Table S1. General message of 14 airlines before and after the filtering with the threshold of 1000 flights per year for an aircraft in 2014

| Airlines | Average Flights/day*aircraft | No. aircrafts | No. aircrafts with >1000 flights | Total No. Flights after Filtering |
|----------|------------------------------|---------------|----------------------------------|----------------------------------|
| AA       | 3.4                          | 676           | 237                              | 291510                           |
| MQ       | 4.6                          | 224           | 217                              | 367189                           |
| F9       | 4.1                          | 56            | 54                               | 84349                            |
| DL       | 3.8                          | 783           | 475                              | 662197                           |
| HA       | 9.3                          | 49            | 18                               | 60946                            |
| AS       | 3.7                          | 142           | 112                              | 154600                           |
| EV       | 4.4                          | 416           | 401                              | 643952                           |
| B6       | 3.5                          | 203           | 186                              | 235850                           |
| US       | 3.7                          | 363           | 273                              | 372884                           |
| VX       | 3.2                          | 55            | 31                               | 36565                            |
| UA       | 2.9                          | 704           | 183                              | 196864                           |
| WN       | 5.3                          | 650           | 591                              | 1132745                          |
| FL       | 3.7                          | 98            | 42                               | 57563                            |
| OO       | 4.8                          | 365           | 330                              | 578300                           |

Table S2. Comparison of the parameters in Complementary cumulative distribution functions (CCDFs) for model 1 with corresponding ones in the transfer function \( q(l) \) in 2014.

| Airlines          | Codes   | \( a_0 \)  | \( \beta_1 \)  | \( a_0 \)  | \( \beta_2 \) |
|-------------------|---------|------------|----------------|------------|----------------|
| American Airlines | AA      | 7.77 \times 10^2 | 2.03 | 0.43 | 35 |
| American Eagle    | MQ      | 3.74 \times 10^3 | 5.0  | 2.84 | 40 |
| Frontier Airlines | F9      | 5.37 \times 10^6 | 9.0  | 3.59 | 90 |
| Delta Airlines    | DL      | 4.67 \times 10^4 | 4.0  | 2.51 | 30 |
| Hawaiian Airlines | HA      | 9.48 \times 10^4 | 3.0  | 3.78 | 30 |
| Alaska Airlines   | AS      | 1.05 \times 10^7 | 9.0  | 3.91 | 80 |
TABLE S3. Comparison of the parameters in CCDFs for model 2 with corresponding ones in the transfer function $q(l)$ in 2014.

| airlines               | codes | $c_2$ | $\beta_1$ | $\lambda$ | $r$  | $\alpha$ | $\beta_2$ | $m$  |
|------------------------|-------|-------|------------|-----------|------|----------|-----------|------|
| JetBlue Airways        | B6    | 1.18  | 8.73       | 81.97     | 0.50 | 0.52     | 8.70      | 15   |
| Virgin America         | VX    | 0.35  | 0.53       | 70.92     | 0.22 | 0.33     | 0.52      | 15   |
| United Airlines        | UA    | 1.99  | 8.47       | 97.07     | 0.63 | 0.41     | 8.45      | 8    |
| US Airways             | US    | 2.13  | 9.90       | 87.72     | 0.79 | 0.48     | 9.25      | 10   |
| Southwest Airlines     | WN    | 8.73  | 16.48      | 82.64     | 0.94 | 0.74     | 16.77     | 6    |
| Atlantic Southeast     | EV    | 0.79  | 6.62       | 79.37     | 0.33 | 0.53     | 6.86      | 21   |
| AirTran Airways        | FL    | 6.95  | 12.61      | 113.90    | 1.08 | 0.55     | 12.39     | 7    |
| SkyWest Airlines       | OO    | 1.50  | 11.83      | 83.33     | 0.57 | 0.75     | 11.95     | 24   |

DELAY PROBABILITY DISTRIBUTION FUNCTIONS FOR US AIRLINES FROM 1995 TO 2013

CCDFs for airlines in Group 1 (Fig. S1 — Fig. S10)
FIG. S1. Complementary cumulative distribution functions of departure delays \( l \) for airline AA from 1995 to 2004 ((a) - (j)). Red lines represent formula (8) \((P = c_0(l + \beta_1)^{-\alpha_0})\) fitting CCDFs mined from real data. \( \Delta l = 10\text{min} \).
FIG. S2. Complementary cumulative distribution functions of departure delays $l$ for airline AA(a), MQ(b), F9(c), EV(d) and HA(e) in 2005. $\Delta t = 10\text{min}$.

FIG. S3. Complementary cumulative distribution functions of departure delays $l$ for airline AA(a), MQ(b), F9(c), EV(d) and HA(e) in 2006. $\Delta t = 10\text{min}$
FIG. S4. Complementary cumulative distribution functions of departure delays $l$ for airline AA(a), MQ(b), F9(c), HA(d) and EV(e) in 2007. $\Delta l = 10\text{min}$

FIG. S5. Complementary cumulative distribution functions of departure delays $l$ for airline AA(a), MQ(b), F9(c) and HA(d) in 2008. $\Delta l = 10\text{min}$.
FIG. S6. Complementary cumulative distribution functions of departure delays $l$ for airline AA(a), MQ(b), F9(c), HA(d) and AS(e) in 2009. $\Delta l = 10\text{min}$.

FIG. S7. Complementary cumulative distribution functions of departure delays $l$ for airline AA(a), MQ(b), F9(c), DL(d), HA(e) and AS(f) in 2010. $\Delta l = 10\text{min}$. 
FIG. S8. Complementary cumulative distribution functions of departure delays \( l \) for airline AA(a), MQ(b), F9(c), DL(d) and HA(e) in 2011. \( \Delta l = 10 \text{min} \).

FIG. S9. Complementary cumulative distribution functions of departure delays \( l \) for airline AA(a), MQ(b), F9(c), DL(d) and HA(e) in 2012. \( \Delta l = 10 \text{min} \).
FIG. S10. Complementary cumulative distribution functions of departure delays $l$ for airline AA(a), MQ(b), F9(c), DL(d), HA(e) and AS(f) in 2013. $\Delta l = 10\text{min}$.

CCDFs for airlines in Group 2 (Fig. S11 — Fig. S29)
FIG. S11. Complementary cumulative distribution functions of departure delays \( t \) for airline UA(a), US(b), WN(c), AS(d) and DL(e) in 1995. \( \Delta t = 10 \text{min} \).

FIG. S12. Complementary cumulative distribution functions of departure delays \( t \) for airline UA(a), US(b), WN(c), AS(d) and DL(e) in 1996. \( \Delta t = 10 \text{min} \).
FIG. S13. Complementary cumulative distribution functions of departure delays $l$ for airline UA(a), US(b), WN(c), AS(d) and DL(e) in 1997. $\Delta l = 10\text{min}$.

FIG. S14. Complementary cumulative distribution functions of departure delays $l$ for airline UA(a), US(b), WN(c), AS(d) and DL(e) in 1998. $\Delta l = 10\text{min}$.
FIG. S15. Complementary cumulative distribution functions of departure delays \( t \) for airline UA(a), US(b), WN(c), AS(d) and DL(e) in 1999. \( \Delta t = 10\text{min} \).

FIG. S16. Complementary cumulative distribution functions of departure delays \( t \) for airline UA(a), US(b), WN(c), AS(d) and DL(e) in 2000. \( \Delta t = 10\text{min} \).
FIG. S17. Complementary cumulative distribution functions of departure delays \( l \) for airline UA(a), US(b), WN(c), AS(d) and DL(e) in 2001. \( \Delta l = 10\text{min} \).

FIG. S18. Complementary cumulative distribution functions of departure delays \( l \) for airline UA(a), US(b), WN(c), AS(d) and DL(e) in 2002. \( \Delta l = 10\text{min} \).
FIG. S19. Complementary cumulative distribution functions of departure delays $l$ for airline UA(a), US(b), WN(c), AS(d) and DL(e) in 2003. $\Delta l = 10\text{min}$.

FIG. S20. Complementary cumulative distribution functions of departure delays $l$ for airline UA(a), US(b), WN(c), AS(d) and DL(e) in 2004. $\Delta l = 10\text{min}$.
FIG. S21. Complementary cumulative distribution functions of departure delays \( l \) for airline AA(a), MQ(b), F9(c), DL(d) and HA(e) in 2012. \( \Delta l = 10 \text{min} \).

FIG. S22. Complementary cumulative distribution functions of departure delays \( l \) for airline B6(a), UA(b), US(c), WN(d), FL(e), OO(f), AS(g) and DL(h) in 2006. \( \Delta l = 10 \text{min} \).
FIG. S23. Complementary cumulative distribution functions of departure delays \( l \) for airline B6(a), UA(b), US(c), WN(d), FL(e), OO(f), AS(g) and DL(h) in 2007. \( \Delta l = 10 \text{min} \).

2008

FIG. S24. Complementary cumulative distribution functions of departure delays \( l \) for airline B6(a), UA(b), US(c), WN(d), EV(e), FL(f), OO(g), AS(h) and DL(i) in 2008. \( \Delta l = 10 \text{min} \).
FIG. S25. Complementary cumulative distribution functions of departure delays $l$ for airline B6(a), UA(b), US(c), WN(d), EV(e), FL(f), OO(g) and DL(h) in 2009. $\Delta l = 10\, \text{min}$.

FIG. S26. Complementary cumulative distribution functions of departure delays $l$ for airline B6(a), UA(b), US(c), WN(d), EV(e), FL(f) and OO(g) in 2010. $\Delta l = 10\, \text{min}$. 
2011

![Complementary cumulative distribution functions for departure delays in 2011](image)

**FIG. S27.** Complementary cumulative distribution functions of departure delays $l$ for airline B6(a), UA(b), US(c), WN(d), EV(e), FL(f), OO(g) and AS(h) in 2011. $\Delta l = 10\text{min}$.

2012

![Complementary cumulative distribution functions for departure delays in 2012](image)

**FIG. S28.** Complementary cumulative distribution functions of departure delays $l$ for airline B6(a), UA(b), US(c), WN(d), EV(e), FL(f), OO(g) and AS(h) in 2012. $\Delta l = 10\text{min}$.
FIG. S29. Complementary cumulative distribution functions of departure delays $l$ for airline B6(a), UA(b), US(c), WN(d), EV(e), FL(f) and OO(g) in 2013. $\Delta l = 10 \text{ min}$.

**Cumulated transfer function $F(l)$ in Group 1 (Fig. S30 — Fig. S39)**
FIG. S30. Complementary cumulative distribution functions of departure delays $l$ for airline AA(a), MQ(b), F9(c), EV(d) and HA(e) from 1995 to 2004. $\Delta l = 10\text{min}$. 
FIG. S31. Complementary cumulative distribution functions of departure delays $l$ for airline AA(a), MQ(b), F9(c), EV(d) and HA(e) in 2005. $\Delta l = 10\text{min}$.

FIG. S32. Complementary cumulative distribution functions of departure delays $l$ for airline AA(a), MQ(b), F9(c), EV(d) and HA(e) in 2006. $\Delta l = 10\text{min}$.
FIG. S33. Complementary cumulative distribution functions of departure delays $l$ for airline AA(a), MQ(b), F9(c), HA(d) and EV(e) in 2007. $\Delta l = 10\text{min}$.

FIG. S34. Complementary cumulative distribution functions of departure delays $l$ for airline AA(a), MQ(b), F9(c) and HA(d) in 2008. $\Delta l = 10\text{min}$.
FIG. S35. Complementary cumulative distribution functions of departure delays $l$ for airline AA(a), MQ(b), F9(c), HA(d) and AS(e) in 2009. $\Delta l = 10\text{min}$. 

FIG. S36. Complementary cumulative distribution functions of departure delays $l$ for airline AA(a), MQ(b), F9(c), DL(d), HA(e) and AS(f) in 2010. $\Delta l = 10\text{min}$. 

$\alpha = 0.67$, $\beta_2 = 70$ for airline AA(a) in 2009. $\Delta l = 10\text{min}$. $\alpha = 0.73$, $\beta_2 = 70$ for airline MQ(b) in 2009. $\Delta l = 10\text{min}$. $\alpha = 0.79$, $\beta_2 = 80$ for airline F9(c) in 2009. $\Delta l = 10\text{min}$. $\alpha = 0.64$, $\beta_2 = 20$ for airline HA(d) in 2009. $\Delta l = 10\text{min}$. $\alpha = 0.73$, $\beta_2 = 80$ for airline AS(e) in 2009. $\Delta l = 10\text{min}$. $\alpha = 0.68$, $\beta_2 = 70$ for airline AA(a) in 2010. $\Delta l = 10\text{min}$. $\alpha = 0.60$, $\beta_2 = 60$ for airline MQ(b) in 2010. $\Delta l = 10\text{min}$. $\alpha = 0.65$, $\beta_2 = 70$ for airline F9(c) in 2010. $\Delta l = 10\text{min}$. $\alpha = 0.51$, $\beta_2 = 60$ for airline DL(d) in 2010. $\Delta l = 10\text{min}$. $\alpha = 0.47$, $\beta_2 = 15$ for airline HA(e) in 2010. $\Delta l = 10\text{min}$. $\alpha = 0.69$, $\beta_2 = 80$ for airline AS(f) in 2010. $\Delta l = 10\text{min}$. 

$\Delta l = 10\text{min}$.
FIG. S37. Complementary cumulative distribution functions of departure delays $l$ for airline AA(a), MQ(b), F9(c), DL(d) and HA(e) in 2011. $\Delta l = 10\text{min}$.

FIG. S38. Complementary cumulative distribution functions of departure delays $l$ for airline AA(a), MQ(b), F9(c), DL(d) and HA(e) in 2012. $\Delta l = 10\text{min}$.
FIG. S39. Complementary cumulative distribution functions of departure delays $l$ for airline AA(a), MQ(b), F9(c), DL(d), HA(e) and AS(f) in 2013. $\Delta l = 10\text{min}$.

Cumulated transfer function $F(l)$ in Group 2(Fig. S40 — Fig. S58)
FIG. S40. $F(t) = a\ln(1 + \frac{t}{T})$ (red lines) fitting cumulated transfer function mined from primary data of airline UA(a), US(b), WN(c), AS(d) and DL(e) in 1995. $\Delta t = 5\text{min}$.

FIG. S41. $F(t) = a\ln(1 + \frac{t}{T})$ (red lines) fitting cumulated transfer function mined from primary data of airline UA(a), US(b), WN(c), AS(d) and DL(e) in 1996. $\Delta t = 5\text{min}$.
FIG. S42. $F(l) = \alpha ln(1 + \frac{l}{\tau})$ (red lines) fitting cumulated transfer function mined from primary data of airline UA(a), US(b), WN(c), AS(d) and DL(e) in 1997. $\Delta l = 5\text{min}$.

FIG. S43. $F(l) = \alpha ln(1 + \frac{l}{\tau})$ (red lines) fitting cumulated transfer function mined from primary data of airline UA(a), US(b), WN(c), AS(d) and DL(e) in 1998. $\Delta l = 5\text{min}$.
FIG. S44. $F(t) = \alpha \ln\left(1 + \frac{t}{\beta_1}\right)$ (red lines) fitting cumulated transfer function mined from primary data of airline UA(a), US(b), WN(c), AS(d) and DL(e) in 1999. $\Delta t = 5\text{ min}$.

FIG. S45. $F(t) = \alpha \ln\left(1 + \frac{t}{\beta_1}\right)$ (red lines) fitting cumulated transfer function mined from primary data of airline UA(a), US(b), WN(c), AS(d) and DL(e) in 2000. $\Delta t = 5\text{ min}$. 
2001

FIG. S46. $F(l) = \alpha ln(1 + \frac{l}{\tau})$ (red lines) fitting cumulated transfer function mined from primary data of airline UA(a), US(b), WN(c), AS(d) and DL(e) in 2001. $\Delta l = 5\text{min}$.

2002

FIG. S47. $F(l) = \alpha ln(1 + \frac{l}{\tau})$ (red lines) fitting cumulated transfer function mined from primary data of airline UA(a), US(b), WN(c), AS(d) and DL(e) in 2002. $\Delta l = 5\text{min}$.
FIG. S48. $F(l) = \alpha ln(1 + \frac{l}{c})$ (red lines) fitting cumulated transfer function mined from primary data of airline UA(a), US(b), WN(c), AS(d) and DL(e) in 2003. $\Delta l = 5\text{min}$.

FIG. S49. $F(l) = \alpha ln(1 + \frac{l}{c})$ (red lines) fitting cumulated transfer function mined from primary data of airline UA(a), US(b), WN(c), AS(d) and DL(e) in 2004. $\Delta l = 5\text{min}$. 
FIG. S50. $F(l) = \alpha \ln(1 + \frac{l}{12})$ (red lines) fitting cumulated transfer function mined from primary data of airline B6(a), UA(b), US(c), WN(d), FL(e), OO(f), AS(g) and DL(h) in 2005. $\Delta t = 5\text{min}$.

FIG. S51. $F(l) = \alpha \ln(1 + \frac{l}{12})$ (red lines) fitting cumulated transfer function mined from primary data of airline B6(a), UA(b), US(c), WN(d), FL(e), OO(f), AS(g) and DL(h) in 2006. $\Delta t = 5\text{min}$.
FIG. S52. $F(t) = a\ln(1 + \frac{t}{\Delta t})$ (red lines) fitting cumulated transfer function mined from primary data of airline B6(a), UA(b), US(c), WN(d), FL(e), OO(f), AS(g) and DL(h) in 2008. $\Delta t = 5\text{min}$.

FIG. S53. $F(t) = a\ln(1 + \frac{t}{\Delta t})$ (red lines) fitting cumulated transfer function mined from primary data of airline B6(a), UA(b), US(c), WN(d), EV(e), FL(f), OO(g), AS(h) and DL(i) in 2008. $\Delta t = 5\text{min}$.
FIG. S54. $F(l) = \alpha ln(1 + \frac{l}{m})$ red lines fitting cumulated transfer function mined from primary data of airline B6(a), UA(b), US(c), WN(d), EV(e), FL(f), OO(g) and DL(h) in 2009. $\Delta t = 5\text{min}$.

FIG. S55. Complementary cumulative distribution functions of departure delays $l$ for airline B6(a), UA(b), US(c), WN(d), EV(e), FL(f) and OO(g) in 2010. $\Delta t = 5\text{min}$. 
FIG. S56. Complementary cumulative distribution functions of departure delays $\Delta t$ for airline B6(a), UA(b), US(c), WN(d), EV(e), FL(f), OO(g) and AS(h) in 2011. $\Delta t = 5$ min.

FIG. S57. Complementary cumulative distribution functions of departure delays $\Delta t$ for airline B6(a), UA(b), US(c), WN(d), EV(e), FL(f), OO(g) and AS(h) in 2012. $\Delta t = 5$ min.
FIG. S58. Complementary cumulative distribution functions of departure delays $l$ for airline B6(a), UA(b), US(c), WN(d), EV(e), FL(f) and OO(g) in 2013. $\Delta t = 5\text{min}$.

**AVGARDE DELAY - ABSORBING TIME $L$ VERSUS SHIFT QUANTITY $\beta_1$ IN EACH YEAR FOR AIRLINES IN BOTH GROUPS (FIG. S59 – FIG. S68)**

FIG. S59. Average delay - absorbing time versus shift quantity $\beta_1$ from 1995 to 1996. Upper panels(a): Group 1 with SPL; lower panels(b): Group 2 with ETSPL, for each year.
FIG. S60. Average delay - absorbing time versus shift quantity $\beta_1$ from 1997 to 1998. Upper panels(a): Group 1 with SPL; lower panels(b): Group 2 with ETSPL, for each year.

TEMPORAL VARIATIONS OF THREE METRICS DURING 20 YEARS(FIG. S69)

Temporal variations of three metrics — the shift quantity $\beta_1$, the compensation interval $m$, and the critical delay $\lambda$, reveal the performance evolution of the whole domestic passenger air transportation of the United States, and the operational features of individual airline companies. Besides all the figures for 2014, statistical results for the years 1995−2013 are all displayed in SI: Fig. S1 — Fig. S10 and Fig. S11 — Fig. S29 for CCDFs in Group 1 and Group 2; Fig. S30 — Fig. S39 and Fig. S40 — Fig. S58 for $F(l)$ in Group 1 and Group 2; And Fig. S59 – Fig. S68 for relations $L(\beta_1)$ with all panels (a) for Group 1, all panels (b) for Group 2, respectively.

From 1995 to 2004, data of only six airlines are available. Group 1 contains only airline AA, while Group 2 contains five other airlines: UA, US, WN, AS and DL. After 2005, data from thirteen airlines are available. Airlines AA, MQ, F9, EV and HA stay in Group 1, while B6, UA, US, WN, FL, OO, AS and DL stay in Group 2, from 2005 to 2007. EV jumps to Group 2 in 2008 and stay there afterward. AS jumps to Group 1 in 2009, then jumps back in 2011, and jumps again to Group 1 in 2013. DL jumps to it in 2010 and stays there afterward. In the year 2014, airline VX appears in Group 2. Due to such jumps, temporal variation behaviors of $\beta_1$, $m$ and $\lambda$ interrupt at corresponding years as shown in Fig. S69.

As we argued in last section, $\beta_1$ in general measures inversely the ability of an airline to absorb the delay in the case of DTPD. From Fig. S66 – Fig. S68 we see that negative relations similar to formula (11) cover airlines in Group 1 from 2009 to 2013 except 2011, while those similar to formula (12) cover Group 2 for all 20 years. No correlation in Group 1 can be found in each panel with SPL before 2005, since only a representing point of airline AA appears. In the $L(\beta_1)$ graphs after 2004, points of HA keep staying at the positions with lower levels of both $L$ and $\beta_1$. Its CCDF less deviates from a power-law meaning heterogeneity. In 2005 and 2006, points for airline F9 stay leftward, exhibiting more heterogeneity of their CCDFs. In addition, points for AA shift rightward in 2007 and 2008, exhibiting more homogeneity of their CCDFs. In addition, points for AA shift rightward in 2007 and 2008, exhibiting more homogeneity of their CCDFs.
FIG. S61. Average delay - absorbing time versus shift quantity $\beta_1$ from 1999 to 2000. Upper panels(a): Group 1 with SPL; lower panels(b): Group 2 with ETSPL, for each year.

keep being isolated from the main strain line of statistical fitting in other years, no obvious negative correlation of $L(\beta_1)$ could be found in Group 1 during 2005 to 2008(also 2011). While the relations $L(\beta_1)$ of Group 2 behave in a negatively linear dependence except airline WN which does not follow the main strain relation and keeps staying at lower $L$ (around 10 minutes) during 15 years (1995 − 2009). This is reminiscent of us with distinctive feature of its point-to-point operation strategy(which is also true for airline HA when only domestic flights are concerned). Detail investigation of such cases would be expected. It is noticeable that airline WN joins the main strain of negatively linear correlations $L(\beta_1)$ from 2010 (Fig. S66 – Fig. S68, and Fig.3A in the text), keeping its low delay - absorbing level but with increased $\beta_1$ from 2010 to 2014 in Group 2. Therefore, for majority of the airlines and for most years, a negative linear correlation between the average delay - absorbing $L$ and $\beta_1$ is valid. We should conclude that, the more homogeneity of an airlines’s DD distribution, the weaker ability for it to absorb immediate preceding delay with the same aircraft, in general.

In observation of the temporal variations(see Fig. S69 (a) and (b)), $\beta_1$ around 2005−2008 has higher or lower bumps compared with the previous values except B6 and UA, which means decreased absorption of delays by other 6 airlines. Simultaneous appearance of bumps of $\beta_1$ by AA, MQ, F9 and HA, especially F9 approaching HA, corresponds to the invalidation of negative linear correlation between $L$ and $\beta_1$. After 2008, F9 (Fig. S69(a)) and WN (Fig. S69(b)) continue their essential increase of $\beta_1$. While after 2013, a new round of $\beta_1$-increase happen to almost all airlines (except the new comer VX), which could predict similar situation Group 2 faced during last bump of $\beta_1$. In contradiction, we can rank UA the best since it keeps lowest $\beta_1$ hence highest $L$ in almost all years.

For airlines in group 2, FL, AS, US and OO have larger values $\beta_1$ from 2005 to 2008, which means decreased ability to absorb DTPD. More importantly, due to quicker drop to zero than the $k(l)$ assumed in Model 2, critical delay $\lambda$ plays more important role than $\beta_1$ or $\beta_2$ in CCDFs. Usually, larger $\lambda$ and smaller $m$ enable higher precision of the phenomenological models (see (c), (d), (e) and (g) of Fig.2A and Fig.2B in the text, for examples). Large $m$ strongly reduces the effect of DTPD assumed in formula (1). Airlines EV and B6 after 2008 (see panels (a) and (e) of Fig. S27—Fig. S31, Fig. S55—Fig. S60, UA and WN during 2005—2008 (see (b) and (d) of Fig. S23—Fig. S27, Fig. S52—Fig. S56), and OO in 2008 and 2013 (see panels (g) of Fig. S26—Fig. S31, Fig. S55—Fig. S60, respectively,
FIG. S62. Average delay - absorbing time versus shift quantity $\beta_1$ from 2001 to 2002. Upper panels(a): Group 1 with SPL; lower panels(b): Group 2 with ETSPL.

serve the worse examples than other airlines during the same years, and in comparison with their own performance in other years.

Comparing panel (b) with (c) in Fig. S69, one can easily see that the levels of $\lambda$ are always higher than corresponding $\beta_1$ in Group 2, and $\lambda$ sometime share similar oscillating-increase tendency of $\beta_1$, say, airlines UA, WN, B6 US, OO, and EV, for examples. Observation of the $\lambda$ - variation can further divide the operation behaviors of the airlines into 4 subgroups: AS, FL and DL often oscillating at higher level above 80; UA, US and WN having gentle oscillations and increases often below 80; B6, EV, and OO having continuous valleys; and finally VX, the isolated new comer. Common behaviors within individual subgroups and difference between them characterized by both $\beta_1$ and $\lambda$ are expected to be understood by investigation to detailed operations.

In addition to the $\lambda$ - valleys they have, airlines B6, EV and OO have higher levels of $m$(see Fig. S69(c) and (d)), which means more chances to be affected by NPF and ITPD. Besides, UA and WN both undergo $m$ - bumps after 2005, then decrease essentially after 2008, which indicates the decrease of effect of NPF and ITPD and growing operation order by DTPD from 2009. Moreover, both WN and US display stable levels of $m$ for a few years, which indicates the operational stability of the airlines. Finally, $m$ of all airlines drop down simultaneously from 2013, indicating the growing tendency of more DTPD in the flight delay events.

* These two authors contributed equally
† To whom correspondence may be addressed. Email: oldpigman1234@126.com, hes@bu.edu
FIG. S63. Average delay - absorbing time versus shift quantity $\beta_1$ from 2003 to 2004. Upper panels(a): Group 1 with SPL; lower panels(b): Group 2 with ETSPL, for each year.
FIG. S64. Average delay - absorbing time versus shift quantity $\beta_1$ from 2005 to 2006. Upper panels(a): Group 1 with SPL; lower panels(b): Group 2 with ETSPL.
FIG. S65. Average delay - absorbing time versus shift quantity $\beta_1$ from 2007 to 2008. Upper panels(a): Group 1 with SPL; lower panels(b): Group 2 with ETSPL, for each year.
FIG. S66. Average delay - absorbing time versus shift quantity $\beta_1$ from 2009 to 2010. Upper panels(a): Group 1 with SPL; lower panels(a): Group 2 with ETSPL.
FIG. S67. Average delay - absorbing time versus shift quantity $\beta_1$ from 2011 to 2012. Upper panels(a): Group 1 with SPL; lower panels(b): Group 2 with ETSPL.
FIG. S68. Average delay - absorbing time versus shift quantity $\beta_1$ in 2013. Upper panels(a): Group 1 with SPL; lower panels(b): Group 2 with ETSPL.
FIG. S69. Temporal variations of three metrics from 1995 to 2014. (a) Shift quantity $\beta_1(t)$ for airlines in Group 1. (b) Shift quantity $\beta_1(t)$ for airlines in Group 2. (c) Critical delay $\lambda(t)$ for Group 2 with ETSPL. (d) Variations of compensation intervals $m(t)$ with time for Group 2 with ETSPL.