment effects were likely concentrated in the service sector.

In the first alternative specification, real GDP per capita was used as the control for local business cycle fluctuations. However, data on real GDP per capita for MSAs is only available from the BEA dating back to 2001, which would shorten the panel the dataset uses by two years. In the second alternative specification, no direct control for local business cycle fluctuations is included since the year fixed effects already control for the national level business cycle and it is possible that, since employment changes are one of the primary factors in changes to MSA GDP and personal income, an overly strong mechanical link between the two would lead to an underestimation of the effects of other variables included in the regression. The results of the primary air traffic specification and the three employment specifications are provided in the appendix to this section.

References

Brueckner, Jan K. . "Airline Traffic and Urban Economic Development," *Urband Studies*, Vol. 40, No. 8 1455-1469, July 2003, pg. 1456.

Appendix

Table 1 – Panel Regression Results

Panel Regression Results				
	Log(Traffic)	Log(Emp)	Log(Emp)	Log(Emp)
Log(Traffic)		0.06231	0.03150	0.04882
		(0.02294)	(0.01352)	(0.01583)
Log(Population)	1.00147	0.71917	0.90306	0.80146
	(0.30647)	(0.04474)	(0.06281)	(0.04358)
Right to Work	-0.06267	0.01500	-0.00644	0.01111
	(0.03915)	(0.00519)	(0.01669)	(0.00327)
Personal Income Tax Rate	0.03413	0.00569	0.00474	0.00765
	(0.01522)	(0.00436)	(0.00369)	(0.00270)
Corporate Income Tax Rate	-0.00708	0.00069	0.00093	-0.00053
	(0.00565)	(0.00132)	(0.00184)	(0.00146)
Low-Cost Carrier (attracted by incentives)	0.18142			
	(0.05609)			
Log(Real Personal Income Per Capita)	0.72847		0.47266	
	(0.30325)		(0.04940)	
Log(Real GDP Per Capita)				0.31055
				(0.04391)
City Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	750	750	750	650
Clusters	50	50	50	50
All standard errors are clustered at the city level				