

Fissuring in Flight: Consolidation and Outsourcing in the US Domestic Airline Industry, 1997-2018

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This report was commissioned by the Communications Workers of America (CWA). Members of CWA work in telecommunications, media, airlines, health care, public service, education, and manufacturing. CWA represents more than 20,000 passenger service agents at American Airlines and its regional subsidiaries Envoy Air and Piedmont Airlines and, as part of its AFA-CWA sector, 50,000 Flight Attendants at 20 airlines.

Brian Callaci is an economist researching how business firms pursue innovations in law and technology to change the boundaries of the firm through vertical dis-integration strategies such as franchising and subcontracting. These strategies often have the effect of leaving workers, small businesses, and other stakeholders outside the walls of the firm that controls their economic lives. Brian received his PhD from the University of Massachusetts Amherst in 2019. Prior to graduate work in economics he worked as a researcher for labor unions including UNITE HERE, Workers United, and Change to Win.

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1 Executive Summary

There is growing evidence that both industrial concentration and practices like outsourcing and contracting out are major contributors to inequality and wage stagnation for blue collar, and increasingly white collar, workers. The decline of the US collective bargaining regime has removed the major force that could counter these trends. First, the falling share of workers in unions has removed the primary source of countervailing power against industrial concentration that would ensure workers get a fair share of corporate profits. Second, the rising use of contracting arrangements excludes outsourced workers from direct collective bargaining with the corporations that control their working conditions, reducing the effectiveness of traditional firm-level collective bargaining.

Industrial consolidation happens when a small number of firms control market share. While the Airline Deregulation Act of 1979 was intended to increase competition in the airline industry, that has not been the outcome. Workers in the US domestic airline industry have been affected by a merger wave that has left three major legacy airlines—American, Delta, and United—in a tight oligopoly with each other, with only low cost carrier Southwest exerting substantial national pressure on the legacy carrier oligopoly.¹ At the same time, workers in the airline industry have also been affected by two distinct types of outsourcing. On one hand, airlines have been increasingly outsourcing ground and passenger service work to third-party contractors. On the other hand, legacy carriers have been turning to outsourced regional airlines to fly an increasing share of routes. Legacy carriers minutely control the operations of regional airlines to an extent virtually equivalent to full integration, yet customers and workers of regional airlines are treated as customers and workers of separate firms under many important applicable laws. This report documents trends in employment and wages in the airline and outsourced airline service industries. Findings include:

¹While other low-cost carriers exert competitive pressure on certain routes, they lack the national network of Southwest. In an industry where firms compete on the extent of their network (especially for lucrative business travelers), this means Southwest is the only national competitor to the American/Delta/United oligopoly.

- Airlines are increasingly turning to third party contractors, as the outsourced share of employment has grown from 19 percent in 2001 to 30 percent in 2018. At the same time, direct employee wages are above the national average for all workers and have been rising. Meanwhile, outsourced employee wages are below the average and have been stagnant.
- Heavily outsourced occupations in the airline industry have lower wages. An increase in outsourcing of ten percent from 2008 to 2018 across a selected group of occupations is correlated with a decline in wages of five percent.
- Employment of regional airline workers has been growing as a share of total airline industry employment, and regional pay scales are far below legacy wage scales. The increasing substitutability of regional for mainline jets threatens to increase the pace of this type of outsourcing.

2 Introduction

The airline industry is currently very concentrated. There are only three major legacy carriers left—American, United, and Delta—as US Airways, TWA, Northwest Airlines, and Continental Airlines have all disappeared by merger since 2001 and ceased to provide effective competition. Moreover, consolidation in the airline industry is even greater than it seems just by looking at the market shares of the largest airlines. Azar et al. (2018) point out that the same investors largely own all three airlines. They show that when one takes into account the prevalence of the same institutional investors owning blocks of shares in each airline, the concentration level in the industry is ten times larger than is “presumed likely to enhance market power” by the antitrust authorities. They also show that increases in this type of concentration have led to higher fares. Azar and his co-authors do not focus on regional airlines or outsourcing, but if they did, they would have also found that “independent” regional airlines like SkyWest are also owned by the same small group of institutional investors.

Consolidation among legacy carriers can be expected to have two distinct effects on wages at those carriers, that push in opposing directions. On one hand, rising concentration makes it easier for airlines to tacitly collude and raise consumer prices, leading to oligopoly profits. This creates a larger pool of money to share with workers. Historically, particularly in unionized industries, there has been a “large firm premium” in US labor markets reflecting this dynamic. On the other hand, there being a smaller number of employers in the industry means that employers do not have to compete as aggressively for workers, which leads to lower wages. Economists call this situation “monopsony,” and evidence shows it contributes to lower wages, particularly in the absence of collective bargaining (Azar et al., 2017). Which of these two effects dominates the other depends mainly on the balance of power between workers and firms in the industry. In an earlier era of US history, labor market institutions, most importantly labor unions, balanced out the monopsony effect and ensured that workers shared in the profits of large firms. As unions have weakened and firms have had more

freedom in setting wages, the monopsony effect has become stronger.²

While many industries have been consolidating horizontally (meaning firms in the same market are merging with each other, eliminating competition), firms have simultaneously been breaking apart vertically (meaning they perform fewer tasks directly in-house, outsourcing them to other firms and creating longer supply chains). The economist David Weil (2014) has coined the term “fissured workplaces” to describe workplaces in which the “lead” firm decides to focus on the most profitable activities and outsource everything else to third parties. This takes the form of manufacturing firms replacing direct employees with staffing agencies, construction general contractors turning to increasingly complex webs of subcontractors, and legacy airlines outsourcing routes to lower-cost regional airlines. In fissured workplaces, the legal boundaries of the firm act as barriers excluding workers outside them from gaining access to shares of profits, internal career ladders, and legal protections (whose coverage remains largely limited to the firm in which the worker has formal employee status).

According to Weil, pressure from shareholders and financial markets, a phenomenon known as “financialization,” has been a major driver of fissuring. Along with pushing managements to outsource more activity, shareholders, empowered and emboldened relative to managers and workers since the 1980s, have also demanded a greater share of corporate profits. Corporations that pay out large sums to shareholders in dividends or share buybacks have less money on hand to invest in innovations or employee skills, wages and working conditions. United paid \$7.75B in buybacks since 2013, Delta \$10.99B, and American \$12.52B.

Fissuring allows firms to pull larger shares of revenue upward by using the legal boundaries of the firm as barriers to exclude workers and other stakeholders from the revenues generated by production. As Donald Tomaskovic-Devey argues, limiting “organizational citizenship” is a key factor generating inequalities in contemporary capitalism (Tomaskovic-Devey, 2014, p. 59). While janitors in General Motors could demand a share of GM’s oligopoly profits

²Labor monopsony is actually a special case of monopsony, or “buyer power” generally. In this case it refers to employers, who buy labor services. But it can also refer to a dominant buyer in any situation, such as an auto company’s monopsony power over its suppliers.

by demanding a wage proportionate to assembly workers, outsourcing janitorial services to contractors prevents these workers from making such claims. Similarly, fast food chains deploy their low-wage business model by ensuring the legal employer of the affected workers is not the corporate chain but the legally independent franchisee. Even though the corporate franchisor minutely prescribes employee training and controls each step of the production process, workers negotiate wages and benefits with the less wealthy franchisee rather than the franchisor that controls their working conditions.

The use of legally separate contractors in airlines can be just as arbitrary as in fast food franchises. For example, years ago American Airlines outsourced 500 wheelchair attendants at Miami International Airport to a low-wage contractor, putting the service contractor Eulen America between the parent company and those workers, and putting the workers outside the walls of American Airlines. However, when the airport enacted a living wage ordinance that raised the wages of employees of service contractors, American *insourced* the work to avoid paying the higher wage. In both the insourcing and outsourcing decisions, American was taking advantage of differential treatment of service contractors and direct airline employees under labor law.³ While outsourcing activities to firms with a comparative advantage in those activities can increase overall efficiency, manipulating business relationships to avoid inconvenient laws does not.

The notion of firms using legal boundaries to reallocate revenue within supply chains is consistent with recent empirical data. A growing body of empirical evidence using administrative social security data suggests that rising inequality is being driven by between-firm rather than within-firm inequality (Card et al., 2012; Song et al., 2015; Barth et al., 2014; Tomaskovic-Devey et al., 2015). Tomaskovic-Devey et al., in particular point out that since outsourcing moves jobs into new industries, and the growth of low-wage firms generates much of the observed inequality, outsourcing might explain the empirical pattern (Tomaskovic-Devey et al., 2015).

³<https://www.miamiherald.com/news/business/tourism-cruises/article222612650.html>

A few recent pieces of research offer additional tools for thinking about airlines. (Wilmers, 2018) focuses on buyer power in supply chains. He finds that horizontal concentration in the retail sector (fewer and fewer firms controlling more of the final consumer market) plus vertical dis-integration in the supply chain (outsourcing manufacturing activities to smaller, less powerful firms) has contributed to wage stagnation for workers in the supply chain. For example, if you are a poultry worker, WalMart's buyer power over the poultry farm where you work gives it the power to put downward pressure on your wages. On the face of it, Wilmer's story looks like the airline industry, which has experienced horizontal concentration at the legacy carrier level plus vertical dis-integration (growth of regionals, outsourcing to airline services firms) in recent decades. Another piece of research offers a different twist. (Goldschmidt and Schmieder, 2015) find that when large manufacturing firms outsource activities (like janitorial or food service) to third party contractors who continue to work on-site, what happens over time is that wages at the manufacturing firm continue to rise, but the wages of outsourced workers do not. Over time, a wage gap opens up between the outsourced workers and their former co-workers at the manufacturing company.

3 Outsourcing of the First Kind: Shifting Ground and Passenger Service Work to Third-Party Contractors

The airline industry has been affected by two distinct types of outsourcing. First, airlines have concentrated on the highest-profit activity of flying passengers and cargo, and have increasingly outsourced maintenance and ground and passenger service activities to low-wage third-party contractors. Second, in part because of improvements in regional jet technology, legacy airlines have increasingly outsourced routes to lower-wage, lower-cost regional airlines. They do this sometimes by subcontracting routes, and other times by maintaining wholly owned but legally distinct regional subsidiaries. In either case, a central advantage is the ability to exclude regional airlines workers from enjoying the wages and benefits of the airline

major’s employees (Forbes and Lederman, 2010).

3.1 Employment and Wages for Direct and Outsourced Airline Workers

When airlines outsource ramp or passenger service work to specialist aviation contractors, that activity leaves a trace in data collected by the Bureau of Labor Statistics: it appears as a fall in employment in the airline industry, and a rise in employment in the support activities for the airline industry. The best data on employment and wages by industry are contained in the Bureau of Labor Statistics’ Quarterly Census of Employment and Wages (QCEW).⁴ The QCEW classifies workers according to the industries of the companies that employ them, using the North American Industrial Classification System (NAICS). Figure 1 presents national employment totals for the NAICS industries “Air Transportation” and “Support Activities for Air Transportation” from 2001 to 2018, as well as the total for both industries combined. Air Transportation encompasses what we would consider the airline industry, including cargo and charter airlines. Support Activities for Air Transportation includes companies that provide specialized services to the air transportation industry, such as airport operations and servicing and maintaining aircraft.

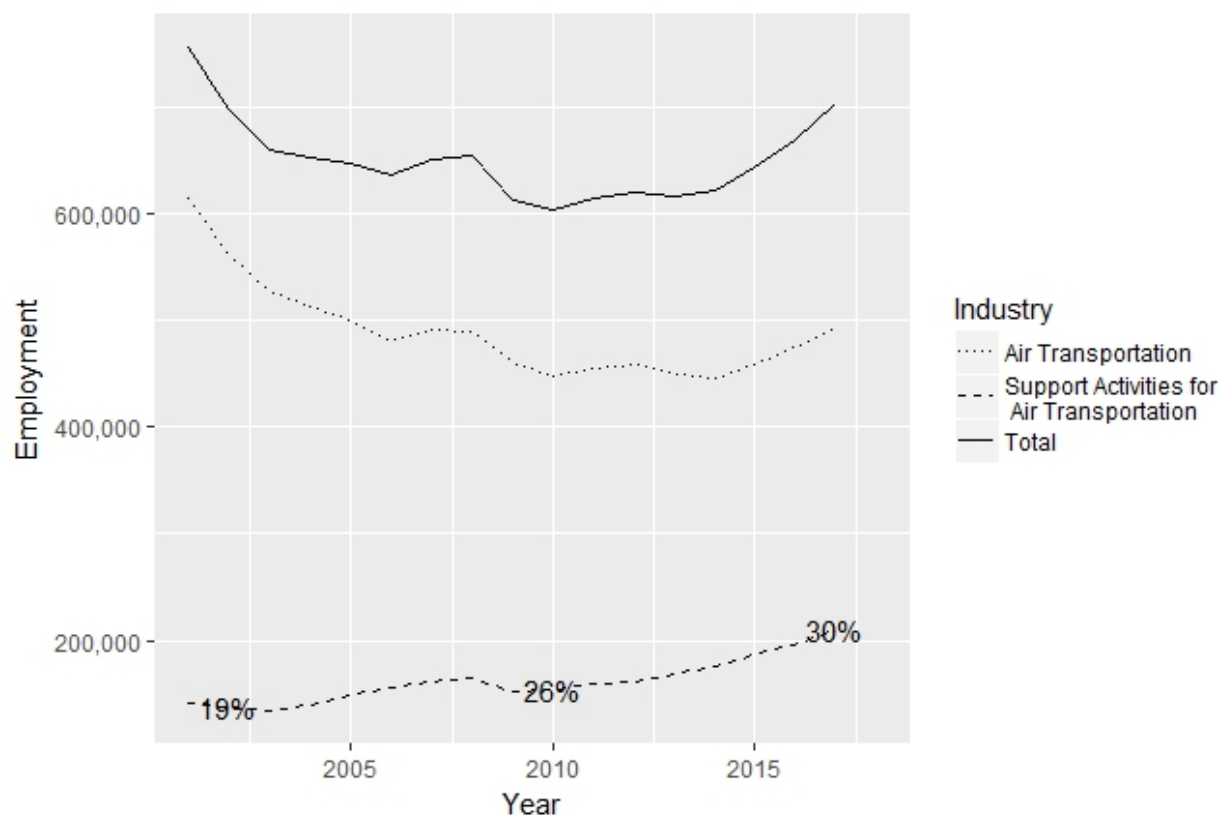
Companies in the support for air transportation industry, such as Air Serv and Menzies, are contractors performing services outsourced by airlines and airport authorities, so employment in this industry is a rough measure of the extent of outsourcing. However, “support activities” is likely to undercount outsourced aviation workers, because some of the companies providing services to airlines are not classified in the “support activities” industry. For example, outsourced janitors employed by a janitorial services company like ABM or security guards employed by a security company like G2 will show up in the janitorial or security industries, respectively, not the support activities for air transportation industry.

⁴<https://www.bls.gov/cew/#databases>; I used the data viewer to pull wages for workers in the specified NAICS industries, private employers only, national annual averages.

Nonetheless it provides a “good enough” rough measure of outsourced aviation jobs. I use only data from private employers, excluding public agencies.

Figure 1 plots employment in Air Transportation and Support Activities for Air Transportation from 2001 to 2018, along with the combined total of both industries.

Figure 1: Airline Industry Employment (Private Employers)



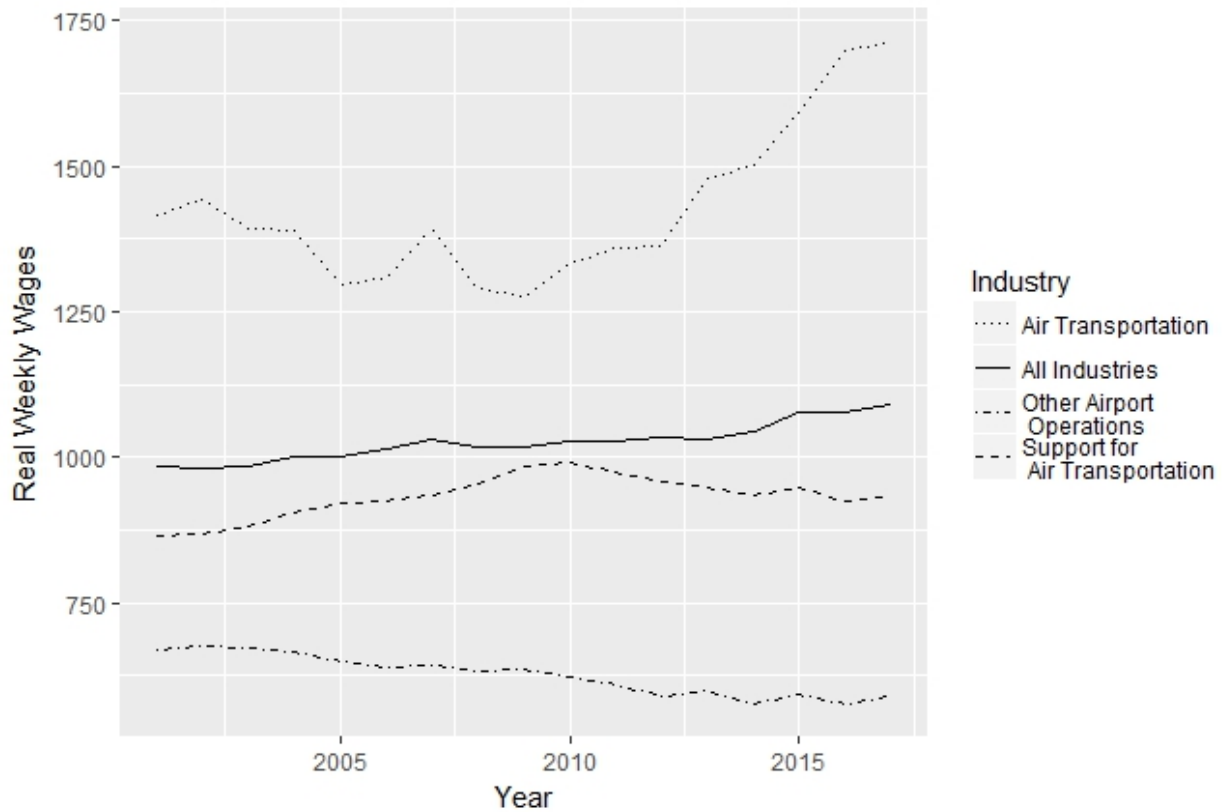
Source: QCEW, <https://www.bls.gov/cew/#databases>

The plotted data show a U-shape curve for direct airline employment and a steady upward trend for outsourced employment. Direct airline employment fell dramatically from 20001 to 2010, a period that contained two recessions, 9/11, and a series of bankruptcies and mergers. Since 2010, airline industry employment has recovered somewhat, but is still well below its 2001 level. Meanwhile,outsourced aviation services employment has grown since 2001, both in absolute terms and as a percentage of the total employment of both industries.

Outsourced services accounted for nineteen percent of total aviation-related employment in 2001, and grew to thirty percent by 2018. It looks like airlines have been turning increasingly to outsourcing since 2001.

The QCEW also contains average wage data. As these are averages of all workers within an industry, it should be kept in mind that they contain the wages of top executives as well as those of production workers. Figure 2 plots the average annual real weekly wages (in 2018 dollars) of workers in the Air Transportation and Support for Air Transportation industries, compared to the average across all industries. I also plot weekly wages in the “Support for Airport Operations” industry, which is a component of the larger Support for Air Transportation industry consisting of activities like transporting disabled passengers within airports and handling baggage. (See Appendix A for a complete breakdown of aviation NAICS industries).

Figure 2: Airline Industry Real Wage



Source: QCEW, <https://www.bls.gov/cew/#databases>

The data show a stark dichotomy between direct airline industry wages and those in the outsourced service industries. Unlike outsourced airline services, the level of direct airline industry wages is consistently well above the average wage across all industries. Also unlike the outsourced industries, direct airline industry wages, despite a difficult first decade, have risen over time. Wages are up twenty-one percent over their 2001 level in real terms. On the other hand, outsourced airline industry wages, like wages across the broader economy, are largely stagnant since 2001. Worse, wages for workers in the other airport operations category are actually *down* twelve percent in real terms relative to 2001.

3.2 Employment and Wages in Aviation-Related Occupations

According to the QCEW data, direct employment in the airline industry has been falling while outsourced employment has been growing. At the same time, direct employee wages have been rising while outsourced employee wages have been stagnant. In the abstract, this presents a puzzle: other things equal wages and employment within an industry should grow or fall together, in line with the demand for the output of that industry.

Workplace fissuring is one possible answer. If airlines keep the high-profit activities like flying the planes in-house, while outsourcing the low-profit activities, like cleaning the planes between flights and handling baggage, to outside companies, this would serve to suppress wages for the workers who have been outsourced. Now that they are outside the boundaries of the larger firm, they are excluded from internal job ladders, wages and benefits commensurate with the unionized workforces of the primary firm, and access to shares of the oligopoly profits earned in particular by legacy carriers.

For those workers who are not outsourced and remain at the primary firm, the effect would depend on their circumstances: for highly trained workers left behind at the primary firm, the exclusion of less-trained workers, easily outsourced workers could mean even more resources for them to share (think Google or Microsoft). Alternatively, for easily outsourced, lower-trained workers, the threat of outsourcing could discipline the wage demands of those workers remaining at the primary firm (think Amazon’s use of temps).

To better understand these two effects, we need to look at the occupational mix in the direct and outsourced industries: which jobs were outsourced, which stayed in-house, and what are the wages in each? We know from Figure 2 that direct airline industry wages have risen while outsourced airline industry wages have fallen. Have direct airline industry wages risen because wages increased for all airline employees, or has the occupational mix within the industry changed such that lower-trained workers were outsourced to low-wage contractors, leaving only highly trained, high-wage workers remaining in the airline industry? As mentioned earlier, Goldschmidt and Schmieder (2015) find that when large German manu-

facturing firms outsource activities (like janitorial or food service) to third party contractors, the manufacturing firm continue to rise, but the wages of outsourced workers do not.

The Occupational Employment Statistics (OES), which contain data on employment and wages for occupations within industries, can allow us to examine this question.⁵ While there are important limitations to OES data that make it inappropriate to compare trends over time the way we did with QCEW data, OES data are good enough for comparing two discrete points a few years apart.⁶ Table 1 compares employment and wages for several occupations within the Air Transportation and Support for Air Transportation Industries, using snapshots from the years 2008 and 2018. My analysis uses annual wages because weekly wages are not available for flight attendants or pilots in OES data.

⁵<https://www.bls.gov/oes/tables.htm>; I pulled 2018 and 2008 occupation-by-industry data. I rely as a starting point on the methodology in Dietz et al. (2013).

⁶<https://www.bls.gov/oes/oes-ques.htm>, F1.

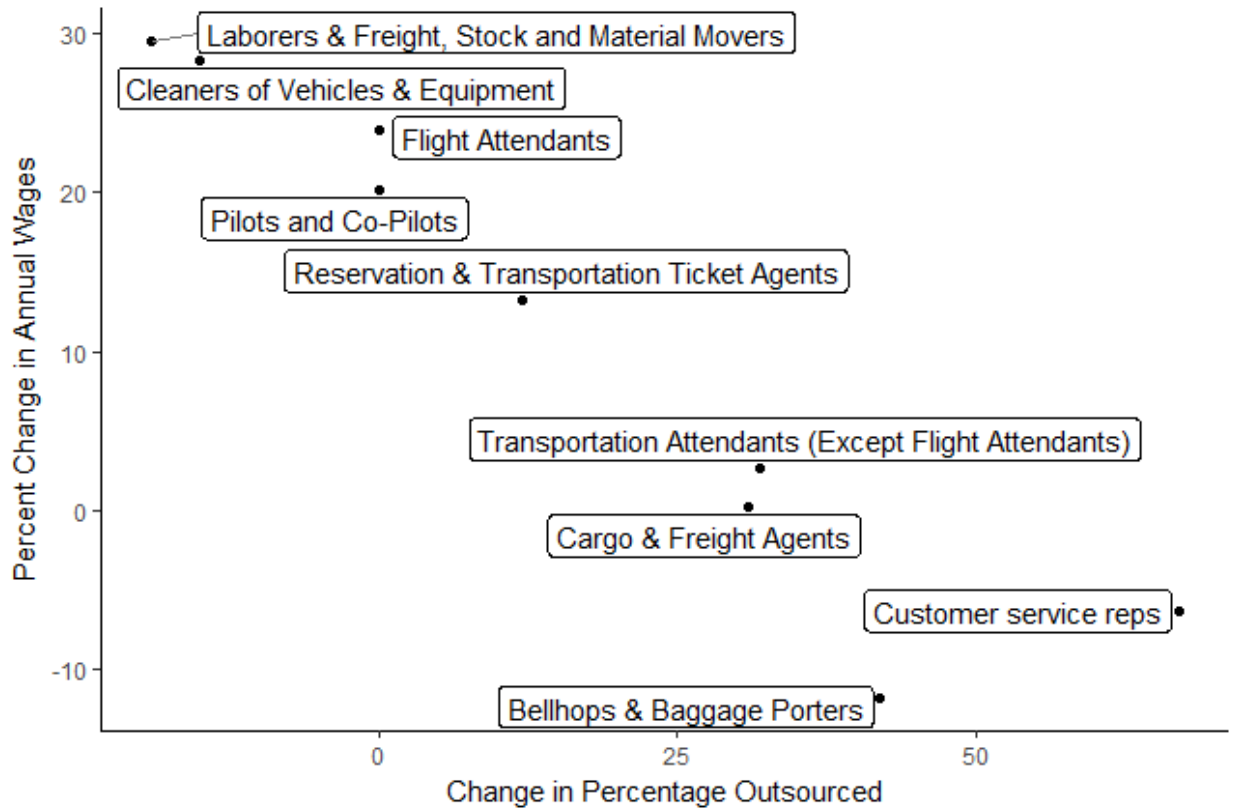
Table 1: Number of workers, average hourly real wages (2018 dollars), and share outsourced for selected occupations

Occupation	No. workers, direct and outsourced				Avg Hrly Real Wage				Pct				Avg Hrly Real Wage weighted across direct & outsourced industries			
	2008		2018		Direct		Outsourced		2008		2018		2008		2018	
	2008	2018	2008	2018	2008	2018	2008	2018	2008	2018	2008	2018	2008	2018	2008	2018
Pilots and Co-Pilots	64,100	73,700	144,000	173,000	NA	NA	NA	NA	0%	0%	0%	0%	144,000	173,000	20%	20%
Flight Attendants	97,400	115,400	46,000	57,000	NA	NA	NA	NA	0%	0%	0%	0%	46,000	57,000	24%	24%
Bellhops & Baggage Porters	16,000	8,700	36,000	27,000	22,000	25,000	25,000	25,000	54%	96%	96%	96%	28,440	25,080	-12%	-12%
Transportation Attendants (Except Flight Attendants)	8,000	8,000	30,000	31,000	23,000	26,000	26,000	26,000	64%	96%	96%	96%	25,520	26,200	3%	3%
Cleaners of Vehicles & Equipment	4,500	12,400	31,000	49,000	27,000	28,000	28,000	28,000	78%	63%	63%	63%	27,880	35,770	28%	28%
Laborers & Freight, Stock and Material Movers	26,800	59,100	32,000	42,000	28,000	32,000	32,000	32,000	51%	32%	32%	32%	29,960	38,800	30%	30%
Cargo & Freight Agents	21,900	16,600	44,000	45,000	30,000	37,000	37,000	37,000	26%	57%	57%	57%	40,360	40,440	0%	0%
Reservation & Transportation Ticket Agents	110,300	80,600	40,000	47,000	31,000	34,000	34,000	34,000	5%	17%	17%	17%	39,550	44,790	13%	13%
Customer service reps	15,000	22,100	36,000	48,000	35,000	33,000	33,000	33,000	30%	97%	97%	97%	35,700	33,450	-6%	-6%

Bellhops and baggage handlers, transportation agents and cargo and freight agents, and customer service representatives, have all been heavily outsourced during the years 2008 to 2018, and all have experienced slow or even negative wage growth. As these occupations are outside the high-profit, “core competency” of flying people and cargo from Point A to Point B, this seems consistent with Weil’s story of workplace fissuring. Still more striking, the occupations that have had the most wage growth, such as cleaners of vehicles and equipment, and laborers, stock and material movers, appear to have experienced net *insourcing* rather than outsourcing during this period. This suggests an answer to why wages have diverged between direct and outsourced employees: it looks as if outsourcing has constrained the wages of workers in occupations susceptible to outsourcing, while leaving the workers in occupations insulated from outsourcing with relatively higher wage growth.

Figure 3 plots the relationship between change in percentage of workers outsourced, that is, $Percentage\ Outsourced_{2018} - Percentage\ Outsourced_{2008}$, against the percent change in annual real wages, that is, $(Wages_{2018} - Wages_{2008}) / Wages_{2008}$ at both ends of this ten-year period.

Figure 3: Relationship of Outsourcing to Wage Growth, 2008 to 2018



Source: OES, <https://www.bls.gov/oes/tables.htm>

There appears to be an almost linear negative relationship: the more outsourced an occupational category, the lower the wages. It is easy to imagine a straight line running through the middle of the points. To look at the strength of the correlation, I run a simple univariate regression on this small number of points. The regression yields a highly significant correlation coefficient of -0.512. The interpretation of this number is that the slope of the regression line through the points in the scatterplot is -0.512. Put another way, a ten percentage point increase in percent outsourced is associated with a fall in wages of 5.12 percentage points.⁷

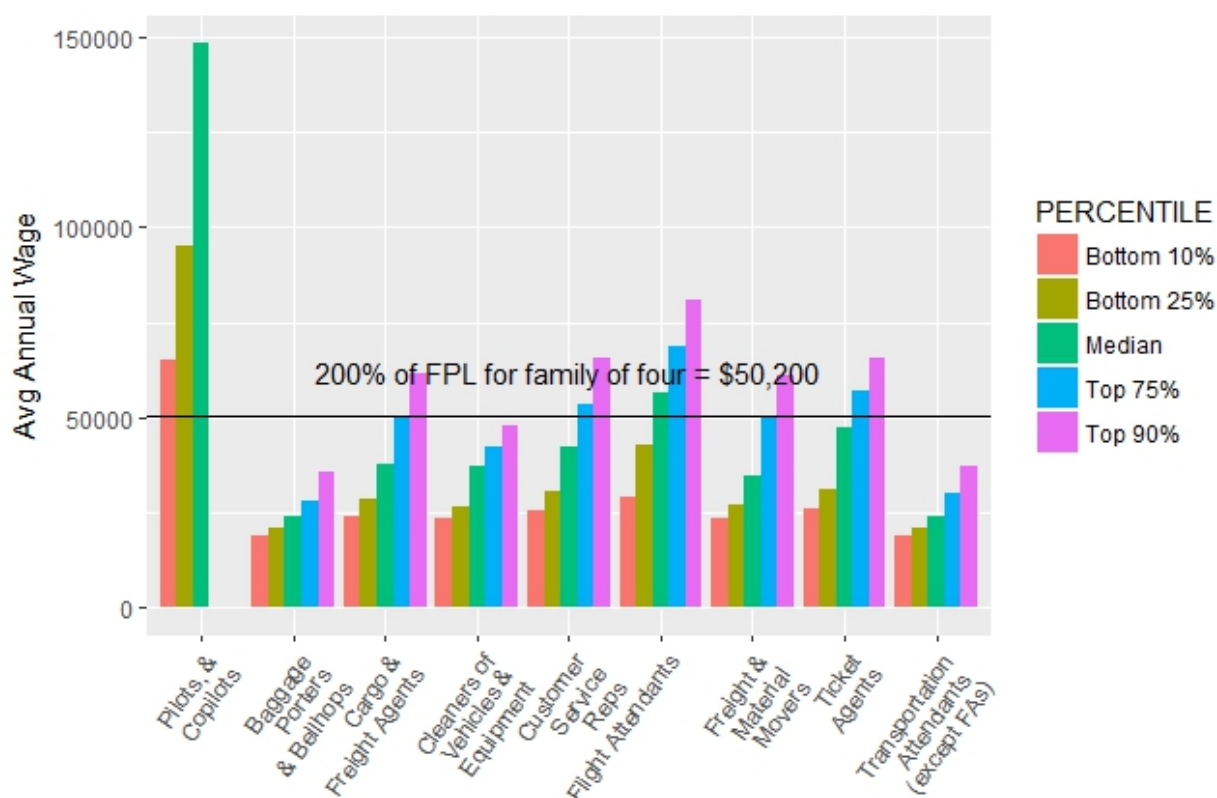
This finding should be taken with a grain of salt, since, in addition to the tiny sample

⁷Regression table is presented in Table 3 in Appendix B.

size, I have not controlled for the characteristics of these workers (such as their education, gender, age, or race) or their industries (such as capital intensity or unionization), and those underlying characteristics may be driving the observed correlations. Nonetheless with the data points we have, there appears to be a negative relationship between outsourcing and wages.

OES data also allow us to look at the distribution of wages for occupations within the air transportation and support for air transportation industries.⁸ Figure 4 presents these data, and compares the wage distributions to 200 percent of the Federal Poverty Line (FPL) for a family of four.⁹

Figure 4: Distribution of Airline Industry (Direct and Outsourced) Occupational Wages



Source: OES, <https://www.bls.gov/oes/tables.htm>

⁸Once again, I am indebted to Dietz et al. (2013) for the methodology here.

⁹<https://aspe.hhs.gov/2018-poverty-guidelines>

The top ten percent of pilot and co-pilot wages is missing from the chart because it is missing from the OES data. Several occupations in the airline industries, including baggage porters and bellhops, cleaners of vehicles and equipment, and transportation attendants, are completely below the line. That is, even the top ten percent of earners still earn less than 200% of the FPL. However, even the higher-paid occupations, like flight attendants, include low-wage workers. The bottom 25% of flight attendants earn below 200% of the federal poverty line.

4 Outsourcing of the Second Kind: Outsourcing Flights to Regional Airlines

The airline industry is not only affected by the outsourcing of jobs like baggage handling to low-wage specialist contractors. Even within the core business of flying airplanes, the major airlines (the so-called “legacy carriers”) outsource a portion of their flights to lower-wage airlines known as “regionals.” While there was once a major quality difference between regionals and legacy carriers, due to the regionals’ specialization in shorter, lower-traffic routes and use of noisy, uncomfortable turboprop aircraft, the introduction of regional jets in the 1990s has given legacy carriers the technology to outsource more flights to regional airlines. Technology is not the only factor affecting the use of regionals, however: pilot and flight attendant unions negotiate the amount of flights that a legacy carrier can outsource to regionals under “scope clauses.” Since the main advantage of regional airlines is their lower labor costs relative to legacy carriers, this may be a concern as contracts become amendable in 2019 and further changes to scope clauses become possible (Forbes and Lederman, 2005).

It can be difficult for customers to tell the difference between flying on a plane operated by the legacy airline and one operated by a regional. No tickets are sold under the regional’s own name or code, and the regional’s aircraft have the legacy carrier’s logo and colors painted on them. The regional’s flight attendants wear the legacy carrier’s uniform, and usually the

regional’s schedule is controlled by the legacy carrier. The use of regional flights is a bit like business arrangements like franchising, which allow large corporations to minutely control the operations of legally “independent” smaller firms in a manner equivalent to if they actually directly employed the workers and owned the assets of the smaller company, but without many of the legal risks, costs, and responsibilities that accompany full legal integration. For example, just as franchised McDonald’s employees do not have rights under labor law against McDonald’s corporation, regional airline employees do not have rights against the legacy carriers that really control their working lives (Callaci, 2018a,b).

4.1 Legacy, Regional, and LCC Employment and Wages

Neither QCEW nor OES data allow us to compare regional airlines to legacy carriers, since both are part of the Air Transportation NAICS industry and are averaged together in BLS statistics. Fortunately, the Department of Transportation collects labor, financial, and operational data on each airline as part of its Form 41 reporting requirements. By merging various data series (or “schedules”) from Form 41 and assigning each airline to its category, we can compare legacy, regional, and LCC carriers to each other and over time, across a wide range of characteristics. For more detail on compiling and wrangling Form 41 data, see Appendix C. Table 5 in Appendix C contains the list of carriers included in the analysis. I focus on the years 1997-2017.

Unfortunately, two regional airlines, Piedmont Airlines (a wholly-owned subsidiary of American Airlines) and Commutair (an independent regional), do not file Form 41 data and are completely missing from the data. While Commutair is rather small (900 employees), Piedmont is not, employing 8,000 workers.¹⁰ This makes Piedmont the third-largest regional airline by employment in 2017 according to Form 41 data, behind Envoy and SkyWest (10,000 FTE employees each) and ahead of ExpressJet (6,000 employees). Piedmont’s workforce would amount to a full thirteen percent of regional airline employment were Pied-

¹⁰<http://piedmont-airlines.com/Our-Company/What-We-Do>; <http://www.flycommutair.com/aboutus/>

mont included with the other airlines that are present in Form 41. The fact that Piedmont is missing means that the estimates for aggregate employment in the next section will be lower than the true value. However, because Piedmont’s pay scales have been similar to those of its peers, the inclusion of Piedmont should not affect the direction of the trends we observe and analyze below.¹¹

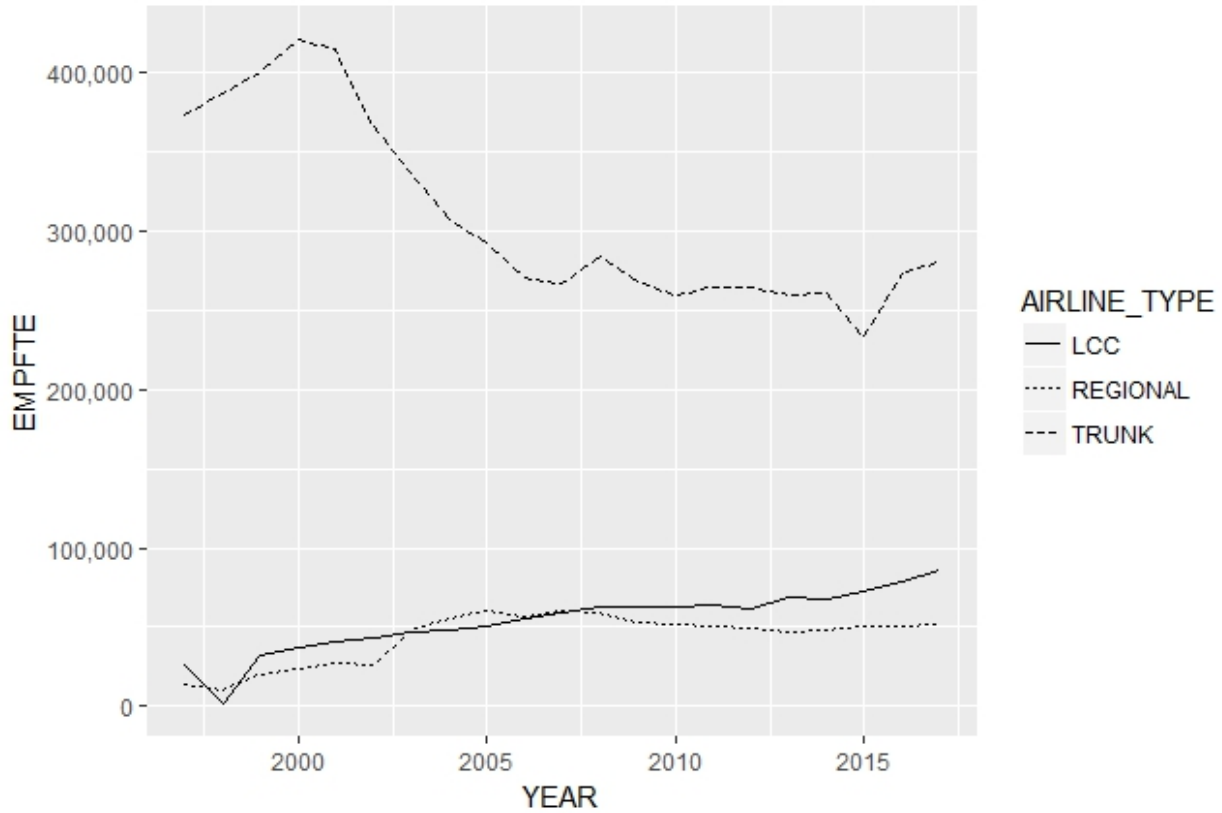
Another problem with the regional data is we cannot be completely certain we are capturing the universe of regional carriers in a given year, due to frequent merger activity, airline name changes, and the scarcity of historical data. Thus we cannot be completely confident that aggregate employment figures are accurate, particularly in early years, since this may reflect airlines that are missing from the data. For example, SkyWest does not appear in the Form 41 data under its current code until 2004.

4.2 Full Time Equivalent Employment Across All Labor Groupings

Using the March full time equivalent (FTE) employment figures from Form 41’s Schedule P-1(a), we can examine employment trends by carrier type. Figure 5 displays legacy, regional, and LCC FTE employment over the years 1997-2017. These are domestic plus international FTE employment numbers, since Schedule P-1(a) is not broken down by operating region.

¹¹The fact of Piedmont pay scale similarity to other regional airlines was confirmed by Joe Burns of AFA-CWA.

Figure 5: Employment by Airline Type, 1997-2017



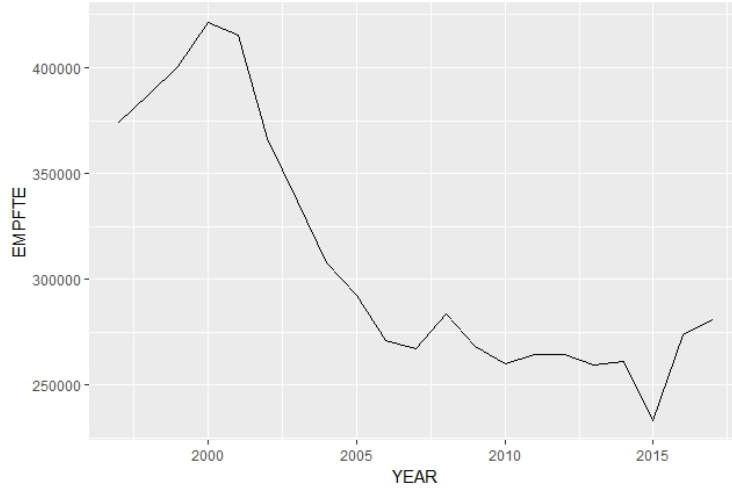
Source: DOT Form 41 Schedule P-1(a)

Plotting both data series in the same graph allows us to compare absolute employment numbers (with the caveat that Piedmont and CommutAir are missing from the regional data, and at least SkyWest is missing prior to 2004). Legacy carrier FTE employment suffered a steep decline after 9/11 and the 2001 financial crisis, as the industry shed 150,000 FTE workers. LCC FTE employment, meanwhile, shows a rise at a similar rate to regionals. Ignoring the 1998 dip for LCCs and Regionals, which likely reflects a data error, we can see some trends clearly. Legacy carrier employment fell rapidly from 2001 to 2008, but has remained stable since then. Regional and LCC employment have risen steadily during the same period. This latter development likely reflects two trends: first, LCCs have steadily taken market share from the legacy carriers. Second, legacy airlines have increased their reliance on re-

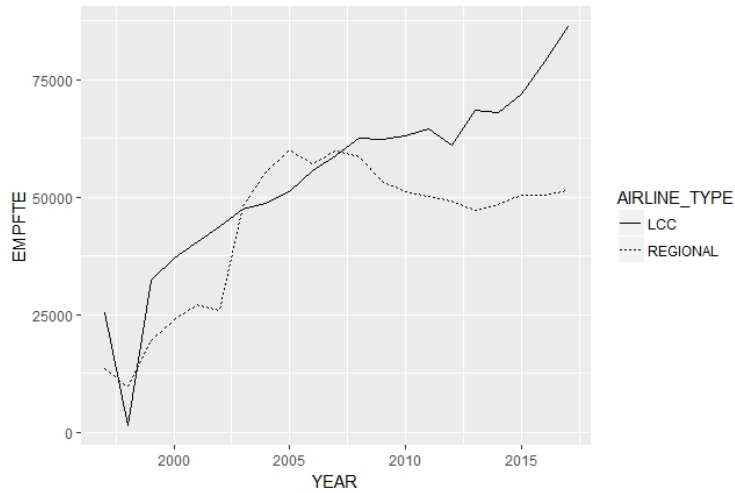
gional jets. Two factors have enabled this trend. First, the introduction in the late 1990s and early 2000s of 70-plus-seat regional jets like the Bombardier CRJ900 and Embraer 175, which are much closer substitutes for mainline jets than earlier regional aircraft, made it possible for legacy carriers to outsource more flights to lower-cost regional airlines. Second, while pilots initially resisted the substitution of cheaper regional flights (with lower pilot salaries) for legacy flights, they relaxed their stance during the economic trauma following 9/11. These factors have dramatically increased the ability of legacy carriers to outsource routes to regional airlines.

While Figure 5 shows us the absolute numbers, it can be hard to see trends clearly when all types of airline are on the same graph, because regional and LCC FTE employment is so much lower than legacy carrier FTE employment. Figure 6 allows us to look at regional and LCC employment trends more closely.

Figure 6: Employment by Airline Type, Separate Scales



(a) Legacy



(b) Regional and LCC

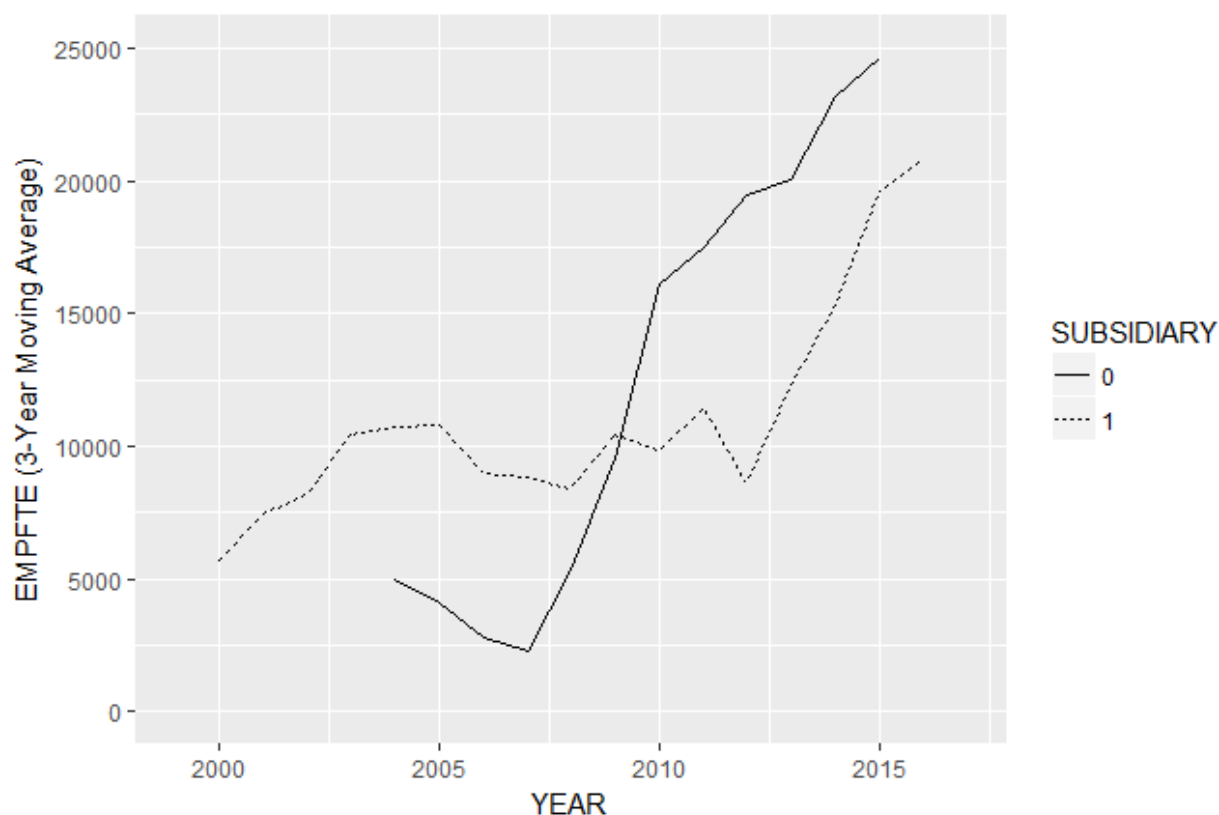
Source: DOT Form 41 Schedule P-1(a)

In Figure 6, we can see more clearly that regional and LCC carrier employment have actually been exploding.

Legacy airlines have a choice when replacing mainline flights with regional flights: they can contract with an “independent” regional airline (albeit still minutely controlled in the ways discussed earlier) or use a wholly-owned subsidiary to make regional flights. The

conventional wisdom is that labor costs are lower at independent regionals, but that wholly-owned regionals give legacy carriers greater control over last-minute schedule changes or adverse weather events (Forbes and Lederman, 2005). To these two considerations, Joe Burns of AFA-CWA has suggested a third: ownership of a regional airline provides a more reliable pipeline of pilots to legacy carriers. Figure 7 plots employment at wholly-owned subsidiary and contract regional airlines.

Figure 7: Regional Airline Employment by Ownership Status



Source: DOT Form 41 Schedule P-1(a), Regional Airline Association

Ownership information for regional airlines is difficult to come by, especially prior to 2008.¹² Moreover, Commutair and Piedmont, the latter a wholly-owned subsidiary of American Airlines, are missing from the data altogether. As a result, Figure 7 should not be

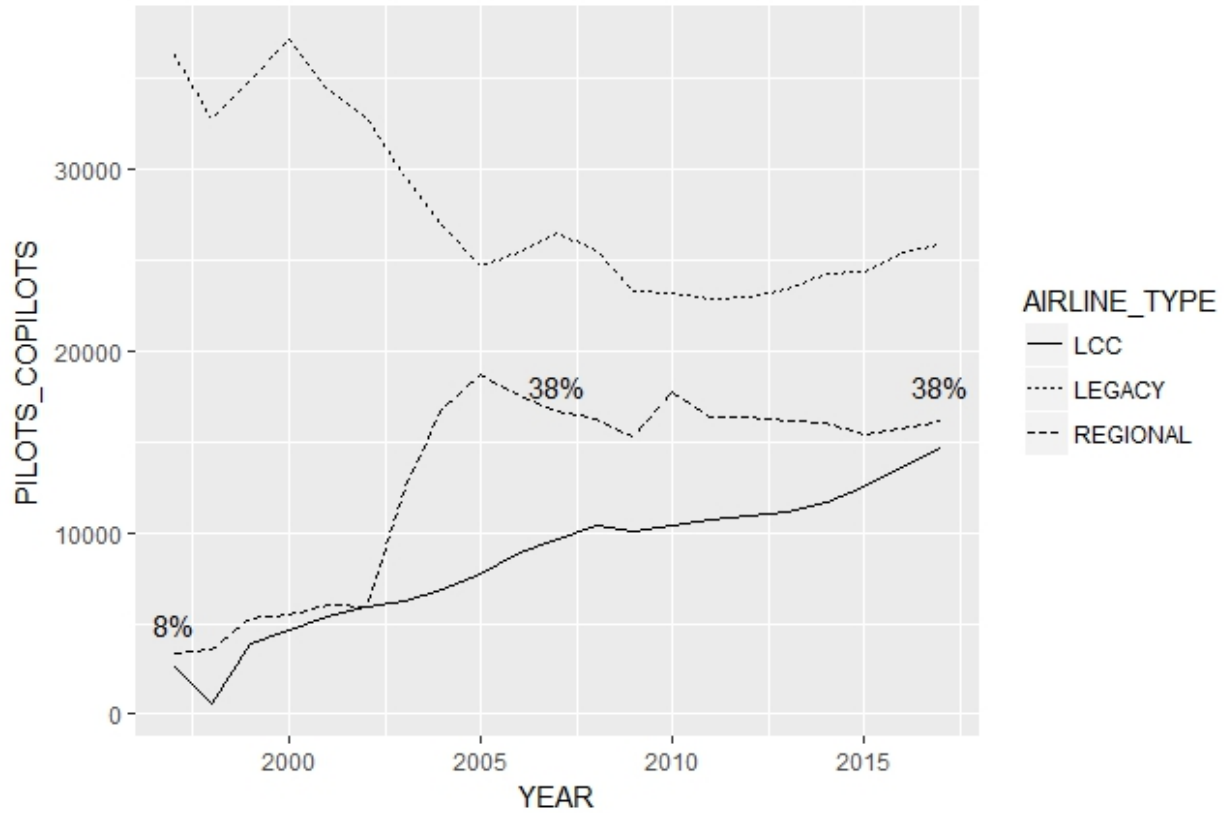
¹²See Appendix C for more information on the coding of ownership status for regional airlines

understood to do anything other than outline broad trends, and is less reliable prior to 2004 (when SkyWest first appears in the data). To overcome some of the jerkiness of the data and make the trends visible, I plot the three-year moving average rather than the raw data series, a simple smoothing technique where each year's observation is averaged with the preceding and the following year. Wholly-owned and contracted airlines are increasing at about the same rate, suggesting that growing reliance on regional flights affects both types of regional airline equally. Regarding the levels of employment at the two types of airline, adding Piedmont's 8,000 employees to the wholly-owned subsidiary line in the last year would put it *above* the level of independent regionals.

4.3 Employment by Labor Grouping

While Schedule P-1(a) contains measures of employment by airline, it does not break down employment by labor group. For that kind of breakdown, we need Schedule P-10, which contains annual employee figures by labor group and region. In this section I exclude international operations to try to get a better apples-to-apples comparison of regional, LCC and legacy carriers. "Pilots and Co-Pilots" in Schedule P-10 contains the following job categories: captain, check pilot, chief pilot, copilot, pilot, reserve pilot, and test pilot. Figure 8 displays domestic employment totals for this labor group over time, by type of airline.

Figure 8: Pilot and Co-Pilot Employment by Airline Type



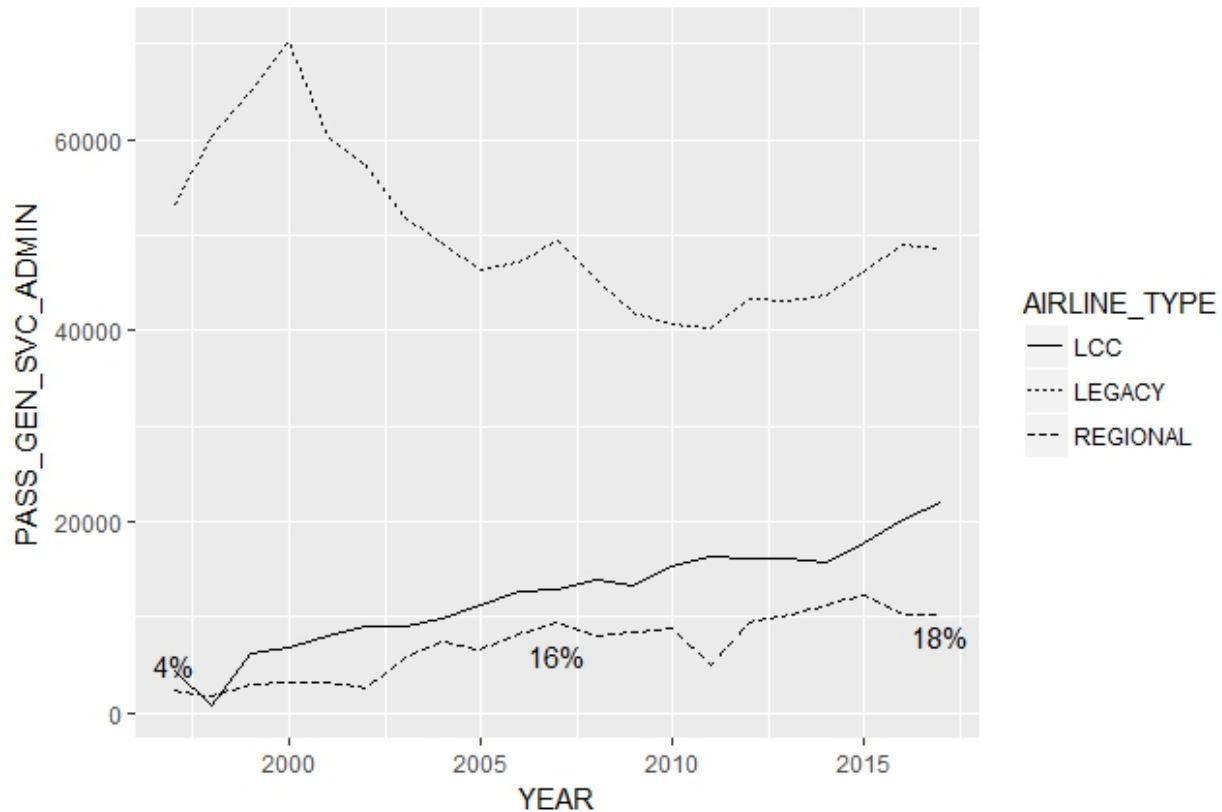
Source: DOT Form 41, Schedule P-10

There is a strong downward trend in legacy pilot employment, coupled with a strong upward trend in regional pilot employment. This suggests that the growth in regional employment is closely related to, and perhaps comes at the expense of, the decline in legacy carrier employment.¹³ While in 1997 almost all pilots in the data were legacy carrier pilots (more than 35,000 legacy pilots vs. less than 5,000 regional or LCC pilots), now there are just over 25,000 legacy pilots compared to over 15,000 regional airline pilots, and just under that many LCC pilots. Regional pilot employment stabilized at thirty-eight percent around 2007.

¹³While the leap in regional pilot employment appears to mirror the steep decline in legacy employment from 1997 to 2005, a portion of the leap in legacy employment is likely due to SkyWest appearing in the data for the first time in 2004.

Meanwhile, the flight attendant category in Schedule P-10, Passenger/General Services and Administration, contains the following job categories: cabin attendant (cargo), cabin attendant (passenger), hostess, purser, steward, and stewardess. The reader will note that this is a broader category than just flight attendants. I plot Passenger/General Services and Administration employment in Figure 9.

Figure 9: Flight Attendant Employment by Airline Type



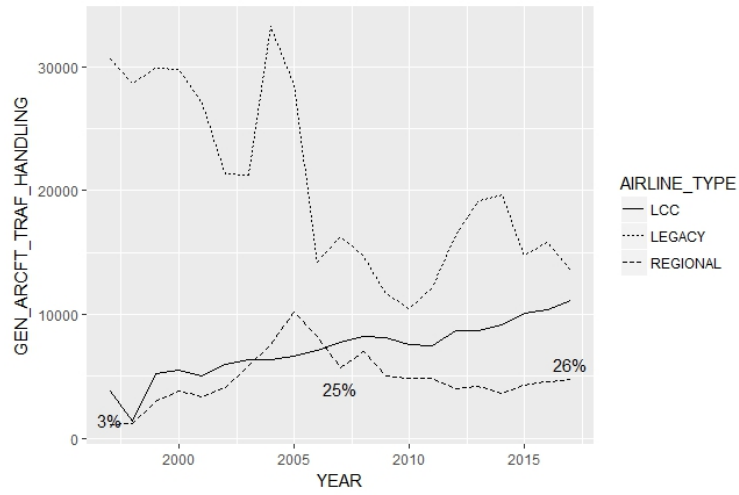
Source: DOT Form 41, Schedule P-10

While the mirror image does not come through as clearly as it does for pilots, nonetheless we see the same broad trend: regional flight attendant employment grows rapidly as a proportion of regional + legacy flight attendant employment after 9/11. A key difference that might explain the lack of a clearer mirror image is the different staffing ratios of flight attendants to pilots in the smaller regional jets vs. the larger aircraft used by legacy and

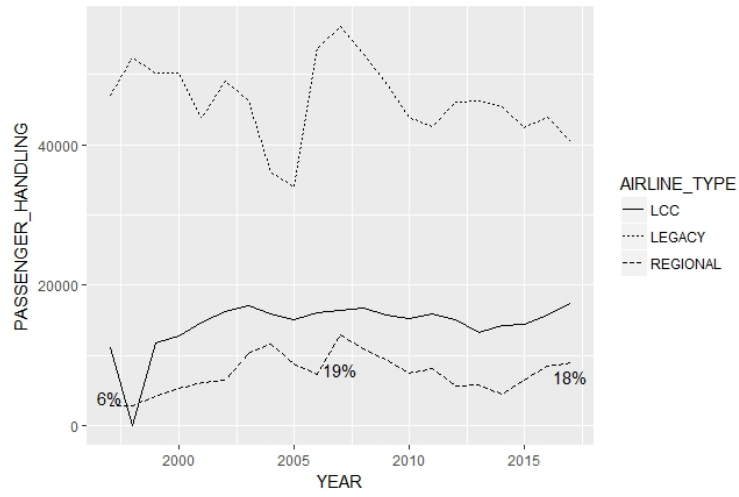
LCC carriers.

The employment trends for other relevant employment groups—General Aircraft and Traffic Handling, Passenger Handling, and Cargo Handling—are presented in Figure 10.

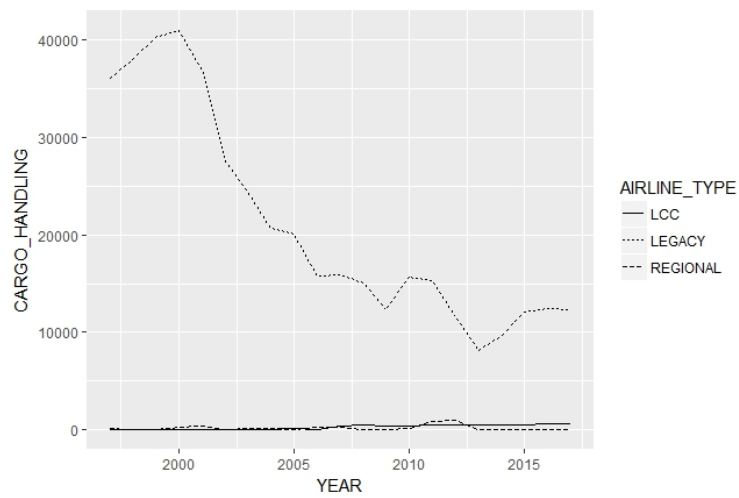
Figure 10: Employment by Airline Type, Other Labor Groups



(a) Aircraft Handling



(b) Passenger Handling



(c) Cargo Handling

The specific job groupings contained in these Schedule P-10 employee count categories, as well as their counterpart labor cost measures in Schedule P-6, are, presented in Table 2.¹⁴ The trend in general aircraft and traffic handling, panel (a), and passenger handling, panel (b), has, as with pilots and FAs, been growth in regional and decline in legacy employment. As with pilots and flight attendants, there was a period of rapid growth until 2007, after which regional employment stabilized. This suggests the outsourcing of work to regional airlines. Finally, cargo handling employment has undergone a dramatic collapse at legacy carriers, while regionals and LCCs never had much cargo handling employment to begin with. This is consistent with cargo handling activities being outsourced to third party contractors.

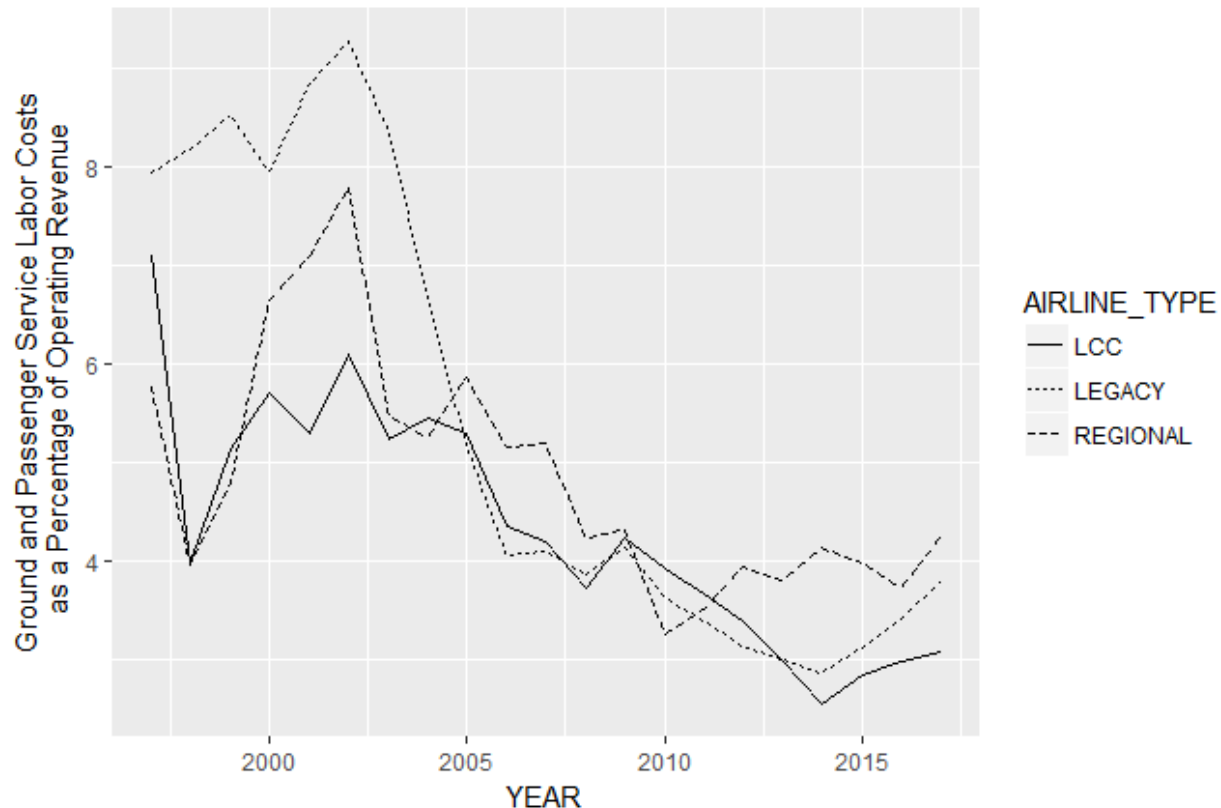
Another way to look at the extent of outsourcing ground and passenger service workers is compare labor costs for this category as a percentage of airline operating revenues over time. By calculating labor costs as percentage of revenue, we measure not just the absolute decline in employment, but the decline relative to the airline's resources. Figure 11 contains those figures.

¹⁴Matching these two schedules together will be important later in calculating average salaries by labor group.

Table 2: Schedule P-6 and Schedule P-10 detailed labor groupings

Job Categories	Schedule P-6	Schedule P-10
Analyst-procedures	Aircraft & Traffic Handling	All
Clerk	Aircraft & Traffic Handling	All
Rates clerk	Aircraft & Traffic Handling	All
Stenographer	Aircraft & Traffic Handling	All
Tariff specialist	Aircraft & Traffic Handling	All
Typist	Aircraft & Traffic Handling	All
Secretary	Aircraft & Traffic Handling	All
Control tower operator	Aircraft & Traffic Handling	Aircraft Control
Crew scheduler	Aircraft & Traffic Handling	Aircraft Control
Draftsman-flight control	Aircraft & Traffic Handling	Aircraft Control
Flight director	Aircraft & Traffic Handling	Aircraft Control
Flight dispatcher	Aircraft & Traffic Handling	Aircraft Control
Flight regulations supervisor	Aircraft & Traffic Handling	Aircraft Control
Flight specifications supervisor	Aircraft & Traffic Handling	Aircraft Control
Meteorologist	Aircraft & Traffic Handling	Aircraft Control
Baggage clerk	Aircraft & Traffic Handling	Cargo Handling
Baggage handler	Aircraft & Traffic Handling	Cargo Handling
Cargo clerk	Aircraft & Traffic Handling	Cargo Handling
Cargo handler	Aircraft & Traffic Handling	Cargo Handling
Express agent	Aircraft & Traffic Handling	Cargo Handling
Freight agent	Aircraft & Traffic Handling	Cargo Handling
Mail handling clerk	Aircraft & Traffic Handling	Cargo Handling
Porter-baggage	Aircraft & Traffic Handling	Cargo Handling
Waybill clerk	Aircraft & Traffic Handling	Cargo handling
Cleaner-aircraft	Aircraft & Traffic Handling	General Aircraft and Traffic Handling
Mechanic-line service	Aircraft & Traffic Handling	General Aircraft and Traffic Handling
Refreshing crew	Aircraft & Traffic Handling	General Aircraft and Traffic Handling
Regional manager	Aircraft & Traffic Handling	General Aircraft and Traffic Handling
Station manager	Aircraft & Traffic Handling	General Aircraft and Traffic Handling
Cashier-ticket office	Aircraft & Traffic Handling	Passenger Handling
Chauffeur-passenger vehicles	Aircraft & Traffic Handling	Passenger Handling
Countermand-airport	Aircraft & Traffic Handling	Passenger Handling
Counter ticket salesman-city	Aircraft & Traffic Handling	Passenger Handling
Doorman-passenger	Aircraft & Traffic Handling	Passenger Handling
Gateman	Aircraft & Traffic Handling	Passenger Handling
Passenger ramp agent	Aircraft & Traffic Handling	Passenger Handling
Passenger sales ticketing clerk	Aircraft & Traffic Handling	Passenger Handling
Reservations clerk	Aircraft & Traffic Handling	Passenger Handling
Reservations manager	Aircraft & Traffic Handling	Passenger Handling

Figure 11: Ground and Passenger Service Labor Costs as Percentage of Operating Revenue



Source: DOT Form 41, Schedules P-1.2 and P-6

For ground and passenger services salaries, I use the Aircraft & Traffic Handling figures from Schedule P-6, which, as can be discerned from Table 2, includes salaries paid to the Aircraft Control, Cargo Handling, General Aircraft and Traffic Handling, and Passenger Handling categories. Operating revenues are reported in Schedule P-1.2. What we see is a steep decline in labor costs across all types of airlines, but especially so for legacy carriers. This decline in labor costs reflects increased outsourcing, wage cuts for this group of workers, or both.

4.4 Annual Salaries by Labor Group

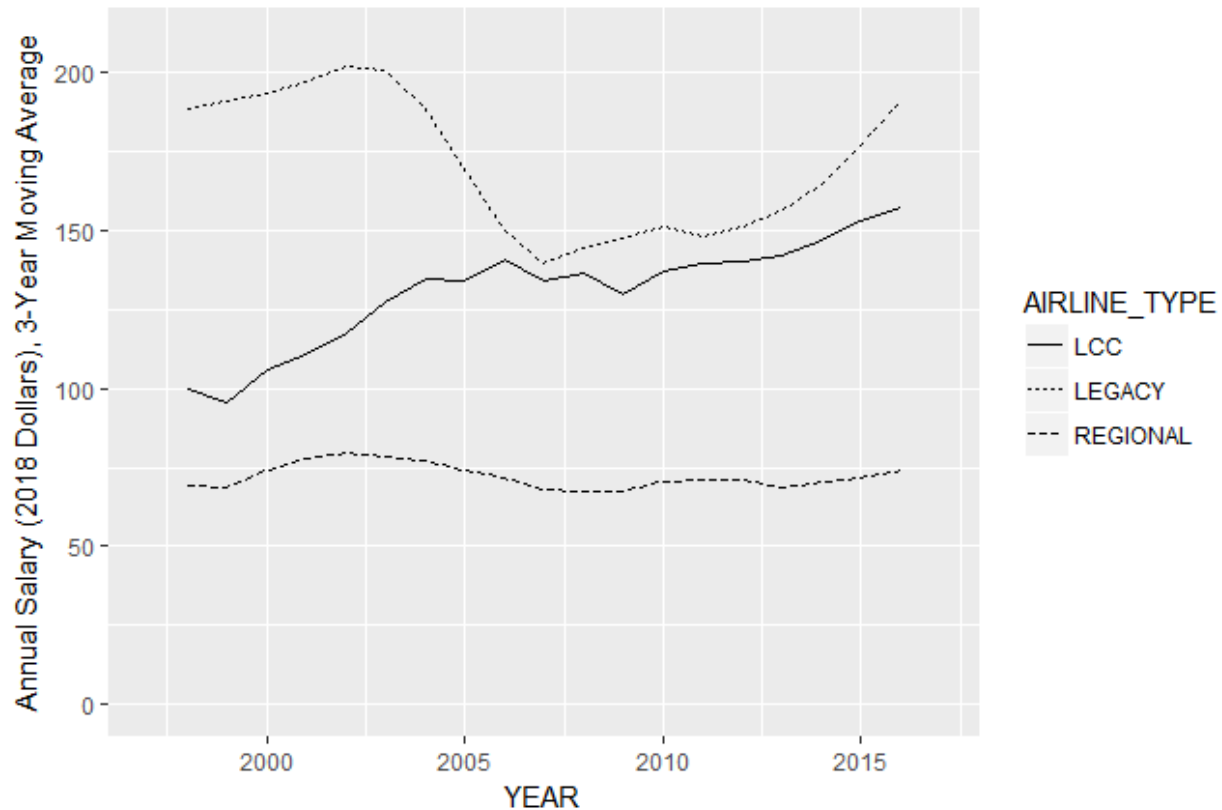
Form 41 data allows us to compare annual salaries for certain labor groups across type of airline.¹⁵ We can estimate average pilot salaries as follows. Once again, these are all domestic figures only, excluding international. PILOT_FLY_OPS from Schedule P-5.2 contains the cost of salaries paid to pilots for each airline.¹⁶ Dividing this by PILOTS_COPILOTS (the number of pilots from Schedule P-10, which luckily exactly matches the specific job categories in Schedule P-5.2) for each airline, and taking the average for each type of airline (legacy, regional, and LCC), we get average pilot salaries for each type of airline. The results, after adjusting for inflation, removing one extremely implausible observation, and applying a three-year moving average, are plotted in Figure 12.¹⁷

¹⁵Unlike employment levels, which are sums over types of airlines, salaries are averages over each type. Thus the absence of Piedmont, Commutair, and SkyWest prior to 2004, assuming their wage schedules are not radically different from peer airlines, is much less meaningful here than it was in the employment totals.

¹⁶More specifically, it contains the salaries of captains, check pilots, chief pilots, copilots, pilots, reserve pilots, and test pilots

¹⁷The extremely implausible observation was regional pilot salaries increasing over 200 percent from 2013 to 2014, to a level above legacy pilots, and falling by almost the same amount from 2014 to 2015. As this is almost certainly an error, I simply removed the 2014 observation. The plot prior to outlier removal and application of the moving average is Figure 17 in Appendix D.1.

Figure 12: Average Domestic Pilot Real Salaries by Airline Type



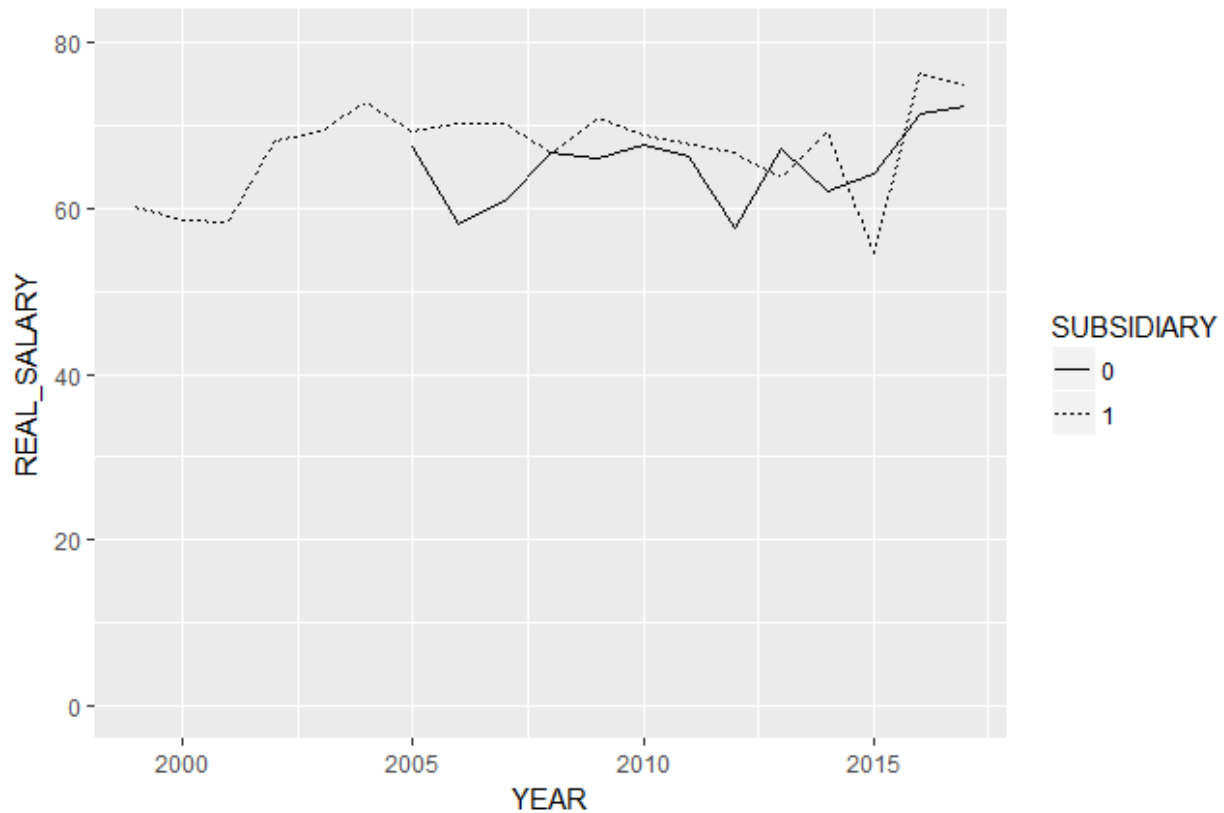
Source: DOT Form 41, Schedules P-5.2 and P-10

It is important to keep in mind that these are averages, and pilot pay scales are scaled to the type of aircraft they fly. The mix of aircraft is therefore a factor in average pilot salaries, even within an airline type. We can see that clearly LCC pilots have experienced the strongest wage growth since 1997, with real salaries up fifty percent since 1997. Legacy pilot salaries show a U-shape, with average salaries declining rather precipitously from 2003 to 2006, but recovering strongly from 2007 to 2017. Regional pilot salaries, meanwhile, are virtually unchanged, hovering around \$75,000 in 2018 dollars for the entire period. The labor cost advantage of regionals, due to the smaller jets and pilot pay scales, remains very large.

We also might be interested in whether average salaries differ between wholly-owned and independent regional airlines. While the conventional wisdom is that wholly-owned

subsidiaries have higher wages than independents, we might want to check that against Form 41 data. Figure 12 presents unsmoothed average real salaries within the regional category by ownership status.

Figure 13: Average Domestic Regional Pilot Salaries by Ownership Status



Source: DOT Form 41, Schedules P-5.2 and P-10

There is no discernible difference between the two types of airline. While the average salaries for wholly-owned airlines swings around more than those for independents, that likely reflects data quality issues rather than true underlying swings in the wage. Over a 20-year period, the two seem to move together in a common trend.

It is also possible to calculate a rough measure of average flight attendant salaries through the following formula:

$$AVG_FA_SALARY = \frac{SALARIES_FLIGHT - PILOT_FLY_OPS}{PASS_GEN_SVC_ADMIN}$$

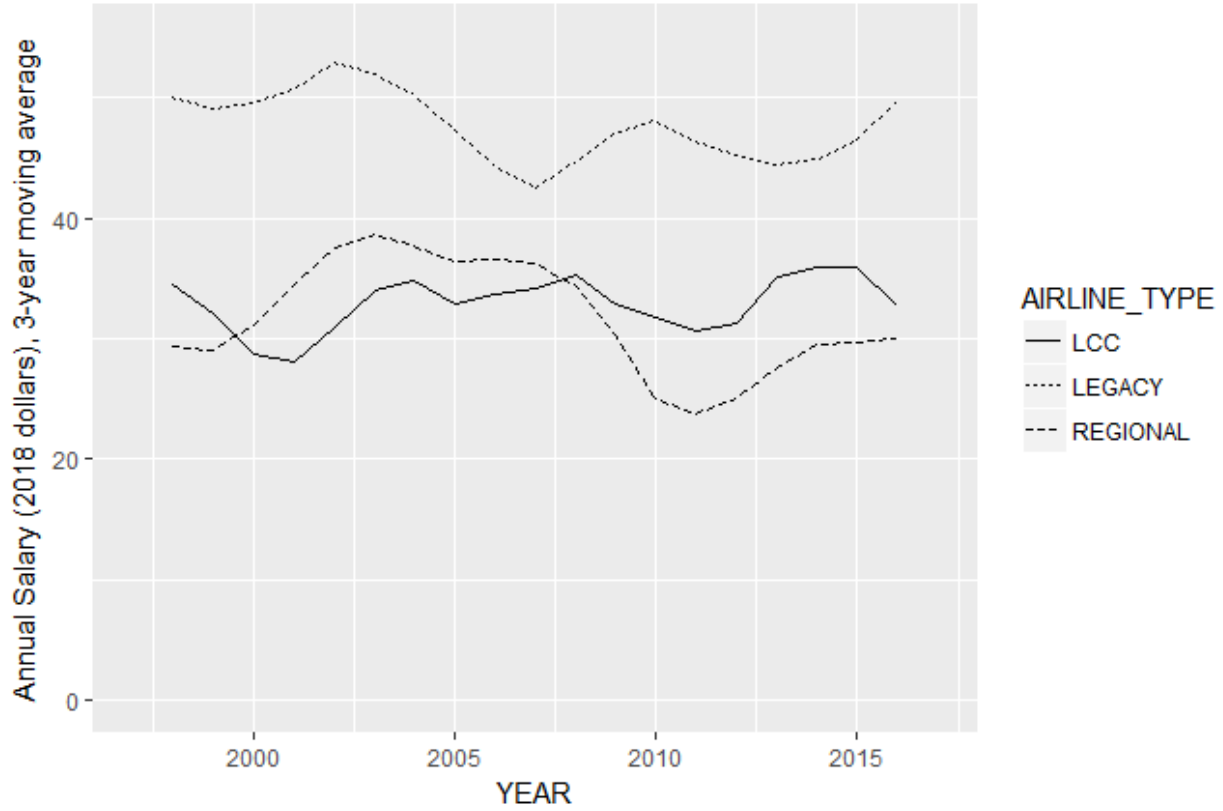
SALARIES_FLIGHT from Schedule P-6 includes salaries for flight attendants and pilots.¹⁸ PILOT_FLY_OPS is the same variable we used to calculate average pilot salaries.¹⁹ The denominator, PASS_GEN_SVC_ADMIN, from Schedule P-10, as we saw above, is (roughly) the number of flight attendants. I then do the same as I did for pilots and take the mean salary by year for each type of airline. Unfortunately, the quality of these flight attendant salary estimates, particularly for regional airlines, appears to be lower than that for the pilot salary estimates. There are several huge swings in the time series plots that likely reflect errors in the data. The plot below charts the data after the removal of several implausible observations and the application of a 3-year moving average.²⁰

¹⁸Specifically, it includes the following employee groups: captain, check pilot, chief pilot, copilot, pilot, reserve pilot, test pilot, flight attendants, communications officer, engineering officer, and navigation officer.

¹⁹Put another way, PILOT_FLY_OPS reports all of the job categories from SALARIES_FLIGHT except Flight attendants, Communications officer, Engineering Officer, and Navigation Officer.

²⁰The pre-smoothing chart is Figure 18, presented along with a description of the smoothing process in Appendix D.2.

Figure 14: Average Flight Attendant Real Salaries by Airline Type



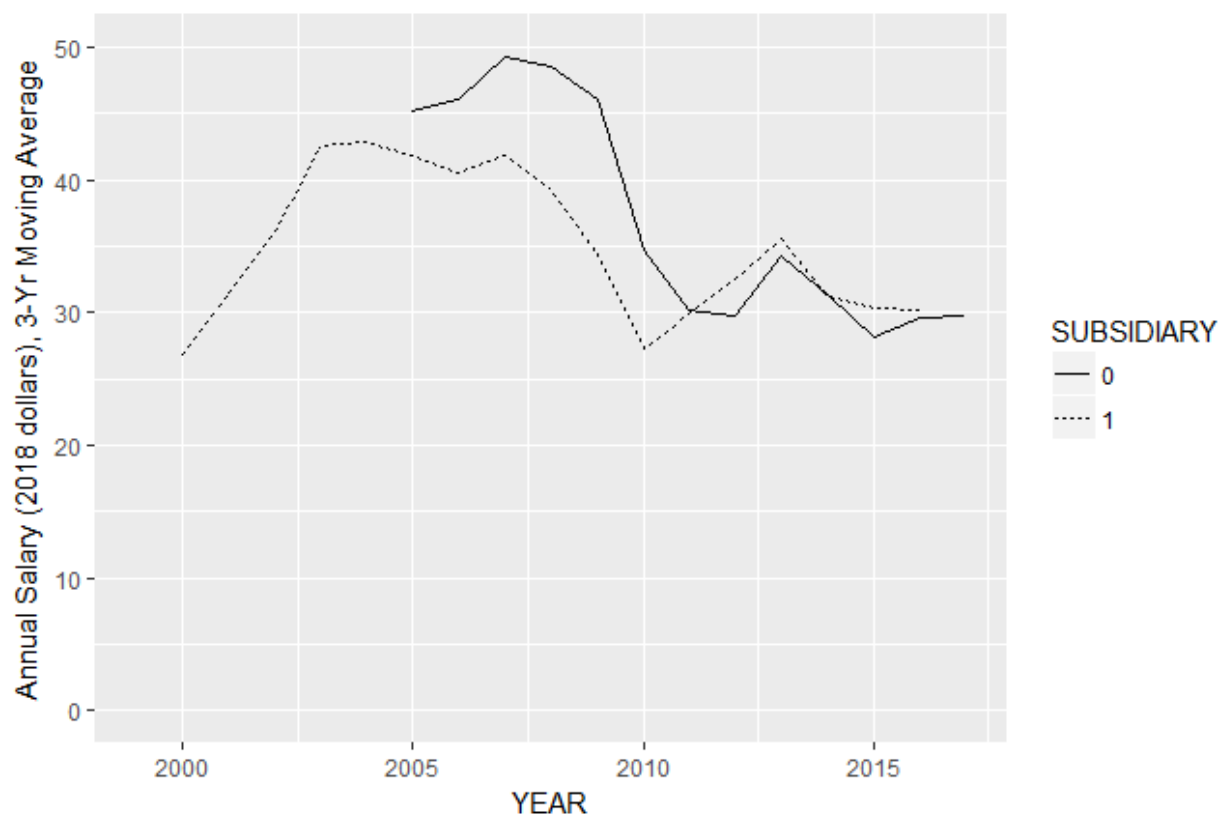
Source: DOT Form 41, Schedules P-5.2, 6, and P-10

Like pilots, flight attendant salaries depend in part on the type of aircraft on which they work. This in turn influences the wage gap between legacy carriers and regional airlines. However, unlike the case for pilots, the skill level and work burdens required of flight attendants are not radically different between the larger aircraft used by legacy carriers and smaller regional jets. Thus there the justification for paying regional and legacy carrier flight attendants differently is weaker.

While there is a fair bit of movement between 1997 and 2017, throughout the period a large gap is evident between legacy and regional airlines: legacy FAs made about \$20,000 more per year than their regional counterparts in 2018 dollars in both 1997 and 2017. Regional FA wages, in fact, are still behind 1997 legacy FA wages in *nominal* (not inflation-

adjusted) terms. The moving averages of both regional and legacy airline FA salaries are essentially flat in real terms over this twenty-year period, although estimated legacy flight attendant salaries rose dramatically in the final three years of the data, a trend muted somewhat by the use of the moving average: \$45,000 in 2015, \$49,000 in 2016, and \$54,000 in 2017. If this trend is real and continues, legacy FAs could be pulling ahead, while regional FAs have not yet shown industry-wide improvements. As the legacy airline market has consolidated into just a handful of airlines, they may be sharing their newfound oligopoly profits with their shrinking base of in-house employees, while excluding workers at regionals from sharing in those gains.

Figure 15: Average Regional Flight Attendant Real Salaries by Ownership



Source: DOT Form 41, Schedules P-5.2, 6, and P-10

As with pilot salaries, there is no discernible difference by ownership status, especially

in the later years. (The data for the later years is also more reliable, as we have a larger sample of airlines in those years. See Table 5 in Appendix C for information about which airlines are in the data for which years.)

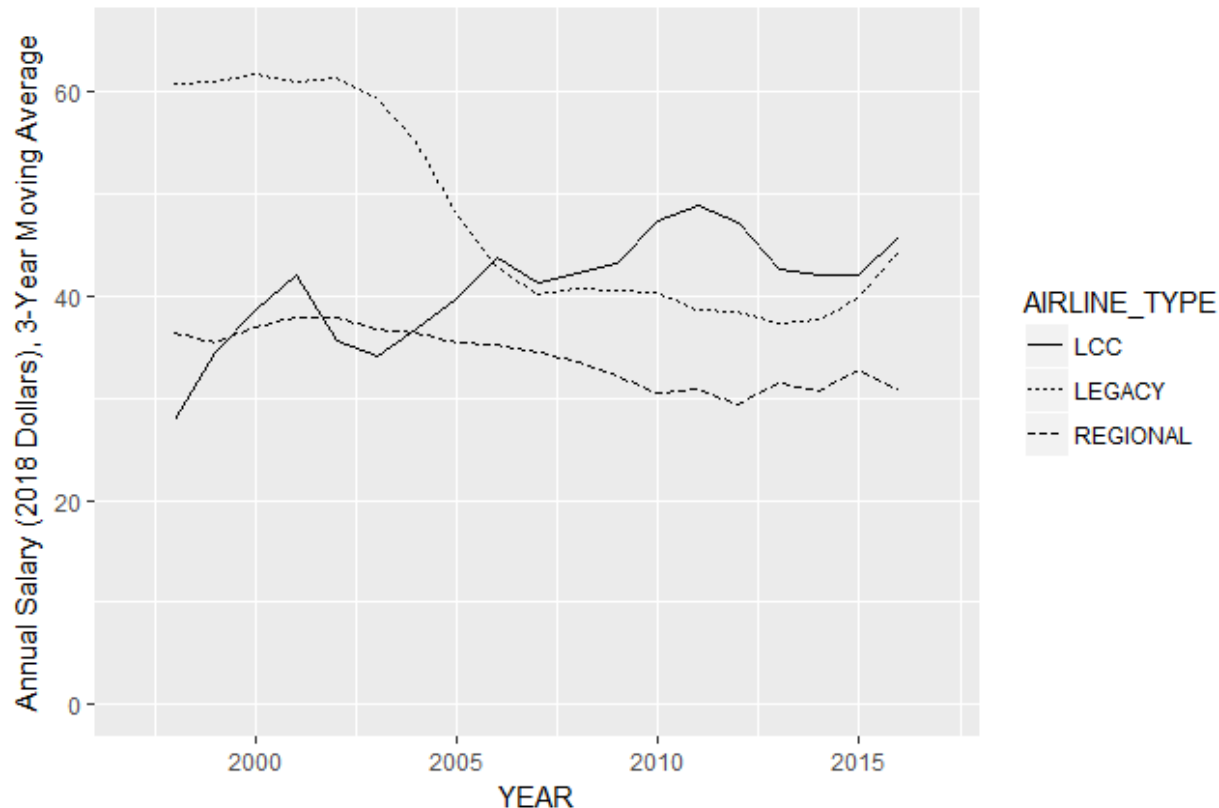
Finally, this report is also concerned with ground and passenger service workers. Unlike flight attendants, ground and passenger service workers have been affected not just by the growth of regionals, but also by outsourcing to third-party contractors. This complicates the analysis, since once these workers are off the airline payroll we can no longer track their salaries using Form 41 data. Nonetheless, it is possible to develop some rough estimates of the salaries of ground and passenger service workers who remain directly employed by airlines. This adds to our analysis of OES data earlier in this report by allowing us to examine salaries by type of airline.

Once again I include domestic US operations only. I sum Aircraft and Traffic Handling Personnel labor costs (P-6) over quarters so each observation is an airline-year pair. Table 2 shows the specific occupations included in this category from Schedule P-6. *SALARIES_TRAFFIC* is the amount spent on salaries for Aircraft and Traffic Handling Personnel (Schedule P-6), the narrowest category including ground and passenger service workers. By matching the labor categories in Schedules P-6 and P-10 to each other (see Table 2 above), we can calculate average salaries for workers in the General Aircraft and Traffic Handling labor group. The formula is as follows:

$$AVG_TRAFFIC_SALARIES = SALARIES_TRAFFIC / (GEN_ARCFT_TRAF_HANDLING + PASSENGER_HANDLING + CARGO_HANDLING + AIRCRAFT_CONTROL)$$

SALARIES_TRAFFIC is the Aircraft and Traffic Handling Personnel figure from Schedule P-6, and *GEN_ARCFT_TRAF_HANDLING*, *PASSENGER_HANDLING*, *CARGO_HANDLING*, and *AIRCRAFT_CONTROL* are the employee counts from Schedule P-10. Figure 14 displays the time series of these salaries over time.

Figure 16: Average Annual Salaries, Ground and Passenger Service Workers

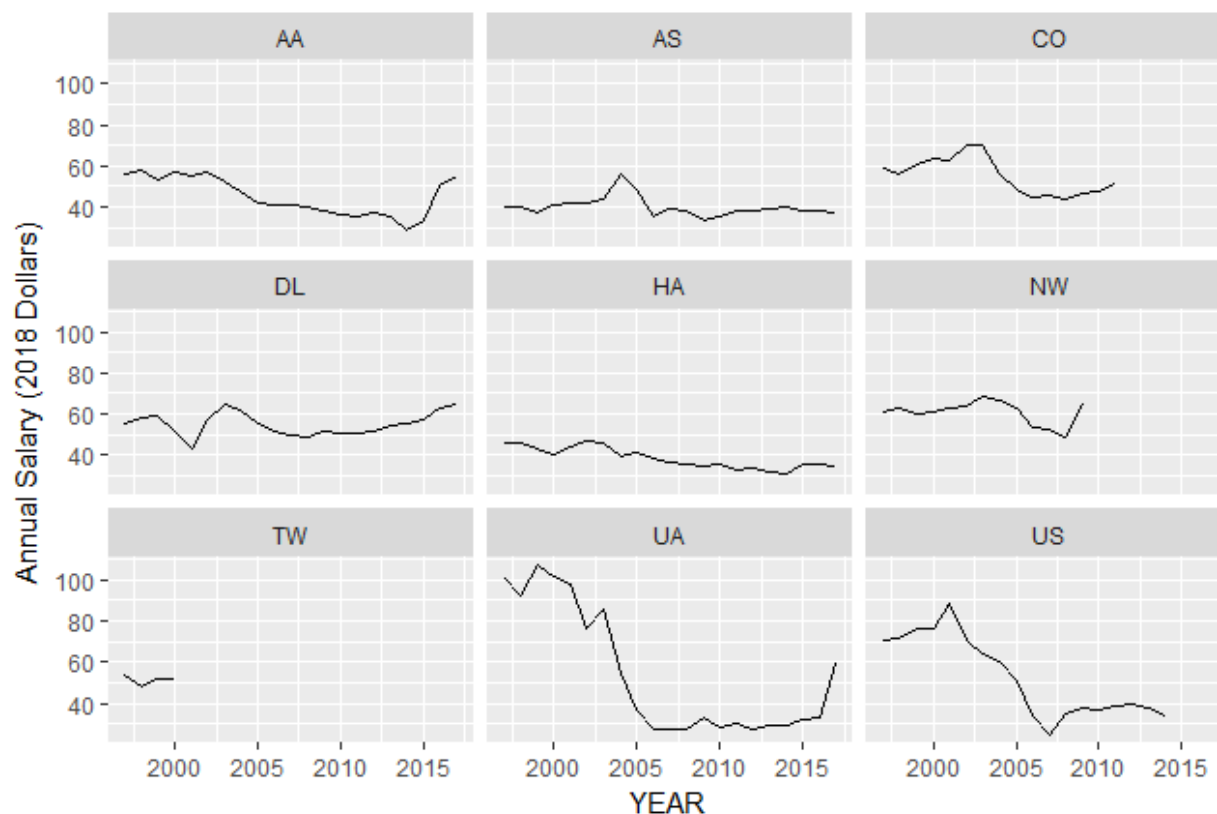


Source: DOT Form 41, Schedules P-6 and P-10

The implausible observation removal process, along with the pre-smoothing time series plots, are contained in Appendix D.3. What we can see after the smoothing process is a dramatic fall in legacy salaries after 9/11, albeit with a partial recovery beginning in 2011. Regional salaries trend downward throughout the period. The gap has narrowed between legacy and regional wages, but only because legacy wages have fallen so far. This is consistent with the analysis of OES wage and employment data as well as of Form 41 employment data earlier in this report: employment of these worker groups has fallen at legacy carriers, in part due to outsourcing to third-party contractors, and that process of outsourcing has been correlated with wage declines for those workers, including those still remaining as direct airline employees.

There is some heterogeneity among the legacy airline category, as can be seen in Figure 15.

Figure 17: Average Annual Salaries, Ground and Passenger Service Workers, Legacy Carriers Only



Source: DOT Form 41, Schedules P-6 and P-10

The steep decline is largely driven by United and US Airways. Other legacy airline wages fell more slowly, and Delta salaries were actually up slightly over the full period, at above 60K in 2017. The relatively high salaries at Delta suggest Delta does not report consolidated results combining data from DAL Global Services with the mainline carrier. The sharp falls at United and US are so far unexplained. This suggests that different airlines have pursued different strategies with respect to outsourcing, and that not all of them necessarily lead to wage declines.

5 Conclusion

The descriptive analysis in this report has established some facts about the airline industry. Legacy airlines are increasingly outsourcing to both low-wage specialist service contractors and to regional airlines. There is strong theoretical and empirical evidence from other industries and from economy-wide studies that such outsourcing contributes to rising inequality and wage stagnation. In the airline industry, we see a clear negative correlation between the increase in outsourcing to third-party contractors from 2008 to 2018, and wage growth for affected occupations within the industry. The American Airlines/Miami Airport example highlights how an airline can use decisions on whether to outsource or directly employ groups of workers to serve as a backdoor method of cutting wages..

In addition to outsourcing to third-party contractors, we also see legacy carriers increasingly outsourcing flights to lower-wage regional airlines, whose prices, scheduling, and ticketing they nonetheless minutely control to the same extent as if they simply used their own aircraft and employees. As more flights take place on lower-wage regional airlines, this would be expected to drag down industry wages. Regional airline workers, however, are currently powerless to bargain wage increases with the corporation that controls their working conditions.

As I have already suggested, Airline control over their contractors and regional affiliates stretches the meaning of the “independence” of these legally separate firms from the dominant airlines that contract with them. As a National Employment Law Project report recently put it in the context of franchising:

While the [franchisors] claim that they have no influence over wages paid to workers, they control wages by controlling every other variable in the businesses except wages (Ruckelshaus et al., 2014, 11).

A similar situation is happening in the airline industry, suggesting that federal authorities should look into whether airlines are manipulating the legal boundaries of the firm to gain

levels of control consistent with vertical integration, but without the costs and risks that go with legal integration.

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Appendices

A Airline and Related Industry NAICS classifications

Government statistical agencies classify industries according to a numerical system that subsumes successively smaller sub-industries in a nested hierarchy, with six-digit NAICS codes representing the most specific industries. In this report I use data from Air Transportation, Support Activities for Air Transportation, and Other Airport Operations. Other Airport operations is a subindustry of Support Activities for Air Transport. The next hierarchy is illustrated below, with the NAICS codes that I actually use in boldface type:

48: Transportation & Warehousing

481: **Air Transportation**

488: Support Activities for Transportation

4881: **Support Activities for Air Transport**

48811: Airport Operations

488111: Air Traffic Control

488119: **Other Airport Operations**

48819: Other Support Activities for Air Transport

B Correlations Between Percent Outsourced and Change in Wages

This section contains the regression table presenting the results of the univariate regressions linking changes in wages to changes in outsourcing. The regression equation is:

$$Pct\ change\ in\ wages = \beta_0 + \beta_1(Change\ in\ percentage\ outsourced)$$

The estimates of the parameters β_0 and β_1 are presented in Table 3 below.

Table 3: Univariate Regression of Percent Change in Wages on Change in Percent Outsourced

	<i>Dependent variable:</i>
	Percent change in wages
Change in percent outsourced	-0.513*** (0.067)
Constant	0.196*** (0.021)
Observations	9
R ²	0.894
F Statistic	59.091*** (df = 1; 7)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01 Std. errors in parentheses

This regression is intended merely to show the statistical correlation between outsourcing and wages of jobs in CWA's jurisdiction. While that includes most of the largest employment groups in the data, it excludes some, such as aviation mechanics. A more robust regression to shed light on the general relationship between outsourcing and wages across all occupations would include all occupations.

Table 4: Employment in Aviation-Related Occupations with More Than 5,000 Employees in the Air Transportation and Support for Air Transportation Industries

Occupation	Air Transportation	Support for Air Transportation	Total
Flight Attendants	114,370	1,070	115,440
Reservation and Transportation Ticket Agents and Travel Clerks	67,130	13,420	80,550
Airline Pilots, Copilots, and Flight Engineers	72,850	850	73,700
Aircraft Mechanics and Service Technicians	32,360	38,080	70,440
Laborers and Freight, Stock, and Material Movers, Hand	39,900	19,160	59,060
Customer Service Representatives	14,700	7,380	22,080
Cargo and Freight Agents	7,150	9,420	16,570
Cleaners of Vehicles and Equipment	4,520	7,860	12,380
First-Line Supervisors of Office and Administrative Support Workers	8,790	3,450	12,240
Transportation Workers, All Other	-	9,980	9,980
Baggage Porters and Bellhops	320	8,360	8,680
Transportation Attendants, Except Flight Attendants	260	7,720	7,980
First-Line Supervisors of Mechanics, Installers, and Repairers	3,300	3,750	7,050
Avionics Technicians	1,820	5,110	6,930
Stock Clerks and Order Fillers	4,600	2,210	6,810
General and Operations Managers	1,750	3,750	5,500

C Description of Form 41 Data

Detailed financial, operational, and labor data on US air carriers are available from the Department of Transportation for the years 1990-2018. These are collected as part of the Form 41 reporting requirements of air carriers, a legacy of the highly regulated nature of the industry prior to the Airline Deregulation Act. The level of firm-level detail available through these data is quite rare and perhaps unique to this industry. In particular, and unlike SEC and other corporate filings, Form 41 data are not consolidated at the parent company or holding company level (meaning even wholly-owned subsidiaries must report results separately, apart from their parent company). Further, Form 41 data include operational, labor, and financial data, making it possible to integrate them. I downloaded the following Form 41 schedules from the DOT's Transtats website:²¹

- Schedule P1(a), monthly interim operations reports of air carrier employment. This contains full-time, part-time, total, and FTE employment figures for each month. To exclude seasonal influences on employment, I took only the March observations for each year. I choose March because it is outside both the Fall/Winter holiday and summer travel seasons.
- Schedule P-1.2, quarterly profit and loss statements for carriers with annual operating revenues of \$20 million or more. I summed across four quarters to get annual figures.
- Schedule P-10, annual employee statistics by labor category. This data set contains employee headcounts by employee grouping.
- Schedule P-5.2, quarterly aircraft operating expenses, including a direct measure of pilot/co-pilot salaries. I summed across quarters to get annual figures.
- Schedule P-6, quarterly operating expenses by objective grouping. This includes payroll expenses for some labor groupings, which allows us, by combining with headcounts

²¹https://www.transtats.bts.gov/tables.asp?DB_ID=135

from Schedule P-10, to calculate average salaries for some job categories. Again, I summed across quarters.

I imported the .csv files into R, a statistical software program, and merged these schedules together to create a single data set where each observation is a single airline-year pair.²² This allows me to measure trends by individual airline (and groupings of airlines) over time. Next, I narrowed the universe of airlines to focus on legacy carriers, their regional affiliates, and LCCs. I included all legacy carriers that were considered legacy airlines in 1990: American, United, Delta, Alaska, US Airways, TWA, Continental, Northwest, and Hawaii. This universe has, of course, shrunk to the point where there are only five such carriers remaining: American, United, Delta, Hawaiian, and Alaska.

In determining which airlines to code as “regionals,” I relied on the research of Angela Hatcher of CWA. Hatcher determined the universe of regional carriers using the Regional Airline Association’s annual reports. Reports for the years 2016-2018, and 2008-2009, are available from RAA’s website.²³ For other years, the internet “Wayback machine” has archived copies of back reports.²⁴ Hatcher also coded regional airlines by their ownership status in each year—whether they were wholly-owned or independent. An airline is coded as wholly-owned in a given year if the RAA report for that year indicates that it is a subsidiary of Delta Air Lines, American Airlines, United Airlines, Alaska Airlines or Hawaiian Airlines. Angela checked legacy airline SEC Form 10Ks to confirm subsidiary status.

I also included LCCs in the analysis. The boundaries of the LCC category are more blurry, and may include airlines that only existed for a couple years, or airlines that are basically glorified charters. As a rule for determining which LCCs to include, I included the major LCCs operating today—Allegiant, Frontier, JetBlue, Southwest, Spirit, and Sun Country—and their predecessor companies. Table 5 presents the airlines included in the data set I used for this analysis.

²²I can provide full details of the lengthy data wrangling process summarized in this sentence upon request, including raw .csv files and R code, for verification.

²³<https://www.raa.org/content-hub/raa-annual-reports/>

²⁴https://web.archive.org/web/2013*/raa.org

Table 5: Airlines Included in Form 41 Data Set by Type and Years Active

Airline	IATA Code	Years Active	2018 Legacy affiliates
Legacy carriers			
Trans World Airlines	(TW)	1997-2000	
Northwest Airlines	(NW)	1997-2009	
Continental Airlines	(CO)	1997-2011	
US Airways	(US)	1997-2014	
Alaska Airlines	(AS)	1997-2017	
American Airlines	(AA)	1997-2017	
Delta Air Lines	(DL)	1997-2017	
Hawaiian Airlines	(HA)	1997-1998; 2000-2007, 2009-2017	
United Airlines	(UA)	1997-2017	
Regional carriers			
Air Wisconsin	(ZW)	1997-2017	American
Compass Airlines	(CP)	2007-2008; 2010-2012; 2015-2017	American, Delta
Envoy Air	(MQ)	1997-2017	American
ExpressJet/Atlantic Southeast	(EV/RU/XE)	1997-2017	American, Delta, United
Mesa Airlines	(YV)	2004-2017	American, United
PSA Airlines	(OH/16)	2004-2017	American
Republic Airlines	(YX)	1997-2017	American, Delta, United
SkyWest	(OO)	2003-2017	American, Alaska, Delta, United

Independence Air	(DH)	2003-2005	NA
Boston-Maine Airways	(E9)	2006-2007	NA
Lynx Aviation	(L3)	2010	NA
Comair	(OH)	2003-2010	NA
Executive Airlines	(OW)	2008-2012	NA
Chautauqua Airlines	(RP)	2013-2014	NA
Shuttle America	(S5)	2006; 2008-2017	NA
Island Air Hawaii	(WP)	2014-2016	NA
Mesaba Airlines	(XJ)	1997-2011	NA
LCCs			
Air Tran Airways	(FL)	1997-2011	
Allegiant Air	(G4)	2004-2017	
Frontier Airlines	(F9)	1997-2017	
JetBlue	(B6)	2000-2017	
Southwest Airlines	(WN)	1997; 1999-2017	
Spirit Airlines	(NK)	1997; 1999-2017	
Sun Country Airlines	(SY)	1999-2017	
Valu Jet	(J7)	1997	

Notes: Bold = wholly-owned in 2018.

Missing from Form 41 reporting: Piedmont Airlines and Commutair, both regional carriers

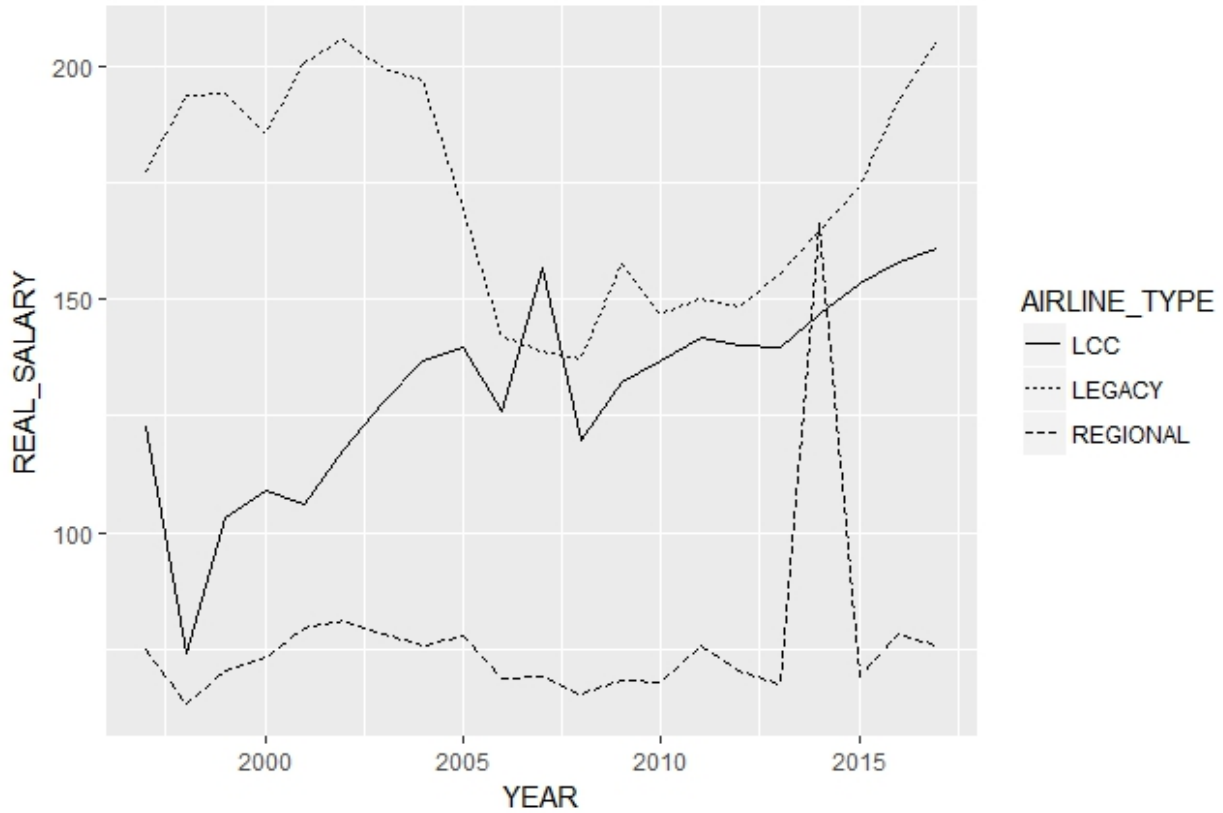
D Cleaning and Smoothing Salary Estimates

The salary data are bumpier than the other data series, perhaps in part because calculating salaries involves combining two or more variables from across two or more schedules from Form 41. To make the trends in the data legible, it was necessary to do some data cleaning. I document the steps I took in that process here. The smaller spikes are best handled with a moving average. Since salaries, especially collectively bargained salaries, should not spike in one direction and then another from year-to-year, applying a moving average smooths out the gyrations and presents an easier to read and likely more realistic picture. The larger spikes, however, require more drastic action. I treat extremely unrealistic observations, based on visual inspection of the time series plots, as errors in the data, and remove them.

D.1 Pilot Salaries

Cleaning and smoothing the pilot salary data is pretty straightforward. The plot of the raw data is contained in Figure 18. This is the counterpart to Figure 12 in the report.

Figure 18: Average Real Pilot Salaries by Airline Type

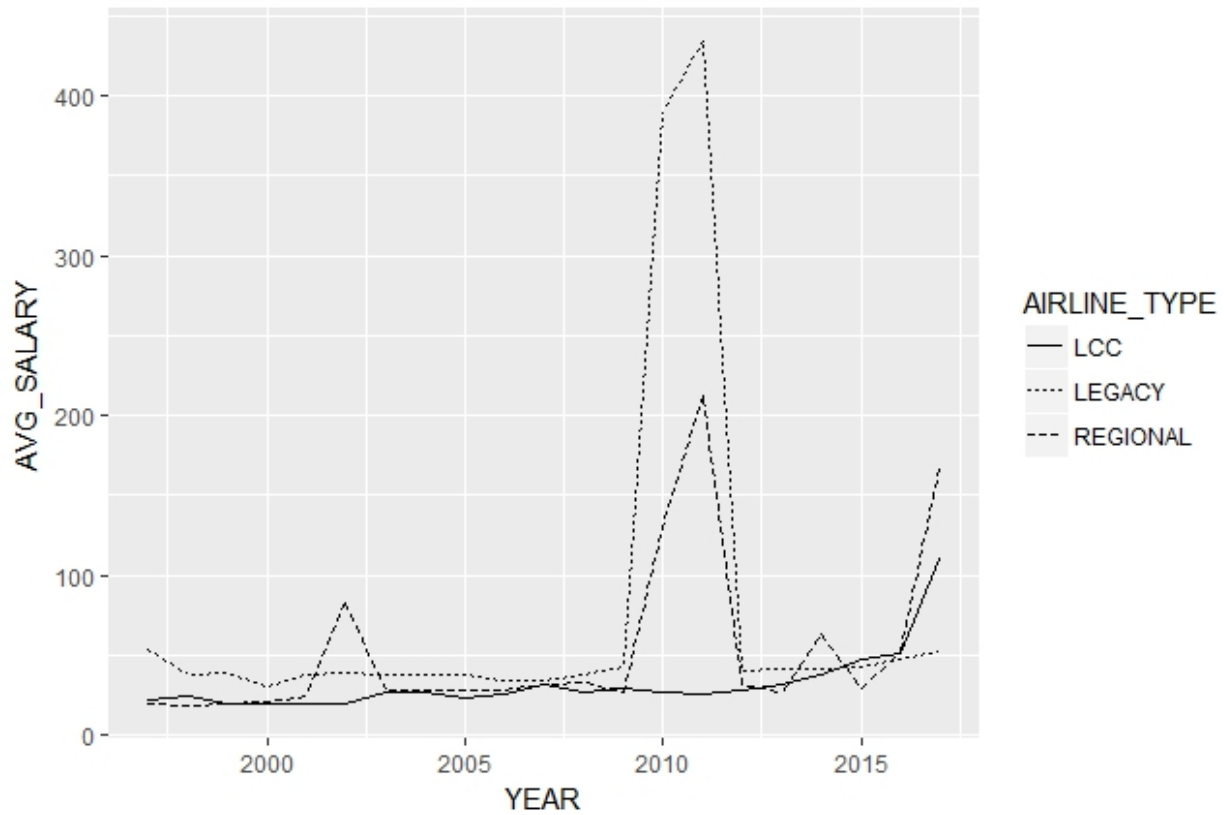


The only extreme outlier is regional airlines in 2014, where salaries more than double from their 2013 level only to fall back down again in 2015. I remove this observation, and apply a three-year moving average for the rest of the data. The resulting Figure 12 in the main body of the text is easier to read and more realistic.

D.2 Flight Attendant Salaries

As can be seen in Figure 19 below, the data for flight attendant salaries is quite a bit uglier. For one thing, even at legacy carriers FAs never averaged \$400,000 a year.

Figure 19: Average FA Salaries by Airline Type

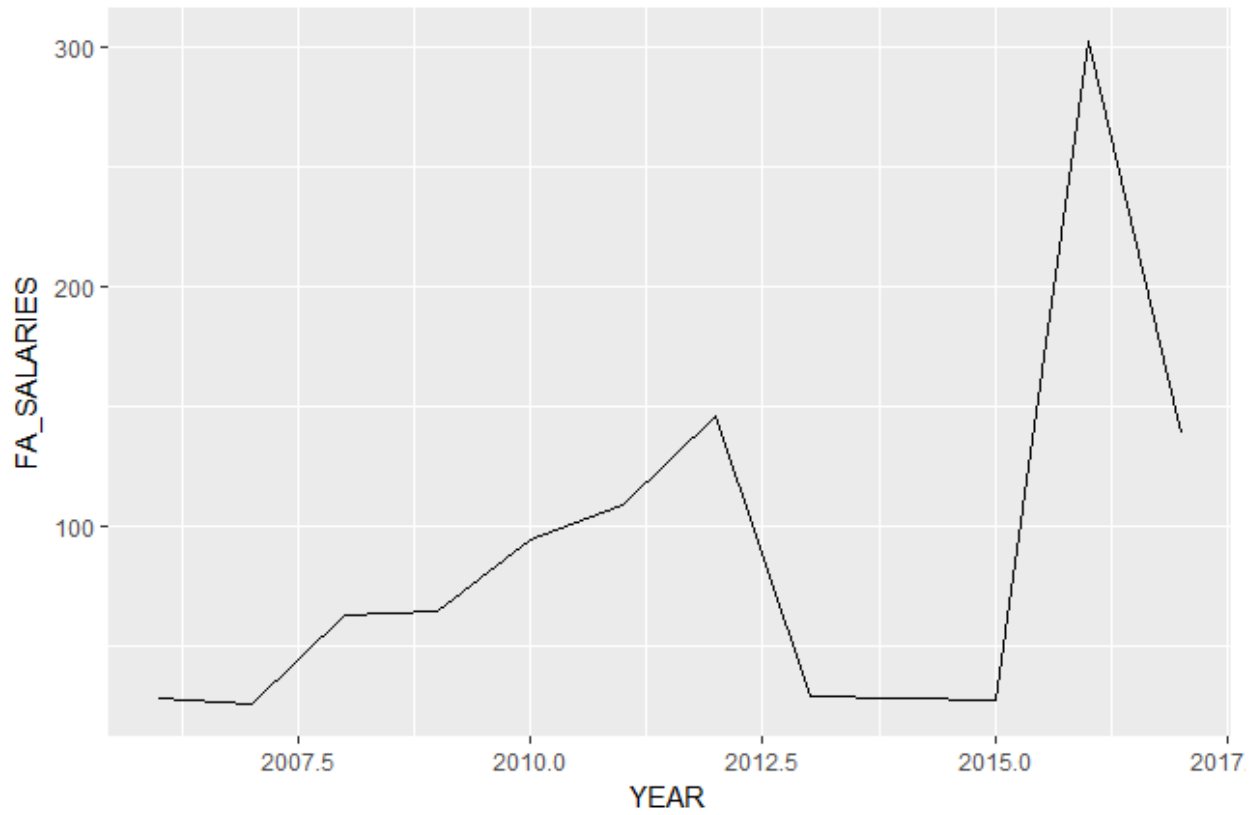


Going through the salary calculations for each airline, I found the following extreme outliers:

- Endeavor jumps from \$39,000 in 2016 to \$1,441,000 in 2017. I remove the data point for Endeavor in 2017.
- Alaska more than doubles from \$28,000 in 1997 to \$77,000 in 1998 and 1999, then back down to \$29,000 in 2000. It also jumps from \$45,000 in 2009 to \$2,477,000 and \$2,787,000 in 2010 and 2011, before falling to \$34,000 in 2012. I remove Alaska observations for 1998-1999 and 2010-2011.
- Atlantic Southeast jumps from \$30,000 in 2010 to \$465,000 in 2011, and then back down to \$33,000 in 2012. I remove the Atlantic Southeast 2011 observation.

- Frontier Airlines shoots from \$20,000 in 2014 to \$124,000, \$150,000, and \$516,000 over 2015-2017. I remove the Frontier Airlines 2015-2017 observations.
- Horizon Air jumps from around \$55,000 in 2007-2009 to \$1,350,000 and \$1,400,000 in 2010 and 2011, falling back to around \$24,000 in 2012-2017. I remove 2010-2011 for Horizon Air.
- United Air Lines drops from \$235,000 in 1997 to \$44,000 in 1998 and 1999. I exclude the United observation for 1997.
- Mesaba Airlines jumps from \$23,000 in 2001 to \$360,000 in 2002, and back down to \$24,000 in 2003. I exclude the Mesaba Airlines 2002 observation.
- ExpressJet jumps from \$17,000 in 2010 to \$238,000 in 2011, the year it combined with Atlantic Southeast. I exclude the 2011 observation.
- Chautauqua only appears in two years, 2013 and 2014, during which reported average salaries were \$17,000 and \$400,000, respectively. I exclude both observations.
- SkyWest is all over the place (see Figure 20), likely due to accounting difficulties arising from very busy merger and divestment activity throughout the 2000s. I exclude all SkyWest observations.

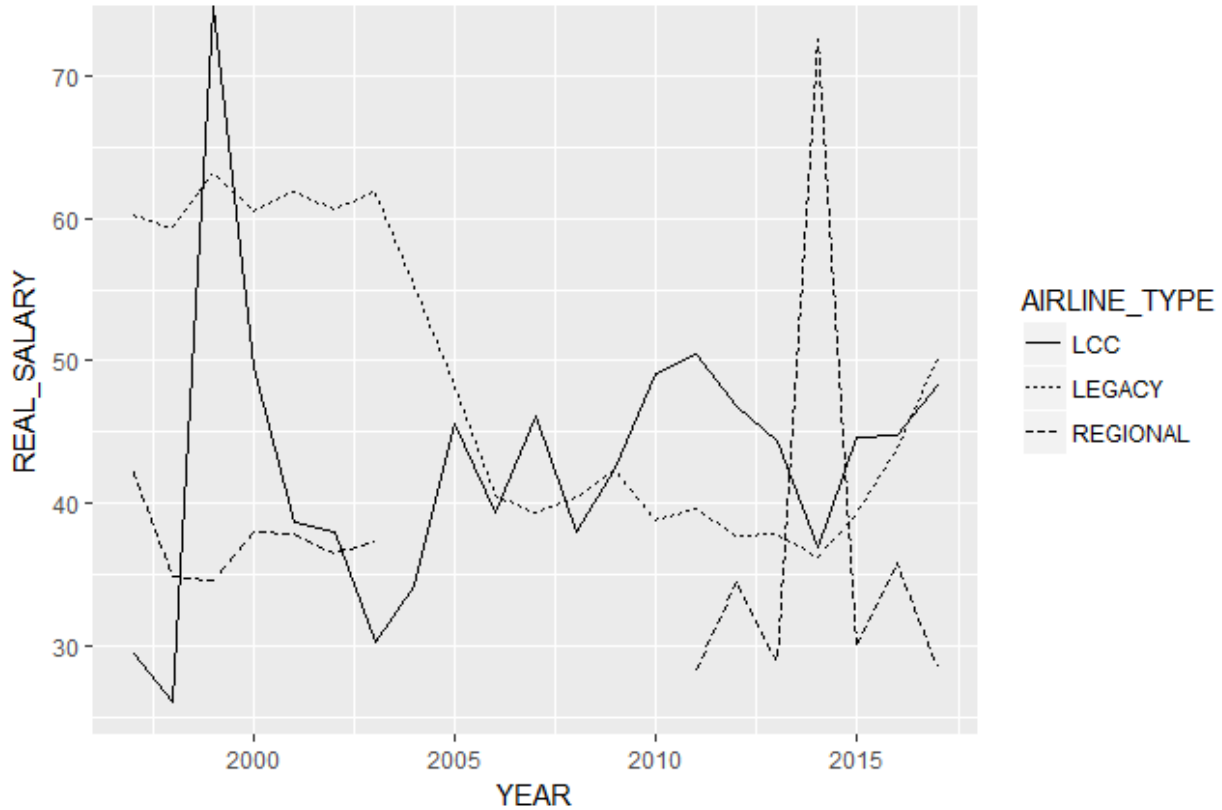
Figure 20: Annual FA Salaries for SkyWest



D.3 Ground and Passenger Service Salaries

There are some apparent spikes in this plot, along with several years of missing values due either to NAs in one of the variables making up the average salary calculation or infinite values due to a zero in the denominator.

Figure 21: Average Ground and Passenger Service Workers Real Salaries



I removed the following extreme outliers from the data set and recalculated the average salary figures.

- The observations for Mesa Airlines from 2004-2010, Shuttle America in 2009, PSA Airlines in 2006, and Spirit Airlines 1999 are NAs or infinitely valued. I exclude these observations.
- ExpressJet 2014-2017 contains zero or negatively-valued observations for average salaries. I remove these observations.
- The observation for Republic Airways in 2010 is \$478,000. It quickly falls to \$27,000 the next year. I remove the 2010 observation.
- Chautaugua only appears in the years 2013 and 2014, during which time salaries jumped from \$46,000 to \$390,000. I remove both years.

- Mesaba Airlines jumps from \$18,000 in 2008 to \$261,000 in 2009 to \$22,000 in 2010. I remove 2009.
- Air Wisconsin gyrates about in the last few years, jumping from \$33,000 in 2013 to \$100,000 in 2014 to \$33,000 in 2015 to \$100,000 in 2016. I remove 2014 and 2016.