# A Comparative Analysis of Price Effects of Two Airline Mergers in China

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# Outline

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# 1. Introduction

- In 2010, two large-scale airline mergers took place in China
- State-owned China Eastern completed its merger with Shanghai Government-owned Shanghai Airlines (MU-FM)
- State-owned Air China successfully increased its stake in private Shenzhen Airlines from 25% to 51% (CA-ZH)

| | China Eastern (MU) & Shanghai Airlines (FM) | Air China (CA) & Shenzhen Airlines (ZH) |
|---|---|---|
| **Hub** | **Shanghai & Shanghai** | **Beijing & Shenzhen** |
| **Before Merger** | **Both suffered severe financial losses** | **ZH was seeking for financial support** |
| **Network** | **Parallel nature** | **Complementary nature** |

# 1. Introduction

- The CA-ZH merger was of complementary nature while the MU-FM was regarded as a parallel merger in terms of their route systems.
- For complementary alliances, airfares decreased and consumers were better off while airfares increased in the markets where parallel alliances occurred.
- Although the appeal of mergers and of airline alliances is much the same for an airline, the same conclusion may not necessarily apply to the airline merger cases, given that alliances are frequently subject to instability, while a merger is usually irreversible and permanent.
- The two mergers with different route systems provides us with a great opportunity to examine their effects on airfare.

# 1. Introduction

- Although the impact of mergers on airfare has been extensively studied in previous literature, research into the merger cases in the Chinese market is sporadic, mainly due to the unavailability of data.
- To the best of our knowledge, the CA-ZH merger has not been rigorously studied in the literature.
- Zhang (2015) is the only paper that examined the price effects of MU-FM merger based on a small number of routes.
- Given that the two mergers took place roughly at the same time, and that merging parties, Air China and China Eastern, and the acquired parties, Shanghai and Shenzhen Airlines, are of similar size, it is interesting to do a comparative study.

# 1. Introduction

- Although China introduced its Anti-Monopoly Law in 2008, the new antitrust enforcement agencies had limited resources and little experience in dealing with antitrust cases.
- All the airline mergers or code sharing agreements in China have never been challenged.
- China's state-owned airlines could enjoy a certain degree of market power through either explicit and implicit collusion, or mergers and acquisitions to defend their market share and eliminate potential competition from private carriers.
- Therefore, the lack of a general deterrent effect of antitrust law gives us an opportunity of examining the pricing effects, which would be otherwise suppressed by effective anticompetitive laws in many developed economies.

# 2. Literature Review

- In the US, there were two waves of airline mergers.
- The first wave occurred in the 1980s following airline deregulation (Borenstein, 1990; Werden et al., 1991; Kim and Singal, 1993; Morrison, 1996; Kwoka and Shumilkina, 2010).
- The second wave emerged in the new century when the landscape of the world airline industry had completely changed and airlines operated in a more deregulated and competitive environment (Brueckner et al., 2013; Luo, 2014; Huschelrath and Muller, 2014, 2015).
- Market power has been detected following the mergers when the merging firms had overlapping routes or if one party provided services and the other was a potential entrant.
- However, fares are likely to decrease in complementary networks because of scale effects, improved service quality and more travel options.

# 2. Literature Review

- Outside US, the results are varied on different cases.
- In the EU market, some papers reported significant price increase after airline mergers (Veldhius, 2005; Brueckner and Pels, 2005; Gaggero and Piga, 2010).
- Other studies drew opposite conclusions. Dobson and Piga (2013) found that after LCC mergers, fares were greatly reduced especially for those early booking tickets.
- Fageda and Perdiguero (2014) found no significant change in price on routes where the two LCCs competed before the merger, whilst price notably increased on routes where full-service airline was competing with LCC.
- In the Japanese market, Mizutani (2011) reported that the merger between Japan Airlines and Japan Air System significantly increased competition and reduced the price.

# 2. Literature Review

- The research on Chinese airline mergers is very limited.
- Zhang and Round (2009) studied the airfare changes charged by China Eastern and China Southern after 2002, and showed that the merger did not trigger significant airfare increase due to stable competition from other airlines and the complementary nature of the consolidation.
- Zhang (2015) investigated the merger between China Eastern and Shanghai Airlines and found that on average the prices increased by approximately 22% on the seven sample routes one year after the merger.

# 3. Data

- Our dataset was constructed using information from the IATA Airport Intelligence Services database.
- The dataset contains monthly domestic airline route information on origin, destination, monthly economy-class airfares and monthly number of passengers by routes and carriers, spanning from January 2005 to December 2016.
- Based on the *Statistical Data on Civil Aviation of China* (CAAC, 2015), we selected 280 most heavily travelled routes with each carrying at least 300,000 passengers in 2014.
- Although there were 2,652 domestic air routes in 2014, these top 280 accounted for two thirds of the total traffic volume.
- Although dozens of airlines operated on these 280 routes, we focus only on the first 11 largest carriers in terms of annual passenger traffic carried.

# 3. Data

- Due to incompleteness of route data in early periods, observations before April 2007 were dropped from the dataset.
- In order to be consistent with some macro variables that are reported quarterly, we use monthly air traffic information to construct a quarterly panel dataset of directional non-stop airport-pair markets.
- We treat each of the pair of route directions as a separate market. This is consistent with the view held in the airline industry that each route direction is a separate market.

# 3. Data

- In total there are 560 domestic directional airline routes. We only keep routes with no missing data during the whole period of study.
- In line with previous literature, routes carrying less than 1,000 passengers a quarter were removed from the dataset.
- As a result, 509 routes are kept in the analysis. Overall, the unbalanced panel data set contains quarterly data ranging from the 2nd quarter of 2007 to the 4th quarter of 2016, with 47,474 observations.
- As both mergers occurred in the first half of 2010, the data set contains a 3-year period before the mergers and a 6-year period after the mergers.

# 4. Methodology

- **Difference-in-Difference Model**

$$\ln(fare)_{ijt} = \beta_0 + \beta_1 overlap_{ij} + \beta_2 potential_{ij} + \beta_3 rival_{ij} + \beta_4 T_t + \beta_5 overlap_{ij} \times T_t + \beta_6 potential_{ij} \times T_t + \beta_7 rival_{ij} \times T_t + \delta X_{ijt} + \gamma_i + \varphi_j + v_t + \mu_{ijt}$$

- Overlap, potential, and rival are different route types following the classification by Kwoka and Shumilkina (2010) and Le (2016)
- ***Overlap*** route: only served by Air China and Shenzhen Airlines before they merged, or by China Eastern and Shanghai Airlines in the MU-FM case
- ***Potential*** route: served by one of the merging party, with the other operating as a potential entrant
- ***Rival*** route: at least one non-merging firm, competing with one or two merging carriers before the merger
- Time dummy ***T*** is 0 before merger and 1 after merger

# 4. Methodology

- **Route types**

| | Overlap | Potential | Rival | Control | Total |
|---|---|---|---|---|---|
| **MU & FM** | 112 | 167 | 297 | 453 | 1029 |
| **CA & ZH** | 36 | 203 | 315 | 435 | 989 |

- The number of total route observations and the number of total route-carrier observations of the two mergers are quite close.
- However, the MU-FM merger sample contains much more overlap routes than the CA-ZH merger sample.

# 4. Methodology

- The following control variables are included
- ***Distance***, measured as the logarithm of route distance, is expected to have a negative sign because our dependent variable is average airfare per kilometer.
- ***Population***, measured as the logarithm of the arithmetic mean of city populations at the two endpoints of each route.
- ***Tour***, a dummy variable, equals one for a tourist route.
- ***HHI*** is the route HHI in logarithmic form measuring market concentration.
- ***LCC*** is a dummy denoting the presence of Spring Airlines on route j at time t.
- ***HSR*** is a dummy variable that takes the value of one if direct high-speed rail (HSR) service is available on route j at time t.

# 5. Results

## The Estimation Results for the MU-FM Merger

| | Basic Models | | | Dynamic Models | | System GMM | |
|---|---|---|---|---|---|---|---|
| | RE | FE | FE+IV | FE | FE+IV | IV for Yt-1 | IV for Yt-1 and more |
| T*Overlap | 0.0224* | 0.0344** | 0.0300*** | 0.0200*** | 0.0168*** | 0.0177 | 0.0110 |
| T*Potential | 0.0206* | 0.0277*** | 0.0334*** | 0.0155*** | 0.0176*** | -0.0012 | -0.0014 |
| T*Rival | 0.0034 | 0.0050 | 0.0024 | -0.0003 | -0.0037 | -0.0009 | -0.0030 |
| lnHHI | -0.0507*** | -0.0767*** | -0.0747*** | -0.0461*** | -0.0453*** | 0.0045 | 0.0031 |
| lnDistance | -0.4418*** | - | - | - | - | -0.2243*** | -0.1788*** |
| lnPOP | 0.0247** | 0.2662*** | 0.1783*** | 0.1579*** | 0.0298 | -0.0115 | -0.0029 |

# 5. Results

## The Estimation Results for the MU-FM Merger Cont'd

| | Basic Models | | | Dynamic Models | | System GMM | |
|---|---|---|---|---|---|---|---|
| | RE | FE | FE+IV | FE | FE+IV | IV for Yt-1 | IV for Yt-1 and more |
| HSR | 0.0176** | 0.0152* | -0.0135*** | 0.0066* | -0.0097*** | 0.0066 | 0.0124** |
| LCC | -0.0554*** | -0.0446*** | -0.0473*** | -0.0230*** | -0.0310*** | -0.0553*** | -0.0419*** |
| Tour | -0.0292** | - | - | - | - | -0.0176* | -0.0082 |
| L.Infare | - | - | - | 0.5350*** | 0.4477*** | 0.4111*** | 0.5605*** |
| L.Indemand | -0.0049 | -0.0184*** | -0.0506*** | -0.0160*** | -0.0290*** | 0.1456*** | 0.0422*** |
| N | 36590 | 36590 | 34381 | 36590 | 34381 | 36590 | 36590 |
| $R^2$ | 0.549 | 0.243 | 0.112 | 0.446 | 0.284 | - | - |

# 5. Results

## The Estimation Results for the CA-ZH Merger

| | Basic Models | | | Dynamic Models | | System GMM | |
|---|---|---|---|---|---|---|---|
| | RE | FE | FE+IV | FE | FE+IV | IV for Yt-1 | IV for Yt-1 and more |
| T*Overlap | 0.0698*** | 0.0678*** | 0.0740*** | 0.0367*** | 0.0451*** | 0.0341*** | 0.0266*** |
| T*Potential | 0.0792*** | 0.0789*** | 0.0828*** | 0.0385*** | 0.0499*** | 0.0435*** | 0.0334*** |
| T*Rival | 0.0549*** | 0.0526*** | 0.0540*** | 0.0241*** | 0.0324*** | 0.0340*** | 0.0270*** |
| lnHHI | -0.0248** | -0.0390*** | -0.0556*** | -0.0331*** | -0.0360*** | 0.0010 | 0.0006 |
| lnDistance | -0.4350*** | - | - | - | - | -0.2177*** | -0.1708*** |
| lnPOP | 0.0038 | 0.1392*** | 0.0615** | 0.0853*** | -0.0228 | -0.0101 | -0.0053 |

# 5. Results

## The Estimation Results for the CA-ZH Merger Cont'd

| | Basic Models | | | Dynamic Models | | System GMM | |
|---|---|---|---|---|---|---|---|
| | RE | FE | FE+IV | FE | FE+IV | IV for Yt-1 | IV for Yt-1 and more |
| HSR | 0.0238*** | 0.0215*** | 0.0025 | 0.0089** | 0.0004 | 0.0011 | 0.0121** |
| LCC | -0.0642*** | -0.0480*** | -0.0576*** | -0.0273*** | -0.0390*** | -0.0686*** | -0.0480*** |
| Tour | -0.0370*** | - | - | - | - | -0.0228*** | -0.0126** |
| L.Infare | - | - | - | 0.5356*** | 0.4398*** | 0.4556*** | 0.5889*** |
| L.Indemand | 0.0038 | -0.0091** | -0.0432*** | -0.0167*** | -0.0273*** | 0.0963*** | 0.0229*** |
| N | 35140 | 35140 | 33029 | 35140 | 33029 | 35140 | 35140 |
| $R^2$ | 0.529 | 0.249 | 0.140 | 0.453 | 0.302 | - | - |

# 5. Results

- HSR entered 224 air routes out of all 509 routes in our sample by 2016.
- However, among the 224 routes, only 62 had HSR services before late 2013 while HSR started to operate on the remaining 162 routes after early 2014.
- Add another dummy variable HSR2014, which equals one if a route enters HSR after early 2014, zero otherwise.
- The coefficient of HSR2014 measures the average different impact of HSR service on airfare before and after early 2014.
- The sum of the coefficients of HSR and HSR2014 therefore indicates average airfare difference on routes with HSR entry after early 2014 and on routes without HSR entry.

# 5. Results

**The Estimation Results of the MU-FM Merger with HSR2014**

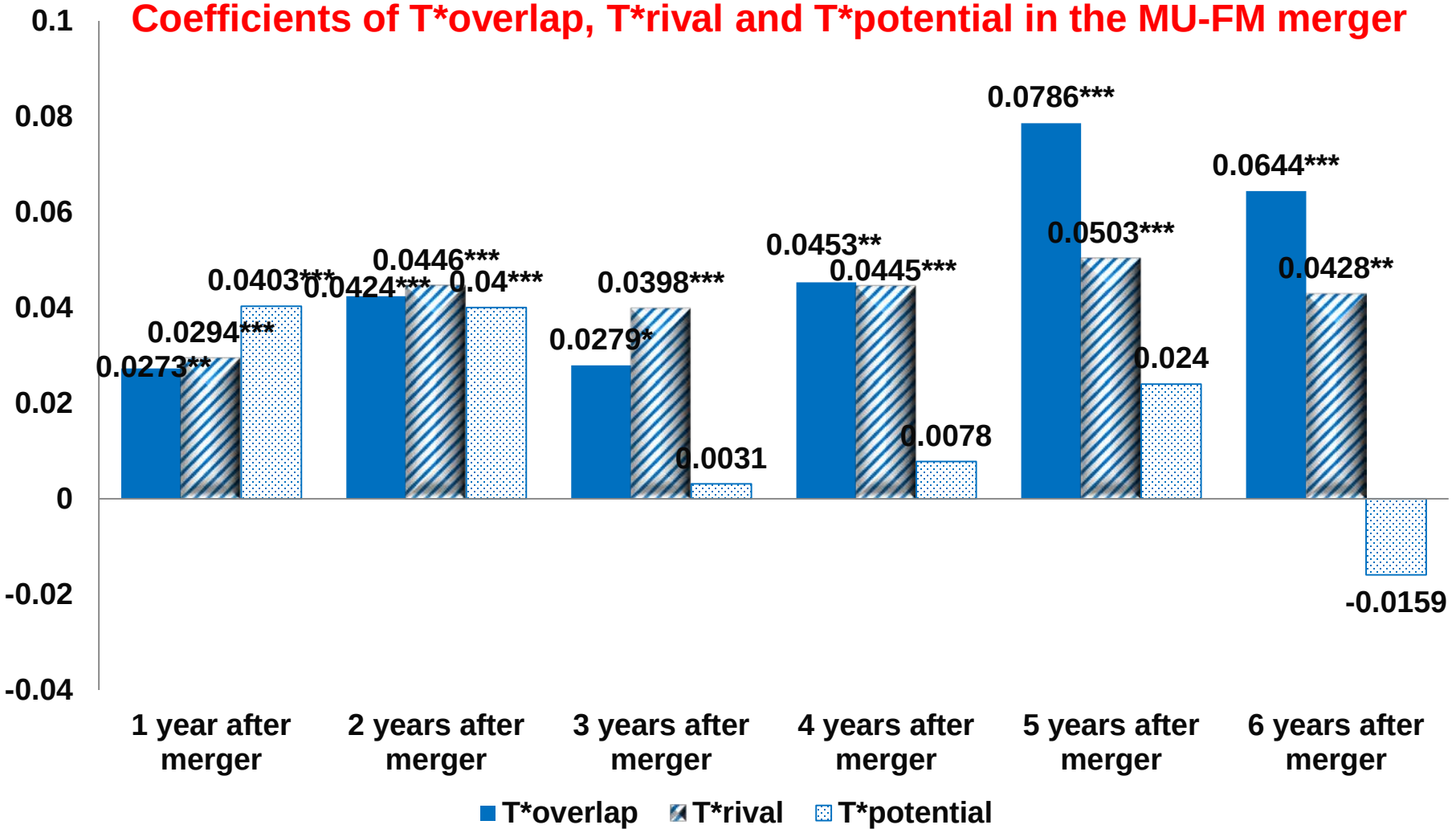
| | Basic Models | | | Dynamic Models | | System GMM | |
|---|---|---|---|---|---|---|---|
| | RE | FE | FE+IV | FE | FE+IV | IV for Yt-1 | IV for Yt-1 and more |
| T*overlap | 0.0213 | 0.0333** | 0.0311*** | 0.0196*** | 0.0175*** | 0.0175 | 0.0110 |
| T*rival | 0.0209* | 0.0280*** | 0.0345*** | 0.0157*** | 0.0185*** | -0.0009 | -0.0010 |
| T*potential | 0.0048 | 0.0065 | 0.0055 | 0.0004 | -0.0019 | 0.0001 | -0.0023 |
| HSR | -0.0468*** | -0.0504*** | -0.0543*** | -0.0227*** | -0.0367*** | -0.0402*** | -0.0138* |
| HSR2014 | 0.0762*** | 0.0775*** | 0.0724*** | 0.0347*** | 0.0446*** | 0.0566*** | 0.0341*** |
| LCC | -0.0530*** | -0.0418*** | -0.0413*** | -0.0218*** | -0.0278*** | -0.0561*** | -0.0417*** |
| Constant | 1.0369*** | -3.3738*** | - | -1.6074*** | - | -1.0980*** | -0.1505* |
| N | 36590 | 36590 | 34381 | 36590 | 34381 | 36590 | 36590 |
| $R^2$ | 0.530 | 0.246 | 0.122 | 0.447 | 0.285 | - | - |

# 5. Results

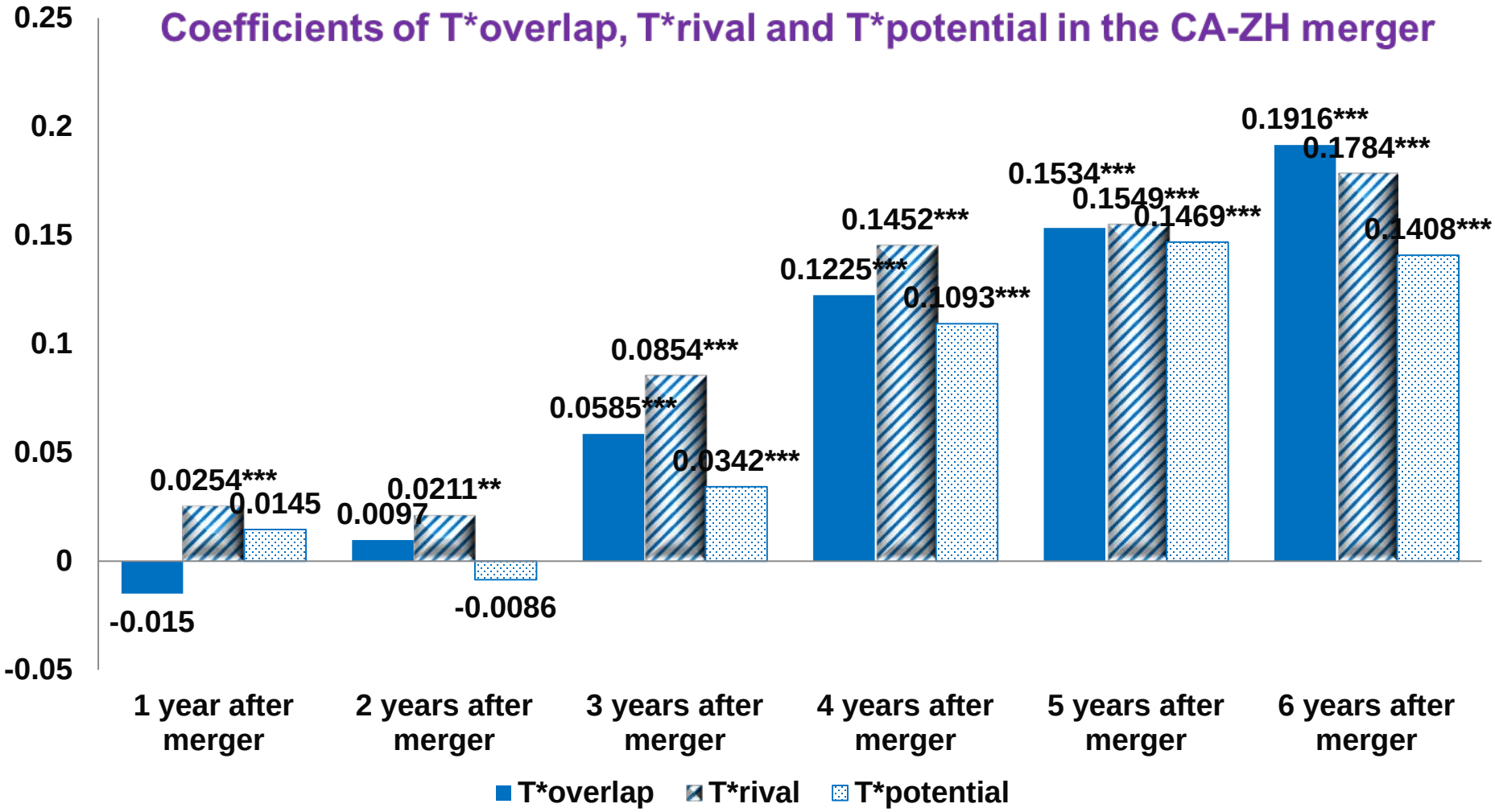
**The Estimation Results of the CA-ZH Merger with HSR2014**

| | Basic Models | | | Dynamic Models | | System GMM | |
|---|---|---|---|---|---|---|---|
| | RE | FE | FE+IV | FE | FE+IV | IV for Yt-1 | IV for Yt-1 and more |
| T*overlap | 0.0688*** | 0.0664*** | 0.0695*** | 0.0362*** | 0.0430*** | 0.0341** | 0.0259*** |
| T*rival | 0.0808*** | 0.0803*** | 0.0830*** | 0.0395*** | 0.0506*** | 0.0448*** | 0.0337*** |
| T*potential | 0.0573*** | 0.0550*** | 0.0557*** | 0.0254*** | 0.0339*** | 0.0359*** | 0.0278*** |
| HSR | -0.0591*** | -0.0618*** | -0.0695*** | -0.0307*** | -0.0446*** | -0.0458*** | -0.0249*** |
| HSR2014 | 0.0986*** | 0.0991*** | 0.0978*** | 0.0472*** | 0.0592*** | 0.0578*** | 0.0474*** |
| LCC | -0.0606*** | -0.0440*** | -0.0499*** | -0.0256*** | -0.0350*** | -0.0691*** | -0.0471*** |
| Constant | 0.8016*** | -2.9417*** | - | -1.2278*** | - | -0.5601*** | 0.0815 |
| N | 35140 | 35140 | 33029 | 35140 | 33029 | 35140 | 35140 |
| $R^2$ | 0.549 | 0.253 | 0.147 | 0.454 | 0.303 | - | - |

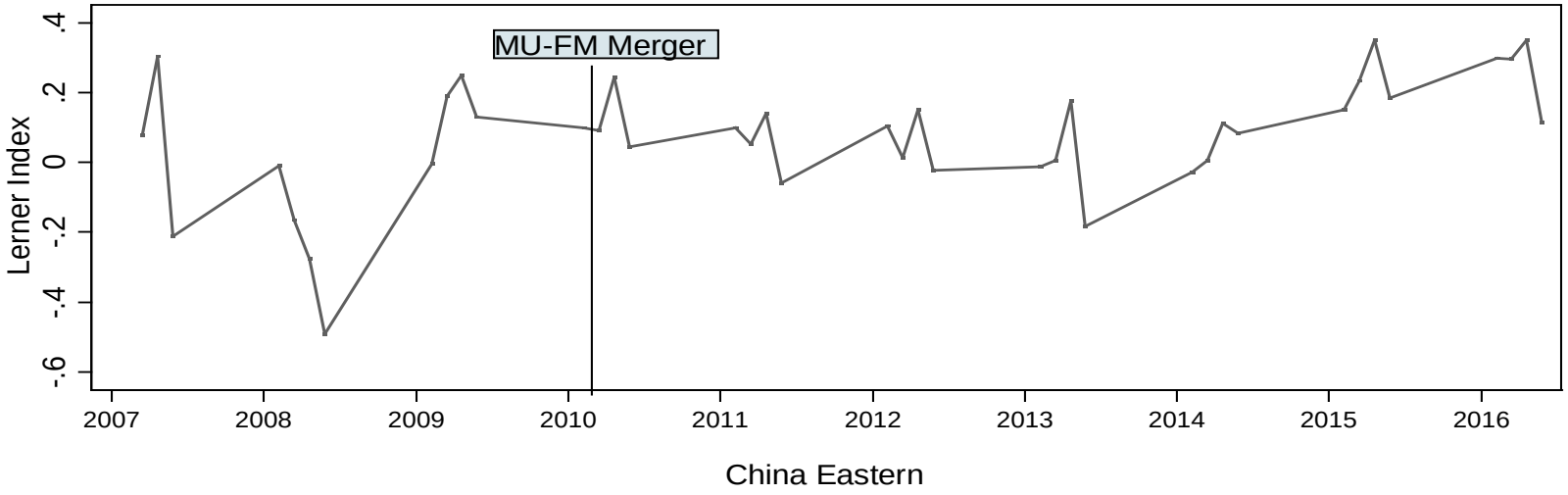
# 5. Results

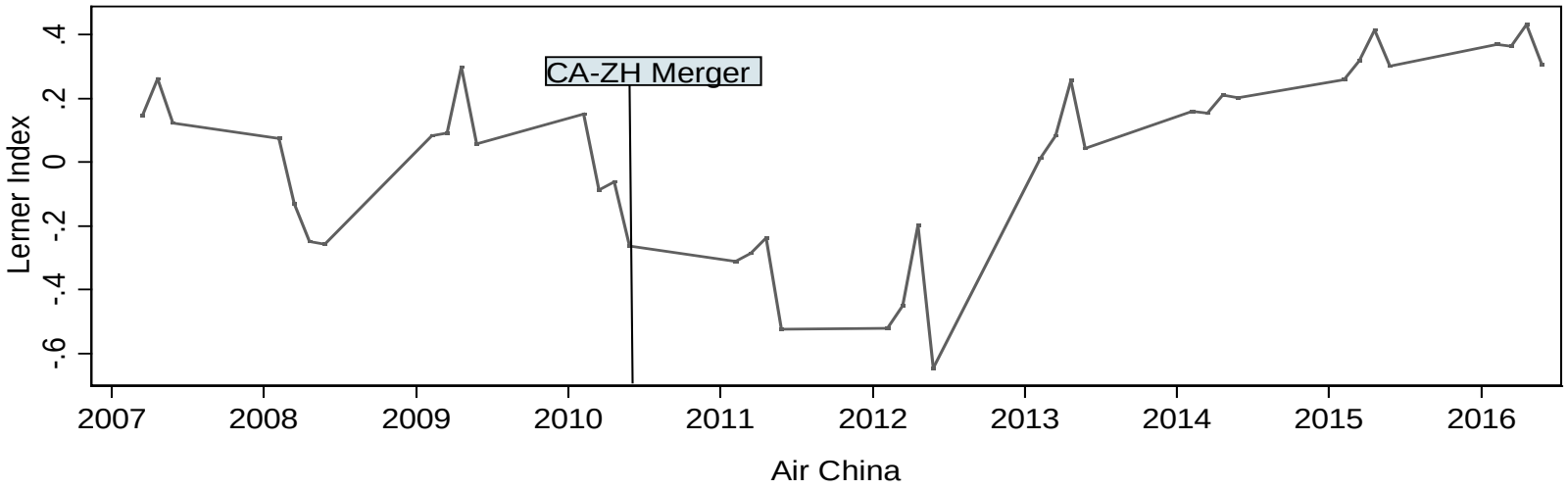

Coefficients of T*overlap, T*rival and T*potential in the MU-FM merger
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
0.0273**
0.0294***
0.0403***
0.0424***
0.0446***
0.04***
0.0279*
0.0398***
0.0031
0.0453**
0.0445***
0.0078
0.0786***
0.0503***
0.024
0.0644***
0.0428**
-0.0159
1 year after merger
2 years after merger
3 years after merger
4 years after merger
5 years after merger
6 years after merger
T*overlap
T*rival
T*potential

# 5. Results


Coefficients of T*overlap, T*rival and T*potential in the CA-ZH merger
0.25
0.2
0.15
0.1
0.05
0
-0.05
-0.015
0.0254***
0.0145
0.0097
0.0211**
-0.0086
0.0585***
0.0854***
0.0342***
0.1225***
0.1452***
0.1093***
0.1534***
0.1549***
0.1469***
0.1916***
0.1784***
0.1408***
1 year after merger
2 years after merger
3 years after merger
4 years after merger
5 years after merger
6 years after merger
T*overlap
T*rival
T*potential

# Market power after merger



# 6. Conclusion

- First, the results are in line with the existing literature that both airline mergers triggered significant price increases on routes affected by mergers relative to the control group.
- However, the average rise is smaller for the merger between China Eastern and Shanghai Airlines than between Air China and Shenzhen Airlines, although the former is of parallel nature.
- We suppose that it was a result of the intense competition brought about by low cost carrier (LCC) and private airline that had a heavy presence in the Shanghai market.

# 6. Conclusion

- Second, incorporating lag effects in our model, we find that in the long run, the price effects are similar in both MU-FM and CA-ZH mergers.
- The patterns have been verified by the calculated Lerner indices, suggesting that substantial market power might not have arisen shortly after the merger until a few years later.
- However, in the short run, the effects of the MU-FM merger are much larger than the CA-ZH merger.
- The variate results in short-term and long-term could be caused by different network structure, distinct financial states and diverse market position of the companies involved in the two mergers.

# 6. Conclusion

- Third, the empirical results show different effects of HSR on airfare during different time periods.
- Specifically, before early 2014, HSR had significantly negative impact on airfare; while after early 2014, the negative effect of HSR on airfare gradually weakened and turned into positive effect.
- Both airline-HSR cooperation after early 2014 and new strategies adapted by airlines in order to react to HSR's competition are possible reasons causing the surprising results.

# Future research

LOGO

- First, with the rapid development of HSR network in China, airline-HSR cooperation has been topical and various theoretical models have been developed such as Xia et al. (2017). However, more empirical studies are needed to confirm the positive impact of HSR on airfares revealed in this study by using more recent data.
- Second, we have analyzed the overall price effects of mergers in the Chinese airline market. It would be interesting to have an in-depth examination of a small number of important routes to airlines to give us a better understanding of how airlines interact in pricing by taking into more route-specific characteristics.

Thank you!

Any Questions/Comments?