Outsourcing Scope and Cooperation: Evidence from Airlines

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Abstract

This paper provides evidence that broad outsourcing scope, whereby a buyer assigns a large share of its outsourced activities to a single supplier, increases both parties' willingness to cooperate with each other. We also provide evidence that the effect of such broad scope on mutual cooperation is greater when externalities between suppliers, which are internalized in broad scope relationships, are more important. We document these effects in the context of outsourcing agreements between major and regional airlines in the US, where we measure cooperation as landing time slot exchanges during inclement weather. Because outsourcing scope – the share of a major's routes that are assigned to a regional – varies across airports within a given outsourcing relationship, we are able to include relationship fixed effects in our regressions. This rare feature of our data allows us to separate the externality internalization mechanism from alternative mechanisms that operate at the interorganizational relationship level, and hence do not vary within a relationship, including dependence balancing, self-enforcing agreements, and interorganizational trust. To the best of our knowledge, this is the first empirical study showing that broad outsourcing scope governs bilateral interfirm cooperation, and isolating a precise mechanism through which it does so.

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Introduction

One of the most important decisions a firm makes in designing its relationship with a supplier is how many of its outsourced transactions or business activities to assign to that supplier. We refer to this decision as one of "outsourcing scope".[1] For example, a manufacturer may outsource most of its parts or components to the same supplier, or may instead spread those purchases across multiple suppliers. Similarly, a firm may outsource a wide range of information technology services to a single provider, or may split them among multiple providers.

The strategy and management literatures have argued that broad outsourcing scope supports "cooperation," that is, costly actions that benefit a transaction partner but cannot be secured contractually. For instance, some studies find that outsourcing scope is broader when suppliers undertake transaction-specific investments, suggesting that broad scope may support such investments (Bakos & Brynjolfsson 1993; Ahmadjian & Oxley 2006; Aral *et al.* 2018). Relatedly, Japanese auto manufacturers, who use broad outsourcing scope relationships with many of their suppliers, have been found to enjoy greater cooperation with these suppliers than their U.S. counterparts, which has contributed to higher quality auto production (e.g., Asunama 1989; Womack, Jones & Roos 1990; Dyer & Hatch 2006; Helper & Henderson 2014). However, to our knowledge there is little systematic and direct empirical evidence that broad outsourcing scope increases cooperation, and the mechanisms through which this may occur are not well understood. This lack of evidence is not surprising: first, cooperation that cannot be secured via contract is difficult to measure; second, outsourcing scope often coexists with other cooperation-

[1] Other authors refer to outsourcing scope as "client-specific scope" (Chatain 2011); "supply portfolio concentration" (Moeen, Mahoney & Somaya 2013); or "number of suppliers" (Aral, Bakos & Brynjolfsson 2018). "Alliance scope" is a different concept, and refers variously to the number of markets two partners plan to target with their alliance (Khanna 1998), or to the number of business functions (R&D, marketing, distribution, etc.) involved in an alliance (e.g., Oxley & Sampson 2004).

supporting relationship features, such as repeated interaction, making it difficult to isolate the effect of scope alone.

Our paper fills this gap in the literature by investigating how outsourcing scope affects cooperation between US major airlines and their regional partners. In airline outsourcing agreements, major airlines operate hub-to-hub flights using large aircraft, and pay their regional partners flat fees to operate short-haul connecting flights using the regional's crew and smaller aircraft, but the major's brand name and reservation system. Major airlines are therefore buyers, and regional partners are suppliers.[2]

An important and frequent cooperation problem in airline outsourcing relationships is the exchange of landing time slots during inclement weather: airlines seek to exchange slots with their partners to minimize schedule disruptions, yet these slot exchanges are not covered by the outsourcing agreement and hence require voluntary cooperation. Exploiting this feature of the industry, we measure cooperation as the number of landing time slots exchanged during inclement weather, and show that broad outsourcing scope increases cooperation by both major and regional airlines. Moreover, we exploit granular variation in our data to hold constant alternate mechanisms through which scope may affect cooperation constant, while isolating a mechanism that is ubiquitous in outsourcing relationships but has been largely ignored: namely, the internalization of externalities between suppliers.

This externality internalization mechanism was originally discussed by Brickley and Dark (1987) in the context of franchising, and was recently generalized to all kinds of interfirm

[2] Major airlines also enter international horizontal alliances with each other, in which flights are combined in a similar way. There are numerous differences, however, between these international horizontal alliances and the domestic outsourcing agreements we study here. For example, in the alliances, partners handle bookings for each other and share revenues rather than paying flat fees. Therefore, for some transactions between two partners, a given partner is the buyer, and in others it is the supplier (Lazzarini 2007). In addition, in international horizontal alliances, partners operate under their own brand name aircraft, rather than the partner's, and use their own gate agents and equipment.

collaborations in a game-theoretic model by Argyres, Bercovitz & Zanarone (2020) (hereafter "ABZ"). The key idea in ABZ, and in our extension of that model below, is that positive spillovers between the activities a buyer outsources to different suppliers generate externalities among suppliers, which are internalized by concentrating those activities into one or few suppliers. This internalization of inter-supplier externalities increases the suppliers' incentives to cooperate with the buyer. In turn, if a buyer's and a supplier's cooperative actions are complementary, broad outsourcing scope increases the buyer's incentive to cooperate with the supplier because the buyer gains more from cooperating when the suppliers also cooperate.

Our data and empirical setting has unique advantages that allow us to measure the effect of outsourcing scope on cooperation and distinguish the externality internalization mechanism from other possible theoretical mechanisms. The first advantage is that the exchange of rationed landing slots under adverse weather is a well-documented cooperation problem in the U.S. airline industry (Vossen & Ball 2006; Forbes & Lederman 2009). This problem is quantitatively important; it affects up to 70% of flights in the winter months, and has a critical impact on delays and cancellations, and hence on the major airlines' brand reputations. To our knowledge, ours is the first study to measure the extent of slot exchange cooperation by analyzing a comprehensive database of such exchanges across all US airports.

A second advantage of using airline outsourcing data is that we are able to observe and analyze variations in the levels of scope *within the same interorganizational relationship*. This feature of the data, which we discuss in greater detail below, arises from the fact that major airlines concentrate their outsourcing with a given regional partner to different degrees at different US airports, holding constant the total number of flights outsourced to that partner. The key benefit of observing intra-relationship variation in scope and cooperation is that by including relationship-level fixed effects in our regressions, we can hold constant all factors operating at the interorganizational level that could affect the link between scope and cooperation. This allows us to control for the endogenous selection of cooperative and trustworthy outsourcing partners into broad-scope outsourcing agreements, as well as for mechanisms (other than the internalization of externalities we aim to identify here) through which outsourcing scope may affect cooperation. These potential alternative mechanisms that our empirical analysis controls for include the development of interorganizational trust (e.g., Zaheer & Harris 2005); norms of reciprocity (e.g., Cropanzano & Mitchell 2005); interorganizational routines (Dyer & Singh 1998; Zollo, Reuer & Singh 2002); dependence balancing to prevent hold-up and support specific investment (Ahmadjian & Oxley 2006; Aral *et al.* 2018); and multipoint contact that facilitates self-enforcing agreements (Bernheim & Whinston 1990).

The rest of this paper is organized as follows. In the next section, we review the literatures related to our study. We then present a simple extension of the ABZ theoretical model to fit our empirical setting and to help us derive testable hypotheses. After describing our context and data in detail, we present the empirical strategy and results and we explain how our strategy allows us to control for alternative mechanisms. We conclude by discussing our paper's implications for future research and management.

Literature Review

A long tradition of research in industrial organization economics emphasizes the disadvantages of broad outsourcing scope to the extent that it studies the negative impact of supplier concentration on buyer profitability (e.g., Bain 1959; Porter 1980), and of buyer concentration on supplier investment incentives and profitability (e.g., Horn & Wolinsky 1988; von Ungern-

Sternberg 1996; Dobson & Waterson 1997). Broader relationship scope, however, has also been shown to generate benefits to both parties to a relationship. Several studies focus on efficiency benefits other than cooperation. Chatain (2011), for example, shows that when certain suppliers possess special knowledge about buyer needs, client-specific scope economies emerge, in which case broader outsourcing scope creates more value than narrower scope. He finds that broader scope relationships between business clients and suppliers of legal services are less likely to be terminated, and result in greater law firm profitability. In a study of the electronics component industry, Moeen, Somaya & Mahoney (2013) find that when buyer-specific knowledge is important, outsourcing relationships with suppliers are broader. Similarly, broader scope relationships may lead to the development of capabilities for working together, and of knowledge-sharing routines (e.g., Dyer & Singh 1998; Anand & Khanna 2000; Dyer & Hatch 2006). Finally, Kalnins and Lafontaine (2004) find evidence that franchisors engage in multiunit franchising (broader relationship scope) when franchisees can more cheaply monitor outlets than can franchisors and possess knowledge of local consumers that franchisors lack.

While numerous contributions to the strategy and economics literatures study the efficiency of broad-scope buyer-supplier relationships, only a handful analyze outsourcing scope as a mechanism to create incentives for cooperation – that is, as part of the relationship's governance structure.[3] For example, buyer-supplier cooperation is thought to be enhanced when each party holds a "hostage" that is of greater value to the owner than to the holder of the hostage (Williamson 1983). The threat by each party to devalue the hostage it holds can be sufficient to ensure cooperation by the partner. Similarly, according to the theory of "dependence balancing,"

[3] A large literature in strategy and economics has studied how buyer-supplier relationships can be made more cooperative by well-designed formal and informal governance structures. For reviews, see Parmigiani & Rivera-Santos (2011); Cao & Lumineau (2015); Lafontaine & Slade (2013); and Gil & Zanarone (2017, 2018).

cooperation is thought to be improved if each party to a transaction makes a transaction-specific investment of the same value. The threat of losing the value of that investment can facilitate cooperation if defection by one party triggers defection by the other (Heide & John 1988). These threats are presumably more effective when the investments are larger in value, as would be the case with broader scope relationships. Ahmadjian & Oxley (2006) find evidence from the Japanese auto industry that concentrating purchases with a smaller number of suppliers is associated with dependence balancing (though they were not able to observe cooperation).[4]

In a similar vein, Bakos & Brynjolfsson (1993), and Aral *et al.* (2018), develop formal property rights models showing that by contracting with fewer suppliers, a buyer can increase each supplier's bargaining power and therefore provide stronger incentives for the supplier to make non-contractible, buyer-specific investments. Consistent with their model's predictions, Aral et al. (2018) show empirically that use of vendor-specific IT is associated with relying on fewer IT suppliers (that is, broader outsourcing scope). These holdup-based models and findings only address cooperation by suppliers alone, thus leaving open the important question of how broad outsourcing scope affects *mutual* cooperation by suppliers and buyers.[5] Moreover, these models do not address the question of how outsourcing scope affects cooperation other than the undertaking of ex ante specific investments.

One model that does address the effects of broad outsourcing scope on mutual cooperation, without relying on the presence of specific investment, is Bernheim and Whinston (1990). According to this model, when two firms enter into multiple transactions with one another, they

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[4] Jiang and Li (2009) find evidence that alliance scope (as distinct from outsourcing scope that we study here) is associated with greater knowledge sharing.

[5] Note that if the holdup models were extended to accommodate for two-sided investments (by the buyer and the supplier), standard arguments (e.g., Grossman & Hart 1986) would imply that if broad scope increases the supplier's bargaining power it must also decrease the buyer's bargaining power. Broad scope would therefore increase the supplier's incentive to invest while reducing the buyer's such incentive.

both stand to lose more if the relationship ends, relative to the case in which they are involved in fewer transactions.[6] The disadvantage of broad outsourcing scope is that while it "pools together" the future gains from cooperation across multiple transactions, it also pools the present gains from defection. Bernheim and Whinston (1990) show, however, that the net effect of broad scope on mutual cooperation is positive because the two firms can use the threat to terminate transactions in which their temptation to defect is weaker to "cross-subsidize" cooperation in the ones in which their temptation is stronger.

The ABZ model, which provides the basis for our empirical investigation in this paper and is discussed in detail in the next section, is different than Bernheim and Whinston (1990) and the rest of the literature on outsourcing scope in the following way. The ABZ model highlights the ubiquitous presence of externalities between suppliers, and shows how broad scope stimulates cooperation by internalizing those externalities. Because externalities can vary *within* a given outsourcing relationship, the ABZ model can therefore predict that different levels of scope within such a relationship will result in different levels of local cooperation: i.e., across different products for which a given buyer and supplier contract components; across different territories in which a given franchisor and franchisee are present; or, in our context, across different airports in which a given major airline and its regional airline partner operate. The rest of the literature on outsourcing scope, in contrast, can only make predictions about how variations in scope *across* different relationships affect cooperation. This is true for the literature on interorganizational trust and norms, as well for the the economics-oriented literature in which scope modifies incentives

[6] While Bernheim and Whinston (1990) is presented as a model of collusion between rivals, its main mechanism could apply to cooperation between exchange partners. The strategy and economics literatures have found extensive evidence supporting the model's prediction that multimarket contact is associated with reduced rivalry (e.g., Cannella & Yu 2013). On the other hand, if buyers are highly dependent on suppliers or vice versa, the punishment mechanism in Bernheim & Whinston (1990) may not be credible in buyer-supplier relationships.

via dependence balancing, cross-subsidization of incentive constraints, and the like at the level of the interfirm relationship.

Theoretical Model and Hypothesis Development

According to the ABZ model, broad outsourcing scope facilitates cooperation by internalizing externalities among suppliers. Under narrow scope, a supplier does not take into account that if it defects on the buyer, it reduces the value of other suppliers' assets that are complementary to the buyer's. (For example, a poor-quality input damages the buyer's brand, which then reduces the buyer's demand for other suppliers' inputs.) A broad-scope supplier, on the other hand, does take this externality into account because it produces multiple inputs itself.[7]

In this section, we study an extension of the ABZ model, which fits our airline outsourcing empirical setting better than the original model, and hence allows us to develop hypotheses on the externality mechanism that we can take to the data. We first present the model, then we briefly discuss its departures from the original ABZ model and why they are suitable in our setting.

Setting

Consider a buyer B and $n > 1$ valuable activities that B outsources to $m \geq 1$ suppliers. Let $A_k \subseteq N = \{1, \ldots, n\}$ be the set of activities outsourced to supplier k. B's cooperation with the supplier is measured by action b, and the suppliers' cooperation with B is measured by the vector $\boldsymbol{s} \equiv [s_1, \ldots s_n]$, where s_i is the cooperative action of the supplier in charge of activity i. All

[7] As another example of this logic, if a franchisee reduces the quality of its service, this will undermine the value of the franchisor's brand, and will therefore also reduce the revenues of other franchisees that share the brand (Brickley & Dark 1987). A broad scope ("multiunit") franchisee will take his externality into account when deciding on its service quality, while a narrow scope franchisee (single unit franchisee) will not.

cooperative action are non-negative real numbers. Cooperation cannot be contracted for , that is, it is "non-contractible". There are may reasons why this might be the case. For instance, in a supply chain, there are dimensions of cooperation, such as the supplier's customization effort or the quality of the buyer's technological assistance and training, which are difficult for a court to verify. In the case of slot exchanges between airlines, which we analyze empirically in this paper, cooperation is non-contractible because when the outsourcing agreement is drafted, it is unknown when and where slot exchanges will be needed in the future, and when this uncertainty is resolved, there is little time to negotiate a contractual agreement due to the urgency of the exchange.

Cooperation generates the following payoffs:

$\pi(b;\boldsymbol{s}) \equiv \sum_{i=1}^{n} v_B^i(s_i) + v_B^B(b;\boldsymbol{s}) - l(b;\boldsymbol{s}) - c_B(b)$ for B, and

$u_k(b;\boldsymbol{s}) \equiv \sum_{i\in A_s} v_i^i\,(s_i,b) + \sum_{i\in A_k}\sum_{j\in(N-A_k)} v_i^j\big(s_j,b\big) - \sum_{i\in A_k} c_i(s_i)$ for supplier k.

The revenues from cooperation, v_B^i, v_B^B, v_i^i, v_i^j, and the direct costs of cooperative actions, c_B and c_i, are increasing in all arguments. B's opportunity cost of cooperation, $l(b;\boldsymbol{s})$, increases in b, and decreases in s_i, for all i. The key features of the model are that:

(1) The buyer's and the suppliers' cooperation are complements:

$\frac{\partial^2 v_B^B}{\partial b \partial s_i} \geq 0$, $\frac{\partial^2 v_i^j}{\partial s_j \partial b} \geq 0$, $\frac{\partial^2 l}{\partial b \partial s_i} \leq 0$, for all i, j.

(2) There are positive spillovers across outsourced activities, which generate externalities when these activities are outsourced to different suppliers. Specifcally, when the supplier in charge of activity j cooperates with B, she generates revenue v_i^j for the supplier in charge of activity $i \neq j$.[8]

[8] There could of course also be complementarities among suppliers' cooperative actions in the suppliers' payoff functions, but since those would add nothing to the model's results, we omit them for analytical simplicity.

Two examples

In manufacturing, an example of complementarity as modeled above is supplier training provided by the buyer, which is more productive (for both the buyer and the suppliers) if the suppliers also cooperate (e.g., by investing effort into learning the buyer's technology). Thus, in manufacturing, it is likely that $\frac{\partial^2 v_B^B}{\partial b \partial s_i} > 0$, and $\frac{\partial^2 v_i^j}{\partial b \partial s_i} > 0$. Externalities between suppliers may also occur in manufacturing – for instance, because high quality or customization of critical component i improves the reputation of the buyer in the final product market, thereby increasing demand for both critical component i and critical component j. When the two components are outsourced to different suppliers, this spillover generates externalities.

In the outsourcing agreements between major and regional airlines that we study here, cooperation is defined as the provision of landing slots from one airline to another when adverse weather causes slot rationing. A key source of complementarity in these slot exchange decisions is that the major's opportunity cost of giving slots to a regional partner is lower when the regional partner also provides slots, so that the major's most important flights are guaranteed to land on time. Thus, in the airline context it is likely that $\frac{\partial^2 l}{\partial b \partial s_i} < 0$.

Externalities in the context of airline outsourcing arise because of the hub-and-spoke structure of the majors' networks: if a regional gives a slot to the major, allowing a major's flight full of passengers to land on time, other regional partners flying the major's passengers to local airports can also take off on time and hence benefit from the focal regional's cooperation. Because a major airline typically uses multiple regional partners at an airport (sometimes even on the same route, see Gil, Kim & Zanarone 2021), these cooperation spillovers across flights generate externalities.

Discussion

Before analyzing the model, it is useful to discuss its two departures from the original ABZ model. First, while in ABZ the buyer cooperates by foregoing an expropriatory action that damages the suppliers ("negative" cooperation), here it cooperates by taking a costly action that benefits the suppliers ("positive" cooperation). This modification of ABZ is appropriate in our contex of outsourcing agreements between major and regional airlines, where we analyze "positive" cooperation by both the major and the regionals (supplying landing slots to each other).

Second, while ABZ analyze both a one-shot and a repeated game version of their model, here we only focus on the one-shot game. This departure is also appropriate in our empirical context. As we shall see, a major goal of our empirical strategy is to disentangle the externality mechanism from other potential mechanisms through which broad outsourcing scope may increase cooperation – most notably, variations across relationships in the extent of relational governance through repeated exchanges.

Cooperation under narrow relationship scope

Suppose each supplier is initially outsourced $t = n/m$ tasks. To illustrate, suppose supplier 1 is outsourced the first t activities, supplier 2 the next t activities, and so on. Under narrow outsourcing scope, B's cooperation, and supplier cooperation for each outsourced activity, are chosen to solve:

$max_b\{v_B^B - l - c_B\}$ for the buyer,

$max_{s_1}\{\sum_{i \in A_1} v_i^1 - c_1\}$,

…

$max_{s_t}\{\sum_{i\in A_1} v_i^t - c_t\}$ for supplier 1, and so on for the other suppliers.

Assume the payoff functions are "well behaved," such that a unique interior solution to this problem exists. Then, buyer and supplier cooperation are characterized by the following first order conditions:

$\frac{\partial v_B^B(b;\boldsymbol{s})}{\partial b} - \frac{\partial l(b;\boldsymbol{s})}{\partial b} - \frac{dc_B(b)}{db} = 0$ for the buyer, (1)

$\sum_{i\in A_1} \frac{\partial v_i^1(s_1,b)}{\partial s_1} - \frac{dc_1(s_1)}{ds_1} = 0,$

…

$\sum_{i\in A_1} \frac{\partial v_i^t(s_t,b)}{\partial s_t} - \frac{dc_t(s_t)}{ds_t} = 0$ for supplier 1, and likewise for the other suppliers.

Notice that B's marginal benefit from cooperating with the suppliers increases in supplier cooperation, and a supplier's marginal benefit from cooperating with B increases in B's cooperation, due to complementarity. Thus, B's cooperation increases in supplier cooperation in each activity, and vice versa.

Cooperation under broad outsourcing scope

Suppose now that B broadens the scope of its relationship with a particular supplier – say, supplier 1 – by subtracting some activities to other suppliers and reassigning them to her. Let $A_1' \supset A_1$ be the new set of activities for supplier 1. We are interested in the following question: how does the broader outsourcing scope affect supplier 1's cooperation *in the activities that were aready outsourced to supplier 1 under narrow scope* (that is, those in the "old" set A_1)?

Under broad outsourcing scope, B's cooperation, and the cooperation of supplier 1 on the activities in set A_1, solve, respectively:

$max_b\{v_B^B - l - c_B\}$, and

$max_{s_1}\left\{\sum_{i\in A_1} v_i^1 + \sum_{i\in(A_1'-A_1)} v_i^1 - c_1\right\}$.

…

$max_{s_t}\left\{\sum_{i\in A_1} v_i^t + \sum_{i\in(A_1'-A_1)} v_i^t - c_t\right\}$.

Assuming as before that a unique interior solution to this problem exists. Then, cooperation between B and supplier 1 under broad scope is characterized by the following first order conditions:

$\frac{\partial v_B^B(b;s)}{\partial b} - \frac{\partial l(b;s)}{\partial b} - \frac{dc_B(b)}{db} = 0$, and (2)

$\sum_{i\in A_1} \frac{\partial v_i^1(s_1,b)}{\partial s_1} + \sum_{i\in(A_1'-A_1)} \frac{\partial v_i^1(s_1,b)}{\partial s_1} - \frac{dc_1(s_1)}{ds_1} = 0$,

…

$\sum_{i\in A_1} \frac{\partial v_i^t(s_t,b)}{\partial s_t} + \sum_{i\in(A_1'-A_1)} \frac{\partial v_i^t(s_t,b)}{\partial s_t} - \frac{dc_t(s_t)}{ds_t} = 0$.

Several interesting results follow from the comparison of the broad scope conditions for cooperation under broad outsourcing scope, (2), to those under narrow outsourcing scope, (1):

a) Supplier 1 cooperates more on each initially outsourced activity after her relationship with B becomes broader. The reason is that the supplier's marginal benefit from cooperation is now larger than under narrow outsourcing scope due to the internalization of externalities (the middle marginal benefit term in the LHS of (2) is absent from (1)).
b) This implies that due to the complementarity between buyer's and suppliers' cooperation, B's cooperation is also higher under broad outsourcing scope than under narrow scope.
c) The increase in supplier cooperation on a given activity induced by broad outsourcing scope is larger the greater the number of activities that were outsourced to other suppliers

under narrow scope and are now internalized (formally, the greater the number of activities in the set $A_1' - A_1$).

Our model thus suggests the following testable hypotheses:

H1: *When externalities between suppliers are important, a supplier cooperates more with the buyer on a given set of activities the broader the scope of its outsourcing relationship with the buyer. Moreover, broader outsourcing scope is also associated with more cooperation by the buyer when there is complementarity between the buyer's and the supplier's acts of cooperation.*

H2: *The positive effect of broader outsourcing scope on cooperation by the supplier and the buyer increases in the size of externalities between suppliers.*

Setting

The setting for our study is outsourcing relationships in the U.S. airline industry. The industry includes three types of airlines: majors, vertically integrated regionals, and independent regionals.[9] Major airlines include United, Delta, and American, which operate larger aircraft Independent regionals operate smaller aircraft to serve local routes, often under an outsourcing agreement with a major. Vertically integrated regionals are those regionals that are owned by a major. For example, American Airlines' integrated regional partners include Envoy Air, PSA Airlines, and Piedmont Airlines. Independent regionals are similar to vertically integrated regionals but are independently owned. Examples include Skywest, Air Wisconsin, Trans States Airlines, and Republic Airways.

[9] A fourth category includes airlines classified as Low Cost Carriers (LCCs). These carriers operate their own flights and do not enter outsorcing agreements with other airlines. Examples include Allegiant Air, Cape Code Air, and Spirit. These airlines are not included in our study.

Independent regional airlines usually operate aircraft that bear the banner of their major airline partner.

Outsourcing relationships between majors and independent regionals are governed by formal contracts called "capacity purchase agreements," under which the regional operates a number of assigned flights while the major sets flight schedules, sells tickets, and buys fuel for such flights. The major collects all revenues, and the regional receives a flat fee for each of its flights from the major (conditional on operating a minimum number of flights). The regional is responsible for aircraft maintenance and labor costs. Majors and regionals enter these agreements in order to reduce the costs of transporting passengers between two cities. Independent regional airlines often operate at lower cost than majors and major-owned regionals because they can avoid paying the higher, union-negotiated wages and benefits to pilots, flight attendants, and mechanics (Forbes & Lederman 2009).[10] Regionals cannot displace majors entirely, however, because they lack the range of landing rights, larger aircraft, reservation systems, advertising capability, fuel price hedging capacity, access to global networks, and other advantages possessed by majors.

An important consequence of the fact that majors enter outsourcing agreements with regionals is that when bad weather causes a reduction in authorized landings at an airport, majors and independent regionals must closely coordinate to adjust their flight schedules in a way that minimizes the costs of delays and cancellations (Forbes & Lederman 2009). The central tool that majors and regionals use to adapt to these local weather shocks is the exchange of landing slots. If adverse weather reduces the number of potential safe landings per hour in a given airport, the Federal Aviation Administration (FAA) rations the initially available landing time slots through a

[10] While their compensation is lower than that paid by major airlines, employees at major-owned regionals are in a better position than those at independent regional to negotiate salary increases. For instance, Forbes and Lederman (2009) report that after Delta acquired Comair, a regional airline, Comair pilots used the common ownership of Delta and Comair as their main argument to seek a salary increase.

Ground Delay Program. All airlines then have the opportunity to exchange slots with one another and their outsourcing partners, through a centralized platform provided by the FAA..

If an airline offers an immediate time slot, it delays or cancels the flight initially assigned to that slot, and in exchange receives a slot for some time in the future (Schummer & Voray 2013). It is thus costly for an airline to offer a slot to another airline because doing so hurts the airline's on-time performance record, and disrupts employees' work schedules, leading to higher labor and logistics costs. Moreover, slot exchanges cannot be negotiated via contracts given the time constraints, and capacity purchase agreements do not specify slot exchanges contingent on weather realizations in advance (Forbes & Lederman 2009). Because giving up a landing slot during inclement weather is a costly and a non-contractible decision, it can be considered as a voluntary act of cooperation. Indeed, it has been shown that because cooperation in the form of slot exchanges is formally non-contractible, informal agreements sustained by repeated interaction are often necessary to sustain cooperation in major-regional partnerships (Vossen & Ball 2006; Gopalakrishnan & Balakrishnan 2017; Gil, Kim & Zanarone 2021). Gil, Kim & Zanarone (2021) also report on an interview with the former COO of a major airline, who indicated that majors must resort to non-contractual rewards to induce their regional partners to supply slots. Specifically, majors count the flights cancelled by regional partners to satisfy the major's slot exchange requests as valid toward the minimum quota of operated flights specified in the agreement, even though they are not contractually obligated to do so.

Thus, the U.S. airline industry is suitable for testing our theoretical hypotheses on outsourcing scope because outsourcing and noncontractible cooperation are ubiquitous, and there is significant variance in outsourcing scope. An additional feature that makes the airline setting suitable is the presence of externalities between different outsourcing regional partners of the same major at a hub airport. To illustrate these externalities, consider the following example of a full American Airlines flight from New York to Chicago's O'Hare airport carrying passengers who will connect to multiple local destinations. Some of the passengers will join a connecting flight to Cleveland operated by one American regional partner (say, Republic), while others will join a connecting flight to St. Louis operated by a different American partner (say, Air Wisconsin). Bad weather in Chicago causes some landing time slots there to be unavailable, so American asks Republic to give up the slot for the St. Louis flight because it has fewer passengers than the flight coming from New York. If Republic refuses, this imposes a negative externality on Air Wisconsin because the New York-to-Chicago flight will be delayed, and therefore the Cleveland flight will be also delayed as it waits for its New York passengers. As a consequence, Air Wisconsin's on-time record is damaged, and it must absorb additional labor and logistics costs.

Consider now the implications of this example for cooperation under narrow vs. broad outsourcng scope. Narrow scope corresponds to American Airlines outsourcing a small share of its flights at O'Hare to each of its regional partners there. In this case, when deciding whether to give up a slot, each regional has little incentive to consider the positive impact of such act of cooperation on American's other O'Hare flights as most of those flights are operated by other regional partners. Thus, continuing with our example, Republic's choice regarding whether to cancel the Chicago-St. Louis flight and give its slot to American's New York- Chicago flight will not fully consider the impact of this choice on the Chicago-Cleveland flight operated by Air Wisconsin. Under broad outsourcing scope, the regional takes into account the positive effects of cooperation on the other regional flights it operates for the major, and hence is more likely to cooperate. Moreover, this greater cooperation by the regional under broad outsourcing scope may lead the major airline to increase its own cooperation with that partner. Due to the hub-and-spoke structure of major airlines' networks, the two types of cooperation – from regional to major, and from major to regional – exhibit positive complementarities. Once the regional has helped the major to solve the slot scarcity problem for its most strategic flights, the major's cost of cooperation (logistic and reputational) through slot exchanges with the regional is reduced and therefore the major's own incentive to cooperate increases.

A second kind of externality between independent regional partners of a major airline involves the reputation of the major's brand. In our example, if Republic repeatedly refuses to give up slots to American in bad weather, then American's on-time record for popular flights from New York to Chicago -- and therefore its brand reputation -- will be damaged. This will cause some New York passengers to switch to, say, United for their Chicago flights, which undermines Air Wisconsin's business at O'Hare. Again, a broad scope partner would take this externality into account when deciding whether to give up a slot and will therefore be more likely to do so than a narrow-scope partner.

Data and Measures

Data

The FAA keeps records of all time slot exchanges in U.S. airports and on slot exchanges in Canadian, Mexican, Caribbean and Central American airports that involve flights to or from a U.S. airport. We obtained these data for the whole month of February 2017 through a Freedom of Information Act request. February is especially well suited for our analysis because of the frequency of inclement weather episodes during that month, and therefore the abundance of Ground Delay Programs declared by the FAA, and slot exchanges. In February 2017 there was at least one airport under a Ground Delay Program on every day of the month. Airports such as Newark experienced Ground Delay Programs on as many as 70% of the days.

In this paper, we focus solely on cooperation episodes between major airlines and their independent regional partners. Such episodes represent 40% of slot exchanges in our data, with variations across the major airlines.[11] The (excluded) remainder represent internal exchanges within a major airline, and exchanges with integrated regionals. We also drop Caribbean and Central American airports from our data, since exchanges between majors and independent regionals do not occur there. In addition, we drop slot exchanges between Air Canada and its regional partners because we can only observe a subset of such exchanges – namely, those that involve flights to or from a U.S. airport. Our final dataset therefore includes all slot exchanges between U.S. major and independent regional airlines that occur at U.S. and Canadian airports in February 2017.

To illustrate the nature of these data, Tables 1A and 1B provide examples of two sets of time slot exchanges as reported by the FAA on February 26, 2016, at La Guardia Airport (LGA) in New York City. Table 1A illustrates regional-to-major cooperation. The flight receiving a time slot in this table is AAL1164 from Dallas/Forth Worth International Airport to La Guardia Airport in NYC, operated by American Airlines (AAL). The panel shows that Trans States Airlines (LOF), an independent regional partner of American, agrees to have new landing time slots assigned to two of its flights (LOF4096 and LOF4131) in order to create a landing slot for American's AAL1164 flight. Table 1B illustrates major-to-regional cooperation. In this table, the flight receiving a slot is ASQ5645 from Hartsfield-Jackson Atlanta International Airport to La Guardia, operated by Atlantic Southeast Airlines (ASQ), a regional partner of Delta (DAL). The panel

[11] Specifically, instances of cooperation between a major and its outsourced regional partners were 47.3% of the total for United, 34.1% for Delta, and 30.7% for American.

shows that Delta agrees to have new landing slots assigned to seven of its flights (DAL2679, DAL1488, DAL2840, DAL1713, DAL1486, DAL2808, and DAL2673) in order to create a landing slot for Atlantic's ASQ5645 flight.

[TABLE 1A HERE]

[TABLE 1B HERE]

Measures of cooperation

To assess whether broader outsourcing scope supports stronger bilateral cooperation, we create two separate cooperation measures at the major-regional-airport-day level (we explain below why we use this specific level of analysis). The first variable, *Cooperation*, counts "instances of cooperation" in a relationship – that is, the number of times a major *m* and a regional *r* respond to a time slot exchange request by delaying and cancelling at least one of their own flights in order to make a landing slot available to a partner, on a given day *d* at a given destination airport *a* in which a Ground Delay Program is in place. Thus, this variable can be thought of as an extensive margin measure of cooperation. Our second variable, *CooperationAlt*, counts the number of flights that a major m and a regional r delay or cancel in order to give up a landing slot to a partner on Ground Delay Program day d and at destination airport a. *CooperationAlt* therefore measures the intensive margin of cooperation.

For each of the two cooperation measures, we separately analyze the case in which the major sacrifices slots to benefit the regional (major-to-regional *Cooperation* and *CooperationAlt*) and the case in which the regional sacrifices slots to benefit the major (regional-to-major *Cooperation* and

CooperationAlt). To illustrate, recall that the flight receiving a slot in Table 1A's slot exchange is operated by American, and that Trans States contributes two of its own flights to make a slot available to American. Therefore, this slot exchange request counts as 1 towards the regional-to-major *Cooperation* measure, and as 2 towards the regional-to-major *CooperationAlt* measure, for Trans States and American at LaGuardia on February 26, 2016. Recall that in Table 1B's slot exchange, the flight receiving the slot is operated by Atlantic Southeast, and Delta contributes seven flights to the exchange. Hence, this exchange counts as 1 towards the major-to-regional *Cooperation* measure, and as 7 towards the major-to-regional *CooperationAlt* measure, for Delta and Atlantic Southeast at LaGuardia on February 26, 2016.

Two observations on the construction of our cooperation measures are in order. First, in addition to direct time slot exchanges between a major and a regional airline, there are instances in which a regional sacrifices a slot for another regional. While the two regionals in these exchanges do not have a direct relationship, they do have an indirect relationship through the major airline umbrella. When constructing our cooperation measures, we therefore assume these regional-to-regional exchanges are mediated by the major – that is, the regional airline sacrificing slots is cooperating with the major, and the major is cooperating with the regional airline receiving slots.[12]

A second observation is that there are major-regional dyads that do not exchange slots at some airports on Ground Delay Program days. We assign a value of zero to both *Cooperation* and *CooperationAlt* for those major-regional-airport-day observations if the major and the regional

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[12] As a robustness check, in Appendix Tables A2 and A3 we repeat our analysis, restricting attention to instances of "direct cooperation" (i.e., major-to-regional or regional-to-major, excluding regional-to-regional). The results are consistent with those in Tables 4 and 5 below.

cooperate at the same airport on some other Ground Delay Program day in our data. We drop those observations from the sample if the major and the regional never cooperate at that airport.

Measures of relationship scope, externalities and control variables

To measure the scope of outsourcing relationships between major and regional airlines, our key explanatory variable, we obtained data on the number of outsourced flights by each major to each independent regional per route in the winter of 2017 from the Bureau of Transportation Statistics. Our key explanatory variable, *Scope*, varies at the airport level within each relationship (again, we explain below why focusing on this level of variation is important for our empirical strategy). Specifically, $Scope$ measures the share of the major m's outsourced flights at airport a that are outsourced to regional r in the winter quarter of 2017.

We proxy the extent of externalities between a major and each regional partner at a given airport with our variable *Externalities:* the number of outsourced flights by major m at airport a that are operated by regionals other than the focal regional r. All else equal, our model predicts that the larger the number of activities (flights) that a major outsources to other partners, the greater the externalities that can be internalized by increasing the scope of the relationship between the major and the focal partner.

Our key control variable in our main regressions testing Hypothesis 1 is $Flights_{mra}$, the total number of flights that major m outsources to regional r at airport a. Including this variable in our regressions is important because it allows us to separate the effect of scope (captured by $Scope$) from the effect of the two airlines' joint slot exchange capacity (measured by $Flights_{mra}$) on cooperation. In particular, using this control variable ensures that any observed positive effect of outsourcing scope on cooperation is not mechanically driven by the fact that a broad-scope partner operates more flights for the major. As an additional control variable, we include $RegFlights_{ra}$, the total number of flights that regional r operates at airport a across all its major partners, in some specifications. This variable controls for the extent of a regional's presence at the airport, which may affect both a major's decision to outsource flights to the regional and the regional's ability to cooperate with the major.

We present summary statistics and a correlation matrix for all variables in Tables 2A and 2B below, respectively.

[TABLE 2A HERE]

[TABLE 2B CORRELATION MATRIX]

The top of Table 2A provides summary statistics for our cooperation measures, and the bottom provides statistics for our main scope measure, externalties variables, and the control variables. While slot exchanges from a major to a regional shows a cooperation frequency of almost four times a day and 15 flights per day on average, slot exchanges from a regional to a major accounts for almost five cooperation instances per day, with 12 flights involved per day and airport. Because the distributions of our cooperation variables are highly skewed, in our empirical analysis we take the natural logarithm of 1 plus the cooperation variable of interest.

Given the noticeable number of zeros, it is important to note that our sample only includes airport-day dyads where we see cooperation by at least one major and a regional, in which case we know that a Ground Delay Program is in place. Therefore, when we observe zero cooperation between a major and a regional at a given airport and day in our sample, it is not because of a lack of slot exchange requests at the airport, it is because that major and regional chose not to cooperate in that airport on that particular day.

Finally, our measure of scope, $Scope$, has an average of 32%, ranging between 3% and 100%. Our externality measure shows that on average majors outsource a total of 1308 flights to regionals other than the focal regional. The number of flights outsourced from a major to a regional, $Flights_{mra}$, averages 829 flights, and the total number of flights operated by a regional across all their major partners, $RegFlights_{ra}$, averages 1525.

[TABLE 3 HERE]

As explained below, it is important for our empirical exercise to show that the same major-regional relationship involves different degrees of outsourcing scope at different airports. For this reason, Table 3 above shows distribution statistics across airports for each major-regional relationship in our data. Note that our sample is restricted to those airports where a Ground Delay Program occurred during February 2017 and so the distribution of scope across all airports (the population) might be even wider than what we observe here. For example the relationship between American Airlines and Republic Airlines is active at seven different airports in our data, with *Scope* values that range between 24% and 88%, a median value of 29%, and a standard deviation of 0.24.

Empirical Methodology and Results

Methodology

To test our main hypothesis, H1, we estimate linear regression models of the following form:

$$\ln(1 + y_{mrad}) = \alpha + \beta Scope + \gamma X_{mra} + \delta_{mr} + \mu_{ma} + \lambda_{ad} + \varepsilon_{mrad}, \qquad (3)$$

where y_{mrad} is either *Cooperation* or *CooperationAlt*. Our dependent variable is the natural logarithm of 1 plus our cooperation measure because we want to take into account those days and airports where the cooperation between major and regional is zero.[13] We estimate separate regressions for *Cooperation* and *CooperationAlt* depending on whether the direction of cooperation is from regional to major or from major to regional. The vector *X* stands for our control variables, $Flights_{mra}$ and $RegFlights_{ra}$, and their corresponding log transformations, which are used as alternative controls in some regressions. Parameters δ_{mr}, μ_{ma}, and λ_{ad} denote major*regional, major*airport, and airport*day fixed effects, respectively. The error term ε_{mrad} is assumed to be normally distributed and *iid*. Under hypothesis H1, we predict that $\beta > 0$.

To test our second hypothesis, H2, we augment regression model (3) by interacting scope with our proxy for externalities between a major's partners:

[13] We have performed robustness checks using alternative transformations of the dependent variable in specification (1). These are y in levels, ln(0.01+y),and the inverse hyperbolic sine of y. All specifications show a positive impact of scope on cooperation in both directions. Results are available from the authors upon request.

$$\ln(1 + y_{mrad}) = \alpha + \beta_1 Scope + \beta_2 Externalities + \beta_3 Scope * Ext + \\ + \gamma X_{mra} + \delta_{mr} + \mu_{ma} + \lambda_{ad} + \varepsilon_{mrad}. \qquad (4)$$

Under hypothesis H2, we predict that $\beta_3 > 0$ when we use *Externalities,* in our interaction term.

The inclusion of multiple sets of fixed effects in our specification warrants a more detailed discussion. The inclusion of relationship fixed effects (δ_{mr}) is key to our empirical strategy, because it allows us to separate the effect of relationship scope on cooperation from the effects of airport-invariant relationship characteristics such as expectations of future interactions trust, accumulated experience and mutual knowledge, which may affect or be affected by scope while at the same time affecting cooperation. Therefore, including relationship fixed effects helps us ensure that our results are not driven by the endogenous selection of "relational" and cooperative partners into broad scope relationships. At the same time, relationship fixed effects allow us to hold constant several mechanisms through which outsourcing scope may affect cooperation other than the externality internalization mechanism we aim to identify here.

The inclusion of major-airport fixed effects (μ_{ma}) is important because they hold constant airline-specific local demand and network structure at each airport, as well as differences across major airlines in the strategic value of each airport. For instance, our major*airport fixed effects control for the possibility that a given airport may be a hub for some majors but not others, and that a given major may use integrated regionals or even its own planes to operate flights at some airports but not others (Forbes & Lederman, 2009). Finally, our specification also includes airport-day fixed effects (λ_{ad}) because these allow us to hold constant airport-day-varying factors that may affect the demand for mutual slot exchanges, such as local demand for air transportation or local weather conditions on a given day under a Ground Delay Program.

Our specification above, with its rich set of fixed effects and controls, goes quite far in holding relevant factors constant, and therefore makes it unlikely that spurious correlations are driving our results. Furthermore, the literature on airline competition consistently shows that majors treat routes as individual markets and make strategic decisions route-by-route rather than at the airport level. For example, Goolsbee and Syverson (2008) show that when Southwest Airlines announces that it is serving a new route, incumbent airlines cut fares on that route only. Gerardi and Shapiro (2009) show that price dispersion for a given route decreases with competition on that route. Lastly, and most related to our study, Forbes and Lederman (2009) show that a major airline's decision regarding whether to outsource a route is driven by characteristics of *that* route. This literature therefore strongly suggests that the number of flights major *m* outsources to regional *r* at airport a is also decided on a per-route basis. Because our *Scope* measure is the result of summing the major's independent route-level outsourcing decisions across all the routes that have a given airport as destination, our scope measure is likely to be exogenous.

Having said this, statistically speaking, exogeneity requires that $cov(\varepsilon_{mrad}, Scope) = 0$. Because our measure of scope is at the major-regional-airport level, and our specifications include major*regional, major*airport and airport*day fixed effects, the main reason for $cov(\varepsilon_{mrad}, Scope \quad) \neq 0$ would be the presence of time-invariant major-regional-airport-specific variables that are correlated with $Scope_{mra}$. Such variables may reflect complementarities between a major's capabilities and airport-regional-specific capabilities. Since our main specifications include $Flights_{mra}$ and $RegFlights_{ra}$ as controls, however, this seems a minor concern. On the one hand, the number of flights a major outsources to a regional at a given airport is correlated with major-regional complementarities at the airport level. On the other hand, the total number of flights operated by a regional at a given airport (across all its major partners) is correlated with airport-regional-specific capabilities that may drive scope towards certain regionals at a given airport.[14]

A second potential reason for $cov(\varepsilon_{mrad}, Scope\ \ ) \neq 0$ is measurement error. Our $Scope$ variable is a proxy for the scope of the major-regional relationship at the airport level, and therefore it may be measuring scope with error if the share of flights is an imperfect characterization of outsourcing scope; that is, if what matters more are numbers of seats or passengers, the percentage of passengers with a connection, and the like. However, as long as the measurement error associated with the use of $Scope$ is orthogonal to, and uncorrelated with, other relationship airport-specific characteristics, it merely biases our estimates toward zero. Thus, a statistically significant coefficient on $Scope$ is a lower bound of the true estimate and would support our hypothesis.

Results

Cooperation at the national level

Before conducting our main exercise involving outsourcing scope at the airport level, we briefly investigate the link between outsourcing scope and cooperation at the national level. We create nation-wide, non-directional measures of cooperation between a major m and a regional r by aggregating our two airport-level cooperation measures for the dyad, *Cooperation* and *CooperationAlt*, across all days and airports in our data, without distinguishing between the

[14] Notice also that in this industry, regional airlines specialize in transportation and plane and crew management, while major airlines design and coordinate flight schedules. Thus, coordination protocols do not depend on the regional partner.

dirction of cooperation (major-to-regional or regional-to-major), and dividing them by the total number of times the major has either received cooperation from or offered cooperation to some regional nationwide in our data. Similarly, we create nation-wide measures of scope by aggregating each major's share of flights outsourced to each regional across airports. We present the results of this exercise in Figures 1A and 1B below, which plot aggregate cooperation and aggregate scope. Figure 1A shows a positive correlation between aggregate *Cooperation* and aggregate scope. Similarly, Figure 1B shows a positive correlation between aggregate *CooperationAlt* and aggregate scope. This evidence is therefore broadly consistent with our hypothesis that broad outsourcing scope facilitates cooperation.

[FIGURE 1A and 1B HERE]

We now turn to our more granular analysis of the link between scope and cooperation, as described by equations (1) and (2) above. This analysis will allow us to study the effect of outsourcing scope on mutual cooperation (regional-to-major and major-to-regional), explore the role of externalities in driving the effect of scope on cooperation, and control for alternative explanations of the role of scope, such as trust, as well as for unobserved heterogeneity in airport weather, outsourcing practices in different airports and across major airlines, as well as across days through the month of February 2017 in the U.S.

Main analysis: Cooperation at the airport level

Tables 4 and 5 provide evidence, respectively, on the frequency and extent (measured in number of flights) to which a regional airline cooperates with its major partners, and a major airline cooperates with its regional partners, in a given day and at a given airport. Our findings show that a major's cooperation is greater in broader scope relationships (columns 1 and 2 in both tables). Table 4 shows than an increase in scope by 10 percentage points increases regional-to-major *Cooperation* by 17.5%, and regional-to-major *CooperationAlt* by 26.5%. Table 5 shows that an increase in scope by 10 percentage points increases major-to-regional *Cooperation* by 26.5%, and major-to-regional *CooperationAlt* by 33.9%. The coefficients are statistically significant at the 1% level, and they are robust to the inclusion of the relationship's number of outsourced flights and the regional's overall presence in a given airport, measured both in levels (columns 3 and 4 in both tables) and in logs (columns 5 and 6 in both tables), as well as to the inclusion of our rich set of fixed effects.

[TABLE 4 and TABLE 5 HERE]

These results show that broad outsourcing scope not only stimulates cooperation by suppliers (an implication already present in the established organizational economics literature) it also stimulates cooperation by the buyer, consistent with the ABZ model. These effects hold even after controlling for factors specific to an airline's operations at a given airport, such as local demand, extent of externalities between partners, strategic importance of the airport for an airline, and many others. Moreover, outsourcing scope has these effects even after controlling for relationship-specific factors that presumably capture any trust, accumulated learning, punishment opportunities, norms of reciprocity that reside at the interorganizational level, and that might contribute to explaining cooperation levels. There results therefore provide strong support for the externality internalization mechanism modelled above.

Further evidence on the role of externalities

In our final empirical exercise, we test hypothesis H2, according to which the positive effect of broad relationship scope on mutual cooperation increases in the extent of externalities between regional partners. Table 6 below provides evidence on regional-to-major cooperation (columns 1, 2, 5 and 6) and major-to-regional cooperation (columns 3, 4, 7 and 8). Because externalities are overall determined at the major-airport level, columns 1 to 4 show results without major-airport fixed effects. Our specifications in columns 5 to 8 include major-airport fixed effects and other controls used in Tables 4 and 5 for robustness reasons.

[TABLE 6 HERE]

Our findings show that, consistent with our hypothesis, the effect of broader outsourcing scope on mutual cooperation is greater when our measure of externalities between regional partners are greater. Accoording to our results in columns 1 and 2 of Table 6, an additional 10 percentage points in scope, paired with an increase of one thousand additional outsourced flights to other regionals serving the same airport, increases regional-to-major *Cooperation* and *CooperationAlt* by 7.3% and 11.4%, respectively. Similarly, the results in columns 3 and 4 show that an additional 10 percentage points in scope, paired with an increase of one thousand additional outsourced flights to other regionals serving the same airport, increases major-to-regional *Cooperation* and *CooperationAlt* by 6.4% and 11.9%, respectively.

While the effect of our externalities proxy is directionally robust across specifications, its effect on regionals' cooperation with majors is statistically less significant when we include our two controls and major*airport fixed effects in the regressions (specifically, the effect of *Externalities* is significant at the 10% level in column 6, but insignificant in column 5). This reduction in statistical significance may be due to multicollinearity between our $Flights_{mra}$ control and the externality proxy (see Table 2B) and, more generally, to the fact that unlike *Scope*, both the externality proxy and the controls are correlated with airport size and the major's presence at the airport. The effect of *Externalities* on majors' cooperation with regionals (columns 7 and 8) is statistically significant even after including controls and major-aiport fixed effects.

It is also important to note that the direct effect of Scope on cooperation between majors and regionals remains positive and statistically significant after controlling for differences in externatlities across airports.

Altogether, our results provide empirical support for the proposition that broad outsourcing scope encourages mutual buyer-supplier cooperation by internalizing externalities among suppliers, as theorized by our extension of the ABZ model. We not only observe more mutual cooperation at airports where the scope of a given major-regional relationship is broader, we also observe direct evidence that the effect of broader local scope on cooperation increases in the extent of externalities. These results cannot be explained by the several theories of relationship scope that do not feature a role for local externalities. We further elaborate on this point below.

DISCUSSION OF ALTERNATIVE MECHANISMS

Our results show that mutual cooperation between a major and a given regional partner is greater in locations (airports) at which outsourcing is broader in scope, and that the effect of such broad scope on mutual cooperation is greatest at locations where the major outsources flights to multiple partners. These results are consistent with the view, emphasized by Argyres et al. (2020), that broad relationship scope incentivizes cooperation by internalizing externalities among suppliers.

Recall that several alternative mechanisms can explain why broad outsourcing scope can improve cooperation. None of these mechanisms, however, is consistent with our empirical findings. Let us consider first dependence balancing, according to which broad scope makes the buyer more dependent on the supplier, rebalancing any bargaining power advantage the buyer may enjoy, and thereby providing the supplier with an incentive to undertake relationship-specific investments. The type of cooperation we analyze (slot exchanges under adverse weather), however, is not a relationship-specific investment.[15] Moreover, dependence balancing operates at the interorganizational level, not at the local level; holding the buyer's and supplier's mutual dependence and relative bargaining power constant (within a given buyer-supplier partnership), there is no reason why the supplier should have a stronger incentive to undertake specific investments at locations where it accounts for a larger share of the buyer's local activities. In other words, according to the dependence balancing logic, it is the scope of the overall relationship, not its distribution across locations, that matters for incentives. Our regressions with relationship fixed effects therefore rule out dependence balancing as an alternative explanation for our findings.

Another alternative way in which broad outsourcing scope may incentivize cooperation is by strengthening and complementing relational governance. Such complementarity between scope and relational governance may arise due to two non-mutually exclusive forces. First, broad outsourcing scope may complement self-enforcing agreements sustained by the shadow of future interactions. Suppose a buyer outsources two transactions the same supplier. If either fails to

[15] More broadly, regional airlines do not make significant specific investments in their relationship with majors. Regionals' small aircraft can be easily redeployed from one major to another, and the service provided by a regional (transporting passengers from a hub to a local airport) does not require the development of relationship-specific human capital.

cooperate, the other will terminate future cooperation on both transactions. If one transaction has higher present value than the other, a self-enforcing agreement between the partners governing both transactions is bonded by greater relational capital than separate self-enforcing agreements with two different suppliers (Bernheim & Whinston 1990). Second, by embedding the buyer and the supplier in a close relationship, broad outsourcing scope may also facilitate the development of interorganizational trust sustained by the shadow of past interactions (Zaheer, McEvily & Perrone 1998), which will eventually result in stronger mutual cooperation. Like dependence balancing, both the multimarket contact and interorganizational trust mechanisms operate at the interorganizational level, and are therefore ruled out by our regressions with relationship fixed effects. Holding constant the total share of its activities that the buyer outsources to a given supplier, as well as the total stock of past interactions between the two organizations, the distribution of outsourcing scope across locations does not affect the two firms' abilities to sustain self-enforcing agreements or their level of interorganizational trust, and hence should not affect cooperation.

A third alternative mechanism through which outsourcing scope may affect cooperation is interpersonal (as opposed to interorganizational) trust (e.g., Uzzi 1996; Lewicki, Tomlinson & Gillespie 2006). Thus, if an airline trusts different employees of a partner airline to different degrees depending on the airport, and cooperation decisions are made locally at those airports, then broader scope and better cooperation within the same major-regional relationship might reflect variability in interpersonal trust across airports. This hypothetical scenario, however, does not apply to the U.S. airline industry because all requests for, and offers of, landing slots during Ground Delay Programs are centrally processed by employees in each airline's Operation Control Center (OCC) – regardless of the airport to which those slots are assigned. Slot requests and offers are generated by a given airline's central dispatchers (Xiong 2010), who communicate them to the FAA (Vossen & Ball 2006; Gopalakrishnan & Balakrishnan 2017). The centralized OCC is typically located at an airline's headquarters. Thus, if a dispatcher at United's OCC wants to communicate with a dispatcher at its outsourced regional partner Skywest's OCC, it must call Skywest's headquarters in St George, Utah. Similarly, if a dispatcher at American Airlines' OCC wants to communicate with a dispatcher at its outsourced regional partner Mesa Airlines' OCC, it must call Mesa's headquarters in Phoenix, Arizona.[16] Because there are no communications between an airline's OCC dispatcher and a partner's manager at a particular airport, there is no clear way for interpersonal trust to develop at the airport level.

CONCLUSION

The key managerial implication of our finding is that managers should think of outsourcing scope as a governance form, and take into account the incentives for cooperation various choices of such scope provide. More specifically, managers should seek to form broad scope relationships with suppliers or buyers when there are important externalities among those suppliers or buyers, and when the details of cooperation are hard to specify contractually.

Externalities and incomplete formal contracts are important in a variety of settings besides airlines and other outsourcing settings such as manufacturing. Examples include platform-based businesses (Cennamo & Santalo 2019) and alliance portfolios (Arora, Belanzon & Patacconi 2020), in which externalities often exist among complementors. For example, an independent videogame developer writing games for the Sony Playstation console does not necessarily take into account the effects of its decisions about game quality on other independent videogame

[16] For a colourful description of the OCC at Mesa Airlines, see this recent article in the popular aviation magazine AirlineGeeks: https://airlinegeeks.com/2018/05/24/inside-the-regionals-mesa-airlines.

developers writing for the same console. Broader-scope relationships between console providers and independent game develops may help to internalize these externalities and improve game quality. Future research should explore the relationship between relationship scope, exernalities among complementors, and cooperation in these other kinds of settings.

Finally, studies of interorganizational cooperation rarely, if ever, are able to observe variations in cooperation in different locations or transactions within the same relationship. Future research should exploit the airline data on slot exchanges to explore dimensions of interfirm governance other than relationship scope. Additionally, future studies should seek out more settings in which cooperation can be measured objectively, and within-relationship variation in cooperation across space and time can be observed.

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Figure 1A. Cooperation and Scope at the National Level

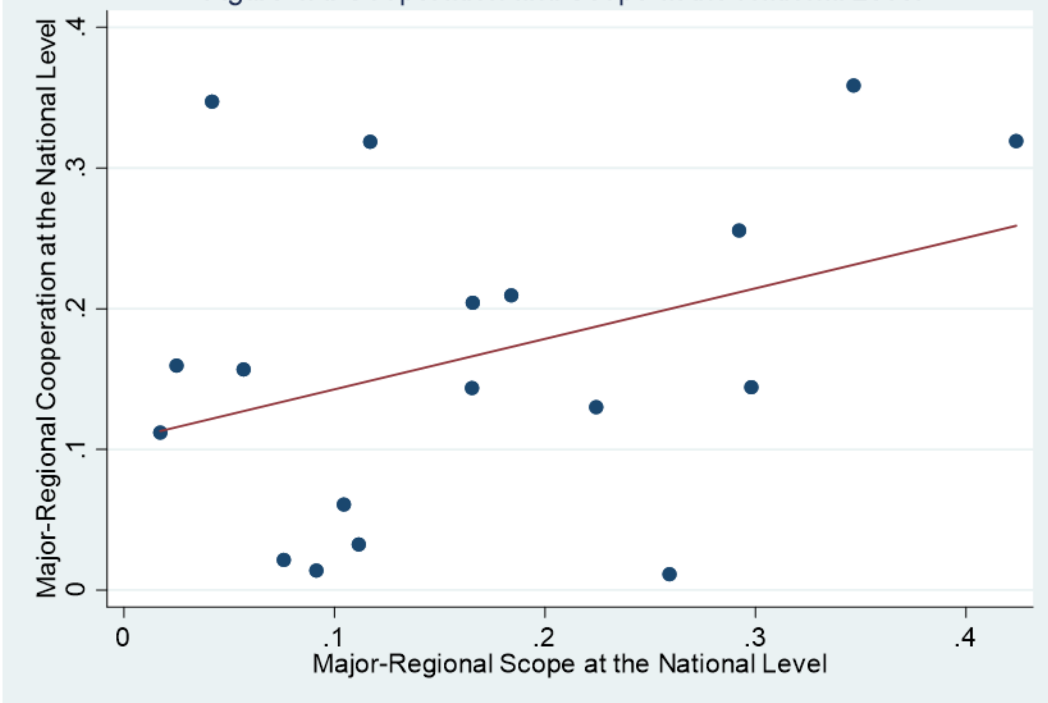

Figure 1B. CooperationAlt and Scope at the National Level

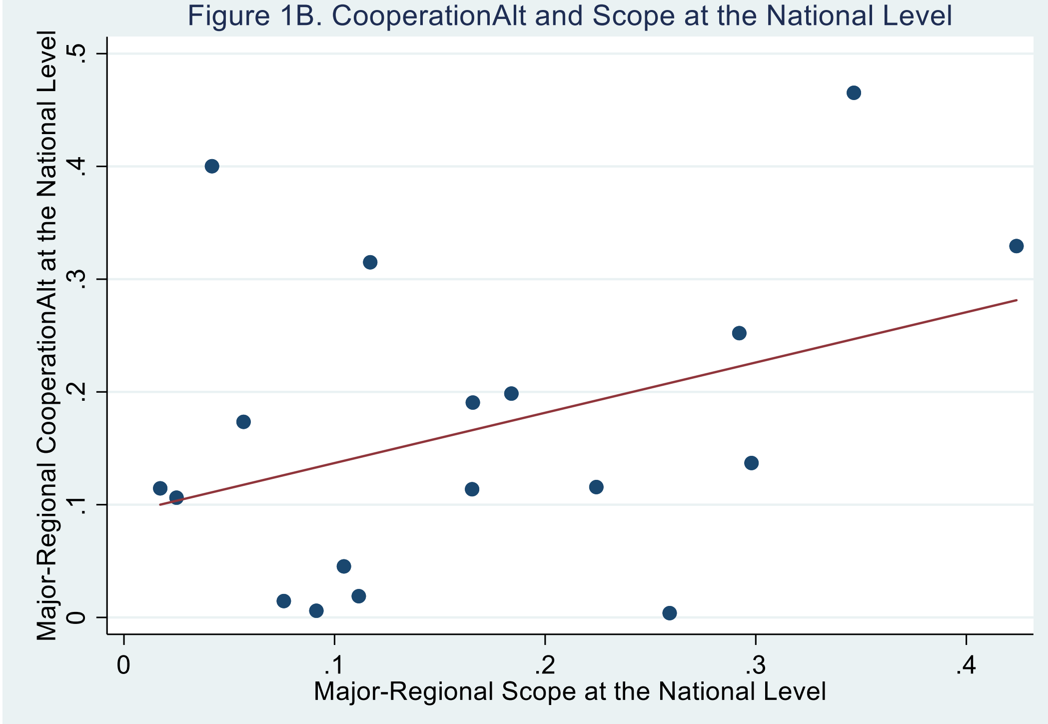

Table 1A. An Illustrative Example of Regional-to-Major Cooperation at New York City La Guardia Airport (LGA)

American Airlines requests a landing slot on Feb 27, 2016, at 4:26am, for flight AAL1164.
To make that slot available, reassignment of arrival slots is requested for the following flights

Airline	Flight ID #	Departure Airport	Arrival Airport	Original Departure Time (Pre-Exchange)	New Departure Time (Post-Exchange)	New Arrival Time (Post-Exchange)
American Airlines	AAL364	ORD	LGA	Feb 26, 9.03pm	Feb 26, 10.50pm	Feb 27, 12.28am
Trans States Airlines	LOF4096	CLE	LGA	Feb 26, 9.09pm	Fe 26, 11.25pm	Feb 27, 12.40am
American Airlines	AAL352	ORD	LGA	Feb 26, 11.36pm	Feb 27, 1.02am	Feb 27, 2.40am
American Airlines	AAL2240	MIA	LGA	Feb 26, 10.05pm	Feb 27, 12.47am	Feb 27, 3.15am
American Airlines	AAL2285	MCO	LGA	Feb 26, 11.30pm	Feb 27, 1.14am	Feb 27, 3.20am
Trans States Airlines	LOF4131	STL	LGA	Feb 26, 11.01pm	Feb 27, 1.36am	Feb 27, 3.35am
American Airlines	AAL2415	MIA	LGA	Feb 26, 11.05pm	Feb 27, 1.10am	Feb 27, 3.38am
American Airlines	AAL348	ORD	LGA	Feb 27, 12.41am	Feb 27, 2.30am	Feb 27, 4.08am

Table 1B. An Illustrative Example of Major-to-Regional Cooperation at New York City La Guardia Airport (LGA)

Atlantic Southeast Airlines requests a landing slot on Feb 26, 2016, at 9:49pm, for flight ASQ5645.
To make that slot available, reassignment of arrival slots is requested for the following flights

Airline	Flight ID #	Departure Airport	Arrival Airport	Original Departure Time (Pre-Exchange)	New Departure Time (Post-Exchange)	New Arrival Time (Post-Exchange)
Delta Airlines	DAL2679	BOS	LGA	Feb 26, 6.00pm	Feb 26, 7.13pm	Feb 26, 7.57pm
Delta Airlines	DAL1488	MIA	LGA	Feb 26, 4.17pm	Fe 26, 6.12pm	Feb 26, 8.30pm
Delta Airlines	DAL2840	DFW	LGA	Feb 26, 4.05pm	Feb 26, 5.55pm	Feb 26, 8.33pm
Delta Airlines	DAL1713	TPA	LGA	Feb 26, 4.45pm	Feb 26, 6.35pm	Feb 26, 8.35pm
Delta Airlines	DAL1486	ATL	LGA	Feb 26, 5.45pm	Feb 26, 7.07pm	Feb 26, 8.39pm
Delta Airlines	DAL2808	FLL	LGA	Feb 26, 5.10pm	Feb 26, 7.15pm	Feb 26, 9.30pm
Delta Airlines	DAL2673	BOS	LGA	Feb 26, 7.00pm	Feb 26, 8.55pm	Feb 26, 9.39pm

Note: Tables 1A and 1B show real-time landing slot exchanges between major and regional airlines on Feb 26th 2016 at La Guardia airport in New York City. In Table 1A, American Airlines (AAL) and its regional partner Trans States Airliens (LOF) coordinate to make a slot available for an AAL flight. In the bottom example, Delta (DAL) makes a slot available to its regional partner Atlantic Southeast Airlines (ASQ).

Table 2A. Summary Statistics of Cooperation, Scope and Other Variables

	Obs	Mean	Std. Dev.	Min	Q1	Median	Q3	Max
Major to Regional								
Cooperation	664	3.92	8.84	0	0	1	4	106
CooperationAlt	664	15.38	36.16	0	0	1	11	357
Regional to Major								
Cooperation	664	4.79	9.62	0	0	1	5	79
CooperationAlt	664	12.60	27.01	0	0	1	9	204

Scope, externalties and airport variables

	Obs	Mean	Std. Dev.	Min	Q1	Median	Q3	Max
Scope	85	0.32	0.24	0.03	0.16	0.25	0.41	1
Externalities	55	1.93	1.09	1	1	2	2	5
ExternalitiesAlt	85	2560.91	4886.84	0	85	465	1688	21065
Flights mra	85	829.11	1533.95	1	59	180	775	8724
RegFlights ra	85	1524.73	2435.65	1	133	400	2008	10405

This table provides summary statistics of cooperations variables used in our analysis, as well as our main explanatory variables, Scope, Externalities and ExternalitiesAlt, and the control variables.

Table 2B. Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) $\mathbf{Flights_{mra}}$	1							
(2) Scope	0.36	1						
(3) $\mathbf{RegFlights_{ra}}$	0.70	0.41	1					
(4) Externalities	0.60	-0.15	0.39	1				
(5) Cooperation (Major to Regional)	0.38	0.33	0.25	0.14	1			
(6) CooperationAlt Major to Regional)	0.24	0.35	0.22	0.03	0.83	1		
(7) Cooperation (Regional to Major)	0.44	0.38	0.31	0.15	0.87	0.76	1	
(8) CooperationAlt (Regional to Major)	0.31	0.31	0.26	0.13	0.78	0.88	0.87	1

Table 3. Distribution of Scope per Major and Regional Relationship across Airports

Major Airline	Regional Airline	# Airports	Mean	Std. Dev.	Min	Median	Max
American Airlines	**Mesa Airlines**	1	0.04	.	0.04	.	0.04
American Airlines	**Air Wisconsin**	5	0.20	0.12	0.11	0.13	0.34
American Airlines	**Compass Airlines**	5	0.52	0.19	0.24	0.53	0.78
American Airlines	**Trans States Airlines**	2	0.10	0.06	0.06	.	0.14
American Airlines	**Republic Airlines**	7	0.41	0.24	0.24	0.29	0.88
American Airlines	**SkyWest**	4	0.44	0.38	0.21	0.27	1
Delta Airlines	**Atlantic Southeast Airline**	4	0.18	0.08	0.11	0.17	0.29
Delta Airlines	**Compass Airlines**	7	0.29	0.15	0.14	0.26	0.52
Delta Airlines	**GoJet Airlines**	7	0.21	0.07	0.09	0.22	0.30
Delta Airlines	**Republic Airlines**	3	0.11	0.06	0.06	0.10	0.18
Delta Airlines	**SkyWest**	8	0.43	0.22	0.10	0.42	0.80
United Airlines	**Mesa Airlines**	4	0.31	0.13	0.20	0.26	0.50
United Airlines	**Atlantic Southeast Airline**	6	0.27	0.19	0.04	0.22	0.60
United Airlines	**GoJet Airlines**	3	0.20	0.08	0.14	0.16	0.29
United Airlines	**Trans States Airlines**	3	0.13	0.05	0.08	0.15	0.16
United Airlines	**Republic Airlines**	7	0.29	0.30	0.03	0.17	0.89
United Airlines	**SkyWest**	7	0.66	0.27	0.30	0.79	0.93
United Airlines	**CommutAir**	2	0.16	0.02	0.15	.	0.17

This table provides summary statistics of the shares of flights per major and regional across airports.

Table 4. Cooperation and Scope: Regionals Cooperating with their Majors

	(1)	(2)	(3)	(4)	(5)	(6)
Dep Var:	**Cooperation**	**CooperationAlt**	**Cooperation**	**CooperationAlt**	**Cooperation**	**CooperationAlt**
Scope	1.751	2.650	1.566	2.221	2.603	3.510
	(0.192)	(0.243)	(0.247)	(0.250)	(0.339)	(0.632)
$Flights_{mra}$			-0.002	0.121		
(thousands)			(0.063)	(0.122)		
$RegFlights_{ra}$			0.047	0.057		
(thousands)			(0.024)	(0.037)		
$\ln(Flights_{mra})$					-0.260	-0.336
					(0.044)	(0.093)
$\ln(RegFlights_{ra})$					0.028	0.100
					(0.074)	(0.094)
Constant	0.846	0.950	1.090	0.968	2.021	2.051
	(0.049)	(0.082)	(0.058)	(0.062)	(0.404)	(0.558)
Major-Regional FE	YES	YES	YES	YES	YES	YES
Major-Airport FE	YES	YES	YES	YES	YES	YES
Airport-Day FE	YES	YES	YES	YES	YES	YES
Observations	664	664	664	664	664	664
R-squared	0.82	0.83	0.82	0.83	0.82	0.83

This table shows results of regressions of cooperation from a regional with its major on scope.
Robust standard errors in parentheses clustered at the major-regional relationship level.

Table 5. Cooperation and Scope: Majors Cooperating with their Regional Partners

	(1)	(2)	(3)	(4)	(5)	(6)
Dep Var:	**Cooperation**	**CooperationAlt**	**Cooperation**	**CooperationAlt**	**Cooperation**	**CooperationAlt**
Scope	2.648	3.393	2.456	2.870	2.865	3.149
	(0.189)	(0.436)	(0.315)	(0.480)	(0.444)	(0.671)
$Flights_{mra}$			0.103	0.317		
(thousands)			(0.078)	(0.132)		
$RegFlights_{ra}$			0.006	-0.0001		
(thousands)			(0.060)	(0.098)		
$ln(Flights_{mra})$					-0.162	-0.101
					(0.100)	(0.178)
$ln(RegFlights_{ra})$					0.101	0.164
					(0.074)	(0.118)
Constant	0.300	0.596	0.325	0.872	0.712	0.481
	(0.048)	(0.099)	(0.027)	(0.080)	(0.669)	(1.114)
Major-Regional FE	YES	YES	YES	YES	YES	YES
Major-Airport FE	YES	YES	YES	YES	YES	YES
Airport-Day FE	YES	YES	YES	YES	YES	YES
Observations	664	664	664	664	664	664
R-squared	0.69	0.68	0.69	0.68	0.69	0.68

This table shows results of regressions of cooperation from a major with its outsourcing regional partner on scope. Robust standard errors in parentheses clustered at the major-regional relationship level.

Table 6. Cooperation and Scope: TheModerating Role of Externalities

	Regional Cooperates with Major		Major Cooperates with Regional		Regional Cooperates with Major		Major Cooperates with Regional	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep Var:	**Cooperation**	**CooperationAlt**	**Cooperation**	**CooperationAlt**	**Cooperation**	**CooperationAlt**	**Cooperation**	**CooperationAlt**
Scope	2.448***	3.417***	2.521***	3.480***	1.572***	2.284***	2.519***	2.997***
	(0.751)	(1.041)	(0.826)	(1.177)	(0.255)	(0.291)	(0.347)	(0.520)
Scope*Externalities	0.731**	1.137*	0.638***	1.194***	0.088	0.881*	0.888***	1.796***
(thousands)	(0.334)	(0.557)	(0.201)	(0.391)	(0.194)	(0.436)	(0.247)	(0.309)
Externalities	-0.011	-0.040	-0.055	-0.103	0.030	-0.024	-0.101***	-0.176***
(thousands)	(0.064)	(0.100)	(0.040)	(0.073)	(0.028)	(0.050)	(0.019)	(0.039)
$Flights_{mra}$					-0.002	-0.202	-0.299**	-0.467***
(thousands)					(0.089)	(0.181)	(0.115)	(0.156)
$RegFlights_{ra}$					0.0468*	0.051	-0.0003	-0.012
(thousands)					(0.025)	(0.038)	(0.058)	(0.093)
Constant	-0.646***	-0.838***	-0.622***	-0.819***	0.561***	-0.154	0.113	-1.090***
	(0.163)	(0.126)	(0.125)	(0.096)	(0.111)	(0.136)	(0.137)	(0.220)
Major-Regional FE	YES	YES	YES	YES	YES	YES	YES	YES
Major-Airport FE	NO	NO	NO	NO	YES	YES	YES	YES
Airport-Day FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	664	664	664	664	664	664	664	664
R-squared	0.73	0.74	0.61	0.62	0.82	0.83	0.69	0.69

This table shows results of regressions of cooperation from a major with its outsourcing regional partner on scope.
Robust standard errors in parentheses clustered at the major-regional relationship level.

Appendix: Additonal Tables and Robustness Checks

Exhibit from the FAA Slot Exchange Platform

Table A1 below reproduces the original screenshot from the FAA slot exchange platform from which the two illustrative examples in Tables 1A and 1B have been constructed.

<Place Table A1 here>

Direct Cooperation

In our empirical exercise we have assumed that regional-to-regional slot exchanges are mediated by the major and have therefore included them in our measures of cooperation. As a robustness check, Tables A2 and A3 below repeat the regressions from tables 4 and 5 using direct measures of regional-to-major and major-to-regional cooperation that exclude instances of regional-to-regional cooperation.

<Place Table A2 and Table A3 here>

The results are entirely consistent with those in Tables 4 and 5, which indicates that the effect of scope on cooperation is not sensitive to whether one interprets regional-to-regional cooperation as being mediated by major airlines.

Table A1. Excerpt of Adaptative Slot Exchanges on February 26th 2016 in La Guardia Airport NYC

…

SS PACKET PROCESSED FROM AAL37 (10.182.183.215)

EDCT RESPONSE:

ACID	ASLOT	DEP	ARR	CTD	CTA	ERTA	IGTD
AAL364	LGA.270028A	ORD	LGA	262250	270028	262259	262103
LOF4096	LGA.270040A	CLE	LGA	262325	270040	262240	262109
AAL352	LGA.270240A	ORD	LGA	270102	270240	270132	262336
AAL2240	LGA.270315A	MIA	LGA	270047	270315	270054	262205
AAL2285	LGA.270320A	MCO	LGA	270114	270320	270154	262330
LOF4131	LGA.270335A	STL	LGA	270136	270335	270120	262301
AAL2415	LGA.270338A	MIA	LGA	270110	270338	270153	262305
AAL348	LGA.270408A	ORD	LGA	270230	270408	270240	270041
AAL1164	LGA.270426A	DFW	LGA	270136	270426	270220	262310

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****

SS PACKET PROCESSED FROM DAL (10.182.182.246)

EDCT RESPONSE:

ACID	ASLOT	DEP	ARR	CTD	CTA	ERTA	IGTD
DAL2679	LGA.261957A	BOS	LGA	261913	261957	-	261800
DAL1488	LGA.262030A	MIA	LGA	261812	262030	-	261617
DAL2840	LGA.262033A	DFW	LGA	261755	262033	-	261605
DAL1713	LGA.262035A	TPA	LGA	261835	262035	-	261645
DAL1486	LGA.262039A	ATL	LGA	261907	262039	-	261745
DAL2808	LGA.262130A	FLL	LGA	261915	262130	-	261710
DAL2673	LGA.262139A	BOS	LGA	262055	262139	-	261900
ASQ5645	LGA.262149A	ATL	LGA	262016	262149	-	261400

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Note: Tables 1A and 1B show real-time landing slot exchanges between major and regional airlines on Feb 26th 2016 at La Guardia airport in New York City. In Table 1A, American Airlines (AAL) and its regional partner Trans States Airliens (LOF) coordinate to make a slot available for an AAL flight. In the bottom example, Delta (DAL) makes a slot available to its regional partner Atlantic Southeast Airlines (ASQ). EDCT stands for Expected Departure Clearance Time.
ACID stands for the operating airline and flight number, ASLOT the designated number of the landing slot at the destination airport, DEP origin airport, ARR destination airport, CTD controlled departure time, CTA controlled tume of arrival, ERTA earliest runway time of arrival, IGTD initial gate time of departure.

Table A2. Direct Cooperation and Scope: Regionals Cooperating with their Majors

	(1)	(2)	(3)	(4)	(5)	(6)
Dep Var:	**Cooperation**	**CooperationAlt**	**Cooperation**	**CooperationAlt**	**Cooperation**	**CooperationAlt**
Scope	1.425	2.128	1.311	1.887	2.126	2.887
	(0.176)	(0.169)	(0.192)	(0.173)	(0.266)	(0.441)
$Flights_{mra}$ (thousands)			-0.030	0.012		
			(0.032)	(0.075)		
$RegFlights_{ra}$ (thousands)			0.041	0.055		
			(0.020)	(0.030)		
$\ln(Flights_{mra})$					-0.204	-0.256
					(0.034)	(0.056)
$\ln(RegFlights_{ra})$					0.013	0.048
					(0.057)	(0.074)
Constant	0.661	0.792	0.681	0.853	1.571	1.750
	(0.038)	(0.053)	(0.040)	(0.053)	(0.298)	(0.404)
Major-Regional FE	YES	YES	YES	YES	YES	YES
Major-Airport FE	YES	YES	YES	YES	YES	YES
Airport-Day FE	YES	YES	YES	YES	YES	YES
Observations	664	664	664	664	664	664
R-squared	0.78	0.77	0.78	0.77	0.78	0.77

This table shows results of regressions of cooperation from a regional with its major on relationship scope. Robust standard errors in parentheses clustered at the major-regional relationship level.

Table A3. Direct Cooperation and Scope: Majors Cooperating with their Regional Partners

	(1)	(2)	(3)	(4)	(5)	(6)
Dep Var:	**Cooperation**	**CooperationAlt**	**Cooperation**	**CooperationAlt**	**Cooperation**	**CooperationAlt**
Scope	1.455	2.010	1.186	1.518	1.352	1.599
	(0.145)	(0.358)	(0.152)	(0.247)	(0.247)	(0.492)
$Flights_{mra}$ (thousands)			0.091	0.244		
			(0.057)	(0.101)		
$RegFlights_{ra}$ (thousands)			0.030	0.022		
			(0.039)	(0.072)		
$\ln(Flights_{mra})$					-0.083	-0.035
					(0.061)	(0.127)
$\ln(RegFlights_{ra})$					0.109	0.143
					(0.041)	(0.078)
Constant	0.329	0.493	0.325	0.479	0.255	0.138
	(0.042)	(0.086)	(0.034)	(0.061)	(0.368)	(0.739)
Major-Regional FE	YES	YES	YES	YES	YES	YES
Major-Airport FE	YES	YES	YES	YES	YES	YES
Airport-Day FE	YES	YES	YES	YES	YES	YES
Observations	664	664	664	664	664	664
R-squared	0.66	0.65	0.67	0.66	0.67	0.65

This table shows results of regressions of cooperation from a major to its regional partners on relationship scope. Robust standard errors in parentheses clustered at the major-regional relationship level.