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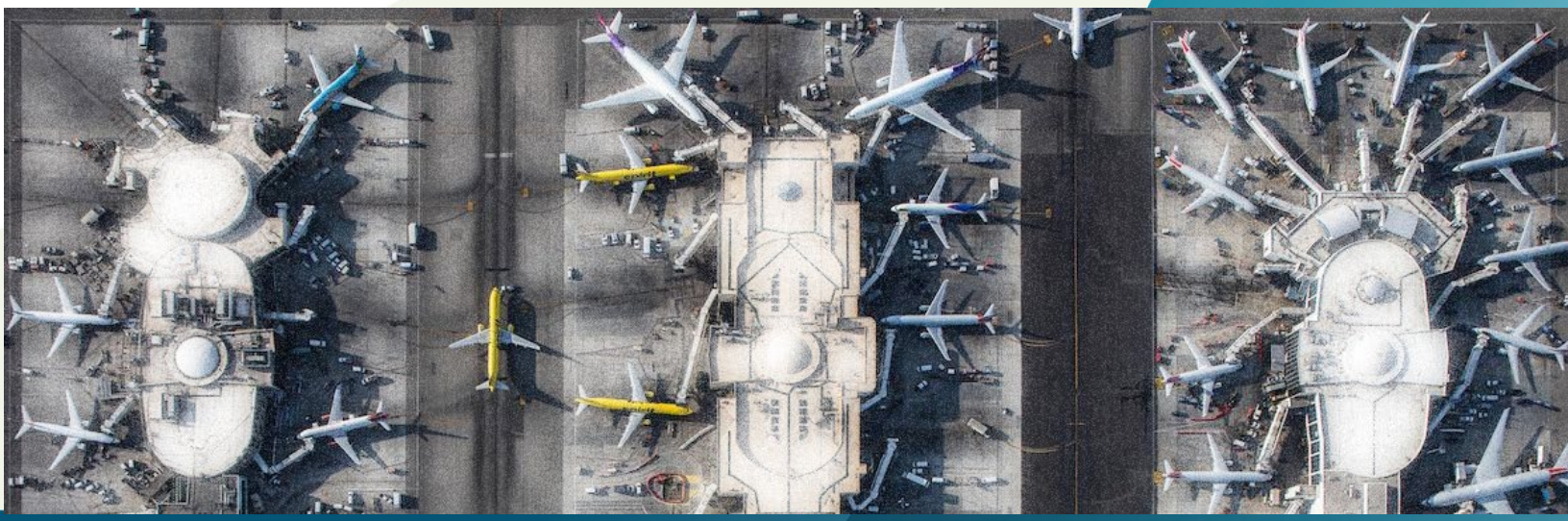
REPORT

Economic Analysis of California Meal and Rest Break (MRB) Law

Impacts on Airline Workers, Customers, and the California and U.S. Economies



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Executive Summary

California's Meal and Rest Break (MRB) law requires that employees take one 10-minute paid rest break within each four-hour block of completed work and a 30-minute unpaid lunch break no later than the fifth hour of work. MRB establishes that during their breaks, employees must be free of any work-related duties, not recallable to work, and, during meal breaks, able to leave their physical place of work. The meal and rest break requirement has existed for decades in one form or another. MRB has never been applied to airline crews, but recent court challenges have called this into question. Applying MRB to scheduled air transportation would be highly disruptive, since airlines do not staff flights with "spare" crew to provide substitute labor inflight for the crew on break, and do not schedule aircraft and crew turns to provide time for breaks on the ground. This study estimates the air service network, economic, and employment impacts to airlines, customers, and employees—and to the California and U.S. economies—if MRB were applied to passenger and cargo air transportation by U.S. carriers.

Airline Financial and Network Impacts of MRB Compliance

Four alternative scenarios of possible carrier adaptations to MRB are considered, as described in Table ES-1. We assume MRB applies throughout the complete flight duration (i.e., block time) of all those flights crewed by pilots and flight attendants of U.S. passenger and cargo airlines who are assigned to a California crew base, regardless of origin or destination. Each scenario is estimated based on 2019 historic operations and crew scheduling, assuming the rest break must be taken no later than the end of the fourth hour on work (i.e., a 4:00 crew duty time).[1] Per federal aviation regulations and/or airline/labor agreements, duty time includes required pre-flight reporting / preparation time, the maximum of scheduled block time and actual 2019 average block time, and post-flight deplaning time. Note that airlines may not have the option to "choose" which MRB adaptation path to pursue, as operational feasibility and legal/collective bargaining agreement (CBA) compliance considerations may narrow or determine the course of action.

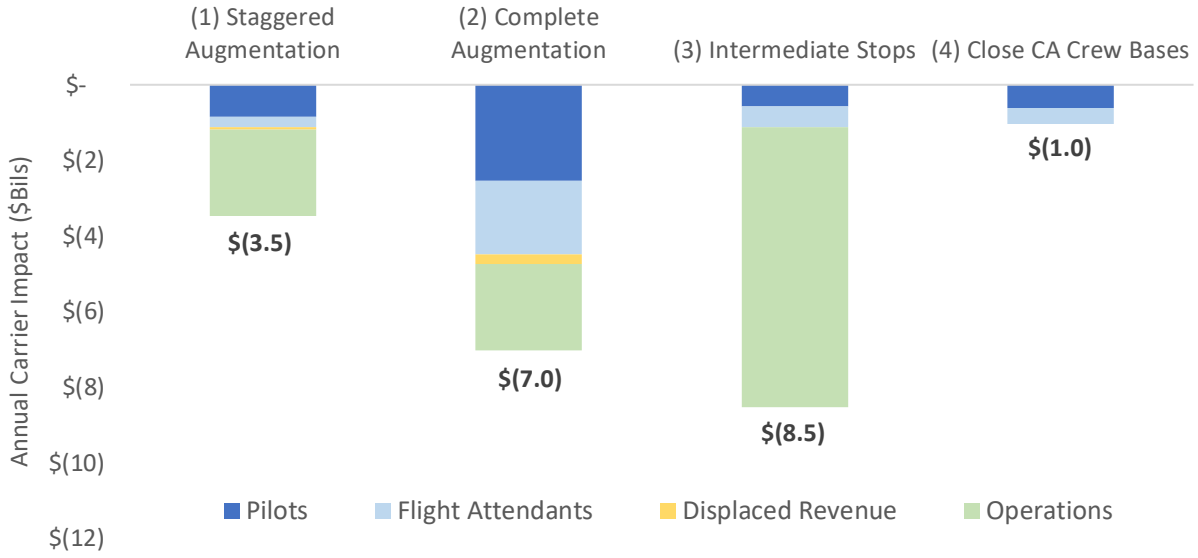
The estimated financial cost to U.S. passenger and cargo airlines of MRB is shown for each scenario in Figure ES-2 assuming airlines' 2019 route networks continue to be operated, split out by the source of the incremental cost—pilots, flight attendants, operations, and revenue passenger displacement. The first three scenarios demonstrate that it is expensive for carriers to comply with MRB rest and meal breaks by increasing flight crew complements or adding stops to current nonstop aircraft routings, with an annual carrier cost between $3.5 billion and $8.5 billion annually. Closing California crew bases is much less expensive at $1.0 billion, assuming it is a feasible solution.

[1] An alternative interpretation is that the rest break must be taken within the four hours of work as opposed to at the end, so that the rest break is on average taken after ~2:30 hours of work. Appendix A shows the principal airline financial, employment, network, and economic impacts of this more restrictive case.

Table ES-1:
California MRB Adaptation Scenarios

(1) Staggered Augmentation of Crews	(2) Complete Augmentation of Crews	(3) Intermediate Stops	(4) Close California (CA) Crew Bases
Add one pilot and one flight attendant to every flight whose total crew duty time exceeds 4:00. Staggering of flight crew active duty ensures FAA and carrier minimums are met continuously. Flights with duty time less than 4:00 incur crew/aircraft ground delay cost to permit MRB breaks.	MRB + FAA-mandated rest may require the complete crew (two pilots + full complement of flight attendants) to be replaced after each 4:00 block of duty time. Flights with duty time less than 4:00 incur crew/aircraft ground delay cost to permit MRB breaks.	Add intermediate stops to flights after each successive 4:00 block of duty time, with crews taking break during intermediate stops. Flights with duty time less than 4:00 incur crew/aircraft ground delay cost to permit MRB breaks.	Potentially avoid MRB exposure by closing CA crew bases and requiring all flights to be crewed from non-CA bases. New deadhead and rest overnight expense (crews must be positioned to continue to operate duty trips that currently originate in California), and crew commute downsides.

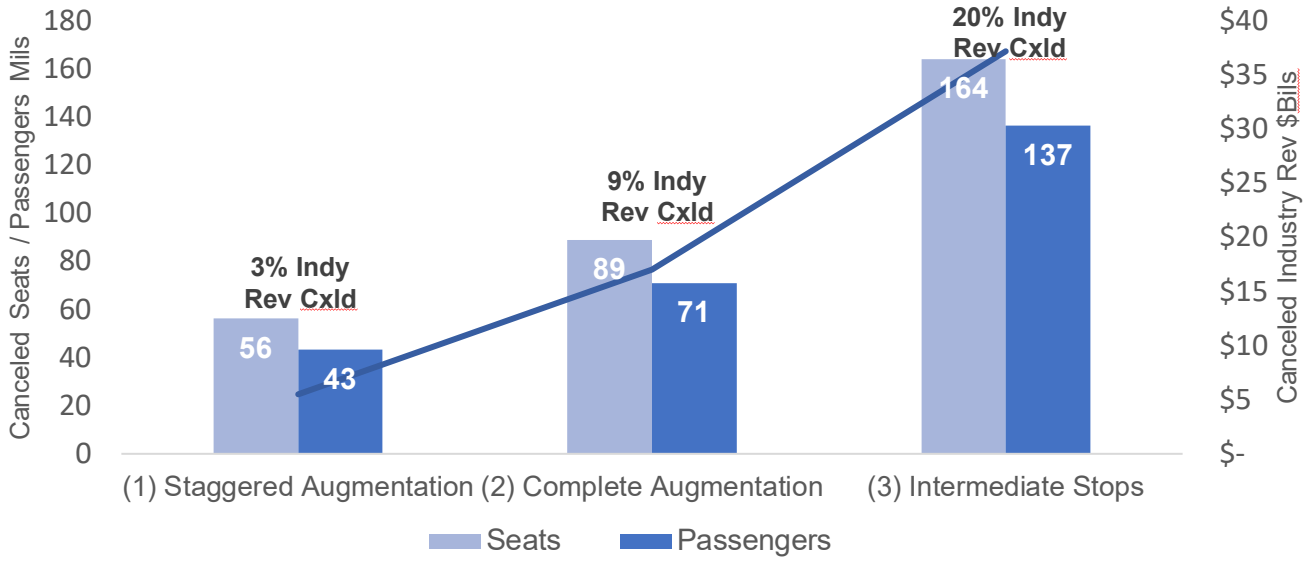
Figure ES-2:
U.S. Passenger + Cargo Carriers MRB Impacts by Adaptation Scenario



The significant cost increases under Scenarios 1-3 are likely to result in reductions in service or full cancellations in those markets with higher exposure to California crews. We identify likely reduced or canceled routes using publicly available data to estimate MRB-driven profitability decline. Routes that perform materially worse due to MRB and have a low or negative segment profit margin are subject to reduction or

cancellation.[2] Figure ES-3 shows that MRB cancellations are likely to reduce total U.S. market revenue by ~3% under Staggered Augmentation and ~9% under Complete Augmentation, with annual industry seats declining by 56 million and 89 million, respectively. The Intermediate Stops scenario would be highly disruptive, with as much as ~20% of U.S. market revenue and 164 million seats likely to be canceled.

Figure ES-3:
U.S. Passenger Airline Flight Cancellation Impacts / Year by MRB Adaptation Scenario



Flight cancellations would significantly reduce California's air connectivity to the rest of the U.S. and to international destinations, with negative impacts on other economic sectors, especially but not confined to tourism. The extension of MRB to flight crews (i.e., pilots and flight attendants) on commercial air travel would decimate the air travel market to, from, and within California:

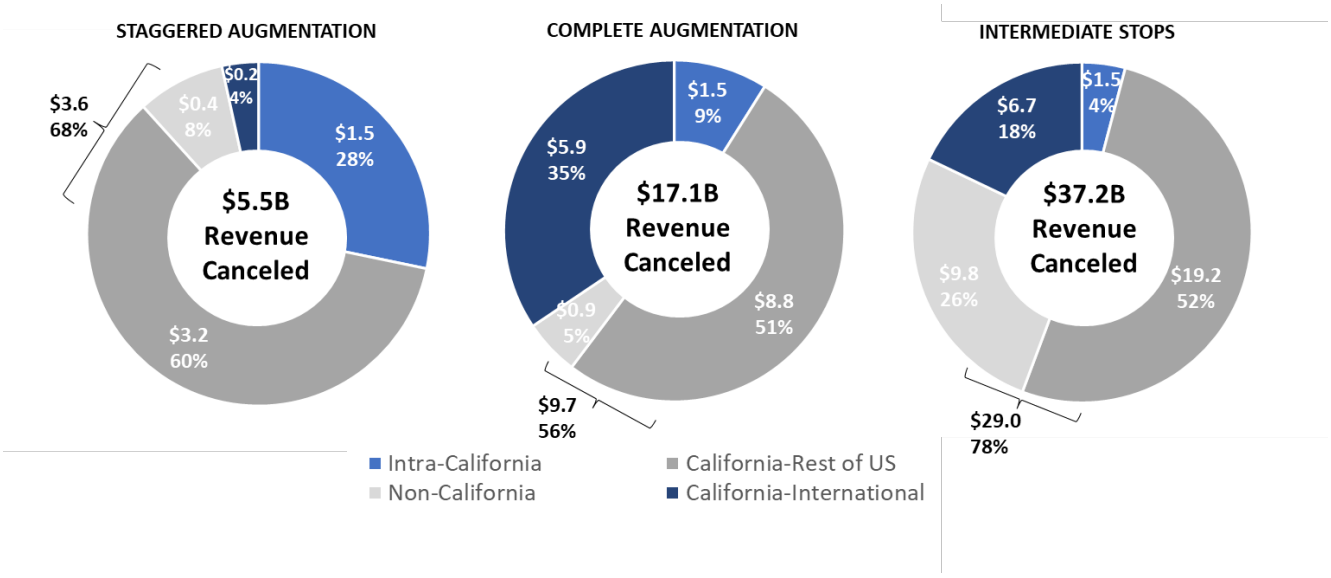
- California-related seats would decline ~22% under Staggered Augmentation, ~36% under Complete Augmentation, and as much as ~55% under Intermediate Stops.
- Long-haul domestic and international flights are most impacted by MRB. For example, 90% of more of all transpacific and transatlantic flights operated to/from California by U.S. carriers would be canceled under the Complete Augmentation and Intermediate Stops scenarios.
- Because of the extended ground turn time cost, short-haul flights are not immune from MRB impacts. Cancellation rates for the shortest flights (0-2 block hours) under the Complete Augmentation and Intermediate Stops scenarios begin at 40% and increase to 60~80% for flights of 8+ hours.

[2] Each carrier route combination is evaluated and identified as likely to cancel if its segment margin (a) declines by at least 10 points due to MRB and (b) is negative post-MRB. The route is likely to have reduced service if: (a) its segment margin declines by > 5 points and its pre-MRB segment margin is < 5 points positive; (b) its pre-MRB segment margin is negative and declines between 5-10 points due to MRB; (c) its pre-MRB segment margin is positive and declines by at least 10 points due to MRB.

- U.S. carrier hub operations in California would be at risk, particularly in Los Angeles and San Francisco/Oakland. The dramatic scale-down in operations at these hubs due to MRB risks destabilizing the rest of the hub because of the loss of connecting revenue. For example, under the Complete Augmentation case, Los Angeles International Airport (LAX) hub carriers American, Alaska, Delta, and United would lose 44% of their total LAX segment revenue to MRB-related flight cancellations—and would lose an additional 11% of LAX revenue on remaining flights whose passengers connected to the canceled flights. The sustainability of LAX as a hub for at least some of these carriers is in doubt when the airport is reduced to 45% of its current revenue size and loses most of its international and long-haul domestic network.

While California is the natural center of impact of cancellations due to MRB, the impacts extend far beyond its borders. California-based crew staff many flights between California and the other U.S. states and foreign countries. Therefore, MRB-related flight cancellations would materially compromise the entire nation's airline route network. The far-ranging route impacts of MRB are shown in Figure ES-4. In each of the Augmentation / Intermediate Stops scenarios, the lost revenue that involves cities in the rest of the U.S. far exceeds the impact to purely intra-California leg markets. Under Stagged Augmentation, intra-California legs make up 28% of the total market revenue canceled by MRB ($1.5 billion), but 68% or $3.6 billion of the cancellation impact by revenue involves either a California–Rest of U.S. or Non-California[3] leg. Under Complete Augmentation, Intra-California markets make up only 9% of the total revenue canceled, while California–Rest of U.S. and Non-California legs are 56% or $9.7 billion of the market revenue canceled.

Figure ES-4:
Passenger Flight Cancellations Mix by Leg Market Type



[3] Non-California passengers have neither a trip origin nor trip destination within California.

MRB Compliance Impacts on the California and National Economies

The impacts to airlines and air connectivity described above have larger implications for the economy of California and the United States. Analysis was conducted to estimate the California and nationwide economic impacts of each scenario. The analysis considered and modeled:

- In the first instance, the increased employment of California-based flight crew required to cover meal and rest breaks.
- The lost employment in flight crew and related ground and support staff as some routes are canceled or reduced due to higher staffing costs.
- The demand response to fare increases, using fare elasticity modeling, as carriers seek to maintain profitability on remaining routes, and the associated impacts on employment.
- The multiplier impacts (indirect and induced impacts[4]) that ripple out into the wider economy.

The results are summarized below and provided in Tables ES-5 and ES-6.

- Staggered Augmentation results in the loss of 14,160 jobs and $2.6 billion in gross state product including multiplier impacts, and 7.8% of the overall air transport-related employment in California. Nationwide, Staggered Augmentation results in the loss of 58,940 jobs including multiplier impacts. The projected route reductions and cancellations decrease overall employment more than the employment gains on the remaining routes with augmented crew.
- Complete Augmentation leads to larger economic impact losses, due to the greater number of air service reductions and cancellations. There is a loss of 52,680 total jobs for a 29.1% air transport-related employment decline in California. Furthermore, there is a decrease of 125,650 total jobs (5.9% decline) across the country.
- The Intermediate Stops case results in the largest economic impacts of all the scenarios, as even more air services are canceled or reduced. In California, 96,730 total jobs are lost. This is over half of all the employment associated with the air transport industry in California. Across the United States, 262,700 total jobs (12.3% decline) are lost.
- Removing crew bases from California results in the loss of 68,960 jobs in California including multiplier impacts. Based on cost increases being passed onto consumers, the net loss of employment nationwide is 3,420 jobs, including multiplier impacts.
- A comparison of Tables ES-5 and ES-6 makes clear that, in all cases except Scenario 4 (where California crew bases close and simply move to another U.S. state), employment and lost value added are materially worse for the U.S. in total than for California alone.

[4] Indirect impacts are employment and economic activity in organizations that supply and service the airline industry. Induced impacts are economic impacts created by the spending of wages, salaries, and profits earned by those working in direct and indirect economic activities related to airline operations.

Table ES-5:
Summary Economic Impacts for California — Including Multiplier Impacts

Scenario	Total Lost Jobs	Gross State Product ($ Bils)	State & Local Taxes ($ Bils)	% Reduction (Air Transport Related Employment) [5]
(1) Staggered Augmentation	-14,160	-$2.6	-$0.4	-7.8%
(2) Complete Augmentation	-52,680	-$9.9	-$1.7	-29.1%
(3) Intermediate Stops	-96,730	-$18.1	-$3.0	-53.4%
(4) California Crew Base Closures	-68,960	-$12.9	-$2.2	-38.1%

Table ES-6:
Summary Economic Impacts for the United States — Including Multiplier Impacts

Scenario	Total Lost Jobs	Gross Domestic Product ($ Bils)	Federal Taxes ($ Bils)	% Reduction (Air Transport Related Employment)
(1) Staggered Augmentation	-58,940	-$8.8	-$1.1	-2.8%
(2) Complete Augmentation	-125,650	-$18.8	-$2.3	-5.9%
(3) Intermediate Stops	-262,700	-$39.4	-$4.8	-12.3%
(4) California Crew Base Closures	-3,420	-$0.5	-$0.1	-0.2%

Unintended Consequences

Applying MRB to flight crew will have significant negative unintended impacts on air transportation employment and the U.S. domestic and international passenger and cargo airline network. These consequences include:

- **Net reductions in direct employment in the airline industry**. Requiring additional flight crew breaks times and augmentation of aircraft might be assumed to increase airline employment, since the effect of MRB is to require additional crew resources to fly the same schedule. However, since airlines are likely to reduce and cancel markets to address increased costs, there is a negative employment offset. This negative impact is especially concentrated for ground employees, who experience no employment gain from flight crew augmentation but will lose from reduced flight volumes. The net effect on direct airline industry employment is negative in all cases.

- **Possible closure of California crew bases**. If airlines seek to eliminate exposure to MRB by closing California crew bases, employees currently based in and living in California may face the unpalatable

[5] Percentage decline based on the total employment figures for air transportation in California in 2019 (NAICS code 481) and associated multiplier impacts, sourced from IMPLAN. The air transportation industry includes all passenger and cargo airline operations in the state as well as activities not included in the MRB analysis such as helicopters, flight schools, aviation clubs, sightseeing, crop-dusting, air ambulances, specialized services, and other general aviation.

option of moving out of state to be located near their new crew base or staying in California and commuting to/from their new non-California crew base, with significant loss in personal time and additional expense.

- **Smaller bases and fewer, less attractive flight choices for California-based crews**. If airlines maintain their California crew bases, the regulations and costs that apply to airline crews would be fractured into different sets of requirements depending on whether the crew were California-based or not. To maintain operational integrity, airlines would likely then be forced to separate their networks into distinct sub-networks of flights operated by the two separate crew sets. This is undesirable for flight crews since there would be fewer choices of flights on which to bid,[6] and reduces airline operational flexibility. Over time, airlines would have a strong cost incentive to switch more routes and assign growth routes to crew bases outside California, to the further detriment of California-based crews. Further, the new unpaid meal breaks taken on the ground for shorter flights (with less than a four-hour duty time) to comply with MRB elongate the duty day but do not increase paid flight crew time. Therefore, total time away from home increases relative to paid flight crew time, which is an unattractive outcome for most crew.

- **Risk to California hubs, and shift of future employment and air service outside California**. Several passenger airlines currently operate hubs and pilot or flight attendant crew bases in California, including United and Alaska in San Francisco; Southwest in Oakland; Alaska, American, Delta, Southwest, and United in Los Angeles; and Alaska and United in San Diego.[7] For many of these hubs, a significant portion of the hub revenue is derived from connecting passengers who are merely transiting California (i.e., neither their true origin nor true destination is in California). These non-California connections generate more than 35% of the total hub revenue at four of the California's largest hubs. Even if airlines maintain California crew bases, there would be a strong incentive over time to avoid higher operational costs by shifting these passengers to flow via hubs located outside California. Over time, this puts the sustainability of the California hubs at great risk.

- **Distortion of U.S.-international airline competition in favor of foreign airlines**. Since few if any foreign airlines maintain crew bases in California, they are generally not subject to MRB. Therefore, nonstop overlap flights that U.S. carriers operate between California and international markets will be at a new significant cost disadvantage. For example, between San Francisco–Singapore there is one nonstop U.S. carrier (United Airlines) and one foreign airline competitor (Singapore Airlines). Under the Complete Augmentation scenario, United Airlines would be required to staff its flights with twice to three times as many pilots and flight attendants as Singapore Airlines due to MRB. Most California long-haul international nonstop markets operated by U.S. carriers face direct nonstop foreign carrier operators. In fact, 38 of the 42 nonstop long-haul international markets served by U.S. carriers from California have direct overlapping nonstop foreign carrier service (representing 95% of total U.S. carrier nonstop international revenue from the state). These foreign airlines will very likely benefit from a shift of passenger demand to their flights as U.S. carriers attempt to raise prices, reduce operations, or cease flying entirely in response to MRB's higher costs.

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[6] At most carriers, a seniority-based crew bidding system is utilized to assign trips to pilots and flight attendants. Fewer bidding opportunities may affect both earnings and time spent outside work and commuting to/from work.

[7] In addition, regional carriers operate several crew bases in California.

- **Distortion of the U.S. airline competitive landscape.** Finally, applying MRB to California-based flight crews distorts competition in the domestic U.S. passenger aviation market, at the macro national level and the micro route level. On a macro national basis, those carriers who have a strong route presence in California and crew bases in the state will be highly impacted by MRB, while those carriers with no California crew bases will not be impacted at all. On a given route, each carrier's exposure to MRB depends on the extent California-based crews are utilized by that airline on that route. Since carriers have different crew bases and route networks, MRB may precipitate the exit of one carrier in a market while not impacting another carrier at all. This is seen in Table ES-7, which illustrates the impact of California MRB on the New York JFK–San Francisco route. Because of high exposure to California-based crew, Alaska is projected to likely cut service on this route post-MRB under the Complete Augmentation case. American is also likely to reduce nonstop service. Delta is impacted but is not projected to reduce service, while JetBlue is not affected at all, since it has no crew base in San Francisco.

Table ES-7:
California MRB Impact in New York JFK–San Francisco Market (Complete Augmentation Case)

New York JFK–San Francisco Nonstop Market				
Nonstop Airline				
California Pilots / Flight Attendants Mix %	52% / 95%	12% / 51%	9% / 59%	0% / 0%
Seats / Day	1,350	900	2,300	1,800
Block Time (Hours)	6.2	6.2	6.2	6.2
Crew Duty Time (Hours)	7.3	7.4	7.4	7.2
Pre-MRB Estimated Profit Margin	Positive	Positive	Positive	Positive
Post-MRB Estimated Profit Margin	Negative	Positive	Positive	Positive
Change Profit Margin	Down > 10%	Down > 5%	Down > 5%	No Impact
Model Prediction	**Cancel**	**Reduce**	No Change	No Change

1 Introduction

1.1 California Meal and Rest Break (MRB) Laws

California's Meal and Rest Break (MRB) law[8] requires employers to offer employees a paid 10-minute rest break for each four hours of work, and an unpaid 30-minute meal break after no more than five hours of work. The meal and rest break requirement, in one form or another, has existed for decades, and never was considered to apply to passenger or cargo air transportation flights until 2019.[9] Airline pilot and flight attendant labor today is among the most heavily regulated professions, with extensive federal regulations and work rules that govern flight crew rest, breaks, and duty time limits. These are mandated by the Federal Aviation Administration (FAA) to maximize safety and crew wellbeing. FAA regularly consults a wide variety of medical, technical and safety experts, airlines, and labor representatives to determine work duty regulations, considering the complex interaction of length of duty time, previous rest, time of day, and breaks during the duty day (among other factors) on fatigue. FAA therefore already ensures a uniform safe operating standard for flight crew duty and break requirements. In addition, many carriers have collective bargaining agreements (CBAs) with labor unions, or labor standards patterned after these agreements, which provide an additional layer of rules governing flight duty time, work breaks, and meal breaks.

In 2019, a district court decision in a class action lawsuit filed by several flight attendants purported to apply meal and rest breaks to flight attendants. As a result of that decision, the potential application of MRB to air transportation by flight crew based in California is now in question. This study estimates the economic, air service network, and employment impacts to airlines, customers, workers, California, and the United States if MRB were applied to passenger and cargo air transportation by U.S. carriers.

In brief, applying MRB to flights operated by air carriers will be highly disruptive. MRB requires that during the full period of each break, the employee must be: (a) free of any work-related duties, (b) not recallable/returnable to work, and, with respect to meal periods, (c) able to leave his/her physical place of work. Airlines do not staff flights with "spare" crew to provide substitute labor inflight for the crew on break, and do not schedule aircraft and crew turns to provide time for breaks on the ground. Pilot complements are nearly always staffed per FAA minimum requirements, and flight attendants are either staffed at FAA requirements or with a small crew buffer to deliver the carrier's required standard of service (especially in premium cabins). Therefore, adding MRB requirements—on top of already extensive FAA regulations and collective bargaining agreement provisions—must necessarily result in substantial additional operating expenses to carriers, which in turn will result in significant changes to airline service networks and aircrew employment levels and practices. These will have downstream economic and employment implications for California and the United States at large.

[8] California Labor Code (LAB) Section 512, as amended.

[9] Air transportation flight crews includes pilots, co-pilots, flight engineers, flight attendants and pursers, and any other crew that is employed on the aircraft while it is engaged in the transportation of people and/or cargo. Other 'ground employees' of all types—including as nonexclusive examples aircraft servicing, passenger servicing, aircraft support and maintenance, marketing, and headquarters staff—already receive breaks consistent with California MRB provisions if they are based in California. MRB provisions for these 'ground employees' are therefore not studied in this analysis.

1.2 Framework for Analysis

The impacts of California MRB are estimated over actual 2019 operations (the most recent pre-COVID period), utilizing publicly available data from the U.S. Bureau of Transportation Statistics.[10] This allows revenues, costs, estimated segment profitability, and operations to be measured consistently across different carriers. All principal 14 CFR Part 121[11] scheduled U.S. certificated air carriers are evaluated,[12] including capacity operated on their behalf by affiliated regional partners.[13] Each scheduled operation by these carriers is assumed to be impacted by MRB if the flight was crewed by at least one pilot/copilot and/or flight attendant based in California, regardless of the leg origin or destination of the flight. Therefore, while flight segments to/from/within California are most likely to be affected, many flight segments that do not involve California but include California-based crews are also impacted by MRB. All carriers with a material California crew base presence provided data on their utilization of California-based pilots and flight attendants for each segment over 2019 for this analysis.[14]

[10] This includes T-100 "Air Carrier Traffic and Capacity Data by Non-Stop Segment and On-Flight Market," the Passenger Origin & Destination (O&D) Survey aka "Data Bank 1B," and Form 41 quarterly financial reviews.

[11] See https://www.faa.gov/licenses_certificates/airline_certification/air_carrier/

[12] Combination carriers include Alaska Airlines, Allegiant Air, American Airlines, Atlas Air, Delta Air Lines, Frontier Airlines, Hawaiian Airlines, JetBlue Airways, Southwest Airlines, Spirit Airlines, and United Airlines. Cargo carriers include Atlas Air, FedEx Express, and UPS Airlines.

[13] Examples in 2019 included Compass, Envoy, ExpressJet, GoJet, Horizon, Mesa, Republic, SkyWest, and Trans States.

[14] JetBlue, Allegiant, Frontier, Spirit, Atlas, and FedEx did not provide segment-level data on exposure to California-based pilots and flight attendants, but each of these non-reporting carriers either have a comparatively small scale of California operations subject to MRB, or do not have California crew bases and so are assumed not to be subject to the rule. We assumed that these carriers utilize 100% California-based crews on only those flights operated to/from their California crew base (if any).

2 California MRB Adaptation Options

MRB prescribes an unpaid 30-minute meal break no later than the end of every fifth hour of work and a paid 10-minute rest break either during or after every four hours of work. We consider several scenarios to adapt to MRB, summarized in Table 1. Each scenario is analyzed under the interpretation that, to comply, the rest break must be taken no later than the end of the fourth hour of work (i.e., maximum 4:00 of crew duty time before break). In all cases, duty time includes required pre-flight reporting / preparation time, the maximum of scheduled block time and actual 2019 average block time, and post-flight passenger deplaning time.

An alternative interpretation is that the rest break must be taken within the four hours of work as opposed to at the end, so that the rest break is on average taken after 2:30 hours of work. We have modeled the principal airline financial, cancellation, employment, and economic impacts of this more restrictive case in Appendix A.

Table 1:
California MRB Adaptation Scenarios

(1) Staggered Augmentation of Crews*	(2) Complete Augmentation of Crews*	(3) Intermediate Stops	(4) Close California (CA) Crew Bases
Add one pilot and one flight attendant to every flight whose total crew duty time exceeds 4:00. Staggering of flight crew active duty ensures FAA and carrier minimums are met continuously. Flights with duty time less than 4:00 incur crew/aircraft ground delay cost to permit MRB breaks.	MRB + FAA-mandated rest may require the complete crew (two pilots + full complement of flight attendants) to be replaced after each 4:00 block of duty time. Flights with duty time less than 4:00 incur crew/aircraft ground delay cost to permit MRB breaks.	Add intermediate stops to flights after each successive 4:00 block of duty time, with crews taking break during intermediate stops. Flights with duty time less than 4:00 incur crew/aircraft ground delay cost to permit MRB breaks.	Potentially avoid MRB exposure by closing CA crew bases and requiring all flights to be crewed from non-CA bases. New deadhead and rest overnight expense (crews must be positioned to continue to operate duty trips that currently originate in California), and crew commute downsides.

* MRB-compliant Staggered Augmentation example for an 8-hour duty time flight: Pilot A operates flight hours 1-4 and 6-8, Pilot B operates flight hours 1-3 and 5-8, and Pilot C operates flight hours 4-5. Complete Augmentation example for an 8-hour duty time flight: Pilots A and B operate flight hours 1-4, Pilots C and D operate flight hours 5-8.

2.1 Staggered Crew Augmentation (Scenario 1)

To achieve MRB compliance, one additional pilot and flight attendant is added to every flight whose total duty time exceeds the 4:00 hours before break.[15] Staggering of flight crew active duty ensures that FAA and

[15] Flights exceeding eight hours of pilot flight time are already augmented per FAA regulation and are also typically augmented for flight attendants, and thus are assumed not to require additional augmentation.

carrier staffing minimums are met continuously during the flight, while also complying with MRB. Flight crew who are relieved from duty may return to work upon the completion of their break. To the extent that narrowbody aircraft do not have sufficient jump seats or crew bunks to accommodate crew not on active duty, the crew is assumed to occupy coach revenue seats, and thus displaces revenue depending on the average load factor[16] of each affected flight.

2.2 Complete Crew Augmentation (Scenario 2)

One interpretation of the intersection of MRB and FAA mandated rest periods requires the complete crew to be replaced once total duty time exceeds the 4:00 threshold.[17] In this scenario, two new pilots plus a new flight attendant complement are required for each 4:00 block of crew duty time. To the extent that narrowbody aircraft do not have sufficient jump seats / crew bunks to accommodate crew not on active duty, the crew is assumed to occupy coach revenue seats, thus displacing revenue depending on load factors.

2.3 Intermediate Flight Stops (Scenario 3)

Instead of crew augmentation, airlines have the option to add intermediate technical stops[18] (no enplanement / deplanement) to any flight that exceeds 4:00 of duty time. This option would add substantial incremental total flight and crew time for each stop, due to the relative inefficiency of approach and departure flight sequences, taxi time, and on-ground break time. Aircraft operating costs would increase due to incremental flight cycles. The revenue impact of adding intermediate stops to flights would be severe, since competing nonstop flights operated by U.S. crews based in states other than California, or foreign-flag flights using non-U.S. crews, would not be subject to the intermediate stops. Even cases where the affected flight/s are the only nonstops in a market would be at significant revenue risk since these flights would lose their current nonstop elapsed time and therefore revenue share advantage over competing one-stop or connecting options. While we do not estimate the revenue loss of intermediate stops in this study, we assume in this case that the combination of revenue loss (due to flight unattractiveness) and cost increases would result in the cancellation or reduction of all markets with material exposure to MRB.

2.4 Extended Ground Turns (Add to Scenarios 1-3)

Flight segments whose total duty time is less than 4:00 do not themselves require crew augmentation or intermediate stops. However, crew who just completed such a shorter flight will in most cases be unable to complete their next flight segment without triggering MRB, even if it is also short. Therefore, a rest period including lunch and a break period (total 40 minutes) is assumed to be required in the crew's ground "turn time" before their next flight segment. Turn time is the time the aircraft is on the ground in between flights. This imposes a new cost, since the aircraft and crew ground time between successive flights during the duty day is rarely long enough to accommodate a 40-minute uninterrupted off-duty time break between the end of

[16] Load Factor = Revenue Passenger Miles / Available Seat Miles, a measure of how full flights are over a defined period.

[17] There is not currently clarity on whether the intersection of MRB and FAA regulations will require staggered or complete augmentation. We assume that if MRB should ultimately apply to airlines, guidance from FAA and other authorities as appropriate will be provided, which then will determine the augmentation solution.

[18] Technical stops involve landing the aircraft in the middle of a route, without taking on or dropping off passengers or cargo. Example: a pre-MRB nonstop flight from Los Angeles to New Orleans that post-MRB lands in Oklahoma City merely for crew rest has an Oklahoma City tech stop.

the crew's previous flight (after required deplaning/debrief time) and the required report time for the next flight (including aircraft / flight pre-departure preparation and boarding time).

We assume that all flights that are too short to require crew augmentation will require a 40-minute additional ground turn time versus current turn times, which is costed at the total prorated crew and aircraft operational cost for that route (less fuel). This represents the cost of additional crew and aircraft needed to continue to generate 2019's revenue level, assuming that current crew and aircraft are optimally utilized on a macro basis. It may well be an underestimate, given the considerable disruption that extended ground times would pose to existing crew, aircraft, and hub bank schedules.

2.5 Close California Crew Bases (Scenario 4)

If MRB applies only to those flights operated by California crews, airlines may have the alternative to close all California crew bases, and thus potentially avoid the expense of crew augmentation, extended ground turns, and intermediate stops[19]. However, there is also a cost to ensure that flights formerly staffed by California-based crew (usually from California airports) are still staffed, now by crew based outside California.

Flight schedules from current California crew bases include extensive nonstops to many destinations, including morning departures to cities around the U.S. that are not themselves crew bases. Such flights—along with longer-haul flights that occupy most or all of a flight crew's duty day—are likely to be operated by California-based crews, since this maximizes crew scheduling efficiencies. For example, Alaska Airlines operates nonstops from its San Francisco (SFO) hub and crew base to cities such as Orlando, Raleigh-Durham, Nashville, and New Orleans. Alaska does not maintain crew bases at any of these destination cities; hence, it is most efficient to utilize SFO-based crew. If California crew bases close, crews from non-California bases such as Portland or Seattle would be required to fly from these non-California crew bases (most likely on a "deadhead" basis[20]) to position for their next day's flight and stay in a hotel.

We estimate the ongoing expense of closing California crew bases to be the new deadheading, hotel, and per diem expenses associated with positioning crew from the nearest non-California crew base for pre-MRB California-crewed flights. One-time transition expenses and any potential CBA constraints are not evaluated.

[19] MRB exposure avoidance is achievable by closing California crew bases so long as the law is applied only to those flight crew based in California. Different implementing regulations and/or interpretations of MRB could produce different compliance requirements.

[20] To "deadhead" is an aviation term for flight crew traveling as passengers on a first flight to be in position to staff a second flight. Deadheading is expensive as crews are typically paid for the unproductive first flight, and if the deadhead crew occupies a revenue passenger seat then the airline forgoes passenger revenue on that flight.

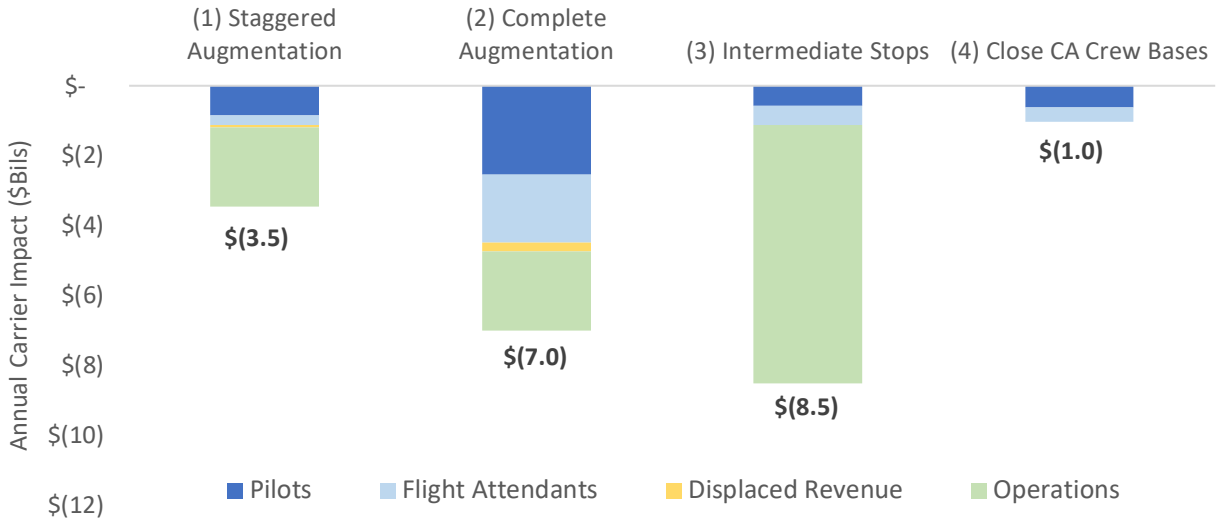
3 Airline Impacts of MRB Compliance

3.1 Airline Financial Impacts (No Change to Network/Crews)

If airlines continued to offer 2019 historic schedules and crewed flights as in 2019, they would incur significant financial impacts when applying MRB. Figure 2 shows that Staggered Augmentation and extended ground time for flights too short to require augmentation (Scenario 1) is the least expensive crew adjustment scenario, driving $3.5 billion in estimated additional expense. Notably, two-thirds of this incremental expense is driven by the increased operational costs of extended ground times for aircraft and flight crew on flights too short to require augmentation. If Staggered Augmentation is not an option, Complete Augmentation and extended ground time (Scenario 2) is double the cost at $7.0 billion, which follows from the necessity to replace the entire crew every four hours of duty time. The revenue seat displacement impact of augmented crew occupying passenger seats is included in this impact, but it is small (at $255 million) relative to the incremental pilot and flight attendant cost impact.

Adding Intermediate Stops in lieu of augmentation (Scenario 3) is the highest cost outcome at $8.5 billion—not surprising because intermediate stops generate considerable additional aircraft cycle and flight-time extension costs, which overwhelm the elimination of augmented crew expense. Additionally, flights with intermediate stops will likely bear a strong revenue loss, as passengers would in most cases switch from flights that are no longer nonstop to competing nonstop options offered by foreign airlines or to U.S. airline flights not staffed with California-based crews. In cases where the flight with the new intermediate stop was previously the only nonstop in the market, the revenue loss is still likely nearly as severe, as the market would split broadly amongst the many one/multi-stop itineraries available in most O&D city pairs.

Figure 2:
U.S. Passenger + Cargo Carriers MRB Impacts by Adaptation Scenario[21]



[21] Cost of extended ground time is included in Scenarios 1 through 3.

With these transformational cost increases inherent in complying with California MRB provisions, airlines may instead seek out alternatives to potentially avoid exposure to California regulations. If airlines sought to avoid the compliance burden by closing California crew bases altogether (Scenario 4), ongoing pilot and flight attendant costs would increase by $1.0 billion—substantial, but a far lower cost impact than augmenting crews or conducting intermediate stops. The impact of closing California crew bases would also fall heavily on pilots and flight attendants currently based and living in California, who would face significant disruptions to their current work schedules. As discussed further in Section 5, California flight crew would have the unpalatable option of relocating to live outside California to the nearest non-California crew base or continuing to live in California but commuting to a crew base located outside California to initiate their duty trips.

3.2 Route Network Impacts: Passenger

Faced with substantial operating cost increases impacting routes in direct proportion to their exposure to California-based crews, it is highly unlikely that airlines could maintain current schedules. At highest risk of cancellation are flights with high exposure to California crews, which generate a large post-MRB change in costs causing the flights to become unprofitable. To determine which routes are most likely to be canceled or reduced due to MRB compliance, Inter*VISTAS* estimated the profitability of each carrier's scheduled flight segments utilizing publicly available DOT cost, revenue, and flight operations data. This approach utilizes allocation mechanisms that are broadly similar to carriers' internal flight profitability systems used for network planning and financial analysis. While our profitability estimate for a given route may vary versus a carrier's own flight profitability system, it has the advantage of being consistent and uniform in cost and revenue reporting across all carriers and is broadly accurate in assessing the relative profitability of routes both within and between carriers. Thus, it is especially helpful to assess the subset of routes at greater risk of cancellation or reduction based on a uniform standard of changes in financial metrics.

For purposes of our analysis, a market is subject to cancellation if its post-MRB compliance segment profitability margin (a) decreases by at least 10 points and (b) is negative. A market is likely to be reduced (but not canceled) if (a) its segment margin declines by more than five points and its pre-MRB margin is less than five points positive, (b) its segment margin is negative pre-MRB and declines between 5-10 points post-MRB, or (c) segment margin remains positive but decreases by at least 10 points post-MRB. Only the first order effect of market cancellations is considered; full network revenue recapture and competitive reactions are not evaluated.

Under these standards, Table 3 shows the expected reduction in total U.S. market revenue (not just relating to California) from reduced service and cancellations under Scenarios 1-3. Staggered Augmentation would cause the elimination of nonstop flights with $5.5 billion (or ~3%) of total U.S. market revenue, 154,000 daily seats, and 119,000 daily passengers. Complete Augmentation is significantly more harmful, resulting in the elimination of nonstop flights with $17.0 billion (or ~9%) of total U.S. market revenue, representing 244,000 daily seats and 195,000 daily passengers. Intermediate Stops would be damaging to the entire U.S. airline market, causing the loss of as much as $37.2 billion (or ~20%) of total U.S. market airline revenue, with 450,000 daily seats and 374,000 daily passengers.

Table 3:
Lost U.S. National Market[22] Revenue and Seats Due to Capacity Reduction and Cancellations

Impact	Market Revenue $Bils	% Market Revenue	Market Seats/Day	% Market Seats	Market Pax/Day	% Market Pax
Scenario 1 (Staggered Augmentation + Ground Time)						
Reduce Capacity	$1.3	1%	25K	1%	20K	1%
Cancel Market	$4.2	2%	129K	4%	98K	4%
Total Lost	$5.5	3%	154K	5%	119K	5%
Scenario 2 (Complete Augmentation + Ground Time)						
Reduce Capacity	$2.4	1%	36K	1%	29K	1%
Cancel Market	$14.6	8%	208K	7%	166K	7%
Total Lost	$17.0	9%	244K	8%	195K	8%
Scenario 3 (Intermediate Stops + Ground Time)						
Reduce Capacity	$6.9	4%	79K	3%	67K	2%
Cancel Market	$30.3	16%	371K	12%	307K	9%
Total Lost	$37.2	20%	450K	15%	374K	11%

The impact of MRB on flights involving California is particularly severe, as expected since California-based crews are most likely to crew flights to/from/within California. Table 4 shows that even the lightest impact Staggered Augmentation case will cause the elimination of between 136,000 daily seats (or ~22% of all airline seats) involving California, with a loss of ~$5.1 billion in airline market revenue. Complete Augmentation would result in the loss of more than 222,000 daily seats (or 36% of all seats) involving California and $16.2 billion or ~39% of all airline market revenue. Intermediate Stops would decimate California's aviation industry, with a loss of 340,000 daily seats (or ~55% of all airline seats) and up to $27.4 billion or 65% of all airline revenue involving California.

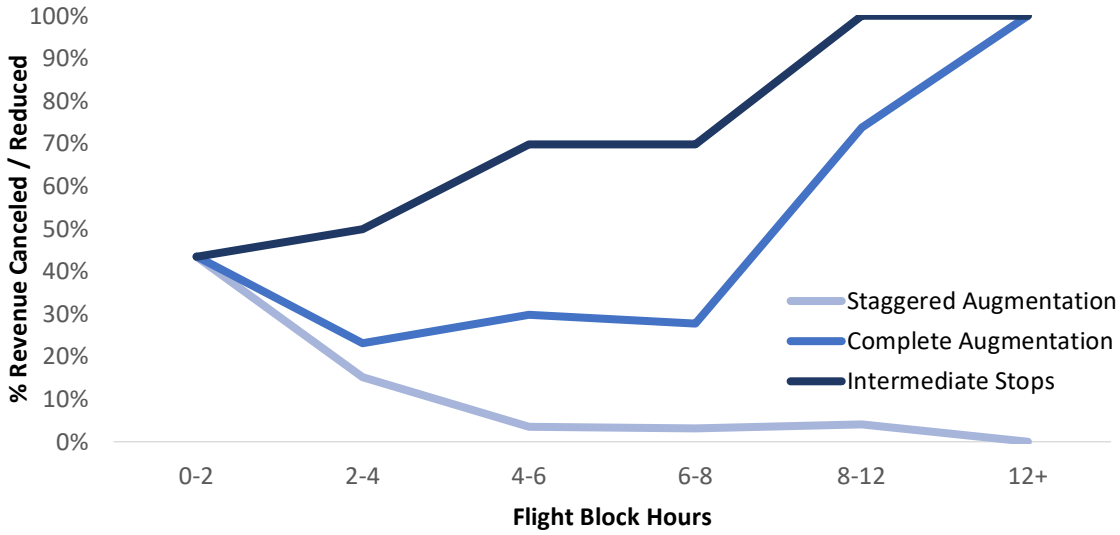
[22] Includes all flights operated globally by principal Part 121 U.S. operators and their capacity-owned commuter affiliate operations. U.S. market revenue is the passenger revenue set captured by U.S. DOT Data Bank 1B, which is a 10% sample of all issued tickets that are operated and/or marketed by most U.S. passenger carriers. Does not include foreign carrier operations.

Table 4:
Lost California Market[23] Revenue and Seats Due to Capacity Reduction and Cancellations

Scenario	CA Revenue $Bils	% CA Revenue	CA Seats/Day	% CA Seats
1 (Staggered Aug + Ground Time)	$5.1	12%	136K	22%
2 (Complete Aug + Ground Time)	$16.2	39%	222K	36%
3 (Intermediate Stops + Ground Time)	$27.4	65%	340K	55%

The impact of California MRB varies substantially depending on the average block time (taxi time plus airborne time) of the flight. As demonstrated by Figure 5, under Staggered Augmentation MRB results in low (single digit) flight cancellations for all block times of four hours or greater (as weighted by revenue). In this Scenario 1, cancellation rates are highest for the shortest-haul flights of up to two block hours, because these flights bear the enhanced ground time penalty. The Complete Augmentation and Intermediate Stops scenarios result in substantially elevated flight cancellation rates for all flights whose total duty time is eight hours or longer. Most long-haul international nonstops operated by the California crews would likely cease to operate due to the prohibitively high costs of complete crew augmentation or intermediate stops.

Figure 5:
California Flight Revenue Canceled by Flight Block Hours



Examples of how route changes are triggered are shown in Table 6, using Southwest's Oakland–Portland, Oregon (PDX) and Alaska's Newark–San Francisco (SFO) routes. Southwest's route is too short at 2.7 duty hours to trigger augmentation under MRB. However, once each flight is complete, when staffed by California-based crews (which occurs 42%~46% of the time), each flight must incur an additional 40-minute break time

[23] Includes all flights operated to/from/within California by principal Part 121 U.S. operators and their capacity owned commuter affiliate operations. Does not include foreign carrier operations.

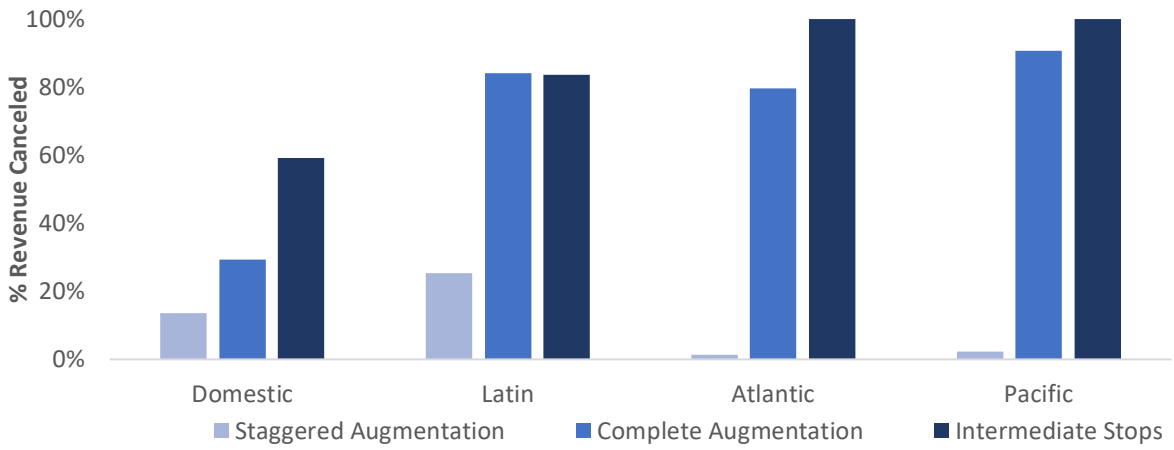
once the flight arrives at PDX to enable crew rest. This elongated turn time decreases the former estimated profitable flight into negative profitability, resulting in projected cancellation of the route. Alaska's Newark–SFO requires augmentation or intermediate stops because it is already over 7 duty hours. While it is currently estimated to be profitable, Complete Augmentation or Intermediate Stops results in a greater than 10-point margin decline into negative profitability, resulting in it likely being canceled. Staggered Augmentation causes less than a 5-point margin decline, therefore there is no assumed change to the route in this case.

Table 6:
Sample Markets Showing Effect of California MRB Impacts

Route	Southwest Oakland–Portland	Alaska Newark–San Francisco		
California MRB Impact	Extended Turn Time	Staggered Augmentation	Complete Augmentation	Intermediate Stops
California Pilots / Flight Attendants Mix %	46% / 42%	26% / 96%		
Seats / Day	1,749	966		
Block Time (Hours)	1.7	5.9		
Crew Duty Time (Hours)	2.7	7.2		
Pre-MRB Estimated Profit Margin	Positive	Positive		
Post-MRB Estimated Profit Margin	Negative	Positive	Negative	Negative
Change Profit Margin	Down > 10%	Down < 5%	Down > 10%	Down > 10%
Model Prediction	**Cancel**	**No Change**	**Cancel**	**Cancel**

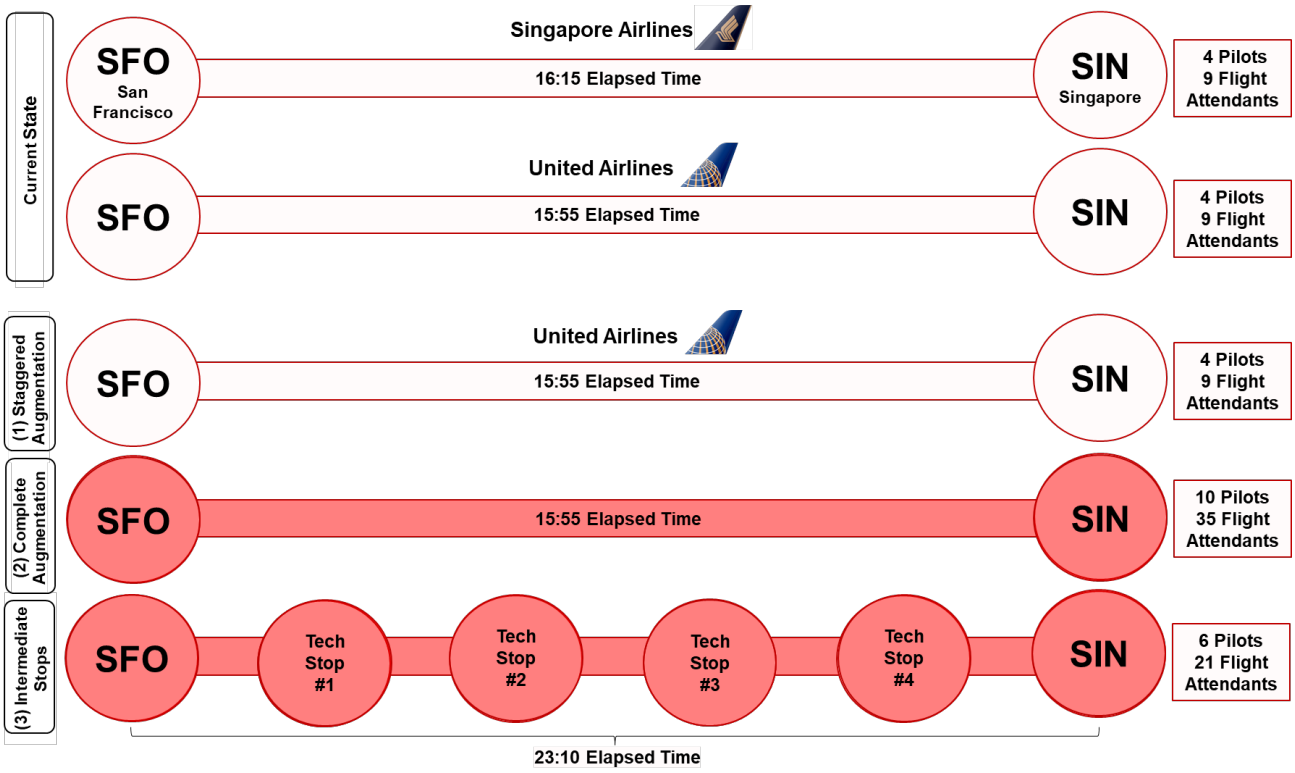
The negative impact of MRB on international flights is seen clearly in Figure 7, which shows the revenue percentage of California Market nonstop flights canceled by world region of the flight. Staggered Augmentation has little impact on long-haul international flights to/from California, since these flights are already augmented for pilots (due to FAA flying time regulations) and typically also for flight attendants. However, under Complete Augmentation and Intermediate Stops, the cost of operating long-haul flights would substantially increase, with multiple crew complements required for the entirety of the flight, or alternatively multiple tech stops required. Therefore, nearly all nonstop flights crewed by California-based employees and operated across the Atlantic or Pacific Oceans and to Latin America would likely cease to operate. Since foreign airlines also today operate nonstops in most of the nonstop international markets currently to/from California by U.S. carriers, and foreign airlines are not subject to MRB unless they have crew bases in California, Figure 7 implies a significant revenue shift from U.S. airlines to foreign airlines.

Figure 7:
California Flights Canceled by Worldwide Region (Revenue Weighted)



To illustrate this impact, consider United's SFO–Singapore (SIN) nonstop flight as shown in Figure 8, which currently requires four pilots and nine flight attendants to operate and has a block time averaging just under 16 hours. Historically, this flight was crewed 100% by California-based pilots and flight attendants. Staggered Augmentation has no impact since this flight already has significant augmented crew because of its long stage length. Under Complete Augmentation, MRB compliance would mandate an additional six pilots and an additional 26 flight attendants to operate SFO-SIN. With Intermediate Stops the 16-hour nonstop flight would require as many as four intermediate stops between SFO and SIN, elongating the trip by as much as seven hours. In contrast, the nonstop flights operated by Singapore Airlines in this market would be unaffected by MRB. As a result, under both Scenarios 2 and 3, United's SFO-SIN flight clearly could not survive MRB compliance.

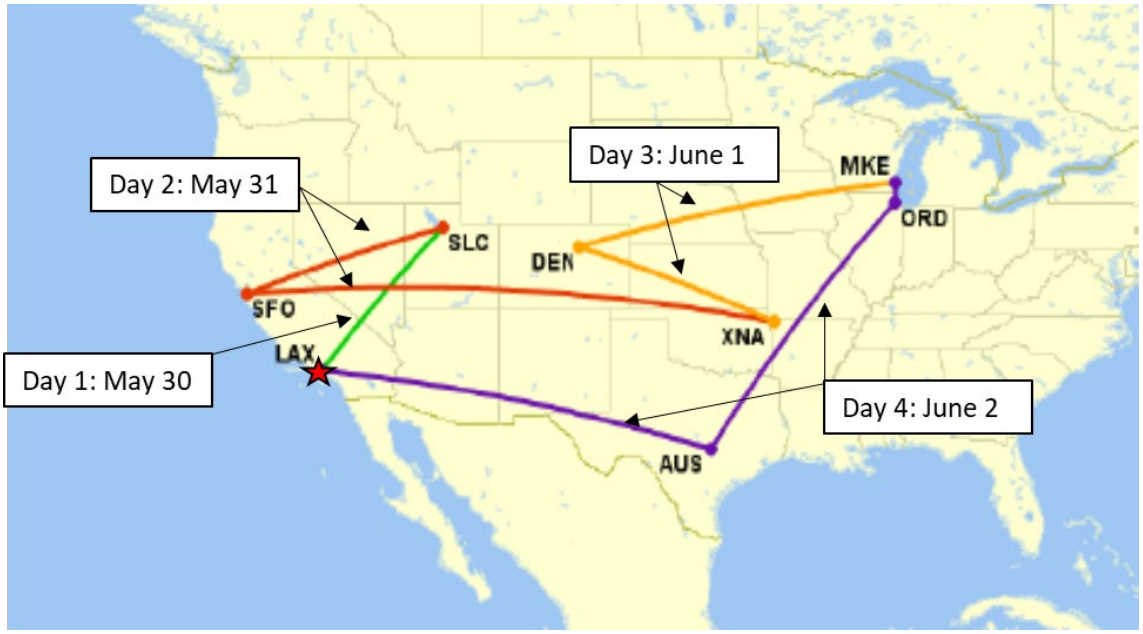
Figure 8:
San Francisco to Singapore MRB Impact Example[24]



While California is the natural center of impact of cancellations due to MRB, its impact would extend far beyond the borders of California alone. California-based crew staff many flights between California and the other U.S. states and foreign countries. Therefore, cancellations of flights operated by these crews would materially compromise the entire nation's airline route network, with economic effects extending far beyond the borders of California. If a California–Rest of U.S. flight cancels due to MRB, the loss of employment of California-based crew would impact California the most, but the loss of airline service similarly harms both the California origin city and the non-California destination city. California-based crew also often staff flights which are completely outside California, when such a pairing is most efficient given the overall schedule and crew availability. Figure 9 gives examples of both phenomena, showing an actual LAX-based SkyWest flight attendant four-day duty trip pattern from May 30–June 2, 2019. The California-based flight attendants staffing this trip worked seven flight segments over the four days, but none of these segments fell purely within California. Four segments involved California as either the origin or destination. Three segments (NW Arkansas–Denver, Denver-Milwaukee and Chicago O'Hare–Austin) did not involve California at all yet would be equally impacted by MRB. In this way, the effects of MRB would be truly national in scope.

[24] Based on FY2019 T100 data and Inter*VISTAS* analysis. Singapore Airlines' crew data is indicative only and not confirmed, based on UA 787-equivalent staffing standard. Singapore operates two A350-900 configurations on SFOSIN (a low-density premium flight with 161 seats, and a regular-density flight with 253 seats).

Figure 9:
SkyWest LAX-Based Flight Attendant Example Four-Day Duty Trip[25]



The financial impacts of MRB by region are shown in Table 10, which divides legs impacted by cancellations due to MRB according to how the leg involves California. In every scenario, the lost revenue involving the California-Rest of U.S. and Non-California markets[26] far exceeds the impact to purely intra-California markets. Under Staggered Augmentation, intra-California legs make up 28% of the total market revenue ($1.5 billion and 56,000 seats per day) canceled by MRB. Fully 60% of the cancellation impact by revenue ($3.2 billion and 76,000 seats per day) involves California–Rest of U.S. flying and another 8% of the impact involves non-California legs; in both cases, other communities throughout the United States are harmed. Under Complete Augmentation, intra-California markets account for only 9% of the total market revenue canceled. California–Rest of U.S. makes up 51% of market revenue ($8.8 billion revenue and 140,000 seats per day) canceled, and non-California markets make up an additional 5% of market revenue canceled.

[25] Source: US Dist Court Nd Cal, Wilson et al v SkyWest Airlines, Inc (Case 3:19-cv-01491-VC Document 60-1, Page 34). Analysis of SkyWest flight attendant pairing data. Pairing G5334 flown by SkyWest flight attendants from May 30-June 2, 2019. Flight from MKE to ORD was a deadhead on United. All other flights were operated by SkyWest.

[26] Non-California legs involve two U.S. cities, neither of which are in California.

Table 10:
Passenger Flight Cancellations Mix by Leg Market Type

Leg Market	Staggered Augmentation			Complete Augmentation			Intermediate Stops		
	Market Rev $Bils	% Market Rev	Market Seats/Day	Market Rev $Bils	% Market Rev	Market Seats/Day	Market Rev $Bils	% Market Rev	Market Seats/Day
Intra-California	$1.5	28%	56K	$1.5	9%	56K	$1.5	4%	56K
California–Rest of US	$3.2	60%	76K	$8.8	51%	140K	$19.2	52%	255K
California-International	$0.2	3%	3K	$5.9	34%	26K	$6.7	18%	29K
Non-California	$0.4	8%	18K	$0.9	5%	21K	$9.8	26%	111K
Total	**$5.4**		**153K**	**$17.1**		**243K**	**$37.2**		**451K**

3.3 Potential Fare Increase Impacts

Airlines' capacity response to recover from post-MRB costs is assumed to also generate some recovery through fare increases as described below. Employment and economic output losses associated with the fare increases were estimated and included in each case:

- **No change in service to the market**: Routes with the least impact do not have a change in service; however, each carrier is assumed to increase fares to maintain previous margins. (The employment and output losses associated with this impact are included in the model.)
- **Reduction in frequencies in the market, but not a full cancellation**: Routes with reduced frequencies are assumed to have an increase in fare level to recover previous margins on the remaining service.
- **Full cancellation of the market:** Routes with the greatest impact are assumed to have a cancellation in nonstop service in the market, in which case there is no change to fares in the market—rather, just a reduction in demand.

As an alternative post-MRB recovery strategy to reducing frequencies or canceling a market, it could be argued that airlines might respond by increasing prices in affected markets to the point necessary to recover their previous margins, with a reduction in demand according to the prevalent demand elasticity. This outcome seems unlikely because the degree of fare increases required to avoid capacity decreases would likely be high. In addition, the impacts of California MRB are different for each carrier—even within one market—thus reducing the likelihood that significant fare-increase attempts would be successful in the marketplace. In any case, simply increasing fares has its own negative impacts on consumers due to the decrease in passenger demand that follows the fare increase. For illustration, Inter*VISTAS* estimated the fare

and passenger impact in affected markets if MRB cost recovery were in fact achievable through fare increases alone. These results are as follows:

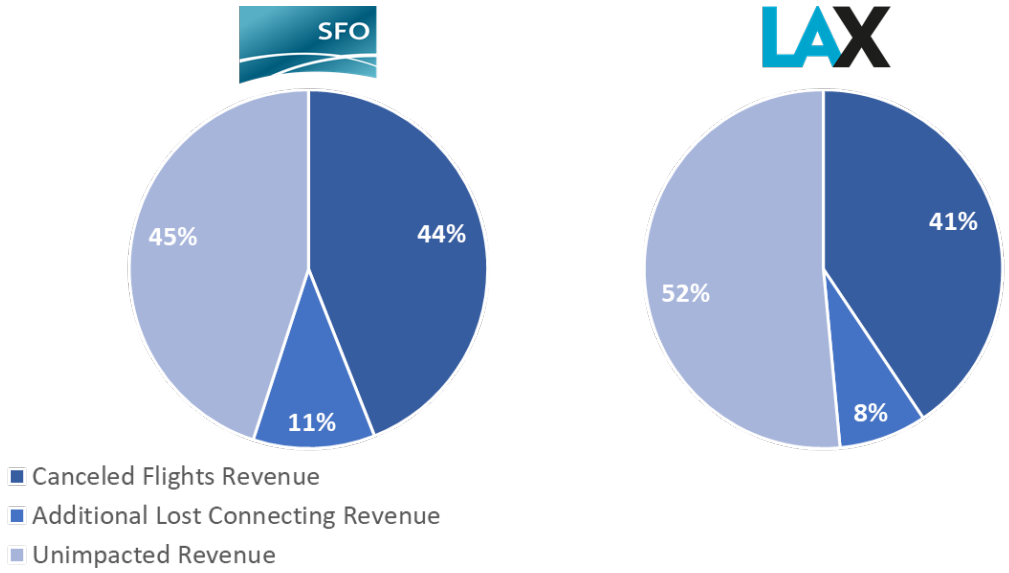
- **Staggered Augmentation**: Average fares would need to increase on average by 14% and passengers would decrease by 23% in affected markets.
- **Complete Augmentation**: Average fare would increase by 18% in affected markets, resulting in a 25% decline in passengers.
- **Intermediate Stops**: Fares would increase by 16%, causing a 21% passenger decline in affected markets.

3.4 Risk to California Airline Hubs

California is home to several hub operations, the largest including United and Alaska at San Francisco (SFO); American, Delta, United, Southwest, and Alaska at Los Angeles (LAX); and Southwest at Oakland (OAK). Hubs serve the local market and connect passengers between origins and destinations that are linked via the hub. Larger hubs with hundreds of daily flights facilitate efficient, multiple daily connecting opportunities for each origin-destination pair via the hub. There are natural scale economies to hub size, since one additional new nonstop city served from the hub allows the airline to sell new one-stop connections to that city from each of the other nonstop cities already served nonstop from its hub. To the extent MRB significantly cuts the air service network to/from California's hub cities, the connection opportunities served will also disproportionally decline, and the lost connections mean that revenue will decline even on those flights that were not reduced or cut to comply with MRB. Ultimately, the survivability of carriers' entire California hub operations could be risk.

This risk is illustrated by the United SFO-SIN example. United would likely cancel this route if it were subject to MRB, and therefore lose the local and segment-prorated revenue on this leg. However, United would also lose a significant portion of the revenue connecting via San Francisco to Singapore. In 2019, United carried 9.4 passengers per day from Austin, Texas (AUS) to Singapore via San Francisco. United's AUS-SFO route performs sufficiently well that MRB compliance is not expected to cause a reduction in service or cancellation of the route. However, United's AUS-SFO flight will lose its prorated share of the revenue from the 9.4 daily passengers who previously flew AUS-SFO-SIN but are now likely lost due to the cancellation of SFO-SIN. United's AUS-SFO leg will also suffer from lost connecting revenue to/from all the other domestic and international flights canceled at SFO. This "lost connecting revenue" is identified in the aggregate segment revenue for California's two largest airline hubs (at LAX and SFO) under Complete Augmentation in Figure 11. In addition to the 41% revenue lost at LAX and 44% lost at SFO by all hub carriers due to direct cancellation, an additional 8% of total LAX revenue and 11% total SFO revenue will be forgone because of lost hub connectivity. With such a severe decline in the scale of hub operations due to MRB, the survivability of the hub carriers' remaining operations in LAX and SFO is at serious risk. Inter*VISTAS* did not evaluate the revenue impact of the potential closure of California hubs.

Figure 11:
SFO/LAX Hub Revenue Risk (Scenario 2 / Complete Augmentation)[27]



3.5 Carrier Financial and Route Network Impacts: Cargo

MRB also affects cargo carriers to the extent they have California crew bases. Several airports in California have significant cargo activity, including Ontario (41 all-cargo departures/day in 2019), Los Angeles (40 departures/day), and Oakland (28 departures/day) among others. Based on 2019 historic schedules and flight crew utilization information, the subset cost of MRB on all-cargo flights is shown for Scenarios 1–3 in Table 12. As expected, impacts are lowest for Staggered Augmentation and highest for the Intermediate Stops case. The change in total flight operations cost from MRB is generally lower for all-cargo flights—ranging from a 0.6% to 2.1% increase in total flight operations costs.

Table 12:
Cargo Carrier MRB Impacts by Adaptation Scenario[28]

Scenario	Flight Ops Cost Change $ Mils	% Change Flight Ops Costs
(1) Staggered Augmentation	$57	0.6%
(2) Complete Augmentation	$132	1.5%
(3) Intermediate Stops	$192	2.1%

[27] SFO hub carriers include Alaska and United. LAX hub carriers include Alaska, American, Delta, Southwest, and United.

[28] Cargo carrier cost and economic impacts are already included in the overall industry impacts in the Executive Summary and Section 3.1 above.

MRB-driven cost increases for cargo operators are also likely to drive a reduction in cargo operations. The passenger case methodology of estimating the change in profitability due to MRB is not possible for all-cargo operations, because insufficient public data is available.[29] Therefore, the cargo analysis focuses on the incremental costs of cargo operations associated with routes operated by California crews, to estimate the likelihood of a cargo route being reduced or canceled. Inter*VISTAS* examined carrier and aircraft costs and carrier operations as reported in standardized fashion to the U.S. DOT for the three largest cargo carriers in California (FedEx, UPS, and Atlas Air). We assumed that cargo markets with an operational cost increase of 20% or more due to MRB would be subject to cancellation, while routes with an operational increase of between 10-20% would be subject to a reduction in operations.

Under this standard, Table 13 shows the reduction in cargo revenue ton miles (RTMs) carried over the U.S. market due to MRB. This reduction ranges from 0.1% of the U.S. market under Staggered Augmentation to 8% of total U.S. carrier RTMs lost under the Intermediate Stops case.

Table 13:
Lost U.S. Carrier Cargo Revenue Ton Miles (RTMs) Due to MRB

Impact	RTMs, Mils	% System RTMs
Scenario 1 (Staggered Augmentation)		
Reduce Capacity	19	0.1%
Cancel Market	0	0.0%
Total Lost	19	0.1%
Scenario 2 (Complete Augmentation)		
Reduce Capacity	161	0.8%
Cancel Market	444	2.1%
Total Lost	605	2.8%
Scenario 3 (Intermediate Stops)		
Reduce Capacity	137	0.6%
Cancel Market	1,564	7.4%
Total Lost	1,701	8.0%

Canceled cargo flight segments involving California are concentrated on flights operating between 4-8 hours, most heavily weighted to the U.S. Midwest, U.S. East Coast, and Anchorage, Alaska. Reductions and cancellations to Anchorage are of concern for California's access to high-value air freight shipments to/from Asia, given Anchorage's function as a critical stopover and transfer hub for air cargo between Asia and the United States. Domestic reductions to the Midwest and East Coast may harm the ability of integrated express cargo operators (such as FedEx and UPS) to serve California reliably for high-yield overnight packages to/from the rest of the United States.

While cargo impacts of MRB are material, they are generally of lower proportionate magnitude than for passenger carriers. Several factors explain this result:

[29] There is no air waybill sampling database for U.S. cargo operations that is equivalent to the data available from DOT Data Bank 1B, the 10% sample of all passenger tickets.

- Cargo carriers do not have flight attendants, so the proportionate cost increase of MRB as applied to a given aircraft type and route will be lower for cargo operations than for passenger operations.
- Lower aircraft and crew utilization increases ability to absorb duty breaks. Cargo carriers generally have lower utilization of aircraft and crew relative to their passenger airline counterparts. For example, express operator schedules typically have an intensive overnight express package flight / hub sortation / flight cycle followed by extended ground dwell time during the day for many cargo aircraft. Additionally, at the key overnight sortation hubs, greater ground dwell time is required between flights relative to passenger operations, to permit time for ground sortation of packages and aircraft loading. Accordingly, the cost of turn-time delay is not applicable to cargo operations.
- U.S. cargo hubs and nonstop activity are centered away from either coast, reducing cargo carriers' exposure to California MRB. Cargo shipments are routing-insensitive, so U.S. cargo hubs tend to be located nearer to the geographic center of the country. For example, FedEx's largest express overnight hub is in Memphis, Tennessee; UPS's largest hub is in Louisville, Kentucky; and DHL's largest hub is in Cincinnati, Ohio. Relative to the U.S. passenger airline network, there is materially less nonstop activity centered along either coast, including California.
- Fewer long-haul international cargo operations to/from California. While a limited number of nonstop cargo operations on long-haul international routes to/from California exist, most transpacific flights transit Anchorage, which is also a local crew base for several cargo carriers. This limits long-haul cargo exposure to California MRB laws.

4 Economic Impacts of MRB Compliance

4.1 Introduction

The impacts to airlines and air connectivity described in previous sections have wider implications for the California and national economies. Analysis was conducted to estimate the economic impact in each of the scenarios. While MRB could result in more staff being required to provide coverage for the additional breaks on certain routes, this is offset by the employment lost due to service and demand reductions following the increase in operating costs. These impacts ripple out into indirect impacts—reduced activities in businesses supporting the airlines (e.g., ground handlers, fuel provision, other suppliers) and induced impacts—the reduced spending in the general economy due to lower employment in the aviation sector.

These economic impacts—employment, labor income, economic output and value-added (Gross State Product), multiplier impacts (indirect and induced)—have been estimated in part by using the IMPLAN Economic Impact Model ("IMPLAN") to estimate the related GDP and economic output. IMPLAN is widely recognized among the industry standards for aviation-related economic impact assessments.

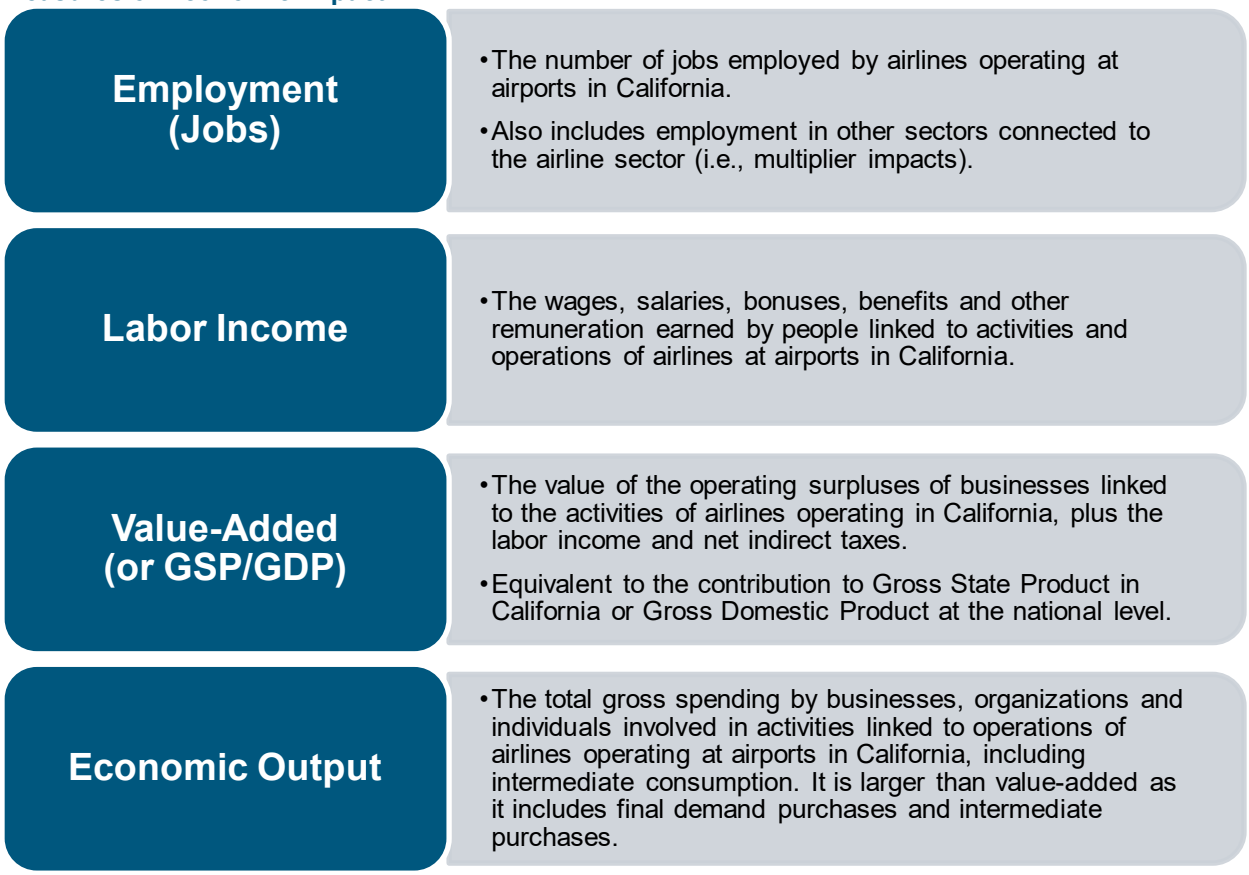
In addition, these economic impacts will have fiscal implications for the State of California. The loss of employment and economic output due to reduced aviation sector activity (as well as multiplier impacts) will reduce revenues to the State and to local governments. The IMPLAN model was used to estimate the associated tax and fiscal impacts.

4.2 What Is Economic Impact?

Economic impact is a measure of the spending and employment associated with a sector of the economy (e.g., air transportation), a specific project (such as the construction of a new facility), or a change in government policy or regulation (such as MRB). In this case, economic impact refers to the economic impact of MRB on the activities of airlines operating from airports in the State of California or otherwise employing crews based therein.

Economic impact can be measured in various ways including employment, income, value added (equivalent to Gross State Product in California or Gross Domestic Product at the national level), and economic output, as summarized in Figure 14. All of these are used to express the gross level of activity or expenditure. Although they are not "net" measures that weigh benefits against costs, these measures can be useful in developing an appreciation of projects, investments, and economic sectors.

Figure 14:
Measures of Economic Impact



4.3 Categories of Economic Impact

The three major components of economic impact of this study are classified as *direct, indirect, and induced* impacts, which collectively capture the economic benefits of airline operations to the State of California's economy. Figure 15 illustrates the various elements that account for economic impact.

- **Direct impacts** account for the employment and economic activity associated with the air transportation (airline) industry in California. Direct impacts can be measured by counting those individuals who work in a particular sector of the economy. In this case, employees of the airline itself as flight crew, gate agents, ground staff, corporate support, and other support staff are included.

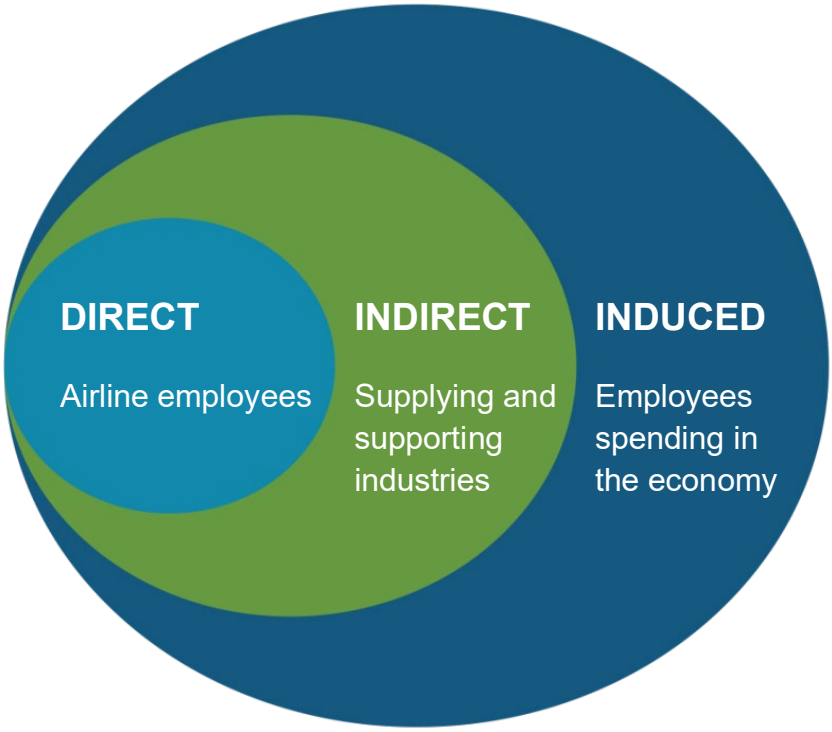
- **Indirect impacts** are employment and economic activity in organizations that supply and service the airline industry in California. This involves employment, wages, value-added, and economic output generated by industries that arise from the presence of airlines. This includes airports, fuel suppliers, catering suppliers, government agencies, third-party firms providing accounting, legal and HR services, etc.

- **Induced impacts** are economic impacts created by the spending of wages, salaries, and profits earned by those working in direct and indirect economic activities related to airline operations. For

example, induced impacts capture the spending of airline employees on groceries, restaurants, childcare, and home renovation that supports employment in a wide range of sectors in the general economy. Induced impact is sometimes called the "household-spending effect."

- **Total impacts** are the sum of direct, indirect, and induced effects.

Figure 15:
Categories of Economic Impact Generated and Facilitated by Airlines Operating from California



4.4 Methodology

For Scenarios 1 to 3 (Staggered and Complete Augmentation, and Intermediate Stops), Inter*VISTAS* analyzed individual routes and carriers for both passenger and cargo services using the output from airline financial and operations previously summarized.[30] This was used to estimate the direct employment impacts in California as follows:

- In the first instance, the MRB requirement would result in increased employment of California crew on some flights as additional crew are required to cover meal and rest breaks (or in the case of the intermediate stop scenario, the longer crew time on certain services). It is assumed that pilot hours of California pilots cannot exceed current levels. The additional pilot hours needed in California would be covered by pilots from elsewhere in the country (who would not move to California, i.e., non-California-based pilots), taken from flights that have been canceled or reduced.

[30] Analysis was conducted assuming a 4:00 hour duty time standard.

- The previous analysis demonstrated that the additional staffing requirements and extended turn times would impose considerable additional costs on some routes, making them no longer viable. Some services are projected to be canceled entirely or reduced in capacity as a result. The crew employment associated with these canceled or reduce flights is assumed to be lost.
- The canceled and reduced services would also reduce the requirement for airline ground crew and support staff. To be conservative and to capture economies of scale, it was assumed that each 1% loss of air capacity would result in a 0.75% decline in ground and support employment.
- Many of the remaining routes still have increased costs due to increased crewing requirements, reducing the profit margin on these routes. Airlines are assumed to attempt to maintain their pre-augmentation route profit margins by increasing fares accordingly. This elicits a demand response, estimated using fare elasticity modeling, leading to further traffic declines and a corresponding employment decline.[31]

The methodological approach is summarized in Figure 16. The net impact on direct employment was a result of the size of each of the aforementioned components.

For Scenario 4, California crew base closures, it is assumed that services remain the same (no lost flights); however, there is the loss of all flight crew employment in California as all flight crew are relocated outside the state (either current California crew employees move to another state or crews currently employed outside California are used, or a combination thereof). The ground and support employment are assumed to be unchanged as the level of air service is unchanged.[32]

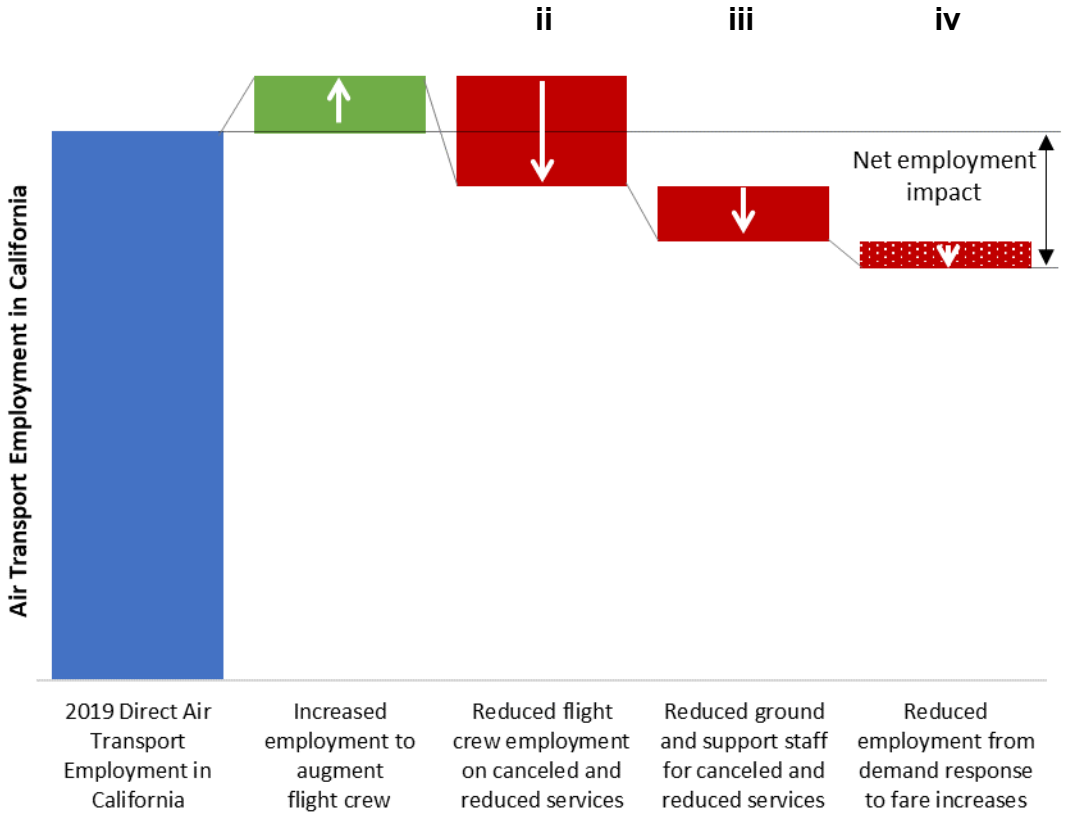
Having estimated the direct employment impacts, the impacts on labor income, value-added, economic output, and multiplier impacts (indirect and induced) were estimated using the IMPLAN Economic Impact Model ("IMPLAN").[33] The economic multipliers used in this study were based on the 2019 Input-Output (I-O) multipliers maintained by IMPLAN for the State of California and for the U.S. national economy/

[31] Crew employment was modeled to decline in proportion to the traffic decline while ground and support employment declined at a 0.75 ratio as described previously. This "second order" fare effect accounted for a small proportion of the economic impact, compared with the "first order" effect caused by service cancellation and reduction.

[32] For Scenario 4, the analysis was conducted for passenger services only.

[33] IMPLAN is an economic impact assessment software system. The system traces its roots to the U.S. Forest Service, which needed an analytic tool to better understand the resource outputs of alternative land management strategies. Responsibility for IMPLAN (short for "impact analysis for planning") eventually shifted to the University of Minnesota before it was established as an independent corporation (then known as the Minnesota IMPLAN Group, or MIG) for developing and selling all future iterations of the IMPLAN database and software. The name changed to IMPLAN in 2013.

Figure 16:
Employment Impact Methodology[34]



4.4.1 Elasticity of Demand

As noted previously, the impact of fare changes was estimated using fare elasticity modeling. In each case, Inter*VISTAS* computed the increase in average airfare and projected the demand response using an appropriate fare elasticity value should the airlines seek to maintain current (2019) route gross margins.

- For the fare elasticity, we surveyed the literature, including our own studies of fare elasticities estimated in a major study Inter*VISTAS* conducted for the International Air Transport Association (IATA).[35] That study not only conducted econometric estimation of fare elasticities by continent, using three different fare data sources, but also synthesized the findings of an extensive literature review. The Inter*VISTAS* study synthesized the results of literature review as well as the new empirical work

[34] Augmentation itself increases employment; however, the net effect after considering canceled and reduced services is negative. It is assumed that pilot hours by California pilots cannot exceed current levels. The additional pilot hours needed in California would be covered by pilots from elsewhere in the country (who would not move to California, i.e., non-California-based pilots), taken from flights that have been canceled or reduced.

[35] See https://www.iata.org/en/iata-repository/publications/economic-reports/estimating-air-travel-demand-elasticities---by-intervistas/

and produced a table of recommended elasticities that varied by continent and provided short- and medium-term figures for consumer fare response.

- We acknowledge that elasticities may change over time, but in practice elasticities are rarely observed to evolve quickly. Nevertheless, after our report for IATA we re-estimated the elasticities with one of the data sets and found that there was no statistically significant change.

An updated literature review did not reveal an indication of changed elasticities.

For the analysis completed for this report, Table 17 outlines the elasticities used, depending on the type of route analyzed (domestic, transatlantic, transpacific). “Short-haul” was defined as routes averaging fewer than 2.5 hours of block time.

Table 17:
Elasticity Estimates

Region	Short-Haul	Long-Haul
Intra-North America	-1.54	-1.40
Transpacific	N/A	-0.84
Transatlantic	N/A	-1.68

Source: IATA (2007) Estimating Air Travel Demand Elasticities

To understand the impact on passengers, two calculations were made:

- Based on the airline cost analysis, routes with reduced profitability but continued services were flagged. For these services, airlines were assumed to increase airfares to recover their previous profitability level (as a percent). This provided an average increase in fares.
- This increase in airfare leads to reduced demand, as noted, through a fare elasticity, which leads to decreased passenger levels. These are second order impacts.

The decrease in passenger demand also impacts the economy, through lower overall activity.

4.5 Impacts of MRB Compliance on the California Economy

Tables 18-21 summarize the resulting economic impacts in California for each of the scenarios.

- Staggered Augmentation (Scenario 1) results in the loss of 14,160 jobs, including multiplier impacts, 7.8% of the overall air transport-related employment in the state.[36] In addition, there is a loss of $2.6

[36] Percentage decline based on the total employment figures for air transportation in California in 2019 (NAICS code 481) and associated multiplier impacts, sourced from IMPLAN. The air transportation industry includes all passenger and cargo airline operations in the state as well as activities not included in the MRB analysis such as helicopters, flight schools, aviation clubs, sightseeing, crop-dusting, air ambulances, specialized services, and other general aviation.

billion to gross state product (value-added) and $4.4 billion in economic output. State and local taxes decline by $0.4 billion.

- Complete Augmentation (Scenario 2) leads to greater economic impact losses than staggered augmentation, with the loss of 52,680 total jobs (29.1% decline). The higher costs to duplicate crew result in more flight cancellations and reductions, resulting in greater lost employment.
- Intermediate Stops (Scenario 3) results in the largest economic impacts of all the scenarios, with 96,730 total jobs lost. This is more than half of all the employment associated with the air transport industry in California. The high costs of these intermediate stops result in substantial service reductions and cancellations.
- The removal of crew bases in California (Scenario 4) results in the loss of 25,450 direct jobs or 68,960 jobs including multiplier impacts.

Table 18:
Economic Impact Results — 1) *Staggered Augmentation*
Passenger and Cargo Services, California Impacts

Impact	Employment	Labor Income ($ Bils)	Gross State Product ($ Bils)	Output ($ Bils)	State & Local Taxes ($ Bils)	% Reduction (Air Transport Related Employment)
Direct	-5,220	-$0.6	-$1.6	-$2.5	-$0.3	*-7.8%*
Indirect	-4,530	-$0.3	-$0.5	-$1.0	-$0.1	*-7.8%*
Induced	-4,400	-$0.3	-$0.5	-$0.8	-$0.1	*-7.9%*
Total	**-14,160**	**-$1.2**	**-$2.6**	**-$4.4**	**-$0.4**	***-7.8%***

Note: Totals may not sum due to rounding.

Table 19:
Economic Impact Results — 2) *Complete Augmentation*
Passenger and Cargo Services, California Impacts

Impact	Employment	Labor Income ($ Bils)	Gross State Product ($ Bils)	Output ($ Bils)	State & Local Taxes ($ Bils)	% Reduction (Air Transport Related Employment)
Direct	-19,440	-$2.3	-$5.9	-$9.4	-$1.2	*-29.0%*
Indirect	-16,860	-$1.2	-$2.0	-$3.9	-$0.2	*-29.1%*
Induced	-16,380	-$1.0	-$1.9	-$3.1	-$0.2	*-29.3%*
Total	**-52,680**	**-$4.6**	**-$9.9**	**-$16.4**	**-$1.7**	***-29.1%***

Note: Totals may not sum due to rounding.

Table 20:
Economic Impact Results — 3) *Intermediate Stops*
Passenger and Cargo Services, California Impacts

Impact	Employment	Labor Income ($ Bils)	Gross State Product ($ Bils)	Output ($ Bils)	State & Local Taxes ($ Bils)	% Reduction (Air Transport Related Employment)
Direct	-35,690	-$4.2	-$10.8	-$17.2	-$2.2	*-53.2%*
Indirect	-30,960	-$2.3	-$3.7	-$7.2	-$0.4	*-53.4%*
Induced	-30,070	-$1.9	-$3.6	-$5.7	-$0.4	*-53.8%*
Total	**-96,730**	**-$8.4**	**-$18.1**	**-$30.1**	**-$3.0**	***-53.4%***

Note: Totals may not sum due to rounding.

Table 21:
Economic Impact Results — 4) *Crew Base Closure*
Passenger Services Only, California Impacts

Impact	Employment	Labor Income ($ Bils)	Gross State Product ($ Bils)	Output ($ Bils)	State & Local Taxes ($ Bils)	% Reduction (Air Transport Related Employment)
Direct	-25,450	-$3.0	-$7.7	-$12.3	-$1.6	*-37.9%*
Indirect	-22,080	-$1.6	-$2.7	-$5.1	-$0.3	*-38.1%*
Induced	-21,440	-$1.4	-$2.5	-$4.1	-$0.3	*-38.3%*
Total	**-68,960**	**-$6.0**	**-$12.9**	**-$21.5**	**-$2.2**	***-38.1%***

Note: Totals may not sum due to rounding.

4.6 Impacts of MRB Compliance on the U.S. Economy

The resulting impacts of each of the scenarios on the U.S. national economy are summarized in the tables below, followed by a comparison of the decline in total air transport-related employment in the country. The economic impacts were estimated using the same methodology as previously described. The national estimates take into the account the employment lost in other states (as well as California) from reduced and canceled flights, such as non-California crew on those flights and ground and support staff at airports across the United States. The analysis also makes use of national-level multipliers from IMPLAN to estimate the economic impacts across the entire country.

- Staggered Augmentation results in the loss of 58,940 jobs including multiplier impacts. This is equivalent to a 2.8% decline in overall air transport-related employment nationwide.[37] In addition, there is a loss of $8.8 billion to U.S. gross domestic product (GDP).

[37] Percentage decline based on the total employment figures for air transportation in the U.S. in 2019 (NAICS code 481) and associated multiplier impacts, sourced from IMPLAN. The air transportation industry includes all passenger and cargo

- As in the case of the California impacts, Complete Augmentation results in larger economic impact losses, with a decrease of 125,650 total jobs (5.9% decline). GDP drops by $18.8 billion.
- As mentioned, the Intermediate Stops case results in the largest economic impacts of all the scenarios. Across the U.S., 262,700 total jobs (12.3% decline) and $39.4 billion in GDP are lost.
- National impacts are estimated for the closure of California crew bases based on the secondary employment impact due to fare elasticity results. If cost increases are passed on to consumers, results for national impacts are a loss of 3,420 total jobs and a GDP decline of $0.5 billion.

Table 22:
Economic Impact Results — 1) *Staggered Augmentation*
Passenger and Cargo Services, National Impacts

Impact	Employment	Labor Income ($ Bils)	Gross Domestic Product ($ Bils)	Output ($ Bils)	Federal Taxes ($ Bils)	% Reduction (Air Transport Related Employment)
Direct	-15,910	-$1.9	-$4.2	-$7.0	-$0.5	*-2.7%*
Indirect	-17,850	-$1.3	-$2.1	-$4.1	-$0.3	*-2.8%*
Induced	-25,170	-$1.5	-$2.6	-$4.6	-$0.3	*-2.8%*
Total	**-58,940**	**-$4.6**	**-$8.8**	**-$15.8**	**-$1.1**	***-2.8%***

Note: Totals may not sum due to rounding.

Table 23:
Economic Impact Results — 2) *Complete Augmentation*
Passenger and Cargo Services, National Impacts

Impact	Employment	Labor Income ($ Bils)	Gross Domestic Product ($ Bils)	Output ($ Bils)	Federal Taxes ($ Bils)	% Reduction (Air Transport Related Employment)
Direct	-33,930	-$4.0	-$8.9	-$15.0	-$1.0	*-5.9%*
Indirect	-38,060	-$2.7	-$4.4	-$8.7	-$0.6	*-5.9%*
Induced	-53,660	-$3.1	-$5.5	-$9.9	-$0.7	*-5.9%*
Total	**-125,650**	**-$9.8**	**-$18.8**	**-$33.6**	**-$2.3**	***-5.9%***

Note: Totals may not sum due to rounding.

airline operations in the state as well as activities not included in the MRB analysis such as helicopters, flight schools, aviation clubs, sightseeing, crop-dusting, air ambulances, specialized services, and other general aviation.

Table 24:
Economic Impact Results — 3) *Intermediate Stops*
Passenger and Cargo Services, National Impacts

Impact	Employment	Labor Income ($ Bils)	Gross Domestic Product ($ Bils)	Output ($ Bils)	Federal Taxes ($ Bils)	% Reduction (Air Transport Related Employment)
Direct	-70,930	-$8.3	-$18.6	-$31.4	-$2.1	*-12.3%*
Indirect	-79,570	-$5.7	-$9.2	-$18.2	-$1.2	*-12.3%*
Induced	-112,190	-$6.5	-$11.5	-$20.6	-$1.5	*-12.4%*
Total	**-262,700**	**-$20.5**	**-$39.4**	**-$70.2**	**-$4.8**	***-12.3%***

Note: Totals may not sum due to rounding.

Table 25:
Economic Impact Results — 4) *Crew Base Closure*
Passenger Services Only, National Impacts

Impact	Employment	Labor Income ($ Bils)	Gross Domestic Product ($ Bils)	Output ($ Bils)	Federal Taxes ($ Bils)	% Reduction (Air Transport Related Employment)
Direct	-920	-$0.1	-$0.2	-$0.4	-$0.03	*-0.2%*
Indirect	-1,040	-$0.1	-$0.1	-$0.2	-$0.02	*-0.2%*
Induced	-1,460	-$0.1	-$0.2	-$0.3	-$0.02	*-0.2%*
Total	**-3,420**	**-$0.3**	**-$0.5**	**-$0.9**	**-$0.06**	***-0.2%***

Note: Totals may not sum due to rounding.

5 Unintended Consequences

On the surface, applying MRB to airline crew would seem to be a positive development from an employment perspective, because it would provide additional break and rest periods to the air crew it covers, beyond rest provisions already contained in FAA regulations and airline / labor collective bargaining agreements. This analysis has shown the significant financial impact to airlines of adopting MRB to California-based air crew, so much so that impacted airlines will be compelled to reduce capacity and associated employment. As a result, the net employment effect is negative in all cases, which we describe in Section 5.1. There are also other significant unintended impacts that are likely to harm exactly the California-based airline crew who are the intended beneficiaries of the rule. We describe these impacts in the remaining sections below.

5.1 Net Loss of Airline (Direct) Employment

As discussed, additional flight crew (pilots and flight attendants) would be required to cover meal and rest breaks under the MRB requirement. This results in increased employment of California-based crew on some flights. At the same time, route reductions and cancellations reduce overall employment numbers of both flight crew and ground/support crew.

Tables 26 and 27 provide a summary of the augmented crew numbers, as well as the reduced employment, under the Staggered Augmentation and Complete Augmentation scenarios in California, while Tables 28 and 29 provide a summary of the employment impacts nationwide. In all scenarios, the projected route reductions and cancellations decrease overall employment numbers in the airline industry, more than offsetting the employment gains on remaining routes with augmented crew numbers. Complete Augmentation results in more air service reductions and cancellations, and thus larger job losses, than Staggered Augmentation.

For non-flight crew such as ticket and sales agents, passenger and cargo handling staff, mechanics and maintenance employees, flight kitchen staff, and headquarters employees, the impact of applying California MRB to flight crew is almost strictly negative. A reduction in an airline's flights and seat capacity offered results directly in less need for the entire range of non-flight crew employees, and hence job losses. There is no material positive offset, since MRB already applies to these employees today if they are California-based.[38]

[38] Note: MRB is less disruptive to airline costs and operations for airline employee groups other than flight crew, because of the greater operational flexibility and workforce pool typically available in their work environments to enable an individual employee to leave to break and then return to work, and to source relief employees during break periods.

Table 26:
Augmented Crew & Reduced Direct Employment — 1) *Staggered Augmentation*
Passenger and Cargo Services, California Impacts

	Additional Jobs	Lost Jobs	Net Jobs
Pilots	2,120	-1,990	130
Flight Attendants	2,040	-2,470	-430
Ground/Support		-4,920	-4,920
Total	**4,160**	**-9,380**	**-5,220**

Note: Totals may not sum due to rounding.

Table 27:
Augmented Crew & Reduced Direct Employment — 2) *Complete Augmentation*
Passenger and Cargo Services, California Impacts

	Additional Jobs	Lost Jobs	Net Jobs
Pilots	2,610	-4,780	-2,170
Flight Attendants	4,810	-8,060	-3,260
Ground/Support		-14,020	-14,020
Total	**7,420**	**-26,860**	**-19,440**

Note: Totals may not sum due to rounding.

Table 28:
Augmented Crew & Reduced Direct Employment — 1) *Staggered Augmentation*
Passenger and Cargo Services, National Impacts

	Additional Jobs	Lost Jobs	Net Jobs
Pilots	2,130	-4,600	-2,470
Flight Attendants	1,370	-4,090	-2,720
Ground/Support		-10,730	-10,730
Total	**3,500**	**-19,420**	**-15,910**

Note: Totals may not sum due to rounding.

Table 29:
Augmented Crew & Reduced Direct Employment — 2) *Complete Augmentation*
Passenger and Cargo Services, National Impacts

	Additional Jobs	Lost Jobs	Net Jobs
Pilots	2,450	-8,260	-5,810
Flight Attendants	3,030	-8,870	-5,840
Ground/Support		-22,280	-22,280
Total	**5,480**	**-39,410**	**-33,930**

Note: Totals may not sum due to rounding.

5.2 Other Unintended Labor Consequences

5.2.1 Possible Closure of California Crew Bases

Faced with a new requirement to apply MRB to flight crew, airlines will likely consider the Scenario 4 alternative of closing California crew bases, since base closures may achieve compliance at a materially lower cost than augmentation and turn time delay. Even if airlines were to absorb the entire financial burden of the one-time and ongoing costs of California crew base closure, and overall airline schedules and employment levels were flat on a national level, there would be significant negative impacts on flight crews stationed at a California crew base who also live in California.

Flight crew often live in a community nearby their airport crew base since this minimizes their time away from home for work duty trips. However, airlines typically do not impose a requirement that employees live in the same metropolitan region as their airport crew base. Some individuals choose to live in another city and/or another state, and commute at their expense and risk to/from their home to the airport crew base, typically as standby employee passengers before and after their duty trips. If California crew bases were closed, California-based flight crew would then face the choice of moving their home from California to another crew base located outside California—with potentially significant personal, family, financial, and quality of life implications—or stay in California and commute to/from their new crew base located outside the state.

For those employees who chose to stay in California after a crew base closure, commuting to/from flights is less time-efficient from an employee perspective. The time spent commuting to and from flights in California is uncompensated lost personal time, and the time required away from home to earn duty pay hours increases. As an example, consider a captain who lives in Los Angeles, works for American Airlines, and is based at LAX. On a sample duty day, her same-day return duty trip might be as follows:

Day 1 Drive to LAX early morning
Day 1 Pilot on morning LAX-DFW-LAX flight (total 6:30 flight hours)
Day 1 Return home in evening

If American's LAX crew base closes because of MRB and she still chooses to live in Los Angeles, her time investment required to fly the same LAX-DFW-LAX rotation may become considerably more complex. Suppose she chooses to be based in PHX, which is American's nearest crew base outside California. Under MRB and to maintain the position of being based outside California, the pilot might be required to physically originate and terminate duty trips at the crew base outside California. If this were to occur, flying the same LAX-DFW-LAX trip could become considerably more complex:

Day 1 Drive to LAX in afternoon
Day 1 personal commute travel LAX-PHX
Day 1 deadhead trip PHX-LAX, rest overnight in LAX
Day 2 Pilot on morning LAX-DFW-LAX flight (total 6:30 flight hours)
Day 2 deadhead trip LAX-PHX to complete the trip
Day 2 (or 3) personal commute travel PHX-LAX
Day 2 (or 3) Return home

Thus, this captain's current simple one-day LAX-DFW-LAX trip would become at least 1.5 days long and involve six flight segments instead of two. This change would be a material decline in flight crew quality of life.

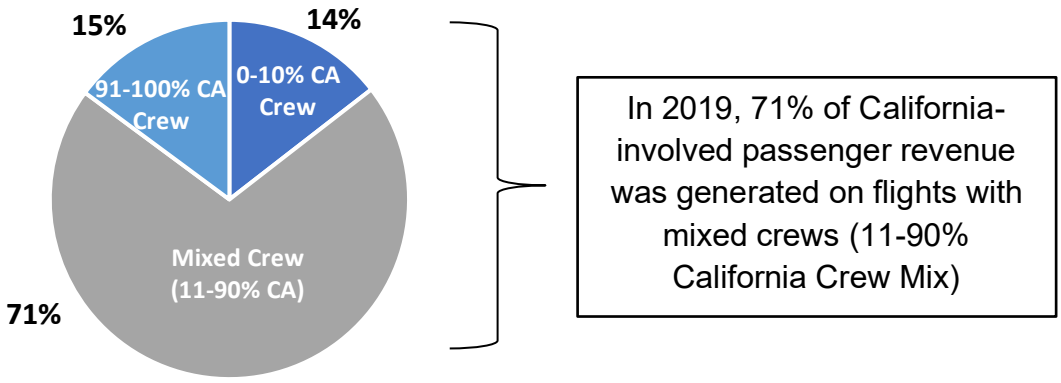
5.2.2 Smaller Bases and Fewer, Less Attractive Flight Choices for California-Based Crews

Today, each U.S. airline has one set of uniform regulations on crew scheduling and rest requirements applicable to the flight crews across its network. These regulations consist of elements prescribed by FAA or airline management plus elements negotiated in airline/labor collective bargaining agreements. If an airline decided to retain its California crew bases after MRB, airline flight crew labor rules would be fractured as California-based flight crews would be subject to an additional set of regulations that are applicable only to them. This fracturing of airline labor rules poses complex operational issues for carriers, since basic scheduling issues such as the total crew complements for each flight and ground time between successive flights depend on whether California crew are present or not. From an operational integrity and schedule planning perspective, each airline maintaining California crew bases would be forced to separate its currently unified network into two divisions, one composed of flights and crew based in California and the other of flights and crew based in all non-California crew bases. This creates an operational inflexibility for the carriers that results in increased cost and almost-certain passenger inconvenience. For example, a California captain might no longer be able to serve as a relief crew for a non-California captain who called in sick, thus increasing the likelihood of flight cancellation if no suitable relief captain may be found.

For flight crews, separate California and non-California-based crew pools would reduce their choice set of flights to work through the periodic open crew bid process. Many large carriers today permit their flight crews to bid freely and crew any flight in the system regardless of base, but in future this choice set would likely be restricted, particularly for California-based flight crews. To reduce MRB cost exposure, airlines would have a strong incentive to reserve flights with the highest proportionate cost exposure to MRB—especially long-haul domestic and international operations under Complete Augmentation or the shortest flights under Staggered Augmentation—for non-California-based crews. Elimination of crew bidding options for certain employees would be negative for flight crew, especially if attractive flights like long-haul international flying were removed from eligibility to manage MRB cost exposure.

Furthermore, even if California crew bases were maintained despite MRB, there is a strong risk to California-based flight crew that routes would switch over time to non-California-based crews. Each of the U.S. carriers operating crew bases in California have most of their total flight crew located in bases outside California. On an individual market level, even for flights that involve California (to/from/within the State), most flights have a mix of California and non-California-based crews. Figure 30 shows that 71% of all passenger revenue involving California was on flights staffed with a diverse mix of crew bases, ranging from 11% to 90% California based crew mix. Airlines cannot build a flight schedule for sale to the public and cannot offer the schedule to its flight crew under the crew bid process without knowing in advance the operating parameters that will apply to each flight. MRB rules impact both the flight schedule (due to extended ground time on certain flights) and the required crew complements (due to augmentation on other flights). Airlines will therefore likely be compelled to eliminate most or all of the 71% of “mixed” flights to achieve certainty on flight schedules and crew complements. Since MRB imposes higher labor costs, there will be a clear economic incentive to shift as many flights as possible to non-California crew bases, to the further detriment of California-based flight crews’ future trip bidding and employment possibilities.

Figure 30:
California Crew Mix % for California Involved Flights (Revenue Weighted)



Finally, the flight options that remain available to California flight crew post-MRB would be less attractive for most flight crew, since the duty day would be lengthened to accommodate mandatory MRB breaks on shorter duty time flights without a commensurate pay increase. After completion of a flight with less than a four-hour duty time, the aircraft and crew ground time for most flights would be required to accommodate either a paid ten-minute rest break, an unpaid thirty-minute meal break, or both. Cost efficiency requires airlines to minimize ground time of aircraft and crew, so few ground turn times are currently long enough to accommodate these breaks without extending the total ground turn time. For most U.S. airlines, flight crew compensation is based primarily on block time flown, with low or no compensation for turn time between flights on the same duty day. Therefore, the insertion of unpaid meal breaks to comply with MRB simply elongates the flight crew duty day, without an increase in compensation. Even the paid short rest breaks result in less than proportionate flight crew compensation increases when the insertion of the rest break causes minimum deplaning and passenger boarding time buffers to apply.

Table 31 demonstrates this impact, using the example of a hypothetical SkyWest LAX-based flight attendant one day crew routing, based on July 2019 schedules. Before MRB, the flight attendant could complete one round-trip to Colorado Springs (COS) and one to Monterrey, California (MRY) in one day, with a total duty time of 10:39 and paid time of 7:44. MRB compliance requires a meal and rest break after arriving in COS, a rest break in LAX upon return from COS, and a meal and rest break after arriving in MRY. The flight attendant's duty day would then increase to 12:29 but paid time would increase only to 8:14. Therefore, MRB compliance would result in an almost two-hour (1:50) increase in the duty day and away-from-home time while increasing paid time by only half an hour. Few flight attendants would consider this a net positive development. Since MRB imposes breaks through the law rather than a CBA work rule, this unfavorable change could not be waived in negotiations between labor representatives and management.

Table 31:
Pre/Post-MRB duty-day extension example (SkyWest LAX-based flight attendants, July 2019)[39]

Pre-MRB SkyWest Example Crew Routing			
Origin	**Time**	**Destination**	**Time**
Crew check-in time: 7:25a			
LAX	8:10a	COS	11:35a
COS	12:16p	LAX	1:49p
LAX	2:30p	MRY	3:47p
MRY	4:20p	LAX	5:49p
Crew off-duty time: 6:04p			
Total duty time: 10:39			
Total paid time: 7:44			

Post-MRB SkyWest Example Crew Routing			
Origin	**Time**	**Destination**	**Time**
Crew check-in time: 7:25a			
LAX	8:10a	COS	11:35a
Meal+Break	11:50a		12:30p
COS	1:00p	LAX	2:33p
Break	2:48p		2:58p
LAX	3:28p	MRY	4:45p
Meal+Break	5:00p		5:40p
MRY	6:10p	LAX	7:39p
Crew off- duty time: 7:54p			
Total duty time: 12:29 (+1:50)			
Total paid time: 8:14 (+0:30)			

5.3 Shift of Air Service and Employment Outside California

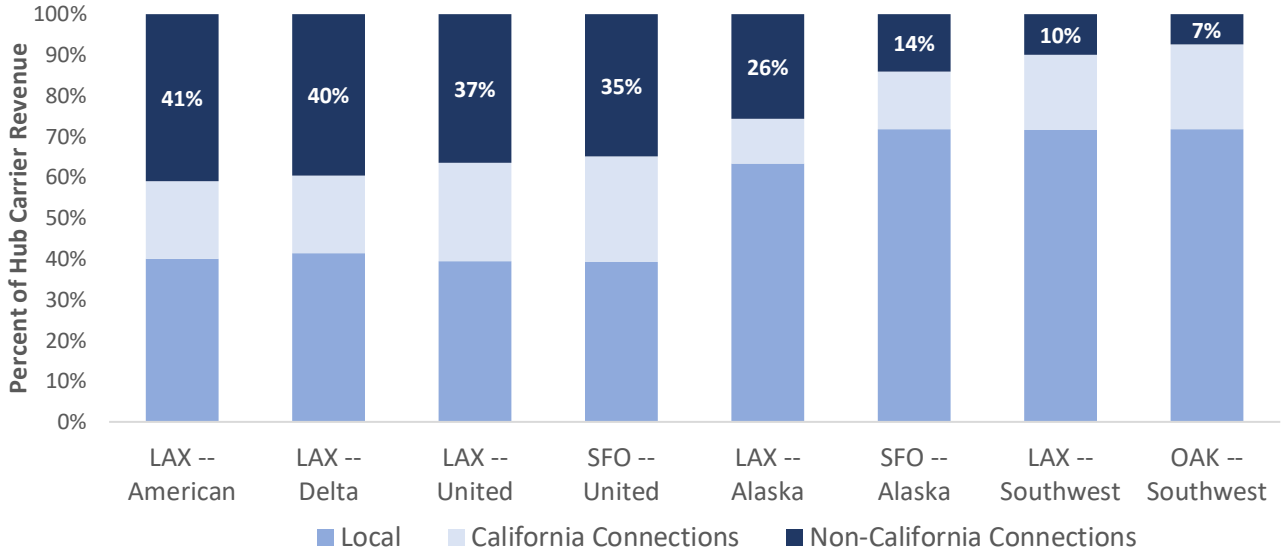
Even if an airline decided to retain its California crew bases after MRB, any new operations flown by California-based crew would face a higher hurdle to profitability, since operating costs would be higher due to augmentation, intermediate stops, and/or extended turn time requirements of MRB. Therefore, airlines would be less likely to consider new or additional service in markets to/from or within California, and especially less likely to expand operations to/from a California crew base, since these markets are much more likely to be operated by California-based crew. The long-term network implications of this shift for California hubs are profound, especially as each of the airlines with crew bases in California operate most of their capacity outside California and, therefore, have the network breadth to reallocate growth to other regions. For example, the global network airlines like United, American, and Delta might pivot some long-haul transpacific flying away from California over time and toward alternative hubs (e.g., Denver for United, Phoenix and Dallas for American, and Seattle and Salt Lake City for Delta). Low-cost carriers like Southwest may allocate Western U.S. growth away from Oakland and Los Angeles in favor of Phoenix, Las Vegas, and Denver.

Figure 32 illustrates this risk to California hubs and California-based flight crews over time. Four of California's largest hubs each have over 35% of their total revenue coming from passengers who are merely transiting California (i.e., neither their true origin nor true destination lies in California). These flows are particularly at risk of reallocation by airlines to other hubs as airlines recalibrate their schedules to decrease exposure to MRB costs. For example, the three largest non-California connecting O&Ds that currently flow via American's LAX hub are DFW-LAX-HNL, ORD-LAX-HNL, and LAS-LAX-HNL. After California MRB, American could just as easily flow each of these O&Ds via its Phoenix hub as part of an MRB cost-driven reallocation of growth in the Western U.S. away from Los Angeles. This accentuates the risk to the sustainability of California hubs, as

[39] Hypothetical routing created from July 2019 SkyWest schedule (operated for United). Assumes only block time and rest break are paid. Assumes 0:45 pre-flight check-in time and when continuous crew presence on the aircraft is broken, 0:15 post-flight deplaning time plus 0:30 boarding time.

described in Section 3 above, and the diminution in flight bid opportunities for California-based flight crews over time.

Figure 32:
Hub Carrier Revenue Mix by Flow at Each California Hub[40]



5.4 Distortion of U.S. International Airline Competition to Favor Foreign Airlines

Section 3 above describes the distortion of the competitive market that likely results from the application of MRB to California-based flight crews. We assume that the geographic scope of the applicability of MRB is not limited to intra-U.S. flying, rather we assume any U.S. carrier operating international flights with California-based crews would also be subject to MRB. In contrast, few if any foreign airlines have California crew bases, so their nonstop flights to/from California which compete directly with U.S. carriers would not be subject to the rule. Thus, foreign carriers would secure a relative cost advantage and would benefit from a shift of passenger demand to their flights. This is true regardless of how U.S. carriers respond to MRB higher costs:

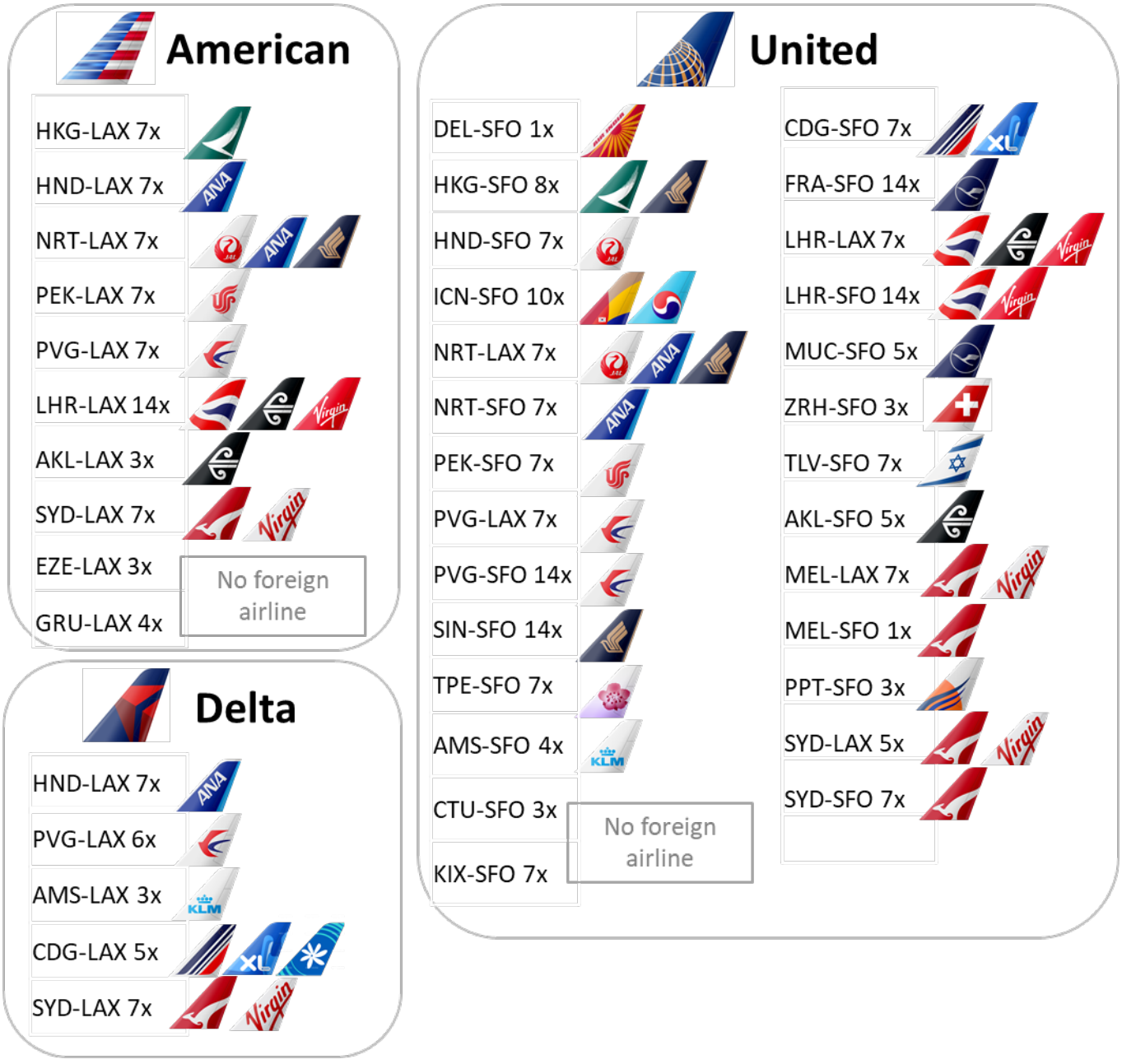
- U.S. airlines absorb the MRB cost increase, resulting in less agile and competitive carriers that may need to find other mechanisms to reduce cost, risking customer loyalty (e.g., reduce service standard, reduce crew complement to FAA minimums)
- U.S. airlines attempt to increase prices to cover MRB cost increase; if not matched, then suffer share loss versus foreign carriers
- U.S. airlines reduce or cease operations (i.e., in the case of Complete Augmentation)
- U.S. airlines introduce intermediate stops, becoming schedule-uncompetitive versus foreign carriers

[40] Based on FY2019 DOT DB1B Survey analysis

Figure 33 shows the nonstop long-haul international routes operated to/from California by each U.S. passenger carrier in 2019, including American, Delta, and United. It is striking that of the 42 nonstop long-haul international markets service by U.S. carriers, one or more foreign airlines offered direct overlapping nonstop service in 38 of these markets, representing 95% of total U.S. carrier nonstop international revenue to/from California. Only four markets did not have nonstop foreign airlines present in 2019. Thus, the likely competitive distortion that will occur with California MRB is high, since none of the foreign airlines would be subject to this regulation, and each is likely to benefit from a shift in demand in their favor as U.S. carriers struggle to respond to MRB.

In some of these markets, the foreign airline is a joint venture / antitrust-immunized partner of the U.S. airline. In such cases, the foreign airline may not be a strict "competitor" in that the joint venture carriers may set prices and share revenue and/or costs together. However, the presence of a foreign joint venture partner does not reduce the risk of the U.S. carrier being unable to continue to operate in MRB-impacted nonstop overlap markets. Since U.S. carrier costs will be increased to often uncompetitive levels, MRB ensures an ongoing financial and negotiations struggle for U.S. carriers to maintain a strong share of overall capacity within their joint ventures under less-than-market competitive cost structures. U.S. airline labor groups therefore face the risk of reduced U.S. carrier nonstop service under MRB and therefore fewer employment opportunities, both in markets where the foreign carrier/s are joint venture partners, and in markets where the foreign carrier/s are non-antitrust immune competitors.

Figure 33:
Foreign-Carrier Nonstop Overlap with U.S. Carrier Long-Haul California International Routes (2019)



5.5 Distortion of U.S. Domestic Airline Competitive Landscape

The application of MRB to California-based flight crews would cause significant distortion in the domestic U.S. passenger aviation market. The financial toll imposed by MRB does not apply equally to all U.S. passenger carriers according to a capacity or revenue metric. At a micro market-specific level, the cost of MRB depends

on how much each carrier utilizes California crew on that route. At the macro national level, the incidence of MRB cost is closely correlated to each carrier's California-based share of total flight crew. This in turn is related to the degree of network exposure a carrier has to California, relative to its overall network size. The application of MRB to flight crew will distort and substantially reduce the competitive environment in individual markets, and as well impose differential harm at the national level.

Table 34 illustrates the route level distortion of competition due to California MRB on the New York JFK–SFO route. There were four nonstop participants in 2019, which vary in their utilization of California-based flight crew. Alaska has the highest exposure to California crews with half of its pilots and 95% of its flight attendants based in California. American is next highest, followed by Delta, and finally JetBlue with zero exposure to California pilots or flight attendants on this route. These crew mixes are as expected because in San Francisco, Alaska has a large pilot and flight attendant crew base, American and Delta have only flight attendant bases, and JetBlue does not have a crew base. While each carrier is estimated to be profitable on the JFK-SFO route before MRB, applying MRB to this route negatively impacts Alaska, American, and Delta, while having no impact on JetBlue. Alaska is predicted to exit JFK-SFO as it becomes unprofitable due its high relative exposure to California crews. American is predicted to reduce service, with no predicted change to Delta and JetBlue service. MRB therefore distorts and reduces competition by conferring a significant competitive advantage to JetBlue and disadvantaging all others, in particular Alaska, which may be forced to exit this market.

Table 34:
California MRB Impact in New York JFK-SFO Market on Each Nonstop Carrier (Complete Augmentation)

New York JFK–San Francisco Nonstop Market				
Airline				
California Pilots / Flight Attendants Mix %	52% / 95%	12% / 51%	9% / 59%	0% / 0%
Seats / Day	1,350	900	2,300	1,800
Block Time (Hours)	6.2	6.2	6.2	6.2
Crew Duty Time (Hours)	7.3	7.4	7.4	7.2
Pre-MRB Model Estimated Profit Margin	Positive	Positive	Positive	Positive
Post-MRB Model Estimated Profit Margin	Negative	Positive	Positive	Positive
Change Profit Margin	Down > 10%	Down > 5%	Down > 5%	No Impact
Model Prediction	**Cancel**	**Reduce**	No Change	No Change

In some affected markets, MRB also distorts competition by substantially eliminating nonstop competition. Table 35 shows the example of Los Angeles–Sacramento, which currently has four nonstop competitors and is too short to face augmentation or intermediate stops but does incur extended turn times. Because of generally lower pre-MRB estimated profitability and an elevated California flight crew mix most of the four competitors, the model predicts that all carriers will cease nonstop service in this market after MRB. While it is qualitatively likely that at least one carrier will remain in the market, Los Angeles–Sacramento is likely to have much fewer seats, fewer nonstop competitors, and higher prices post-MRB.

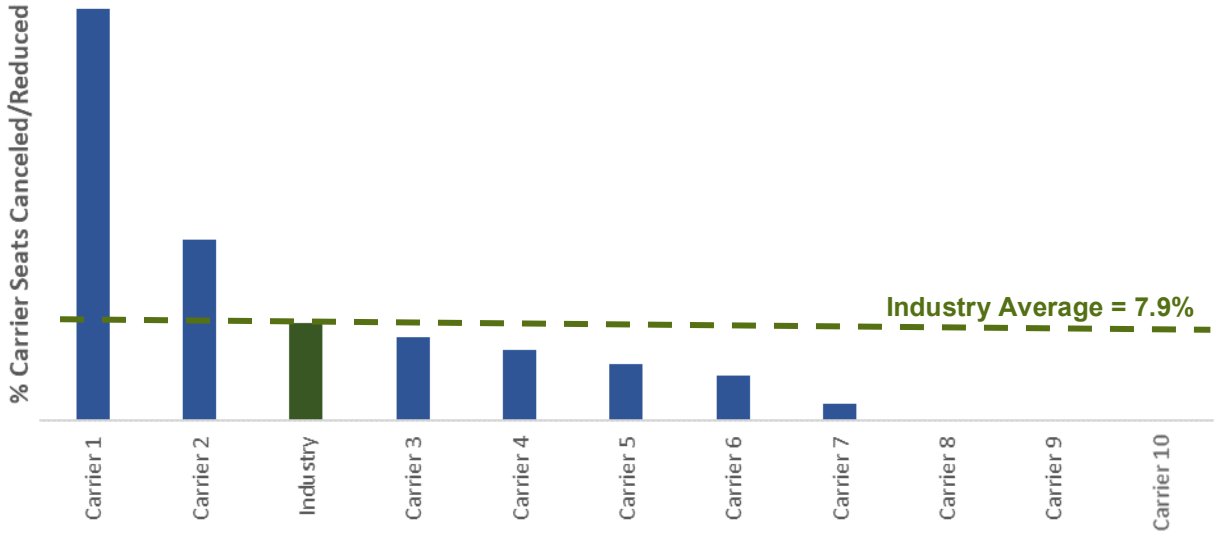
Table 35:
Impact of California MRB in Los Angeles–Sacramento Market on Each Nonstop Carrier (Extended Turn Time Impact)

Los Angeles–Sacramento Nonstop Market				
Airline				
California Pilots / Flight Attendants Mix %	28% / 30%	88% / 91%	78% / 77%	92% / 95%
Seats / Day	2,300	820	350	600
Block Time (Hours)	1.5	1.5	1.7	1.6
Crew Duty Time (Hours)	2.4	2.7	2.8	2.7
Pre-MRB Model Estimated Profit Margin	Breakeven	Negative	Breakeven	Positive
Post-MRB Model Estimated Profit Margin	Negative	Negative	Negative	Negative
Change Profit Margin	Down > 10%	Down > 10%	Down > 10%	Down > 10%
Model Prediction	**Cancel**	**Cancel**	**Cancel**	**Cancel**
Qualitative Prediction	Reduce to one airline with fewer seats, higher prices			

Figure 36 illustrates the distortion of competition on a national level, by ranking U.S. passenger carriers based on the predicted percentage of total seats by carrier which are likely to be canceled or reduced due to California MRB, under the Complete Augmentation scenario. Carrier identities and absolute cancellation/reduction rates have been masked to preserve confidentiality. Relative to the industry average cancellation rate, California MRB materially harms two U.S. carriers with substantially higher likely percentage reductions to their networks. Moderate harm would be imposed on four passenger carriers which are slightly below the industry average impact, while four carriers incur low or no impact at all because they do not maintain California crew bases. This large variation in impact by carrier illustrates well the risk to the nation's transportation network of introducing an inconsistent patchwork of labor regulations that varies by state.

Carriers would be harmed or passed over by virtue of the historical evolution of their geographic focus within the national network and their crew base locations, and each carrier's network would be hollowed out accordingly (or not).

Figure 36:
Percentage of Total Seats Canceled/Reduced Due to MRB by Anonymized U.S. Carrier (Complete Augmentation)



5.6 Other Unintended Consequences

There are additional material impacts from reduced air services due to MRB, including:

- Loss of flight enabled tourism and business activity revenue. Fewer flights due to MRB naturally reduces the total airline seat supply to/from affected airports. For most airline passengers, time efficient modal substitutes are rarely available. Intercity high speed rail transportation does not currently exist in California, and car/bus transportation is significantly less time efficient than air travel. Therefore, a reduction in airline seat supply into a region's airport/s is likely to lead to fewer total inbound tourist arrivals into the affected region. The economic activity spurred by inbound tourism (e.g., hotels, restaurants, catering, tourism attractions, sports arenas, convention facilities) will also decline. Business opportunities and trade may also decline absent nonstop flight connections. These impacts are not estimated in this analysis.

- Lost airport revenue and economic activity. Fewer flights due to MRB will negatively impact the level of passengers and flight operations handled by affected airports. Airport revenue will then decline, since most of the sources of airport revenue (e.g., landing fees, rents/charges from airlines and concessionaires, car rental and ground transportation activity, parking) are all tied to the level of airport flight activity. The impact on airport revenue and activity is not separately enumerated but is a significant component of our estimated indirect economic impacts.

Appendix A — 2:30 Duty Hours Results

Discussion on Figure A-1 (2:30 Duty Hour Limit)

Changing the maximum duty hours until rest from 4:00 to 2:30 will increase the cost of most augmentation scenarios, since the requirement for augmentation occurs earlier and the number of total augmentations required increases for longer trips. As shown in Figure A-1 below, the cost of Complete Augmentation jumps to $9.9 billion per year (Scenario 2), and the cost of operating Tech Stops increases by as much as $5.2 billion (Scenario 3). However, for flights between 2:30 and 4:00 of duty time, the MRB compliance method shifts to crew augmentation from extended ground time. We estimate that staggered crew augmentation is less expensive than extended ground times, since only one pilot and flight attendant are required, relative to the increased crewing time for all pilots and flight attendants and the aircraft operating expense of extending ground times. Therefore, the substitution of additional crew augmentation for flights between 2:30 and 4:00 of duty time decreases the total cost of Scenario 1 to $2.1 billion. There is no change to the cost of closing California crew bases.

Figure A-1:
U.S. Passenger + Cargo Carriers MRB Impacts by Adaptation Scenario (2:30 Duty Hours)

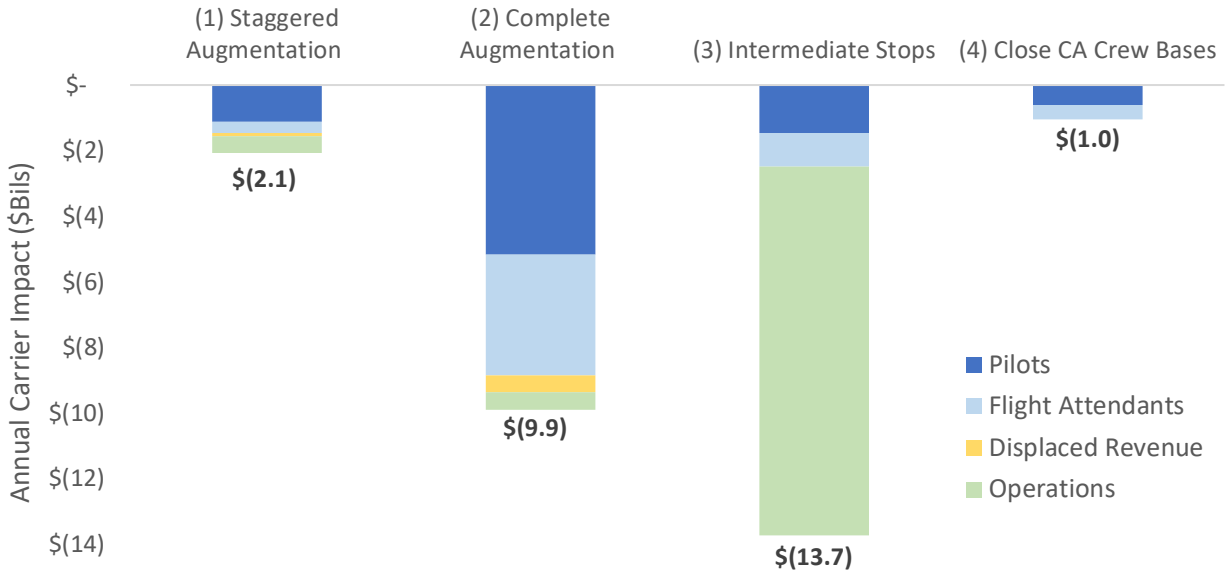


Table A-2:
Passenger Flight Cancellation Impacts by MRB Adaptation Scenario

Scenario	2:30 Duty Hours			
	Mkt Rev $Bils	% Mkt Rev	Mkt Seats/Day	% Mkt Seats
(1) Staggered Augmentation	$2.4	2%	67K	3%
(2) Complete Augmentation	$23.2	13%	264K	9%
(3) Intermediate Stops	$47.2	25%	625K	20%

Table A-3:
Summary Economic Impacts for California — Including Multiplier Impacts (2:30 Duty Hours)

Scenario	Jobs	Value Added ($ Bils)	State & Local Taxes ($ Bils)	% Reduction[41] (Air Transport Related Employment)
(1) Staggered Augmentation	-4,280	-$0.8	-$0.1	-2.4%
(2) Compete Augmentation	-54,200	-$10.1	-$1.7	-29.9%
(3) Intermediate Stops	-106,470	-$19.9	-$3.3	-58.8%

Table A-4:
Summary Economic Impacts for the U.S. — Including Multiplier Impacts (2:30 Duty Hours)

Scenario	Jobs	Value Added ($ Bils)	Federal Taxes ($ Bils)	% Reduction (Air Transport Related Employment)
(1) Staggered Augmentation	-46,760	-$7.0	-$0.8	-2.2%
(2) Compete Augmentation	-142,500	-$21.4	-$2.6	-6.7%
(3) Intermediate Stops	-374,090	-$56.1	-$6.8	-17.6%

[41] Percentage decline based on the total employment figures for air transportation in California in 2019 (NAICS code 481) and associated multiplier impacts, sourced from IMPLAN. The air transportation industry includes all passenger and cargo airline operations in the state as well as activities not included in the MRB analysis such as helicopters, flight schools, aviation clubs, sightseeing, crop-dusting, air ambulances, specialized services, and other general aviation.

Table A-5:
Lost U.S. Carrier Market[42] Revenue and Seats Due to Capacity Reduction and Cancellations

Impact	2:30 Duty Hours			
	Mkt Rev $Bils	% Mkt Rev	Mkt Seats/Day	% Mkt Seats
Scenario 1 (Staggered Augmentation)				
Reduce Capacity	$1.0	1%	18K	1%
Cancel Market	$1.3	1%	49K	2%
Total Lost	$2.4	2%	67K	3%
Scenario 2 (Complete Augmentation)				
Reduce Capacity	$1.7	1%	30K	1%
Cancel Market	$21.5	12%	234K	8%
Total Lost	$23.2	13%	264K	9%
Scenario 3 (Intermediate Stops)				
Reduce Capacity	$4.3	2%	70K	2%
Cancel Market	$42.9	23%	555K	18%
Total Lost	$47.2	25%	625K	20%

Table A-6:
Lost California Market[43] Revenue and Seats Due to Capacity Reduction and Cancellations

Scenario	2:30 Duty Hours			
	CA Rev $Bils	% CA Rev	CA Seats/Day	% CA Seats
(1) Staggered Augmentation	$2.0	5%	55K	9%
(2) Complete Augmentation	$21.2	51%	238K	39%
(3) Intermediate Stops	$32.3	77%	400K	65%

[42] Includes all flights operated globally by principal Part 121 U.S. operators and their capacity-owned commuter affiliate operations. U.S. Market Revenue is the passenger revenue set captured by U.S. DOT Data Bank 1B, which is a 10% sample of all issued tickets that are operated and/or marketed by most U.S. passenger carriers. Does not include foreign carrier operations.

[43] Includes all flights operated to/from/within California by principal Part 121 U.S. operators and their capacity owned commuter affiliate operations. Does not include foreign carrier operations.

Figure A-7:
California Flights Canceled by Flight Block Hours (Revenue Weighted)

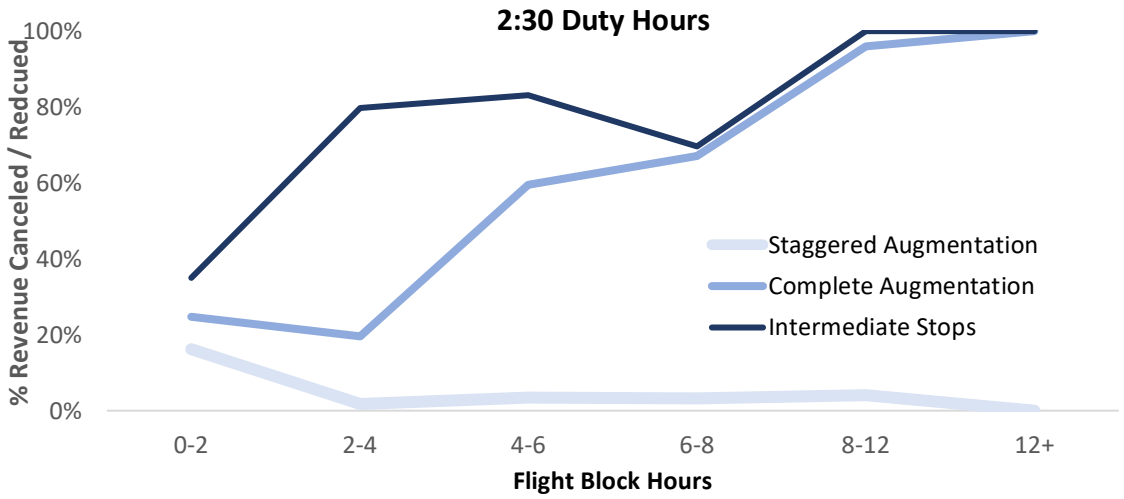


Figure A-8:
California Flights Canceled by Worldwide Region (Revenue Weighted)

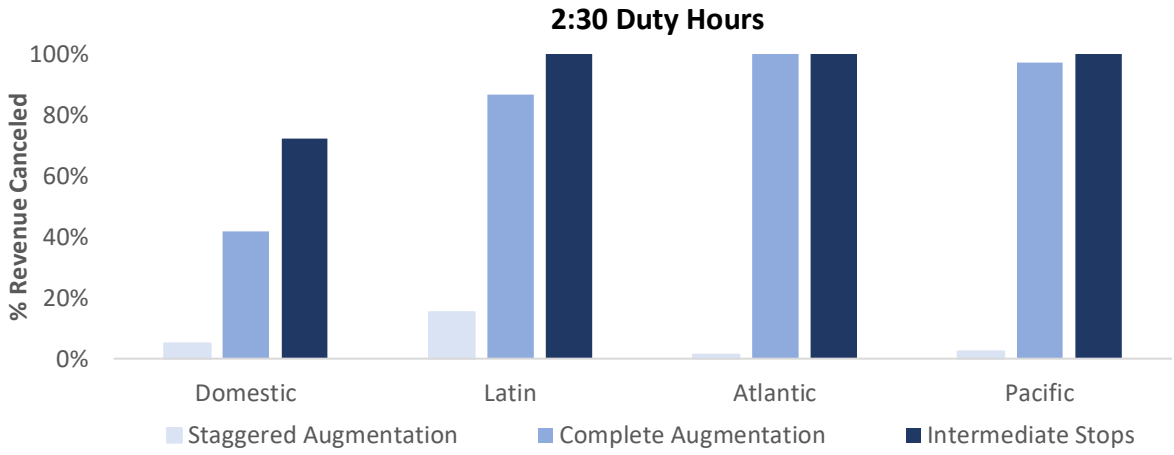


Table A-9:
Cargo Carriers MRB Impacts by Case, $Mils

Scenario	2:30 Duty Hours	
	Flight Ops Cost Change	% Change Flight Ops Costs
(1) Staggered Augmentation	$64M	0.7%
(2) Complete Augmentation	$251M	2.8%
(3) Intermediate Stops	$346M	3.9%

Table A-10:
Lost U.S. Carrier Cargo Revenue Ton Miles Due to MRB

Impact	2:30 Duty Hours	
	Revenue Ton Miles, Mils	% System RTM
Scenario 1 (Staggered Augmentation)		
Reduce Capacity	19	0.1%
Cancel Market	0	0.0%
Total Lost	19	0.1%
Scenario 2 (Complete Augmentation)		
Reduce Capacity	94	0.4%
Cancel Market	1,184	5.6%
Total Lost	1,278	6.0%
Scenario 3 (Intermediate Stops)		
Reduce Capacity	398	1.9%
Cancel Market	1,651	7.8%
Total Lost	2,049	9.6%

Table A-11:
Economic Impact Results — 1) *Staggered Augmentation: 2:30 Duty Hours*
Passenger and Cargo Services, California Impacts

Impact	Employment	Labor Income ($ Bils)	Value Added ($ Bils)	Output ($ Bils)	State & Local Taxes ($ Bils)	% Reduction (Air Transport Related Employment)
Direct	-1,580	-$0.2	-$0.5	-$0.8	-$0.1	*-2.4%*
Indirect	-1,370	-$0.1	-$0.2	-$0.3	-$0.0	*-2.4%*
Induced	-1,330	-$0.1	-$0.2	-$0.3	-$0.0	*-2.4%*
Total	**-4,280**	**-$0.4**	**-$0.8**	**-$1.3**	**-$0.1**	***-2.4%***

Note: Totals may not sum due to rounding.

Table A-12:
Economic Impact Results — 2) *Complete Augmentation: 2:30 Duty Hours*
Passenger and Cargo Services, California Impacts

Impact	Employment	Labor Income ($ Bils)	Value Added ($ Bils)	Output ($ Bils)	State & Local Taxes ($ Bils)	% Reduction (Air Transport Related Employment)
Direct	-20,000	-$2.4	-$6.1	-$9.7	-$1.2	*-29.8%*
Indirect	-17,350	-$1.3	-$2.1	-$4.0	-$0.3	*-29.9%*
Induced	-16,850	-$1.1	-$2.0	-$3.2	-$0.2	*-30.1%*
Total	**-54,200**	**-$4.7**	**-$10.1**	**-$16.9**	**-$1.7**	***-29.9%***

Note: Totals may not sum due to rounding.

Table A-13:
Economic Impact Results — 3) *Added Intermediate Stops: 2:30 Duty Hours*
Passenger and Cargo Services, California Impacts

Impact	Employment	Labor Income ($ Bils)	Value Added ($ Bils)	Output ($ Bils)	State & Local Taxes ($ Bils)	% Reduction (Air Transport Related Employment)
Direct	-39,290	-$4.7	-$11.9	-$19.0	-$2.4	*-58.6%*
Indirect	-34,080	-$2.5	-$4.1	-$7.9	-$0.5	*-58.7%*
Induced	-33,100	-$2.1	-$3.9	-$6.3	-$0.4	*-59.2%*
Total	**-106,470**	**-$9.3**	**-$19.9**	**-$33.1**	**-$3.3**	***-58.8%***

Note: Totals may not sum due to rounding.

Table A-14:
Economic Impact Results — 1) *Staggered Augmentation: 2:30 Duty Hours*
Passenger and Cargo Services, National Impacts

Impact	Employment	Labor Income ($ Bils)	Value Added ($ Bils)	Output ($ Bils)	Federal Taxes ($ Bils)	% Reduction (Air Transport Related Employment)
Direct	-12,620	-$1.5	-$3.3	-$5.6	-$0.4	*-2.2%*
Indirect	-14,160	-$1.0	-$1.6	-$3.2	-$0.2	*-2.2%*
Induced	-19,970	-$1.2	-$2.1	-$3.7	-$0.3	*-2.2%*
Total	**-46,760**	**-$3.6**	**-$7.0**	**-$12.5**	**-$0.8**	***-2.2%***

Note: Totals may not sum due to rounding.

Table A-15:
Economic Impact Results — 2) *Complete Augmentation: 2:30 Duty Hours*
Passenger and Cargo Services, National Impacts

Impact	Employment	Labor Income ($ Bils)	Value Added ($ Bils)	Output ($ Bils)	Federal Taxes ($ Bils)	% Reduction (Air Transport Related Employment)
Direct	-38,480	-$4.5	-$10.1	-$17.0	-$1.1	*-6.7%*
Indirect	-43,160	-$3.1	-$5.0	-$9.9	-$0.7	*-6.7%*
Induced	-60,860	-$3.5	-$6.3	-$11.2	-$0.8	*-6.7%*
Total	**-142,500**	**-$11.1**	**-$21.4**	**-$38.1**	**-$2.6**	***-6.7%***

Note: Totals may not sum due to rounding.

Table A-16:
Economic Impact Results — 3) *Added Intermediate Stops: 2:30 Duty Hours*
Passenger and Cargo Services, National Impacts

Impact	Employment	Labor Income ($ Bils)	Value Added ($ Bils)	Output ($ Bils)	Federal Taxes ($ Bils)	% Reduction (Air Transport Related Employment)
Direct	-101,010	-$11.8	-$26.5	-$44.7	-$3.0	*-17.5%*
Indirect	-113,310	-$8.1	-$13.1	-$25.9	-$1.7	*-17.5%*
Induced	-159,770	-$9.3	-$16.4	-$29.3	-$2.1	*-17.7%*
Total	**-374,090**	**-$29.1**	**-$56.1**	**-$100.0**	**-$6.8**	***-17.6%***

Note: Totals may not sum due to rounding.

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