(weakly) fare wars on routes that they serve. Conversely, the entry by smaller carriers, such as Southwest, Alaska, and AmericaWest, tends to encourage fare wars. These carriers often have lower costs, and fare wars are a tactic they can use to fend off larger carriers or to increase market share.

Another interesting result dealing with causation concerns the use of fare wars to encourage exit. Morrison and Winston find that fare wars have had only a small effect on the number of carriers in a market. Moreover, the time trend shows that the likelihood of a fare war has risen over time, all else constant. So the degree of collusive ability to either cause exit or to keep air fares at a high average level is not as strong as one might fear given the consolidation that has taken place during the past two decades in the airline industry. Instead, the lowering of equilibrium prices in the industry is continuing. Deregulation is working at the route level to lower prices even in the face of significant concentration of air carriers at the national level.

Finally, does the paper offer insight into the future pattern of airline fare wars? To firms, it appears that many of their efforts to maintain oligopoly behavior, free of fare wars, are at best only weakly successful and often are failures. An airline seat has too many of the features of a commodity product. The industry has too many diverse players with heterogeneous incentives. The hope that the industry will soon shake out seems to go unrealized. A major initiative by American Airlines to simplify industry pricing structures caused further fare wars rather than price structure matches. To policymakers, the authors are quite convincing that the particular nature of imperfect competition in this industry most likely involves continuing price wars. Overall, lower prices will not be evenly spread across all markets and will not occur in many markets across all periods of time. Thus, while the views of what constitutes imperfections in competition differ between policymakers and industry, both groups agree that competition is indeed imperfect and that fare wars will continue as a reflection of this imperfection. Both also agree that these imperfections are preferable to the imperfections imposed by rate and route regulation.

Comment by Dennis W. Carlton: This paper provides a significant contribution to our understanding of the forces responsible for airline fare wars. The paper relies on the contributions of oligopoly theory to
identify the important economic forces and, after estimating a probit model for predicting fare wars, calculates the reduction in industry profits from fare wars. The paper presents a thorough, careful, and thought-provoking analysis. In this comment I raise three issues. First, are there any structural features of the airline industry that make it peculiarly susceptible to unstable behavior such as fare wars? Second, are the empirical facts of the airline industry consistent with the oligopoly theories used? Third, is the counterfactual profit experiment informative beyond being a summary of the probit coefficients?

*Instability in the Airline Industry*

The paper treats fare wars as the result of a breakdown of a collusive price agreement in an oligopolistic industry. Without the oligopolistic structure, we should apparently expect reasonably stable price behavior. Although that may be the correct textbook prediction in many industries, I am not certain it is correct for all industries. That is, I am not certain that the common perception is correct that airline fare wars are an unusual phenomenon especially when compared with what are considered to be competitive industries. Often when one looks at these competitive industries, the amount of turbulence at the micro level is enormous. (Two examples are price studies that show a lot of large price changes in “stable times,” and entry studies that show large gross entry and exit rates for “stable” industries.) This turbulence raises the question whether the empirical phenomenon of price wars is particularly unique to airlines or whether it is a common one prevalent in both oligopolistic and nonoligopolistic market structures. Is figure 2 significantly different for the airline industry than for other industries? Knowing the answer to that question would help put the contribution of this paper in better perspective.

Some have argued that several industries, such as airlines, are plagued with instability. In these industries a core does not exist for structural reasons, and any price equilibrium breaks down. In these theories it is not the breakdown of collusion that causes fare wars, but rather the distinguishing structural features of these industries. Those features in the airline industry include uncertain demand, short-run fixed capacity, and the effect that both the level and the variance of demand have on a firm’s cost of operation. Both the level and variance
of demand can be affected by rivals, and demand on one route can be affected by supply and demand elsewhere in the network. All these features distinguish airlines from simple textbook models of either competitive or collusive industries. Some or all of these features also apply to other transport systems, such as railroads, less-than-truckload service, and ocean shipping, and to some nontransport systems. Several articles analyzing the instability in many of these industries have been published. It would help my understanding of this paper’s empirical results to know how these key underlying structural characteristics affect the observed fare wars. For example, how do airlines with more developed networks behave compared with those that rely on less feeder traffic? Is it the theory of the core or the theory of oligopoly that is driving the results? I suspect both.

Oligopoly Theory and Specific Quantitative Results

The authors use the many variants of oligopoly theory to focus their empirical analysis. In fact, as they recognize, many of the oligopoly models are based on an information setting much different from that of the airline industry. Airlines learn of their rivals’ fares and capacity decisions immediately and may have good information on load factors. There is not much room here for theories based on secret fare discounts. Information flows in the airline industry have gotten much better during the past twenty years with widespread information sharing through computer networks. It is interesting that this improved information sharing seems not to have affected the frequency of price wars.

The authors find that the presence of more competitors raises the likelihood of a price war, although with even one firm, fare wars seem to occur (see footnote 40 of the paper). With only one firm, it seems to me that any price “wars” have little to do with oligopoly theory, unless the influence of potential competition is large. I would like to learn more about why the authors think “price wars” appear with only one firm. If oligopoly theory is used to explain fare wars, should an alternative econometric specification be used wherein the number of firms interacts with all the other variables so that when there is only one firm, the oligopoly theory is “turned off”?

1. See Lester G. Telser, “Competition and the Core.” *Journal of Political Economy* 104 (February 1996), pp. 85–107, for a good review of both the theory and recent applications.
I have a few specific comments on the empirical results and modeling. First, the uncertainty in gross domestic product is surely less important in any theory of oligopoly than the demand uncertainty on individual routes in explaining fare wars on individual routes. Can measures of route-specific uncertainty be created? Moreover, the authors should analyze whether fare wars that are route specific should be modeled differently from fare wars that occur across the entire route network.

Second, I would model the effect of number of competitors differently. Not only would I use an interactive specification as described above, but I would estimate separately the effect of a single firm and then estimate a nonlinear effect of additional competitors. I would focus on determining whether the incremental effect of additional competitors on the likelihood of fare wars ever vanishes. In other words, is there an equilibrium value for the probability of a fare war as the number of competitors increases? Finally, the reader must be wary of using the paper’s results on fare wars to predict the overall changes in exogenous variables on the industry because fare levels and duration of fare wars may also change in response to changes in exogenous variables.

Counterfactual Experiment

I am not sure I appreciate the contribution of the paper’s counterfactual experiment measuring the financial effect of fare wars. If the experiment is used as a way to present the probit coefficients and illustrate the magnitude of those coefficients, then fine. But if it is to assess how the removal of fare wars could raise industry profitability, then I do not feel that the counterfactual poses a relevant-thought experiment because it fails to postulate an achievable alternative state of the world.

Suppose, as the authors suggest, that the airlines are in some sort of collusive oligopoly equilibrium with breakdowns occasionally leading to fare wars. How does the counterfactual experiment alter exogenous structural characteristics to eliminate the probability of a fare war? The counterfactual seems to hold constant all exogenous variables affecting fare wars. If, for example, a law were enacted preventing fare wars, it is not at all clear to me that other important equilibrium variables such as the number of competitors or the average fare would not also change. Instead of having infrequent fare wars, there may be more competitors
or persistently lower fares. Any financial gain from the removal of fare wars could be offset by the additional entry or by the decline in average fares. It is not a relevant-thought experiment to eliminate fare wars and to hold all else constant if entry and fare wars are part of the equilibrium oligopoly outcome. Therefore I do not ascribe much empirical relevance to the observation that elimination of fare wars would greatly improve industry financial performance.

I conclude by complimenting the authors on adding a thoughtful and thorough contribution to their impressive research on the airline industry.

Authors’ Response: Dennis Carlton raises the question why price wars appear on routes with only one firm. Our findings, however, are based on fare wars that occur on routes with more than one carrier. Carlton also suggests that any profit gains from eliminating fare wars could be offset by a decline in average fares. We argue in the paper that this is not clear, because fare wars do not appear to affect the most important influences on average fares and because fare wars have distinctive effects that would be hard to duplicate. We believe that the appropriate thought experiment is to assume carriers exercise much greater “discipline” in capacity expansion and pricing decisions and not, as Carlton suggests, to assume a law is passed to prevent fare wars. Airline executives appear to be confident that the recent discipline in capacity expansion will endure. It will be interesting to see whether they are correct.