



Halle Institute for Economic Research  
Member of the Leibniz Association

# Discussion Papers

No. 21

November 2020



 Competition, Cost Structure, and Labour Leverage: Evidence from the U.S. Airline Industry

Konstantin Wagner

## Author

### **Konstantin Wagner**

Otto von Guericke University Magdeburg and  
Halle Institute for Economic Research (IWH) –  
Member of the Leibniz Association,  
Department of Financial Markets  
E-mail: [konstantin.wagner@iwh-halle.de](mailto:konstantin.wagner@iwh-halle.de)  
Tel +49 345 7753 755

The responsibility for discussion papers lies solely with the individual authors. The views expressed herein do not necessarily represent those of IWH. The papers represent preliminary work and are circulated to encourage discussion with the authors. Citation of the discussion papers should account for their provisional character; a revised version may be available directly from the authors.

Comments and suggestions on the methods and results presented are welcome.

IWH Discussion Papers are indexed in RePEc-EconPapers and in ECONIS.

## Editor

Halle Institute for Economic Research (IWH) –  
Member of the Leibniz Association

Address: Kleine Maerkerstrasse 8  
D-06108 Halle (Saale), Germany  
Postal Address: P.O. Box 11 03 61  
D-06017 Halle (Saale), Germany

Tel +49 345 7753 60  
Fax +49 345 7753 820

[www.iwh-halle.de](http://www.iwh-halle.de)

# Competition, Cost Structure, and Labour Leverage: Evidence from the U.S. Airline Industry\*

## Abstract

I study the effect of increasing competition on financial performance through labour leverage. To capture competition, I exploit variation in product market contestability in the U.S. airline industry. First, I find that increasing competitive pressure leads to increasing labour leverage, proxied by labour share. This explains the decrease in operating profitability through labour rigidities. Second, by exploiting variation in human capital specificity, I show that contestability of product markets induces labour market contestability. Whereas affected firms might experience more stress through higher wages or loss of skilled human capital, more mobile employee groups benefit from competitions through higher labour shares.

*Keywords: competition, labour leverage, labour share, threat of entry*

*JEL classification: G39, J31, L93*

\* I am grateful to Jeff Gorham from the U.S. Department of Transportation for helping me with the data. I thank Mario Brandtner, Stefano Colonnello, Michael Koetter, Thomas Krause, William McShane, Matthias Mertens, Carola Müller, Steffen Müller, Felix Noth, Paige Ouimet, Gianpaolo Parise, Gregor von Schweinitz, Jessie Wang, Qizhou (Leo) Xiong, Yishay Yafeh, seminar participants at the IWH, and the IWH Financial Markets & SAFE Winterschool (Riezlern) for insightful discussions and comments. Felix Klischat and Sithara Thies provided excellent research assistance.

## 1 Introduction

Evaluating the effects of competitive pressure on firms is key to understand an economy’s ability to adapt to a changing economic environment. At the firm level, competitive shocks often materialize as contractions in revenues. How hard these shocks hit firms depends on how flexibly they can react to such adverse events. Operating leverage—the ratio of fixed to total costs—expresses the sensitivity of a firm’s income to changes in revenues. Consequently, firms with high operating leverage will suffer more from a negative demand shock than firms that can easily adapt to a changing economic environment.

In the presence of labor rigidities, labor expenses contribute to labor leverage, a crucial component of operating leverage. The labor share, which captures the fraction of output that goes to labor, has been used in the finance literature as a measure of labor leverage (Marfè, 2017a; Donangelo, Gourio, Kehrig, and Palacios, 2019). This paper investigates how economic shocks driven by competitive pressure affect firm performance and how these relate to labor leverage. By capturing competitive pressure through threat of entry, I address endogeneity concerns associated with decisions of entry (e.g., Goolsbee and Syverson, 2008; Parise, 2018).

Whereas labor leverage is sensitive to both competition in product markets and labor markets, prior studies have neglected the latter aspect of contestability. My testing ground provides a comprehensive assessment of the interplay between competitive pressure and labor leverage. More specifically, I study the effects of product market contestability and whether product market contestability induces labor market contestability.

To investigate firm-level competition, I focus on the U.S. airline industry. The distinctive setting allows me to study the effects of competition on firm-level labor shares and performance. The U.S. airline industry is characterized by high competitive pressure and frequent entries of competitors into spatially segmented markets. Using highly granular data on air carriers, I am able to assess competition at the route-market level.

I identify the effect of competitive pressure on firm profit margins by exploiting the threat of entry by a budget carrier. On the level of route markets, I find that incumbent airlines decrease ticket prices by -2.1% on average, once a market becomes contestable. This leads to a decrease in incumbents' size by -5.5% on average, as proxied by ticket sales in a market. Second, I show that the firm-level labor share of incumbents is positively related to both realized entry and threat of entry. That is, a higher fraction of total revenues is spent on wages, once competitive pressure on airlines increases. Third, I decompose the labor share in different ways to illustrate how lower operating profitability is directly linked to increases in labor leverage. Whereas the share of non-labor related expenses instantly adjusts to competitive pressure, the share of labor expenses, i.e., the labor share, increases. This result is economically significant. I find that more than 80% of the decrease of an airline's EBIT margin caused by competitive pressure is related to the increase in labor leverage.

I provide evidence that the labor shares of different groups of employees are differentially affected by competitive pressure. Management compensation does not contribute to increases in the labor share. One explanation of this result might be lower levels of variable pay at times of tougher competition owing to weaker financial performance of incumbent airlines. This is in line with a narrative that variable compensation is a risk-sharing contract and as such allows firms greater flexibility at times of poorer economic performance (e.g., [Efung, Hau, Kampkötter, and Rochet, 2018](#)). In contrast, both ground crews and flight crews benefit from more competition. The results for the latter group can partially be attributed to labor market effects. This is consistent with labor market contestability induced by product market contestability.

In the empirical analysis, I use a measure of human capital specificity to investigate whether product market contestability can induce labor market contestability. If an entry into a product market becomes more likely, the entering firm will also demand more labor

and thus contestability of related labor markets will increase, too. Oligopsonists' rents will be challenged in a similar way as those of oligopolists. Additional pressure on labor markets can increase operating leverage through higher wages, which potentially crowds out financing opportunities. At the same time, contestability of labor markets could induce a loss of skilled human capital through poaching.

There is a growing body of literature on how labor rigidities affect financing conditions of firms. For instance, [Marfè \(2017b\)](#) demonstrates how the labor share—a proxy of labor leverage—can explain the premia of value firms over growth firms. In addition, [Marfè \(2017a\)](#) argues that income insurance from shareholders to workers comes at the expense of higher short-run dividend risk. [Donangelo et al. \(2019\)](#) document that firms with higher labor leverage exhibit higher equity returns. These returns come at the cost of a higher sensitivity to economic shocks. [Simintzi, Vig, and Volpin \(2015\)](#) show that higher levels of labor protection—which make labor expenses arguably more rigid—increase operating leverage, crowding out financial leverage. This is in line with [Favilukis, Lin, and Zhao \(2019\)](#) who find that higher operating leverage through higher labor shares leads to higher credit risk. I contribute to this literature by showing that the deterioration of firms' operating performance from competitive pressure is linked to changes in labor leverage. My results support the narrative that rigid labor costs lead to increases in a firm's sensitivity to adverse sales shocks through operating leverage. More specifically, the lower ability to turn revenues into profits, i.e., lower EBIT margins caused by labor rigidities in my setting, narrows firms' abilities to finance operations with retained earnings.

As a result of both its distinct competitive structure and regulated mandatory data disclosure, the U.S. airline industry has been intensively researched in fields related to industrial organization, competition and entry decisions (e.g., [Berry, 1992](#); [Borenstein and Rose, 1994](#); [Goolsbee and Syverson, 2008](#)). More recently, the setting of the U.S.

airline industry has also been used to investigate pay determination on various levels of corporations. For instance, [Benmelech, Bergman, and Enriquez \(2012\)](#) investigate how airlines in financial distress renegotiate wages, [He, Whited, and Guo \(2018\)](#) study how relative performance evaluation in executive compensation affects competition, and [Aggarwal and Schenone \(2019\)](#) exploit the availability of on-time performance data—a key performance indicator for airlines—to evaluate the nexus between non-financial performance and executives’ incentive schemes. I contribute to this literature by extending the analysis to airline-level labor shares and by investigating how competitive pressure affects different labor groups differentially.

This paper is also related to the literature on the dynamics and determinants of labor shares. Recently, researchers have found evidence of decreasing labor shares for various developed economies (e.g., [Karabarbounis and Neiman, 2014](#); [Dao, Das, Koczan, and Lian, 2017](#)), contradicting the traditional view that the labor share is constant (e.g., [Kaldor, 1957](#)). Explanations for this phenomenon are manifold and range from a decrease in the cost of capital, increased trade and international outsourcing, and the decline of labor market unionizations to measurement issues.<sup>1</sup> [Autor, Dorn, Katz, Patterson, and van Reenen \(2017\)](#) argue that firm heterogeneity in productivity leads to industry concentration and ultimately lower labor shares. In their setting, industry structure is driven by highly productive superstar firms. I investigate similar regularities as [Autor et al. \(2017\)](#) but at the firm-level rather than the industry level. Whereas the specific setting of the US airline industry allows me to observe increasing competition rather than increasing industry concentration, I come to the same conclusion. My findings verify the negative relation between market power and labor shares, i.e., that a decrease (increase) in market power is related to an increase (decrease) in labor shares.

More recently, we observe higher industry concentration, larger firms and fewer com-

---

<sup>1</sup>For a thorough description of potential drivers of the labor share, see [Dao et al. \(2017\)](#), for instance.

petitors (e.g., [De Loecker and Eeckhout, 2017](#)), and job market polarization (e.g., [Autor, Katz, and Kearney, 2006](#); [Goos and Manning, 2007](#)). In the light of these developments, it is of particular interest to investigate the distribution of total revenues among different groups of employees. Whereas the evolution of top-level pay has been intensively researched in finance (e.g., [Rosen, 1981](#); [Gabaix and Landier, 2008](#)), the interest in within-firm pay inequality is new to this literature (e.g., [Mueller, Ouimet, and Simintzi, 2017](#); [Dittmann, Montone, and Zhu, 2018a](#); [Dittmann, Schneider, and Zhu, 2018b](#)). I contribute by examining how competitive pressure on firms affects different groups of employees differentially and by documenting that especially mobile labor groups benefit from this situation through higher labor shares.

## **2 The economics of labor share, operating leverage, and labor leverage**

### *2.1 Measurement and interpretation*

The labor share is the sum of labor costs over a measure of output. At the macro-level, the labor share is usually defined as total labor compensation over gross domestic product (e.g., [Karabarbounis and Neiman, 2014](#)). In this case, the labor share expresses the fraction of the market value of final goods produced in a country going to wage-earners. Hence, changes in the labor share capture the workforce's time-varying participation in national value-added through wages.

Firm-level studies often define the labor share as the fraction of labor expenses over a firm-level measure of value-added (e.g., [Marfè, 2017b](#); [Donangelo et al., 2019](#)). The advantage of using value-added as the basis for firm-level labor shares is that the macro-level labor share can be constructed through aggregation. Whereas the exclusion of intermediaries omits double-counting, it neglects output of firms with high shares of intermediary good production. As I do not provide a general equilibrium analysis, I use total revenues as the basis of the calculation of labor shares, in line with the labor share



definitions of non-manufacturing sectors used by [Autor et al. \(2017\)](#).<sup>2</sup> In this way, I capture the share of labor expenses relative to the gross output produced by firms.

The concept of labor share is closely related to the concept of operating leverage. Operating leverage captures the effect of changes in revenues on profits. The channel of these changes is a firm's cost structure, namely the relation of fixed costs to variable costs. In the model of operating leverage, a higher share of fixed costs increases profitability in times of high revenues, whereas it reduces profitability in times of low revenues. This mechanism is analogous to financial leverage. High financial leverage increases the positive impact of asset returns on equity returns in good times, but also amplifies the negative impact in bad times.<sup>3</sup> Operating leverage induced by labor expenses is referred to as labor leverage (e.g., [Lev and Zambon, 2003](#)).

[Marfè \(2017a\)](#) uses labor share as a proxy for wage insurance from shareholders to employees and shows that higher wage insurance can lead to higher short-term dividend risk. The amplification of existing labor rigidities can have sizable effects on firm performance. For instance, [Simintzi et al. \(2015\)](#) show that employment protection has an impact on capital structure through the crowding out of financial leverage by operating leverage. The work by [Efing et al. \(2018\)](#) confirms these findings. In their study on the banking sector they show that banks with compensation plans that rely more on variable components have lower operating leverage. At the same time, riskier banks prefer to choose lower operating leverage.

The use of total revenues in the calculation of labor shares allows me to interpret the labor share in the context of operating profitability. Based on accounting identities of the profit and loss account, I decompose estimated effects on the EBIT margin into

---

<sup>2</sup>Estimations based on value-added in the appendix are based on the definition of value-added used by [Favilukis et al. \(2019\)](#).

<sup>3</sup>Note that operating leverage is closely related to the concept of adjustment costs in production with fixed costs (e.g., [Lucas, 1967](#)) or to situations where firms can only change production after incurring additional adjustment costs (e.g., [Hamermesh and Pfann, 1996](#)).

the contribution of non-labor related expenses and of labor expenses, where the latter is captured by the labor share. In this way, I can relate the estimated effects of competitive pressure on profitability to different cost components, where labor share can be interpreted as labor leverage, i.e., labor induced operating leverage.

## *2.2 Labor share and competition*

In a simple model of oligopoly, a decrease in oligopolistic market power is followed by a decrease in prices and an increase in aggregate quantities of goods sold. If product market power is reduced by the entry of new firms, market shares of incumbent firms will also decrease. In a first step, I therefore analyse the effects of competitive pressure on ticket sales on distinct routes to determine the impact of competition in my setting. More specifically, I estimate the price and quantity effects of competition both on the total market and on the market subset, where only the incumbents' tickets are considered.

By construction, the labor share captures both competition in product markets (revenues, denominator) and competition in labor markets (labor expenses, numerator) in which firms operate. I therefore decompose the aggregate effect into its two components to pin down the importance of each channel—product market competition and labor market competition—in my setting.

Compared to a setting where there is perfect competition, uncontested labor markets are characterized by lower wages and a lower demand for labor. For instance, [Benmelech, Bergman, and Kim \(2018\)](#) document that higher employer concentration in local labor markets and lower wages go hand in hand. Following the idea of contestability, the expansion of a competitors' activities should affect labor market outcomes. Higher demand for labor and subsequently higher wages would then translate into higher labor shares. Under the assumption of a perfect labor market, all firms would be affected in the same way at a given point in time. It might be more realistic, however, to relax this

assumption. Relaxations might be necessary because of regional fragmentation, limited mobility of labor groups, or human capital specificity of employee groups across airlines. Differential affectedness of employee groups might thus be explained by airline-employee group specific aspects that make the labor force of some airlines more attractive to a potential entrant. In my empirical analysis, I apply a measure of human capital specificity based on aircraft types employed by carriers. I argue that airlines with matching human capital specificity would be affected more by competitive pressure if contestability of labor markets is induced by product market contestability.

### **3 The U.S. airline industry**

#### *3.1 Studying competition in the U.S. airline industry*

One major challenge in studying the effects of competition is the definition of markets and the identification of firms competing therein. This is particularly challenging when considering differentiated multi-product firms or industries that are characterized by a high level of market fragmentation (e.g., [Hoberg, Phillips, and Prabhala, 2014](#); [Hoberg and Philips, 2016](#)). The setting of the U.S. airline industry offers some special features that help to deal with these challenges. First, flights are relatively homogeneous goods. When compared, a connection between city A and city B by a legacy carrier and a flight executed by a budget airline are close substitutes. The assumption of substitutability is important, as I will use the threat of entry by a budget carrier to capture competitive pressure. Homogeneity of goods is also underpinned by national regulation and industry standardization of the U.S. carrier business. I show this substitutability by investigating whether a budget carrier's entry affects incumbent airlines' quantity and price decisions.

Second, a study of the U.S. airline industry has to consider the sub-markets in which carriers operate. Spatial segmentation can be tackled by an analysis that takes into account connections between regions. The U.S. airline data enables me to capture precisely

which airlines are competing with each other on routes between city markets. In this way, I can evaluate a carrier's exposure to competition.

Apart from the observability of the industry structure, an analysis of the U.S. airlines has another benefit when it comes to investigating competition. The continuous entry by budget carriers into the industry—and particularly the evolution of Southwest Airlines' business—is perceived as an industry-disrupting phenomenon. Budget airlines are seen as one of the major reasons for the failure of the U.S. airline industry to be profitable for decades (Borenstein, 2011). This makes it a suitable setting in which to study tough competition at the firm-level.

### *3.2 Market penetration by Southwest Airlines*

I focus on changes in competitive pressure which I capture by threat of entry at firm-level to evaluate subsequent effects on labor shares of firms. Threat of entry is directly linked to the concept of contestability. A market is said to be contestable if there are no barriers that deter a potential competitor's entry. According to the theory of contestable markets, this alone is sufficient for competitive pricing of goods, even without a single realized entry into the incumbents' market (Baumol, Panzar, and Willig, 1982). Early evidence from the literature on contestability suggests that airline markets are in principle contestable: “once a carrier has a station at an airport it appears to be relatively easy to start new service into that station” (Bailey and Panzar, 1981, p. 131).

In my analysis, I focus on changes in contestability that increase competitive pressure on incumbent airlines. In order to evaluate the effect of competition, I look at changes in contestability by considering changes in airline-level threat of entry. In deriving measures of competitive pressure at the airline level, I follow the approach of Goolsbee and Syverson (2008), which is based on threat of entry by the budget carrier Southwest Airlines.

The reasons for using threat of entry by Southwest Airlines for this study are threefold.

First, the airline industry is characterized by alliances and cooperation between airlines, which makes identifying truly competing firms challenging. In this respect, Southwest is different from other airlines in that it has not been involved in code sharing or interline ticketing on national routes since its incorporation. Therefore, Southwest can be considered a true competitor to other airlines.

Second, Southwest is not a budget airline that wins market shares by offering low ticket prices accompanied by extra costs. Southwest is one of the leading carriers in customer satisfaction, according to the Bureau of Transportation Statistics (BTS). In an effort to ensure cost-efficiency and good on-time performance, Southwest has developed its own boarding procedures to keep turnaround times short. In general, low ticket prices are possible because of lean structures in the company. For instance, to reduce complexity in training and route planning Southwest has kept to the Boeing 737 as the only aircraft type since the airline's inception. Later in my analysis, I make use of this feature when investigating the effects of contestability of product markets on labor markets through human capital specificity.

Third, since the operation of its first flights in Texas in the 1970s, Southwest has continued to expand its route-network all over the country, posing a severe threat to the profitability of legacy carriers' routes. As early as 1990 operating revenues from domestic operations of Southwest corresponded to 12% of those of American Airlines and increased steadily to 95% in 2010. In 2012, 2013 and 2014, Southwest Airlines' operating revenues from domestic operations exceeded those of American Airlines.

## **4 Empirical approach**

### *4.1 Threat of entry in airline industry and empirical methodology*

Market entries decrease incumbents' market power and industry concentration but are costly if entry barriers exist. If such costs are sufficiently small or even zero there is a

threat of entry to the incumbents' market. In order to capture competitive pressure, I look at changes in entry costs to potential entrants.

Quantitative evaluation of threat of entry requires a definition of when a market is threatened. I build on the work by [Goolsbee and Syverson \(2008\)](#), who evaluate the anticipation effect by incumbent airlines to the threat of entry by Southwest. In their work, threat of entry is defined at the level of routes, where a route is fully characterized by its two endpoints. A route served by an incumbent airline is said to be threatened if Southwest is active at both endpoints but is not yet serving the route itself. Figure 1 depicts how an incumbent's route A–B (solid line) is threatened (dash-dotted line) once Southwest serves routes (dotted lines) from both endpoints of the incumbent's route, but does not serve route A–B. Whenever Southwest enters a new airport, all routes between this airport and the airports that it already serves are threatened. This places severe stress on incumbents. This has been documented by [Goolsbee and Syverson \(2008\)](#), who find that legacy carriers decrease ticket prices in anticipation of entries by Southwest.

Note that contestability is not limited to product markets but also applies to labor markets. For instance, if there are no or only low entry costs to an oligopsony of labor, observed wages and labor demand should be higher than in a labor market with sufficiently high entry costs. When a potential entrant threatens the product market and entry barriers to labor markets are sufficiently small, labor markets might also be contested, as the potential entrant eventually demands higher quantities from labor markets. Increases in wages in anticipation of a potential entry could in principle have the same entry-detering effect as decreases in product prices. In this way, product market contestability can lead to labor market contestability.

## 4.2 *Identification strategy*

The endogenous nature of entry decisions poses a serious challenge to identification in studies aiming at evaluating the effect of changes in competition. I therefore make use of variation in threat of entry based on Southwest's route network expansion. This expansion has a direct effect through entry to the entered route. In addition, it has an indirect effect by threatening as yet unentered route markets.

The key assumption underlying identification is closely linked to the concept of direct and indirect effects of the extension of Southwest's network. The intention of Southwest to enter a new airport is purportedly to service initially entered route markets. In this case, threat of entry is exogenous to both threatened routes and threatened airlines. Whereas this seems to be a rather restricting assumption at first sight, it becomes clearer when considering a numerical example. As of the end of year 1990 (2000, 2010), Southwest operated flights between 29 (55, 88) distinct city markets. When starting to operate flights between an already captured city market A and a new city market B there is a direct effect of entry on the route market connecting A and B. In addition, there is an indirect effect of threat of entry on 28 (54, 87) additional route markets, i.e., the connections between newly entered city market B and the existing city markets that are not yet connected to B. Given the numbers of route markets that are affected by an expansion of Southwest's network, it seems somewhat unlikely that Southwest's decision to enter a new city market is primarily driven by characteristics of one of the 28 (54, 87) specific route markets.

The measure of threat of entry captures a change in contestability based on endpoint presence. Even after a route market is threatened, entry to it might be easier or more difficult for Southwest for various reasons connected to, e.g., the airlines operating there or slot availability at airports in the market. Here, I build on the result of previous results that full endpoint presence substantially increases the likelihood of an entry and as such

increases contestability (Bailey and Panzar, 1981; Parise, 2018).

It is important to account for realized entries as variation in threat of entry may have at least two sources in this setting. First, increases in the number of threatened routes may stem from increased city market presence by Southwest. Second, decreases in the number of threatened routes may stem from realized entries, i.e., an entry into a previously threatened market. Once entry is realized, route markets that used to be threatened are reclassified from threatened to unthreatened. Therefore, it is of crucial importance to account for entered routes: If not, the absence of a threat does not discriminate between two very different circumstances, namely an incumbent's routes being unentered and not threatened, and an incumbent's previously threatened routes being entered.

Figure 2 depicts four stages of entry to underline the importance of accounting for realized entry. As before, the routes served by the incumbent are solid, the routes served by Southwest are dash-dotted, and routes threatened by Southwest are dotted. In stage I, none of the incumbent airlines' routes are affected by Southwest. In stage II, one of the three routes of the incumbent is threatened, because Southwest has entered two routes connected to C and D. In stage III, Southwest also services the connection B–D, resulting in all routes of the incumbent being threatened. In stage IV, Southwest enters all the previously threatened routes resulting in no route being threatened.

In this example, it becomes clear that without considering a measure capturing entry, unthreatened route markets can comprise two very different stages of competition: markets without any presence by Southwest (stage I.) and markets where Southwest is servicing all relevant connections (stage IV.). Not incorporating entry into the analysis should yield lower estimated effects of threat of entry. Therefore, I account for entries to pin down the effect of contestability more precisely.



### 4.3 Market fragmentation and measurement of competitive pressure

When firms are active in multiple markets, a firm-level quantitative measure must reflect the importance of single market segments in the aggregate measure. In this analysis, route markets are defined as connections between city markets rather than connections between airports. City markets include all the airports that are within a metropolitan area. Corresponding identifiers are assigned by the U.S. Department of Transportation. Using city markets is important in accounting for the business model followed by Southwest and to fully capture competitive pressure on incumbent airlines. For instance, Chicago has multiple airports, the largest of which is Chicago O’Hare International Airport, which is a hub for American Airlines. Southwest, however, uses the older Midway International Airport for all its connections to the Chicago metropolitan area. Using city markets that comprise multiple airports rather than connections between single airports takes into account the close substitutability of connections to different airports within metropolitan areas.

In order to quantify the threat of entry intensity  $\theta_{it}$  by Southwest, I follow the approach used by [Parise \(2018\)](#).

$$\theta_{it} = \sum_k \theta_{ikt} = \sum_k \frac{\text{Passengers}_{ikt}}{\text{Passengers}_{it}} \times \text{I(Threatened route)}_{kt} . \quad (1)$$

In equation (1)  $\text{I(Threatened route)}_{kt}$  is an indicator that takes the value of 1 if both endpoints of route  $k$  have been entered by Southwest at or before time  $t$ , whereas route  $k$  is not serviced by Southwest. This is weighted by the relative importance of this route market to the airline  $i$  by considering passenger numbers at route  $k$  at time  $t$  as a share of total passengers of airline  $k$  at  $t$ . Summing up the route-airline-time specific measure of threat of entry  $\theta_{ikt}$  over all routes  $k$  returns the aggregate figure  $\theta_{it}$  at the level of airline  $i$ . This measure takes values between zero and one. Economically, it expresses the

fraction of passengers transported by an airline that is contestable by Southwest.

Following the above equation, I also construct a measure capturing realized entries:

$$\gamma_{it} = \sum_k \gamma_{ikt} = \sum_k \frac{\text{Passengers}_{ikt}}{\text{Passengers}_{it}} \times \text{I(Route entered)}_{kt} . \quad (2)$$

In an analogous manner to the calculation of threat of entry intensity, equation 2 constitutes the computation of entry intensity  $\gamma_{it}$  of firm  $i$  at time  $t$ . The indicator takes the value of 1 if Southwest has entered route  $k$  at or before time  $t$ . Economically,  $\gamma_{it}$  expresses the fraction of passengers transported by an airline in a period on a market that was entered by Southwest. Controlling for entry is important in this analysis to distinguish between unentered or unthreatened markets and contested markets.

Compared to other studies that use threat of entry in the US airline industry to capture product market competition, my main outcome variable labor leverage is also related to labor markets. Endpoint presence of an airline—which is the pre-condition for a route to be threatened—also implies labor market presence. The weighting factor in equation (1) reflects an airline’s share of threatened passenger flights. As this threat can only be realized by Southwest using additional staff,  $\theta_{it}$  also is a proxy for unrealized labor demand aggregated at the firm-level. Hence, the applied measure of contestability also captures unrealized labor demand that carriers on contested routes face. In contrast, the realized labor demand from the decision of Southwest to enter routes is captured by  $\gamma_{it}$ .

#### 4.4 Regression analysis

In the first step of the analysis I investigate the impact of threat of entry by Southwest on the route level. This is important in order to verify the impact of competitive pressure and contestability on prices and quantities in my setting. If flights by Southwest and incumbent airlines are not substitutes, I would not expect to find any effect at this level.

The unit of observation is the route market-quarter:

$$\ln(y_{kt}) = \beta_1 \Gamma_{kt} + \beta_2 \Theta_{kt} + \mathbf{1}\alpha_{kt} + \epsilon_{kt} . \quad (3)$$

The outcome variables  $y_{kt}$  in equation (3) are average ticket prices, numbers of tickets sold, and ticket sales on route  $k$  in time  $t$ . The variable  $\Gamma_{kt}$  is one if route  $k$  was entered by Southwest at or before time  $t$ . The indicator variable  $\Theta_{kt}$  is one if route  $k$  is threatened by Southwest at time  $t$ . I include route market fixed effects to control for route market characteristics that are time-invariant, such as distance between endpoints. Time fixed effects capture general trends in ticket prices and account for countrywide time-varying effects, such as national (de)regulation and changes in ticket demand resulting from economic conditions. Using log-prices and time fixed effects, coefficient estimates can be interpreted as percentage changes in real terms. Both types of fixed effects are included in the vector  $\alpha_{kt}$ .

The main analysis in this paper is of the effect of changes in competition on firm-level outcome variables. The unit of observation is the airline-quarter.

$$\ln(y_{it}) = \beta_1 \gamma_{it} + \beta_2 \theta_{it} + \delta x_{it} + \mathbf{1}\alpha_{it} + \epsilon_{it} \quad (4)$$

The outcome variables  $y_{it}$  in equation (4) comprise firm financials, labor shares, and other wage-related quantities of firm  $i$  in time  $t$ . Main explanatory variables are the aforementioned realized entry intensity  $\gamma_{it}$  and threat of entry intensity  $\theta_{it}$ . The vector of fixed effects  $\alpha_{it}$  is defined at the level of firm  $i$  in time  $t$  and comprises airline fixed effects and time fixed effects. In order to account for merged entities, I assign merged entities a new firm identifier. In this way, I account for cases in which previously separate entities had different wage policies in place and might have been exposed to different levels of competitive pressure. In addition to this, I control for firm size  $x_{it}$ . This is essential when

investigating pay-related outcome variables in a highly competitive industry over a long time period, as firm size is seen to be a major determinant of employee pay evolution, in the cross-section, along the time-series dimension, and within-firms (Gabaix and Landier, 2008; Mueller et al., 2017).

#### 4.5 *Decomposition of the labor share*

The labor share can be decomposed in various ways. Inspired by Baker and Wurgler (2002), I use three different decompositions to deepen the analysis of firm-level effects of competition on the labor share.

The first decomposition is based on the accounting identity defining operating income. Starting from the definition of EBIT, dividing by operating revenues and splitting operating expenses into total labor expenses and non-labor expenses yields

$$\frac{\text{EBIT}}{\text{Revenues}} = 1 - \frac{\text{Labor expenses}}{\text{Revenues}} - \frac{\text{Non-labor expenses}}{\text{Revenues}}, \quad (5)$$

where the expression on the left-hand side of the equation is the EBIT margin and the first subtrahend on the right is the labor share. I estimate regressions with each of the three fractions as dependent variables. In this way, the aggregate effect of contestability on EBIT margin can be broken down into its components relating to the labor share and the non-labor expense share. Estimating equation (5) in this way allows inference on how firms' operating profitability is affected by competitive pressure. In addition, we gain insights into how cost structure related to labor expenses translates into financial performance when firms are exposed to greater competition.

Second, I decompose the labor share into its constituting components, i.e., labor expenses and revenues, using the logarithm. Equation (6) is then estimated in the manner

described above.

$$\log \left( \frac{\text{Labor expenses}}{\text{Revenues}} \right) = \log (\text{Labor expenses}) - \log (\text{Revenues}) \quad (6)$$

This decomposition is interesting for two reasons. First, I can verify whether my baseline results also hold once I account for potential skewness of the labor share distribution by applying the natural logarithm. Second, I can identify which of the two components is the main driver of the baseline result of competitive pressure on the labor share, i.e., whether changes in labor share stem from changes in pay levels or from changes in revenues.

Lastly, I decompose the labor share into labor shares of functional subgroups of employees, using aggregate salary figures.<sup>4</sup> I then estimate equation (7) in the manner described above.

$$\frac{\text{Labor expenses}}{\text{Revenues}} = \frac{\text{Ground crew sal.}}{\text{Revenues}} + \frac{\text{Flight crew sal.}}{\text{Revenues}} + \frac{\text{Management sal.}}{\text{Revenues}} + \frac{\text{Others' sal.}}{\text{Revenues}} + \frac{\text{Total benefits}}{\text{Revenues}} \quad (7)$$

This decomposition addresses potential redistributive effects that a competitive shock might have. If the changes in labor share are driven by decreases in operating revenues, all groups of employees should be affected in a similar fashion. However, different groups might be differentially affected by competition. For instance, [Cuñat and Guadalupe \(2009\)](#) document that import competition increases top management compensation. This can be explained by higher demand for managerial skills in periods when firms are under pressure. At the same time, management could also be disciplined with lower pay resulting in a lower management labor share if managers are not able to maintain the original market position, once Southwest is threatening or expanding into the domain of

---

<sup>4</sup>*Total benefits* cannot be attributed to functional subgroups. I therefore list it as a separate category.

incumbent firms.<sup>5</sup>

A major distinction between flight crew and ground crew is the different level of mobility. Whereas flight crews are mobile by the definition of their professional activity, ground crews are located at the specific airport from which a carrier operates flights. At the same time, both groups might be affected by a higher demand by Southwest for labor related to the operation of flights into a new station. Both ‘others’ and ‘total benefits’ are residual groups that cannot be assigned to one of the aforementioned groups. I keep them in my analysis to make sure to decompose the full effect on labor share that I capture.<sup>6</sup>

## 5 Data

### 5.1 Sources

Ticket data are taken from the Airline Origin and Destination Survey (DB1B) provided by BTS. This dataset represents a 10% random sample of all domestic tickets. The observation is on the level of domestic itineraries. Apart from details on market fare, origin and destination, information on the identity of the ticketing carrier and the operating carrier, the number of passengers and the number of coupons is also provided. I calculate fares per passenger by dividing the market fare by the number of passengers.

I obtain airline financial information from BTS’s Form 41 Financial Data. Quarterly operating balance sheet data are from Schedule B-1, and quarterly profit and loss statement data are from Schedule P-1.2.

Data on quarterly wages and employment can be found in Form 41 Financial Data.

---

<sup>5</sup>Note that management share of airlines captures not only compensation to executive managers but also compensation to lower levels of management and general administration. Owing to this aggregation, estimated effects on management share must be interpreted in a more general way.

<sup>6</sup>Note that all but the last decomposition are not feasible using value-added as the basis of the calculation of the labor share, as EBIT margin requires revenues in the denominator (Equation (5)) and value-added based on sum of labor expenses and EBITDA can take negative values (Equation (6)). The decomposition of the value-added labor share based on different groups of employees is part of the appendix.

Wage data are contained in Schedule P-6 on operating expenses. Salaries are reported by labor categories. Corresponding numbers of employees in these labor categories can be found in Schedule P-10.<sup>7</sup>

Data on connections between airports come from the T-100 Domestic Market Database, which is part of Form 41 Traffic data. The observation is at the level of airline-itinerary-quarter, where itineraries are characterized by their two endpoint airports. I retrieve information on number of transported passengers, transported freight and mail, capacity, scheduled departures, and departures performed.

## *5.2 Sample selection and descriptive statistics*

For the route-level analysis, I remove observations with more than five passengers per ticket and observations that are indicated as bulk fares to omit potential group discounts. In line with [Snider and Williams \(2015\)](#), I then exclude interline tickets and tickets that have more than three coupons. Observations for which fees per passenger are less than \$25 or more than \$2,500 in 2008 dollars are also removed from the sample. This is done to omit key punch errors or redemption of frequent flier bonus programs. For the regression analysis, I calculate average per passenger fares on the level of route markets whenever there are at least 100 passenger observations available. Calculations of average ticket prices in my sample are based on 192,205,136 market fare-passenger observations from the DB1B database.

The sample for the airline-level analysis comprises airlines that have quarterly coverage of their financials data through the BTS, i.e., carriers with an annual operating revenue of at least \$20 million. I exclude airlines that are mainly active in the cargo business or that operate as charter airlines. I further limit the analysis to the years 2001 to 2017, i.e., after the AIR-21 regulation was signed into law ([Snider and Williams, 2015](#)). The aim

---

<sup>7</sup>The procedure applied to attain average wages by group is the one described by [Benmelech et al. \(2012\)](#).

of this regulation was to enhance competition in the U.S. airline industry. Thus, I only consider observations from the new regime.<sup>8</sup> In order to account for outliers, I exclude the observations for which the labor share is above or below the 2nd percentile or the 98th percentile, respectively. The final sample for the airline analysis consists of 1,433 airline-quarter observations that refer to 40 distinct airlines.

Descriptive statistics are reported in Table 1. About one third (28%) of the route-market observations in my sample are threatened, whereas 61% have experienced entry by Southwest. At the level of airlines, 33% of passenger-weighted routes are threatened, whereas 51% of passenger-weighted routes are entered by Southwest during the sample period. These numbers illustrate the significant impact that Southwest's expansion has had on the airline industry.

The average labor share based on revenues is 31%, whereas the average labor share based on value-added is at 85%. Flight crews' salaries make up for the largest fraction of total labor expenses (30%), followed by those for ground crew (25%), others (14%), and management (2%). As total benefits—which make up 30% of labor expenses—cannot be attributed to distinct groups, they are separately reported.

## 6 Results

### 6.1 *How does competitive pressure affect prices, quantities, and sales?*

In the route-level analysis, I investigate the impact of threat of entry by Southwest on the level of route markets. Table 2 reports coefficient estimates from Equation (3) to verify the impact of contestability on prices and quantities.

The sample in columns 1 to 3 contains all covered carriers within a route market.

---

<sup>8</sup>The regulation was effective at the level of airports rather than at the level of route-markets. This means it is not feasible to exploit this regulatory shock for my identification. See Table A.4 of the appendix for estimation results where I include pre-2001 data. Whereas results are generally robust, effects are less pronounced than in the baseline analysis in Table 3.



Once Southwest has entered a market, average ticket prices drop by 9.3% whereas the number of tickets sold increases by 11.1%. This is in line with the general view that more competition leads to more goods sold at lower prices. Note that this includes the tickets sold by Southwest. Thus, the results from columns 1 to 3 do incorporate but are not limited to the effect on incumbents. It could be that decreases in average ticket prices and increases in quantities are driven by the additional supply of tickets that is observed because of the entrance of Southwest.

Columns 4 to 6 refer to analyses based on the incumbents' ticket sales only, i.e., all airlines but Southwest's tickets are used to calculate route market data. Results suggest that incumbents' ticket prices drop by 7.9% whereas quantities increase by 4.4%. These results are in line with the findings of [Parise \(2018\)](#), who documents a drop in ticket prices once budget carriers enter a route. Whereas part of the effects observed in columns 1 and 2 might be driven by the additional supply of low-price tickets by Southwest, results in columns 4 and 5 indicate that incumbent airlines do react to an entry of Southwest with changes in prices and quantities. The result in column 6 on total sales implies that incumbents' ticket sales decrease once Southwest enters, whereas the total market size is unaffected (column 3). This evidence is supportive of the assumption of substitutability of flights operated by budget airlines and flights operated by legacy carriers.

Columns 6 to 9 refer to analyses in which I consider changes in contestability by incorporating threat of entry. This setting can be directly related to the firm-level analysis where both entry and threat of entry are incorporated in the estimation. In line with the results of [Goolsbee and Syverson \(2008\)](#), I find that endpoint presence of Southwest has an impact on ticket prices of incumbents in anticipation of entry. The point estimate of -2.2% suggests a lower average effect on prices than the one in the aforementioned paper. One reason for this might be that my investigation is not conditional on eventual entry within a certain time period. The negative effect on ticket sales of -5.1% is also

meaningful. Relating this to the point estimate of the sales reaction on eventual entry in the same specification—which is -8.4%—anticipation affects total sales in an economically significant way. Firm size—which is often proxied by total sales—is an important determinant of both employee pay and within firm pay inequality. For instance, larger firms benefit more from highly talented labor because of economies of scale (Gabaix and Landier, 2008; Mueller et al., 2017). At the same time, aggregated sales enters labor share in the denominator. In the subsequent firm-level analysis, I examine the impact of contestability on firm level pay-related outcomes.

## 6.2 *How does competitive pressure affect labor leverage?*

Table 3 depicts results on the effect of competition on the labor share. Estimations relate to the specification of equation (4). Column 1 relates to a model where I do not control for entry, similar to the baseline specification by Parise (2018). Threat of entry has a positive impact on labor share. Once I control for entry, the magnitude of the coefficient estimate of threat of entry further increases. This is consistent with the prediction on the importance of incorporating *entry* in the estimation.<sup>9</sup> In order to ensure that threat of entry captures higher levels of contestability precisely, I thus include both entry and threat of entry in all other estimations.

In all specifications, threat of entry maintains its positive effect on labor share, i.e., higher levels of contestability lead to higher labor shares. From column 3 onward, I introduce separate identifiers for merged entities and unmerged entities to account for changes in labor shares resulting from mergers or acquisitions. I use this specification as the baseline for the regression analyses of the decomposition of the labor share in Section 6.3 and 6.4. The incorporation of fixed effects that account for mergers has only minor effects on point estimates. The coefficient estimate for threat of entry is quite sizable at

---

<sup>9</sup>In Section 4.2 I argue that the coefficient estimate underestimates the true effect as the counterfactual to threat-of-entry incorporates both zero exposure to competition and full exposure, i.e., entry.

28.5%. In other words, an increase from the 25th percentile to the 75th percentile relates to an increase in the labor share of 8.5 percentage points  $((0.445 - 0.148) \times 28.5\%)$ . Firm size generally correlates negatively with labor share, in line with [Autor et al. \(2017\)](#), who argue that large (superstar) firms have smaller labor shares. My results are robust to the exclusion of firm size as a control variable (column 4).

Column 5 shows results of a regression in which management pay is excluded from the calculation of labor share, to ensure that peculiarities of management pay (such as high fractions of variable pay) are not driving my results. I exclude total related fringe benefits when calculating labor shares in column 6. Whereas results are more sensitive to the exclusion of benefits, they generally hold and do not lose their economic significance. Even under the most conservative approach, an increase from the 25th to the 75th percentile relates to an increase in the labor share of 5.6 percentage points  $((0.445 - 0.148) \times 18.8\%)$ .

Table [A.2](#) of the appendix reports estimation results similar to those described above but uses value-added as the denominator in the calculation of labor shares. The results reveal the same patterns: The incorporation of entry intensity into the estimation strengthens the identification of the effect of threat of entry on labor shares, labor shares are positively related to higher values of contestability across specifications, and firm size is negatively related to labor shares.

### *6.3 Do labor rigidities explain the decrease in firms' financial performance?*

In this section, I look at various decompositions of the labor share, building on accounting identities from the profit and loss statement.

Table [4](#) reports estimation results from the decomposition of the EBIT margin. Results suggest that threat of entry has a negative impact on operating profitability. The negative effect on EBIT margin can be explained by the increase in labor share. More

specifically, more than 80% of the decrease in EBIT margin is related to the increase in labor leverage ( $81.89\% = 0.285 \times |-0.348|^{-1}$ ). The impact of threat of entry on non-labor expense share is statistically insignificant at conventional levels and economically small. An increase from the 25th percentile to the 75th percentile of threat of entry corresponds to an increase in the non-labor expense share of only 1.9 percentage points ( $(0.445 - 0.148) \times 6.3\%$ ). This is about one fifth of the estimated increase of the labor share in the same scenario which is 8.5 percentage points.

These findings support the idea that labor expenses are closer to the notion of fixed cost to firms than non-labor expenses and that labor rigidities are responsible for decreasing operating performance. The insignificant and economically small estimates for non-labor expenses indicate that airlines can easily adjust these expenses in times of higher competitive pressure.

Table 5 reports estimation results from the decomposition of the logarithm of labor share into its components. Whereas the point estimate on the logarithm of labor expenses is positive, it remains statistically insignificant at conventional levels. This suggests that the effect might be driven primarily by changes in revenues, caused by contestability in product markets. This evidence is consistent with the route-level results in Table 2.

#### *6.4 Are all groups of employees equally affected by competitive pressure?*

If the rise in labor shares as a response to increased contestability is driven by changes in revenues as Table 5 suggests, all groups of employees should be affected in the same manner. Table 6 tests this conjecture by considering the decomposition of the labor share into labor shares by distinct employee groups.

The impact of contestability on ground crews' labor share is economically small with a point estimate of 5 percentage points, but statistically significant at the 5% level. The impact on the flight crew is almost three times that on the ground crew. The statistically

significant point estimate of 14.3 percentage points is economically sizable. Relating the point estimate to the average flight crew share and considering an increase from the 25th to the 75th percentile of threat of entry implies a rise in the flight crew’s labor share of almost a fifth ( $18.9\% = (0.445 - 0.148) \times 14.3\%/0.108$ ). Whereas there is a sizable difference between ground crew and flight crew in Table 6, both participate in increases in labor share owing to contestability. In contrast, there is no evidence that the management share rises. The point estimate is economically small and statistically insignificant at conventional levels. Whereas payments from bonuses and profit sharing are reflected in the management share, stock options are part of the benefit share which is indeed increasing. However, the considerable increase in the benefit share is most likely linked to changes in incidental wage costs. The relative changes in benefits share associated with contestability is almost proportional to the relative changes observed in the labor shares of flight crew and ground crew as a result of to contestability.

One reason for the difference in economic magnitude of effects of contestability among the ground crew and flight crew could be the greater mobility of the latter group of employees. Flight crews might therefore be particularly targeted by Southwest on the labor market. Then, increases in the labor share of the flight crew might not only reflect product market contestability through changes in revenues, but also contestability of labor markets through higher competitive wages. In Table 7, I use the share of aircrafts of the Boeing 737 family in the fleet of an airline to capture human capital specificity. More specifically, *Human capital specificity* is an indicator that takes the value of 1 if an airline has a Boeing 737 share in its fleet above the median of all carriers in my sample.<sup>10</sup> As Southwest only uses aircrafts of the Boeing 737 family, this measure indicates how attractive a competitor’s crew is to Southwest in the labor market.

---

<sup>10</sup>The median of Boeing 737 share is 0 in my sample, as displayed in Table 1. In unreported tests I use the top quartile as a robustness check which refers to a Boeing 737 share of at least 17.7%. Results are robust to this alteration.

Results in columns 1 and 2 of Table 7 indicate that human capital specificity does not amplify results for ground crews' labor shares. In contrast to this, columns 3 and 4 confirm that flight crews' labor shares with human capital more suitable to Southwest react more strongly to competitive pressure. Reasons might be both greater mobility and greater relevance of aircraft-specific training for the latter group. This evidence supports the idea that increased competition in the product market can affect labor markets. Thus, changes in labor shares through competitive pressure can also be the result of labor market contestability.

Not surprisingly, human capital specificity does not amplify effects of the group of management employees in columns 5 and 6 of Table 7. Even if administrative employees are dealing with logistics relating to aircraft types, their human capital will be far less linked to a specific aircraft type than members of flight crews. Also, the mobility of this employee group, inherent in their task, is lower than for flight crews.

Table A.3 in the appendix reports results of the decomposition by employee groups based on value-added in the calculation of labor shares. These results generally confirm the findings in Table 5.

## 7 Conclusion

I investigate the nexus between changes in the competitive environment, firm-level labor shares, and firm profitability. First, I document that increased competition has an impact on incumbent firms. The reduction of firm profitability caused by competitive pressure is largely related to increases in labor shares, owing to labor rigidities. Whereas an increasingly challenging environment demands more flexibility from firms, higher shares of fixed labor costs, i.e., higher labor leverage, exacerbate the severity of a competitive shock.

Second, the decrease in EBIT margin, which is tightly linked to the increase in labor

leverage, limits firms' ability to finance business with retained earnings. This corroborates with previous evidence that a rise in labor leverage changes investors' perception of firms and can ultimately tighten financing conditions. Tighter financial constraints imply less financing or at least financing at a higher cost. In particular, when funding is sorely needed to respond to fierce competition, financial constraints can result in a doom loop. The absence of necessary investments induces further losses in market share, resulting in even higher labor leverage, yielding even tighter financial constraints, and so on.

Third, the decomposition of the effect of competition on the labor share reveals that employee groups are differentially affected by competitive pressure. On the one hand-side, managerial pay does not react to increased competitive pressure. One explanation might be performance-based compensation for management staff. On the other hand, employees of the potentially most mobile labor group—flight crews—benefit from increased competitive pressure. This evidence is supporting a narrative that more competition can amplify pay inequality within firms and within industries.

Lastly, I find evidence in support of the narrative that labor markets become contested once entry to product markets is significantly facilitated. This poses challenges for incumbent firms at two different stages of entry. In anticipation of potential entries, increased wages depress profit margins. Once entry occurs, competitors might poach staff, which further complicates incumbents' businesses. In times of severe competitive stress particularly, firms might require highly skilled human capital to maintain quality standards.

## References

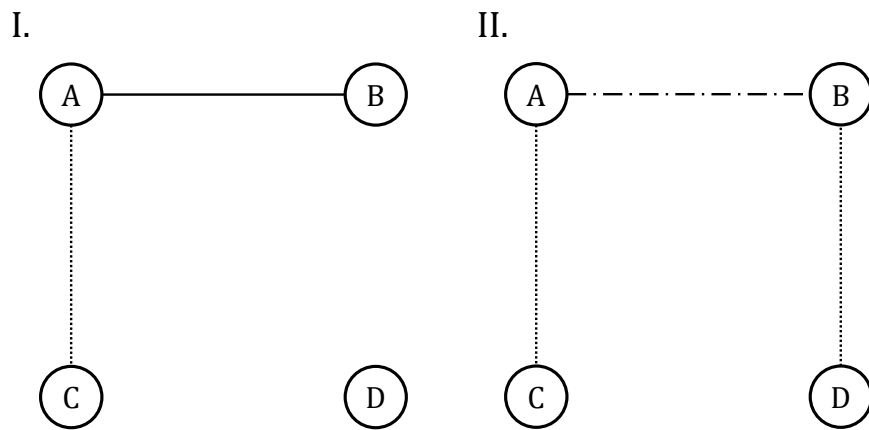
- Aggarwal, R. K., and C. Schenone. 2019. Incentives and Competition in the Airline Industry. *The Review of Corporate Finance Studies* 8:380–428.
- Autor, D., D. Dorn, L. F. Katz, C. Patterson, and J. van Reenen. 2017. The Fall of the Labor Share and the Rise of Superstar Firms. *NBER Working Paper No. 23396* 107:180–185.
- Autor, D. H., L. F. Katz, and M. S. Kearney. 2006. The Polarization of the U.S. Labor Market. *American Economic Review* 96:189–194.
- Bailey, E. E., and J. C. Panzar. 1981. The Contestability of Airline Markets during the Transition to Deregulation. *Law and Contemporary Problems* 44:125–145.
- Baker, M., and J. Wurgler. 2002. Market Timing and Capital Structure. *Journal of Finance* 57:1–32.
- Baumol, W. J., J. C. Panzar, and R. D. Willig. 1982. *Contestable Markets and the Theory of Industry Structure*. New York: Harcourt Brace Jovanovich.
- Benmelech, E., N. Bergman, and H. Kim. 2018. Strong Employers and Weak Employees: How Does Employer Concentration Affect Wages? *NBER Working Paper* .
- Benmelech, E., N. K. Bergman, and R. J. Enriquez. 2012. Negotiating with Labor under Financial Distress. *Review of Corporate Finance Studies* 1:28–67.
- Berry, S. T. 1992. Estimation of a Model of Entry in the Airline Industry. *Econometrica* 60:889–917.
- Borenstein, S. 2011. Why Can't US Airlines Make Money? *American Economic Review: Papers & Proceedings* 101:233–237.
- Borenstein, S., and N. L. Rose. 1994. Competition and Price Dispersion in the U.S. Airline Industry. *Journal of Political Economy* 102:653–683.



- Cuñat, V., and M. Guadalupe. 2009. Globalization and the Provision of Incentives inside the Firm: The Effect of Foreign Competition. *Journal of Labor Economics* 27:179–212.
- Dao, M. C., M. Das, Z. Koczan, and W. Lian. 2017. Why Is Labor Receiving a Smaller Share of Global Income? Theory and Empirical Evidence. *IMF Working Paper No. 17/169* .
- De Loecker, J., and J. Eeckhout. 2017. The Rise of Market Power and the Macroeconomic Implications. *NBER Working Paper Series Working Paper* 23687.
- Dittmann, I., M. Montone, and Y. Zhu. 2018a. Wage Gap and Stock Returns. *Unpublished Working Paper* .
- Dittmann, I., C. Schneider, and Y. Zhu. 2018b. The Real Cost of CEO Compensation: The Effect of Behindness Aversion of Employees. *European Corporate Governance Institute (ECGI) - Finance Working Paper No. 559/2018* .
- Donangelo, A., F. Gourio, M. Kehrig, and M. Palacios. 2019. The Cross-Section of Labor Leverage and Equity Returns. *Journal of Financial Economics* 132:497–518.
- Efing, M., H. Hau, P. Kampkötter, and J.-C. Rochet. 2018. Bank Bonus Pay as a Risk Sharing Contract. *HEC Paris Research Paper No. FIN-2018-1285* .
- Favilukis, J., X. Lin, and X. Zhao. 2019. The Elephant in the Room: the Impact of Labor Obligations on Credit Risk. *American Economic Review*, forthcoming.
- Gabaix, X., and A. Landier. 2008. Why has CEO Pay Increased so Much? *Quarterly Journal of Economics* 123:49–100.
- Goolsbee, A., and C. Syverson. 2008. How do Incumbents Respond to the Threat of Entry? Evidence from the Major Airlines. *Quarterly Journal of Economics* 123:1611–1633.
- Goos, M., and A. Manning. 2007. Lousy and Lovely Jobs: The Rising Polarization of

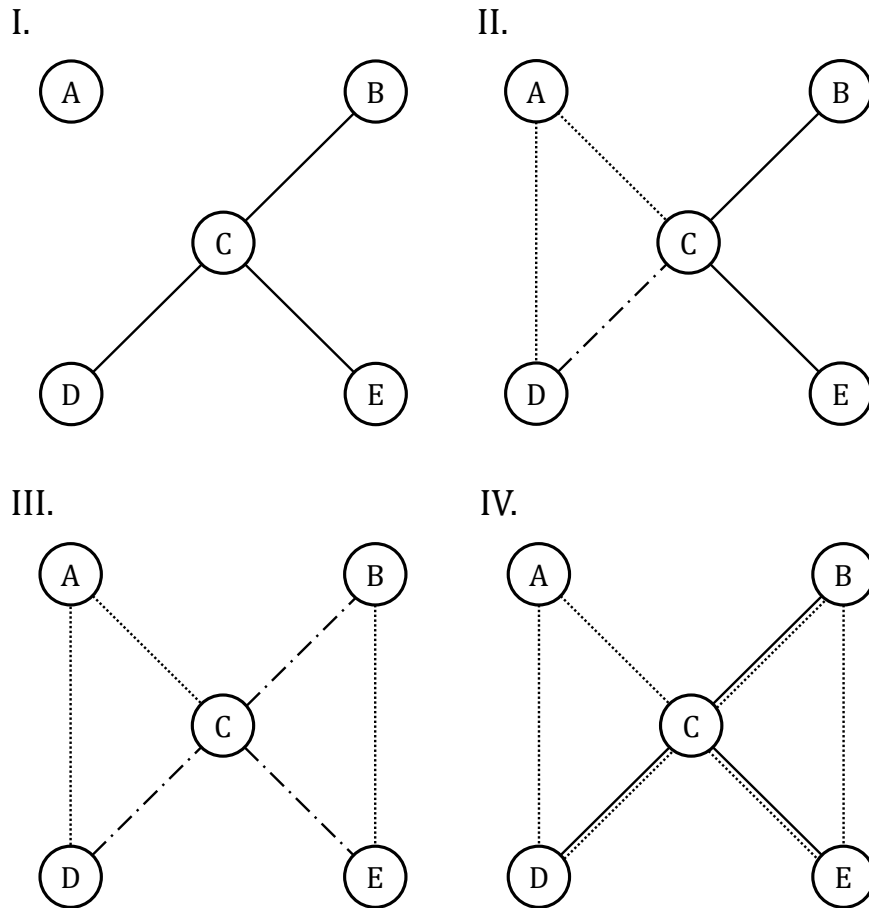
- Work in Britain. *Review of Economics and Statistics* 89:118–133.
- Hamermesh, D. S., and G. A. Pfann. 1996. Adjustment Costs in Factor Demand. *Journal of Economic Literature* 34:1264–1292.
- He, L., T. M. Whited, and R. Guo. 2018. Relative Performance Evaluation and Strategic Competition. *Working Paper* .
- Hoberg, G., and G. Philips. 2016. Text-Based Network Industries and Endogenous Product Differentiation. *Journal of Political Economy* 124:1423–1465.
- Hoberg, G., G. Phillips, and N. Prabhala. 2014. Product Market Threats, Payouts, and Financial Flexibility. *Journal of Finance* 69:293–323.
- Kaldor, N. 1957. A Model of Economic Growth. *Economic Journal* 67:591–624.
- Karabarbounis, L., and B. Neiman. 2014. The Global Decline of the Labor Share. *Quarterly Journal of Economics* 129:61–103.
- Lev, B., and S. Zambon. 2003. Intangibles and Intellectual Capital: An Introduction to a Special Issue. *European Accounting Review* 12:597–603.
- Lucas, R. E. 1967. Adjustment Costs and the Theory of Supply. *Journal of Political Economy* 75:321–334.
- Marfè, R. 2017a. Income Insurance and the Equilibrium Term Structure of Equity. *Journal of Finance* 72:2073–2130.
- Marfè, R. 2017b. Labor Rigidity and the Dynamics of the Value Premium. *Working paper* URL [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2610565](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2610565).
- Mueller, H. M., P. P. Ouimet, and E. Simintzi. 2017. Within-Firm Pay Inequality. *Review of Financial Studies* 30:3605–3653.
- Parise, G. 2018. Threat of Entry and Debt Maturity: Evidence from Airlines. *Journal of Financial Economics* pp. 226–247.

- Rosen, S. 1981. The Economics of Superstars. *American Economic Review* 71:845–858.
- Simintzi, E., V. Vig, and P. Volpin. 2015. Labor Protection and Leverage. *Review of Financial Studies* 28:561–591.
- Snider, C., and J. W. Williams. 2015. Barriers to Entry in the Airline Industry: A Multidimensional Regression-Discontinuity Analysis of AIR-21. *Review of Economics and Statistics* 97:1002–1022.



**Figure 1: Example of a threatened route**

Solid lines indicate the incumbent's connections between route markets, dotted lines indicate routes serviced by Southwest airlines, and dashed lines indicate routes by the incumbent that are threatened by Southwest. In stage I, the connection between route markets A and B of a legacy carrier is not threatened, as Southwest only operates flights from A but not from B. In stage II, the connection between route markets A and B of a legacy carrier (solid line between A-B) is said to be threatened (dash-dotted line between A-B), as Southwest has connections to both endpoints (dotted lines between A-C and B-D).



**Figure 2: Example of the importance of considering realized entry**

Solid lines indicate the incumbent's connections between route markets, dotted lines indicate routes serviced by Southwest airlines, and dash-dotted lines indicate routes by the incumbent that are threatened by Southwest. In stage I, the legacy carrier operates three routes. Southwest does not operate any routes and thus does not threaten routes of the legacy carrier. In stage II, Southwest has started to operate connections from C and D but not the connection C–D. Thus, C–D is threatened. In stage III, Southwest also serves connections from B and E such that all three routes by the incumbent are threatened. However, no route of the incumbent has been entered. In stage IV, Southwest enters all previously threatened routes. The legacy carrier is exposed to no threat of entry but all the routes it serves are now challenged through realized entries.

**Table 1: Summary statistics**

This table shows summary statistics for route-markets and airline characteristics of my sample. Refer to Appendix Table A.1 for variable definitions.

	<i>N</i>	Average	S.E.	p25	Median	p75
<i>Route level analysis:</i>						
Entry indicator	118,295	0.612	0.487	0.000	1.000	1.000
Threat of entry indicator	118,295	0.281	0.449	0.000	0.000	1.000
Average ticket price (USD)	118,295	196.269	71.100	148.198	185.395	231.748
Number of passengers	118,295	1,624.795	2,918.916	264.000	629.000	1,743.000
Ticket sales (USD)	118,295	296,697.379	566,392.604	51,586.195	117,038.203	308,759.781
<i>Airline characteristics:</i>						
Total assets (mln. USD)	1,433	6,607.660	11,848.075	248.112	931.125	5,249.399
Revenues (mln. USD)	1,433	936.547	1,509.724	102.172	197.344	1,151.640
Expenses (mln. USD)	1,433	914.684	1,425.506	101.579	188.951	991.297
EBIT (mln. USD)	1,433	21.862	221.307	-8.417	3.416	26.581
Entry intensity	1,433	0.512	0.290	0.238	0.556	0.755
Threat of entry intensity	1,433	0.325	0.219	0.148	0.300	0.445
Share of Boeing 737 aircrafts	1,389	0.168	0.309	0.000	0.000	0.177
<i>Pay-related variables:</i>						
Labor share (based on revenues)	1,433	0.311	0.107	0.229	0.285	0.371
Labor share (based on value-added)	1,433	0.845	0.482	0.630	0.799	1.016
Total labor expenses (mln. USD)	1,433	259.228	403.587	32.676	59.790	259.212
Management total salaries (mln. USD)	1,433	3.999	5.652	0.614	2.222	4.897
Flight crew total salaries (mln. USD)	1,433	78.889	120.524	10.806	22.255	86.135
Ground crew total salaries (mln. USD)	1,433	65.416	104.182	6.508	15.476	52.171
Others' total salaries (mln. USD)	1,433	32.858	64.188	2.318	4.467	37.263
Total benefits (mln. USD)	1,433	78.066	122.669	9.067	16.993	74.313

**Table 2: Ticket prices, ticket quantities, ticket sales and the effect of competition**

This table reports estimates from regressions of average ticket prices, average ticket quantities and average ticket sales on measures of competition by Southwest Airlines in the US airline industry between 2001 and 2017. The data frequency is quarterly. A route market describes connections between two city markets as defined by the bureau of transportation statistics (BTS). The dependent variable in columns 1, 4, and 7 is the log of ticket prices ( $\log(p)$ ), in columns 2, 5, and 8 the dependent variable is the log of quantities of tickets sold, and in columns 3, 6, and 9 the dependent variable is the log of ticket sales ( $\log(p \times q)$ ). Ticket prices and quantities are taken from the BTS Airline Origin and Destination Survey (DBIB). The DBIB database is a 10% sample of all tickets. The independent variables are *Threat of entry*, which is a dummy variable that is equal to one if Southwest Airlines is present at an airport in both the origin city market and the destination city market but has not yet serviced flights between the city markets, i.e. in the route market, and *Entry*, which is a dummy variable equal to one if Southwest Airlines has entered the route market in this or a previous quarter. Columns 1 to 3 report results on the influence of competition on the total route market. Here, dependent variables are calculated based on all tickets sold in a route market. Columns 4 to 9 report results on the influence of competition and the threat of entry on incumbents only. Here, dependent variables are calculated based only on the tickets sold by non-budget airlines. All columns include route market fixed effects and time fixed effects. Robust standard errors are clustered by route markets and are displayed in brackets below parameter estimates. Significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively. Refer to Appendix Table A.1 for variable definitions.

Dependent variable:	Complete Route Market			Only Incumbent Airlines (Ex-Southwest)					
	log(p) (1)	log(q) (2)	log(p × q) (3)	log(p) (4)	log(q) (5)	log(p × q) (6)	log(p) (7)	log(q) (8)	log(p × q) (9)
Threat of entry							-0.022*** (0.007)	-0.029 (0.021)	-0.051*** (0.021)
Entry	-0.093*** (0.004)	0.111*** (0.012)	0.018 (0.012)	-0.079*** (0.004)	0.044*** (0.012)	-0.035*** (0.013)	-0.100*** (0.008)	0.016 (0.023)	-0.084*** (0.023)
Time FE	X	X	X	X	X	X	X	X	X
Route market FE	X	X	X	X	X	X	X	X	X
Mean( <i>y</i> )	5,219	6,575	11,795	5,245	6,363	11,609	5,245	6,363	11,609
S.D.( <i>y</i> )	0.347	1.225	1.209	0.345	1.174	1.182	0.345	1.174	1.182
<i>R</i> <sup>2</sup>	0.703	0.537	0.528	0.707	0.511	0.503	0.707	0.511	0.503
N	118,295	118,295	118,295	118,295	118,295	118,295	118,295	118,295	118,295

**Table 3: Labor shares and the effect of competition**

This table reports estimates from regressions of labor shares on measures of competition by Southwest Airlines in the US airline industry between 2001 and 2017. The data frequency is quarterly. The dependent variable in columns 1 to 4 is the labor share calculated as total labor expenses over total revenues, in column 5 the dependent variable is the labor share calculated as total labor expenses excluding salaries to management over total revenues, and in column 6 the dependent variable is the labor share calculated as total labor expenses excluding benefits over total revenues. The independent variables are *Threat of entry*, which is the relative importance of a route to an airline measured by the share of passengers on this route relative to all passengers of this airline times an indicator for threat of entry and summed up on the airline-level, *Challenge*, which is the relative importance of a route to an airline measured by the share of passengers on this route relative to all passengers of this airline times an indicator for threat of entry and summed up on the airline-level, and *Firm size*, which is the log of total assets of each airline. All columns include airline fixed effects and time fixed effects. I account for mergers in fixed effects by distinguishing pre- and post-merger entities. Robust standard errors are clustered at the level of airlines and displayed in brackets below parameter estimates. Significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively. Refer to Appendix Table A.1 for variable definitions.

Dependent variable:	Labor share				Labor share, w/o management	Labor share, w/o benefits
	(1)	(2)	(3)	(4)	(5)	(6)
Threat of entry	0.106* (0.061)	0.351*** (0.096)	0.285*** (0.082)	0.273*** (0.082)	0.235*** (0.087)	0.188*** (0.060)
Entry		0.300** (0.118)	0.256** (0.108)	0.228* (0.119)	0.215* (0.108)	0.164** (0.076)
Firm size	-0.072*** (0.013)	-0.072*** (0.013)	-0.067*** (0.014)		-0.063*** (0.013)	-0.047*** (0.010)
Time FE	X	X	X	X	X	X
Airline FE	X	X	X	X	X	X
Accounting for mergers			X	X	X	X
Mean( $y$ )	0.311	0.311	0.311	0.311	0.299	0.222
S.D.( $y$ )	0.107	0.107	0.107	0.107	0.103	0.076
$R^2$	0.631	0.656	0.682	0.606	0.667	0.671
N	1,433	1,433	1,433	1,433	1,433	1,433



**Table 4: Decomposition of the effect of competition on labor share based on operating profit and loss**

This table reports estimates from regressions of EBIT margin, labor share and non-labor expense share on measures of competition by Southwest Airlines in the US airline industry between 2001 and 2017. The data frequency is quarterly. The dependent variables in this table are chosen based on the following decomposition of the of labor share:

$$\underbrace{\frac{\text{EBIT}}{\text{Revenues}}}_{\text{EBIT margin}} = 1 - \underbrace{\frac{\text{Labor expenses}}{\text{Revenues}}}_{\text{Labor share}} - \underbrace{\frac{\text{Non-labor expenses}}{\text{Revenues}}}_{\text{Non-labor expense share}}$$

Note that the constant on the right-hand side of the equation is omitted due to the incorporation of fixed effects. The dependent variable in column 1 is the EBIT margin calculated as EBIT over total revenues, in column 2 the dependent variable is the labor share calculated as total labor expenses over total revenues and in column 3 the dependent variable is non-labor expense share calculated as total non-labor expenses over total revenues. The independent variables are *Threat of entry*, which is the relative importance of a route to an airline measured by the share of passengers on this route relative to all passengers of this airline times an indicator for threat of entry and summed up on the airline-level, *Challenge*, which is the relative importance of a route to an airline measured by the share of passengers on this route relative to all passengers of this airline times an indicator for threat of entry and summed up on the airline-level, and *Firm size*, which is the log of total assets for each airline. All columns include airline fixed effects and time fixed effects. I account for mergers in fixed effects by distinguishing pre- and post-merger entities. Robust standard errors are clustered at the level of airlines and displayed in brackets below parameter estimates. Significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively. Refer to Appendix Table A.1 for variable definitions.

Dependent variable:	EBIT margin	Labor share	Non-labor expense share
	(1)	(2)	(3)
Threat of entry	-0.348** (0.155)	0.285*** (0.082)	0.063 (0.156)
Entry	-0.311* (0.158)	0.256** (0.108)	0.055 (0.140)
Firm size	0.077*** (0.020)	-0.067*** (0.014)	-0.011 (0.026)
Time FE	X	X	X
Airline FE	X	X	X
Accounting for mergers	X	X	X
Mean( $y$ )	0.004	0.311	0.685
S.D.( $y$ )	0.165	0.107	0.168
$R^2$	0.509	0.682	0.580
N	1,433	1,433	1,433

**Table 5: Decomposition of the effect of competition on labor share based on the logarithm**

This table reports estimates from regressions of labor shares, labor expenses and revenues on measures of competition by Southwest Airlines in the US airline industry between 2001 and 2017. The dependent variables in this table are chosen based on the following decomposition of the log of labor share:

$$\log\left(\frac{\text{Labor expenses}}{\text{Revenues}}\right) = \log(\text{Labor expenses}) - \log(\text{Revenues})$$

The data frequency is quarterly. The dependent variable in column 1 is the log of labor share calculated as total wages over total revenues, in column 2 the dependent variable is the log of labor expenses and in column 3 the dependent variable is the log of revenues. The independent variables are *Threat of entry*, which is the relative importance of a route to an airline measured by the share of passengers on this route relative to all passengers of this airline times an indicator for threat of entry and summed up on the airline-level, *Challenge*, which is the relative importance of a route to an airline measured by the share of passengers on this route relative to all passengers of this airline times an indicator for threat of entry and summed up on the airline-level, and *Firm size*, which is the log of total assets of each airline. All columns include airline fixed effects and time fixed effects. I account for mergers in fixed effects by distinguishing pre- and post-merger entities. Robust standard errors are clustered at the level of airlines and displayed in brackets below parameter estimates. Significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively. Refer to Appendix Table A.1 for variable definitions.

Dependent variable:	<u>log(Labor share)</u>	<u>log(Labor expenses)</u>	<u>log(Revenues)</u>
	(1)	(2)	(3)
Threat of entry	0.949*** (0.225)	0.096 (0.344)	-0.853** (0.321)
Entry	0.908*** (0.298)	0.215 (0.368)	-0.693 (0.424)
Firm size	-0.193*** (0.038)	0.223*** (0.077)	0.415*** (0.066)
Time FE	X	X	X
Airline FE	X	X	X
Accounting for mergers	X	X	X
Mean( <i>y</i> )	0.311	0.004	0.685
S.D.( <i>y</i> )	0.107	0.165	0.168
<i>R</i> <sup>2</sup>	0.682	0.509	0.580
N	1,433	1,433	1,433

**Table 6: Decomposition of the effect of competition on the labor share with respect to different groups of employees**

This table reports estimates from regressions of labor share and labor share by subgroups of labor on measures of competition by Southwest Airlines in the US airline industry between 2001 and 2017. The data frequency is quarterly. The dependent variables in this table are chosen based on the following decomposition of the of labor share:

$$\frac{\text{Labor expenses}}{\text{Revenues}} = \frac{\text{Ground crew salaries}}{\text{Revenues}} + \frac{\text{Flight crew salaries}}{\text{Revenues}} + \frac{\text{Management salaries}}{\text{Revenues}} + \frac{\text{Others' salaries}}{\text{Revenues}} + \frac{\text{Total benefits}}{\text{Revenues}}$$

The dependent variable in column 1 is the labor share calculated as total labor expenses over total revenues and in column 2 to column 5 the dependent variable is total salaries over total revenues for each of the listed groups of employees. The dependent variable in column 6 is the benefit share calculated as total benefits over total revenues. The independent variables are *Threat of entry*, which is the relative importance of a route to an airline measured by the share of passengers on this route relative to all passengers of this airline times an indicator for threat of entry and summed up on the airline-level, *Challenge*, which is the relative importance of a route to an airline measured by the share of passengers on this route relative to all passengers of this airline times an indicator for threat of entry and summed up on the airline-level, and *Firm size*, which is the log of total assets of each airline. All columns include airline fixed effects and time fixed effects. 1 account for mergers in fixed effects by distinguishing pre- and post-merger entities. Robust standard errors are clustered at the level of airlines and displayed in brackets below parameter estimates. Significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively. Refer to Appendix Table A.1 for variable definitions.

Dependent variable:	Labor share (1)	Ground crew share (2)	Flight crew share (3)	Management share (4)	Others' share (5)	Benefit share (6)
Threat of entry	0.285*** (0.082)	0.050* (0.028)	0.143*** (0.039)	0.027 (0.018)	-0.004 (0.014)	0.069*** (0.025)
Entry	0.256*** (0.108)	0.001 (0.035)	0.173*** (0.050)	0.021 (0.018)	-0.005 (0.014)	0.066*** (0.032)
Firm size	-0.067*** (0.014)	-0.018*** (0.008)	-0.020*** (0.005)	-0.006*** (0.001)	-0.003* (0.002)	-0.019*** (0.005)
Time FE	X	X	X	X	X	X
Airline FE	X	X	X	X	X	X
Accounting for mergers	X	X	X	X	X	X
Mean( <i>y</i> )	0.311	0.073	0.108	0.012	0.029	0.089
S.D.( <i>y</i> )	0.107	0.040	0.050	0.016	0.018	0.037
R <sup>2</sup>	0.682	0.778	0.755	0.738	0.659	0.678
N	1,433	1,433	1,433	1,433	1,433	1,433

**Table 7: The effect of competition on the labor share with respect to different groups of employees considering human capital specificity**

This table reports estimates from regressions of labor share and labor share by subgroups of labor on measures of competition by Southwest Airlines in the US airline industry between 2001 and 2017. The data frequency is quarterly. The dependent variable in column 1 to column 6 is total salaries over total revenues for each of the groups of employees. The independent variables are *Threat of entry*, which is the relative importance of a route to an airline measured by the share of passengers on this route relative to all passengers of this airline times an indicator for threat of entry and summed up on the airline-level, interaction of *Threat of entry* and a *Human capital specificity* which is a dummy variable that takes the value of 1 if an airline has a Boeing 737 share in its inventory larger than the median airline of my sample in a year. As control variables I use *Challenge*, which is the relative importance of a route to an airline measured by the share of passengers on this route relative to all passengers of this airline times an indicator for threat of entry and summed up on the airline-level, and *Firm size*, which is the log of total assets of each airline. Uneven columns use actual inventory rates in the calculation of *Human capital specificity* which limits the analysis to the year 2006 to 2017. In even columns, *Human capital specificity* is based on actual inventory rates from 2006 onwards. In years prior to 2006, I use the 2006 inventory rate. All columns include airline fixed effects and time fixed effects. I account for mergers in fixed effects by distinguishing pre- and post-merger entities. For brevity, only the interaction term is reported in the table. Robust standard errors are clustered at the level of airlines and displayed in brackets below parameter estimates. Significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively. Refer to Appendix Table A.1 for variable definitions.

Dependent variable:	Ground crew share		Flight crew share		Management share	
	(1)	(2)	(3)	(4)	(5)	(6)
Threat of entry $\times$ Hum. cap. spec.	-0.032 (0.023)	-0.024 (0.020)	0.112** (0.053)	0.137** (0.051)	-0.006 (0.011)	0.004 (0.009)
Entry and size controls	X	X	X	X	X	X
Time FE	X	X	X	X	X	X
Airline FE	X	X	X	X	X	X
Accounting for mergers	X	X	X	X	X	X
Full sample	X		X		X	
Post-2006 only		X		X		X
Mean( $y$ )	0.073	0.064	0.108	0.110	0.012	0.011
S.D.( $y$ )	0.040	0.038	0.050	0.056	0.016	0.014
$R^2$	0.788	0.845	0.778	0.876	0.753	0.782
N	1,389	991	1,389	991	1,389	991

Appendix for

“Competition, Cost Structure, and Labor Leverage:  
Evidence from the U.S. Airline Industry”

**Table A.1: Definition of variables**  
 Unless otherwise stated, all data are provided by the US Department of Transportation through the Bureau of Transportation Statistics (<https://www.bts.gov/>).

Variable	Databases	Definition
<b>Route-level</b>		
Average ticket price ( $\log(p)$ )	Airline Origin and Destination Survey (DB1B)	(Logarithm of) Average price of a route market's tickets in USD
Entry	T-100 Domestic Market Database	Indicator that is equal to one if route market is entered by Southwest and zero otherwise
Number of passengers ( $\log(q)$ )	Airline Origin and Destination Survey (DB1B)	(Logarithm of) Number of passengers of a route market
Threat of entry	T-100 Domestic Market Database	Indicator that is equal to one if route market is threatened by Southwest and zero otherwise
Ticket sales ( $\log(p \times q)$ )	Airline Origin and Destination Survey (DB1B)	(Logarithm of) Average price of a route market's tickets times number of passengers of a route market
<b>Airline-level</b>		
Benefit share	Form 41, P-1.2 and P-6	Total related fringe benefits over total revenues (Total related fringe benefits over sum of total labor expenses and EBITDA, when based on value-added)
EBIT	Form 41, P-1.2	Operating profit or loss
EBIT margin	Form 41, P-1.2	EBIT over operating revenues
EBITDA	Form 41, P-1.2	EBIT plus depreciation and amortization
Entry	T-100 Domestic Market Database	Intensity of entry as defined in formula 2
Expenses	Form 41, P-1.2	Operating expenses
Firm size	Form 41, B-1	Log of total assets
Flight crew labor share	Form 41, P-1.2, P 5.2, and P-6	Sum of salaries of pilots and co-pilots, flight attendants, and other flight personnel over total revenues (Sum of salaries of pilots and co-pilots, flight attendants, and other flight personnel over sum of total labor expenses and EBITDA, when based on value-added)
Flight crew salaries	Form 41, P 5.2, and P-6	Sum of salaries of pilots and co-pilots, flight attendants, and other flight personnel
Ground crew labor share	Form 41, P-1.2 and P-6	Sum of salaries of maintenance labor and aircraft and traffic handling personnel over total revenues (Sum of salaries of maintenance labor and aircraft and traffic handling personnel over sum of total labor expenses and EBITDA, when based on value-added)
Ground crew salaries	Form 41, P-6	Sum of salaries of maintenance labor and aircraft and traffic handling personnel
Human capital specificity	Form 41, B-43	Indicator that takes the value of 1 if Share of Boeing 737 aircrafts of an airline is above the median
labor expenses	Form 41, P-6	Sum of total salaries and total related fringe benefits
Labor share	Form 41, P-1.2 and P-6	Total labor expenses over total revenues (Total labor expenses over sum of total labor expenses and EBITDA, when based on value-added)
Labor share w/o management	Form 41, P-1.2 and P-6	Total labor expenses excluding management salaries over total revenues (Total labor expenses excluding management salaries over sum of total labor expenses and EBITDA, when based on value-added)

(Continued)

**Table A.1:** – *Continued*

Management labor share	Form 41, P-1.2 and P-6	Management salaries over total revenues (Management salaries over sum of total labor expenses and EBITDA, when based on value-added)
Management salaries	Form 41, P-6	Sum of management salaries
Non-labor expense share	Form 41, P-1.2	Operating expenses minus total labor expenses
Revenues	Form 41, P-1.2	Operating revenues
Threat of entry	T-100 Domestic Market Database	Intensity of threat of entry as defined in formula 1
Others' salaries	Form 41, P-6	Sum of salaries of other personnel and trainees
Others' share	Form 41, P-1.2 and P-6	Sum of salaries of other personnel and trainees over total revenues (Sum of salaries of other personnel and trainees over sum of total labor expenses and EBITDA, when based on value-added)
Share of Boeing 737 aircrafts	Form 41, B-43	Share of aircrafts of the Boeing 737 family of a carrier's fleet in a given year
Value-added	Form 41, P-1.2	Sum of labor expenses and EBITDA

**Table A.2: Labor shares based on value-added and the effect of competition**

This table reports estimates from regressions of labor shares on measures of competition by Southwest Airlines in the US airline industry between 2001 and 2017. The data frequency is quarterly. The dependent variable in columns 1 to 3 is the labor share calculated as total labor expenses over value-added, in column 4 the dependent variable is the labor share calculated as total labor expenses excluding salaries to management over value-added, and in column 5 the dependent variable is the labor share calculated as total labor expenses excluding benefits over value-added. Value-added is calculated as the sum of total labor expenses and EBITDA. The independent variables are *Threat of entry*, which is the relative importance of a route to an airline measured by the share of passengers on this route relative to all passengers of this airline times an indicator for threat of entry and summed up on the airline-level, *Challenge*, which is the relative importance of a route to an airline measured by the share of passengers on this route relative to all passengers of this airline times an indicator for threat of entry and summed up on the airline-level, and *Firm size*, which is the log of total assets of each airline. All columns include airline fixed effects and time fixed effects. I account for mergers in fixed effects by distinguishing pre- and post-merger entities. Robust standard errors are clustered at the level of airlines and displayed in brackets below parameter estimates. Significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively. Refer to Appendix Table A.1 for variable definitions.

Dependent variable:	Labor share				Labor share, w/o management	Labor share, w/o benefits
	(1)	(2)	(3)	(4)	(5)	(6)
Threat of entry	0.316** (0.148)	0.671** (0.257)	0.598** (0.266)	0.527* (0.299)	0.535** (0.253)	0.497** (0.197)
Entry		0.428 (0.289)	0.359 (0.308)	0.262 (0.352)	0.319 (0.296)	0.277 (0.223)
Firm size	-0.140*** (0.033)	-0.141*** (0.033)	-0.132*** (0.037)		-0.121*** (0.033)	-0.086*** (0.029)
Time FE	X	X	X	X	X	X
Airline FE	X	X	X	X	X	X
Accounting for mergers			X	X	X	X
Mean( $y$ )	0.845	0.845	0.845	0.845	0.812	0.602
S.D.( $y$ )	0.482	0.482	0.482	0.482	0.458	0.361
$R^2$	0.278	0.281	0.286	0.270	0.305	0.263
N	1,433	1,433	1,433	1,433	1,433	1,433



**Table A.3: Decomposition of the effect of competition on the labor share based on value-added with respect to different groups of employees**

This table reports estimates from regressions of labor share and labor share by subgroups of labor on measures of competition by Southwest Airlines in the US airline industry between 2001 and 2017. The data frequency is quarterly. The dependent variables in this table are chosen based on the following decomposition of the of labor share:

$$\frac{\text{Labor expenses}}{\text{Value-added}} = \frac{\text{Ground crew salaries}}{\text{Value-added}} + \frac{\text{Flight crew salaries}}{\text{Value-added}} + \frac{\text{Management salaries}}{\text{Value-added}} + \frac{\text{Others' salaries}}{\text{Value-added}} + \frac{\text{Total benefits}}{\text{Value-added}}$$

The dependent variable in column 1 is the labor share calculated as total labor expenses over total value-added and in column 2 to column 5 the dependent variable is total salaries over total value-added for each of the listed subgroups of labor. The dependent variable in column 6 is the benefit share calculated as total benefits over total value-added. Value-added is calculated as the sum of total labor expenses and EBITDA. The independent variables are *Threat of entry*, which is the relative importance of a route to an airline measured by the share of passengers on this route relative to all passengers of this airline times an indicator for threat of entry and summed up on the airline-level, *Challenge*, which is the relative importance of a route to an airline measured by the share of passengers on this route relative to all passengers of this airline times an indicator for threat of entry and summed up on the airline-level, and *Firm size*, which is the log of total assets of each airline. All columns include airline fixed effects and time fixed effects. I account for mergers in fixed effects by distinguishing pre- and post-merger entities. Robust standard errors are clustered at the level of airlines and displayed in brackets below parameter estimates. Significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively. Refer to Appendix Table A.1 for variable definitions.

Dependent variable:	Labor share (1)	Ground crew share (2)	Flight crew share (3)	Management share (4)	Others' share (5)	Benefit share (6)
Threat of entry	0.598** (0.265)	0.130** (0.055)	0.324** (0.131)	0.063 (0.040)	-0.018 (0.044)	0.099 (0.080)
Entry	0.359 (0.308)	-0.039 (0.070)	0.302** (0.150)	0.041 (0.037)	-0.026 (0.039)	0.082 (0.091)
Firm size	-0.132*** (0.037)	-0.032** (0.014)	-0.038** (0.015)	-0.011* (0.006)	-0.006 (0.005)	-0.044*** (0.009)
Time FE	X	X	X	X	X	X
Airline FE	X	X	X	X	X	X
Accounting for mergers	X	X	X	X	X	X
Mean( <i>y</i> )	0.845	0.205	0.285	0.033	0.081	0.242
S.D.( <i>y</i> )	0.482	0.154	0.177	0.055	0.068	0.137
<i>R</i> <sup>2</sup>	0.286	0.545	0.250	0.445	0.410	0.384
N	1,433	1,433	1,433	1,433	1,433	1,433

**Table A.4: Labor shares and the effect of competition, including pre-2001 data**

This table reports estimates from regressions of labor shares on measures of competition by Southwest Airlines in the US airline industry between 1990 and 2017. The data frequency is quarterly. The dependent variable in columns 1 to 3 is the labor share calculated as total labor expenses over total revenues, in column 4 the dependent variable is the labor share calculated as total labor expenses excluding salaries to management over total revenues, and in column 5 the dependent variable is the labor share calculated as total labor expenses excluding benefits over total revenues. The independent variables are *Threat of entry*, which is the relative importance of a route to an airline measured by the share of passengers on this route relative to all passengers of this airline times an indicator for threat of entry and summed up on the airline-level, *Challenge*, which is the relative importance of a route to an airline measured by the share of passengers on this route relative to all passengers of this airline times an indicator for threat of entry and summed up on the airline-level, and *Firm size*, which is the log of total assets of each airline. All columns include airline fixed effects and time fixed effects. I account for mergers in fixed effects by distinguishing pre- and post-merger entities. Robust standard errors are clustered at the level of airlines and displayed in brackets below parameter estimates. Significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively. Refer to Appendix Table A.1 for variable definitions.

Dependent variable:	Labor share			Labor share, w/o management	Labor share, w/o benefits
	(1)	(2)	(3)	(4)	(5)
Threat of entry	0.096* (0.057)	0.144* (0.072)	0.101** (0.048)	0.095** (0.045)	0.079** (0.035)
Entry		0.090 (0.073)	0.099* (0.052)	0.099** (0.049)	0.076** (0.035)
Firm size	-0.035** (0.014)	-0.036** (0.014)	-0.035*** (0.013)	-0.033*** (0.012)	-0.023*** (0.008)
Time FE	X	X	X	X	X
Airline FE	X	X	X	X	X
Accounting for mergers			X	X	X
Mean( $y$ )	0.310	0.310	0.310	0.298	0.226
S.D.( $y$ )	0.094	0.094	0.094	0.092	0.066
$R^2$	0.487	0.494	0.586	0.595	0.580
N	2,354	2,354	2,354	2,354	2,354



Halle Institute for Economic Research –  
Member of the Leibniz Association

Kleine Maerkerstrasse 8  
D-06108 Halle (Saale), Germany

Postal Adress: P.O. Box 11 03 61  
D-06017 Halle (Saale), Germany

Tel +49 345 7753 60  
Fax +49 345 7753 820

[www.iwh-halle.de](http://www.iwh-halle.de)

ISSN 2194-2188