Micro Foundations of Network Formation: Experimental Evidence from American Municipal Governments

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Abstract

By focusing on organizational or network level analysis, the earlier research agenda on intergovernmental collaboration is either "too late" or "too aggregated" to explain public officials' individual motivation of network formation. Existing literature relies on observational data to discuss governments' collaborative decisions from a rear-view mirror perspective; after networks have formed. To help us get a proactive worldview, this study examines three fundamental network formation theories at individual official level. These theories include rational choice, ideological homophily, and relational trust. A nationwide conjoint survey experiment of U.S. municipal officials, including elected officials and city managers, was conducted to test the hypotheses. The results indicate that municipal officials' collaboration decisions are jointly driven by all three theories, but ideological homophily contributes relatively smaller explanation power than the other two. In addition, the subgroup analysis of Democrat and Republican respondents further discusses the complex interaction effects between fair sharing of cost and ideological homophily. This experimental approach of network analysis advances network theories and provides new opportunities to study collaborative governance.

Keywords: Network formation, Collaborative governance, Conjoint experiment, Municipal governments

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Introduction

What drives governments to collaborate with each other? This is one of the most long-standing research questions in the field of public administration. The basic theoretical rationale for developing scholarship on collaborative network is straightforward: many intergovernmental problems cannot be solved or solved easily, by single organizations (Agranoff and McGuire 2001, 296). The increasing complexities of interorganizational actions facilitate our need to investigate the process of network emergence in public organizations (O'Toole Jr 1997). With this consideration, the ways public organizations connect with each other and the motivations they reach collaborative decisions are pre-conditions for scholars to further study other network activities and outcomes.

In this vein, public policy and management literature integrates diverse theoretical approaches to explain network formation (e.g., Berry et al. 2004; Henry et al. 2011; Provan and Kenis 2008; Scott and Thomas 2017; Yi et al. 2018). Two areas of study, however, need further investigation. The first one is mechanism confusion, which means that multiple theories and hypotheses can explain the same network phenomenon (Siciliano et al. 2021). For example, many scholars agreed that collaboration agreements are functions of risk aversion from network actors: Public organizations seek to bridge with new collaborators when they perceive low risk; and they seek to bond with existing collaborators under high risk (Berardo and Scholz 2010). However, risk is difficult to measure and often inferred by hindsight. Network actors' risk perceptions toward partnerships may result from: (1) cost/benefit calculations, (2) attribute-based homophily, (3) relational trust, or other possible factors. Such mechanism confusion creates barriers for scholars to compare the explanation powers between different theories, because many of them have overlapping functions that need to be isolated (Siciliano et al. 2021).

Second, network scholars develop abundant evidence about intergovernmental network at organizational or network levels, but we paid relatively sparse attention to network the-

ories at individual-level. By way of definition, the most fundamental elements in networks are individuals who managing organizations within networks, because they "... as actors can be seen simultaneously as occupants of positions within a public administrative organization and as components of one or more multiorganizational web(s) of action built in one way or another around functions or public problems" (O'Toole Jr 2015, 362). However, the previous research agenda is either "too late" or "too aggregated" to explain individual officials' incentives of network activities. By focusing on meso or macro levels, existing literature discusses public organizations' collaborative behaviors from a rear-view mirror perspective; after networks have formed. Public managers' initial motivation to trigger collaborative decision is empirically unknown.

To help us get a proactive worldview, I propose an experimental approach to study network formation. Experimental method is useful to solve the above two problems in network research. Randomization techniques in experiments are effective to achieve mechanism isolation, so researchers can compare effects between different theories in a common standard. Moreover, most experiments are situated at individual-level, which allow researchers to closely observe collaborative willingness of organizational decision-makers. Based on these premises, this study asks: What micro-level mechanisms motivate public managers to make collaborative decisions in an intergovernmental world?

Specifically, this study compares the relative explanatory power of three fundamental but competing network theories. These theories are rational choice, ideological homophily, and social capital. In rational choice, collaborative partnerships are functions of costs/benefits calculation between network members (Ostrom 1990). This approach assumes that collaboration is largely based on participants' self-interests. However, ideological homophily argues that collaborations are determined by participants who share similar ideological beliefs, which are not always generated from rational considerations (Jenkins-Smith and Sabatier 1993). The theory of social capital is in the middle ground between the above two approaches, which argues that self-interests and ideological beliefs are respectively under- and

over-socialized concepts (Granovetter 1985). In alternative, collaboration is established on the relational trust that comes from prior interactions. Although these three theories are influential to explain network formation, the direct comparison between them is encountered by mechanism isolation issue in observational studies' posterior analyses.

Therefore, I examined causal mechanism directly from each of these theories in a survey based conjoint experiment of municipal officials (elected officials and city managers) across the United States. As part of the survey, I provided a vignette about implementing a sustainable development program. Municipal officials were then asked to choose program proposals suggested by potential collaborator cities. The three network theories are manipulated as attribute components in the program proposals, and respondents need to trade off among attributes. Using this strategy, I simultaneously compared treatment effects from the three theories on officials' partner selection choices.

The findings indicate that all three theories contribute significant effects on municipal officials' collaborative decisions. Interestingly, rational choice and social capital theories share similar and stronger effects than ideological homophily. In particular, low costs, high benefits, and good collaborative experiences are major reasons for partnerships. In addition, fair distribution of program costs between collaborators is also important, but it is conditional on officials' party affiliations. Although municipal officials have tendencies to collaborate with cities that share the same partisanship, this effect is less critical in our model. Overall, collaborative decisions of municipal officials are not solely determined by a single theory. Conversely, collaborative decisions are driven by multi-dimensional considerations in reality.

This article sheds new light on network formation theories at individual-level analysis, and especially on interlocal collaborative decisions of municipal leaders. The establishments of rational choice, ideological homophily, and social capital theories in the conjoint experiment bridge solid connections with existing literature. Combining the findings from this study and other levels' (meso and macro) network research, scholars can translate collaborative motivations of public managers before networks happened to actual organizational

process after networks have formed. From this perspective, we can further advance network theories conceptually and methodologically.

Competing Network Theories

Before proceeding, I wish to clarify at the outset about the definition of network and network theory in this article. Network is a complex concept, which has multiple definitions and types in public policy and management literature. This article follows the classic definition from Agranoff and McGuire (2001, 296):

> "Networks, as the term is used in the literature, typically refers to multiorganizational arrangements for solving problems that cannot be achieved, or achieved easily, by single organizations. Public management networks are led or managed by government representatives. Simply put, networks constitute emergent phenomena that are distinctive managerial vehicles and that offer challenges for the single organization and its management."

This definition not only provides a clear demonstration about the purpose of intergovernmental network, but also indicates the necessity of studying network activities of government representatives. Based on this insight, this article specifies network formation at individual officials' collaborative decision.

For network theories, the literature distinguishes networks by multiple types given their different functions, such as learning networks (Nisar and Maroulis 2017; Siciliano 2015), service networks (Romzek et al. 2014), and policy networks (Ingold and Leifeld 2016; Yi et al. 2018). However, network members in any of these networks have demands to find new collaborative partners for achieving organizational goals. Regarding this feature, using collaborative decision as a potential network outcome is generalizable to different institutional contexts. The literature also investigates network activities by different structures, such as nodes, dyads, triads, and multi-layer relationships (Berardo and Scholz 2010). As a micro

level study to examine the fundamental theories of collaborative behaviors, this article only emphasizes on the most basic network activity: collaborative willingness from one actor to another. I recognize that this simplistic two-actor mode is limited to describe many multi-dimensional network activities embedding in complex network structures, but it serves well as an outcome measurement to isolate interdependency of other confounding factors in the institutional environment. Therefore, it fits with the research purpose of this study.

Revising the Three Traditions of Network Research

Scholarship on interorganizational collaboration has been "treating networks seriously" for more than two decades (O'Toole Jr 2015). As an applied science, the field of public administration incorporates interdisciplinary traditions into the network research agenda (Berry et al. 2004). Among numerous network theories in public policy and management, most of them can be traced back to three traditions: Neo-institutional economics, political psychology, and sociology.

This categorization is different from Berry et al.'s (2004) seminal article, which sorts network research traditions into sociology, political science, and public management (see Table 1). Berry and her colleagues categorize network traditions by different assumptions about human behaviors: social embeddedness in sociology, rational choice in political science, and instrumentalism in public management. However, the field of political motivated reasoning is fast growing in the past decade, which has changed many political scientists' minds about human behaviors(Taber and Lodge 2006). This stream suggests that public officials' ideological views strongly shape their affinity of policy actions (Butler et al. 2017). To better capture network theories today, I revise Berry et al.'s (2004) categorization and break down the political science network research tradition into neo-institutional economics with rational choice assumption (Ostrom 1990; Williamson 1981) and political psychology with motivated reasoning assumption. In addition, this study agrees with Berry et al.'s (2004, 543) opinion on public management in the network tradition category, which integrates diverse traditions

into the network research agenda and "...geared toward instrumental concerns."

Table 1: The Network Traditions

Berry et al. (2004)	**Current Revision**	**Assumptions About Behavior**
Sociology	Sociology	Social embeddedness
Political science	Neo-institutional economics	Rational choice
	Political psychology	Political motivated reasoning
↓	↓	↓
Public management	Public management	Integration and instrumentalism

The following parts in this section introduce each of the three network research perspectives and their representing theories. In particular, this study investigates costs/benefits analysis from neo-institutional economics, ideological homophily from political psychology, and relational trust from sociology. These theories are competing with each other, because their basic assumptions about human behaviors are different: Costs/benefits analysis is built on rational choice assumption, ideological homophily is based on motivated reasoning assumption, and relational trust is developed by social capital assumption. Although these theories offer unique explanations of network formation, they are not mutually exclusive, because network decisions are often combinations of multi-dimensional considerations in complex information environments (Silvia 2018). Therefore, the purpose of this study is not to choose an optimal network solution for public managers, but rather to examine the relative explanation power between different theories in public officials' collaborative decisions.

Rational Choice Assumption and Costs/Benefits Analysis

Williamson (1981) and other neo-institutional economics scholars assume that human behaviors are generally rational. Therefore, network members' self-interested utility maximization should predict their decisions, and rational factors should explain the major variations of network activities. Collaborative behaviors are functions of costs and benefits between network actors, so network actors' decisions should largely depend on their expec-

tations of economic gains in the actions they involve.

The rational choice theory and costs/benefits analysis are powerful in network literature. Finishing intergovernmental tasks in collaboration is an attractive strategy, because every network actor has strengths and constraints in work (Olson 1965). Through effective communication and coordination, each network actor learns from each other, and eventually achieve costs reduction and benefits maximization in an ideal condition. The rational choice theory is immense in the context of polycentric governance. For example, Lubell et al. (2002) investigate American watershed management and argue that partnerships are more likely to emerge when organizations need to offset costs associated with severe environmental problems. Similarly, other authors find that organizations join partnership to access knowledge for policy solutions (Berardo and Lubell 2016; Hileman and Bodin 2019). The rational choice theory also fits with individual level (Ostrom 1990). In studying networks of frontline bureaucrats, individuals like to build connections with peers with strong expertise, so they can maximize their own benefits (Nisar and Maroulis 2017; Siciliano 2015). In addition, frontline bureaucrats also search advises from peers who are most accessible to reduce social costs (Siciliano et al. 2021).

On the other side, social scientists not always agree with the pure rational model, even if they consider costs and benefits in collaborative decisions. Originated from behavioral economics, some authors argue that the costs/benefits calculus should condition on fairness of cost allocation between collaboration parties (Ostrom 1998). Abbink et al. (2001, 5) call this argument as "punishment hypothesis", in which "...punishment attributes a motive to the second mover's rejection of an unequal division asserting that it is done to punish the first mover for unfair treatment." Therefore, sharing the costs equally is important in a partnership, otherwise actors may reject the collaboration proposal regardless how much utility they can gain from it. For example, Shrestha (2012) find that conflicts about fair sharing critically affect success of collaborative public programs. Nonetheless, cost fairness has not been popularly examined yet in network literature. Thus, this study integrates both

the pure rational model and a cost fairness assumption into the hypothesis testing.

H1a: Municipal officials are more likely to form collaborations with partners that offer lower costs.

H1b: Municipal officials are more likely to form collaborations with partners that offer fair sharing of costs.

H2: Municipal officials are more likely to form collaborations with partners that offer larger benefits.

Motivated Reasoning Assumption and Ideological Homophily

Political psychology offers a different view about human behaviors rather than the conventional rational model. It suggests that "all reasoning is motivated" (Taber and Lodge 2006, 756). People "...generate theories that view their own attributes as more predictive of desirable outcomes" (Kunda 1987, 636). When this assumption applied to political life, people process information by their partisan goals rather than accuracy, which means that people no longer make decisions by actual evidence they observe but by prior ideological beliefs they defend (Taber and Lodge 2006).

The theory of political motivated reasoning is widely used in political science and public administration. It affects citizens' policy judgements and voting decisions (e.g., Bisgaard and Slothuus 2018; Graham and Svolik 2020; James and Van Ryzin 2017). Compared to citizens, some authors suggest that the effect of motivated reasoning is even stronger among politicians (Baekgaard et al. 2019; Christensen and Moynihan 2020). Therefore, investigating how prior ideological beliefs shape government officials' decision is timely and important.

In network literature, the impact of prior ideological beliefs on collaborative decisions has been introduced by the advocacy coalition framework, which argues that network actors with similar beliefs comprise coalitions and they learn policy knowledge within the coalitions (Jenkins-Smith and Sabatier 1993). Following this stream, Leach and Sabatier (2005) find that when considering network actors' political deep core beliefs and policy beliefs, rational

choice variables are no longer significant to determine partnership. Similarly, Henry (2011) investigates policy networks in California regional planning system, he finds that political elites tend to collaborate with ideology similar actors and avoid connecting with ideology dissimilar actors.

Network scholars classify ideological belief coalition into attribute based homophily, which argues that network actors create ties with those who share similar attributes (Siciliano et al. 2021). Although network formation may be affected by multiple attributes (such as gender and ethnicity), this study focuses on ideological homophily. I assume that municipal officials will select collaborators who match with their ideological beliefs. This assumption is supported in different contexts. For example, Rabovsky and Rutherford (2016) find that presidential and state policy maker ideology affects American universities' external networking efforts. Song et al. (2018) also discover the ideological homophily effect among Korean municipal council members in interlocal collaborations.

H3: Municipal officials are more likely to form collaborations with partners that share the similar ideology beliefs.

Social Capital Assumption and Relational Trust

Sociologists study human behaviors by structural social contexts (Burt 1997). Granovetter (1985, 481) argue that "behavior and institutions are affected by social relations." He criticizes both the over- and under-socialized concepts in understanding economic actions: under-socialized account is too narrow to explain behaviors from utilitarian self-interest; over-socialized account over internalizes behaviors, so ongoing social relations are omitted in analysis. Based on this argument, network analysis should not only emphasize on costs/benefits analysis or ideological homophily, but also the social capital created by interactions between people (Burt 1997).

The theory of social capital assumes that prior interactions between network actors are likely to build relational trust (Granovetter 1985; Krackhardt et al. 2003). In network liter-

ature, relational trust motivates actors to extend collaborations (Siciliano et al. 2021). For example, Bunger (2013) find that interorganizational trust boost administrative coordination among nonprofit organizations. Scott and Thomas (2015) also observe social capital effect from environmental collaboration. Their results indicate that the probability of tie formation increases if two organizations both participate in the same collaborative group. Huang (2014) explains the mechanism between prior interaction, trust, and tie formation by investigating mental health networks. He suggests that intense interaction increases the likelihood of information sharing, but this effect is only conditional on actors' perceived trustworthiness between each other.

Although the effect of social capital on collaboration has been repeatedly tested, some limitations remain. Siciliano et al. (2021) point out that the theoretical direction between trust and collaboration is unclear. Collaboration builds trust, but trust can also result further collaboration. Sciliano and his colleagues suggest that network analysis in this area should include longitudinal analysis, but data availability issue hinders more authors to use this method (Berardo et al. 2020; Isett and Provan 2005). Rather than longitudinal analysis, I use experimental method to solve the theoretical direction problem. Through manipulating information about past collaborative experience, I examine municipal officials' collaborative decisions in a hypothetical experimental scenario.

H4: Municipal officials are more likely to form collaborations with partners that they shared good collaborative experiences in history.

Testing the Determinants of Network Formation

Recently, public policy and management scholars have achieved significant progress in studying public networks by embracing new methods, such as agent-based simulation (Scott et al. 2019), longitudinal analysis cite (Siciliano et al. 2020), and coded meeting records (Berardo et al. 2014). However, we still face some obstacles. For example, it is difficult to isolate mechanisms of the above theories from each other and simultaneously compare

their effects. In addition, dyadic connections often arise dependently with other surrounding connections in the network (Scott and Ulibarri 2019). Therefore, it is challenging to exclude confounding factors of collaborative decisions among public organizations.

Conjoint Experimental Design and Identification Strategy

To overcome these difficulties and test the above hypotheses causally, I introduce a conjoint experimental approach to study network formation. The design and data analysis plan were pre-registered at [anonymous for peer-review] (see Appendix A). Within a sustainable development program vignette, I constructed the above theories into four program attributes. This design (a) isolated attributes' components by randomization; (b) captured theoretical mechanisms of the hypotheses; (c) and required respondents to trade-off between multiple attributes in collaborative decision-making.

After briefly introducing the program scenario, the survey presented three pairs of hypothetical city partnership opportunities. In each pair, respondents compared two program proposals from two cities. Then, respondents were requested to indicate which city they prefer to collaborate with. The chosen proposals were coded as 1, otherwise 0. Each program proposal contains information of four attributes: program costs (own cost and partnership city's cost), job creation benefits, collaborator's partisanship (Democrats or Republicans), and previous collaborating experiences with this city. Respectively, these four attributes corresponded to the three theories we interested: costs/benefits analysis, ideological homophily, and relational trust. Table 2 displays detailed information of each attribute. It is worth noting that the cost attribute contains two elements for hypotheses testing. It tested whether respondents prefer the lowest cost (H1a, component (1)) or fair sharing of cost (H1b, component (2)). After the conjoint comparison tasks, respondents answered questions about their party affiliation, ideology, and position tenure. Finally, they also answered demographic questions of race, gender, age, and education. Survey instruments are reported in Appendix B.

Table 2: Attributes for Collaborative Program Proposals

Attributes	Components
Cost of the program Theory: cost aversion/cost fairness (H1a, H1b)	(1) You pay: $250,000; your partner pays: $750,000 (2) You pay: $500,000; your partner pays: $500,000 (3) You pay: $750,000; your partner pays: $250,000
The program will create Theory: benefit (H2)	(1) 200 jobs in your city (2) 500 jobs in your city (3) 800 jobs in your city
The program is proposed by Theory: ideological homophily (H3)	(1) Democrats (2) Republicans
Previous working experiences with this city Theory: Relational trust (H4)	(1) Good (2) Bad (3) No experience

As aforementioned, every proposal randomly assigned a component for each attribute, thus these components are independent treatments in the between and within subject design (Hainmueller et al. 2014). There are totally $54 = 3 \times 3 \times 2 \times 3$ possible combinations of attribute components in program proposals (see Table 2). The conjoint experiment not only randomized attribute components, but also the order of attributes across respondents. This design reduced order effects, which made the results more robust[1] ((Hainmueller et al. 2014). In summary, one can see every attribute as an independent and identically distributed random variable. I regressed them in one linear probability model that used proposals as units of analysis (Equation 1). Standard errors were clustered at individual level to control non-independence of the within subject proposal comparison.

$$Collaboration = \beta_1 Cost + \beta_2 Benefit + \beta_3 Party + \beta_4 Trust + \mu \tag{1}$$

Testing H3 needs to measure the interaction between respondents' self-partisanship identities and the partisanship attribute components in program proposals. If respondents' self-partisanship identities match with the partisanship attribute components, for example a Democrat respondent see a Democrats proposed program proposal, the probability of she or

[1]Order of attributes within respondents are fixed, which avoided the within subject confusion.

he chooses this proposal will be increased. Therefore, the completed identification strategy shows in Equation 2.

$$Collaboration = \beta_1 Cost + \beta_2 Benefit + \beta_3 Party + \beta_4 Trust + \beta_5 Party \times SelfParty + \mu \quad (2)$$

Since Hainmueller and his colleagues developed conjoint experiment (Hainmueller and Hopkins 2015; Hainmueller et al. 2014), this method has been widely used in political science and public administration (e.g., Hollibaugh Jr et al. 2020; Jankowski et al. 2020; Jilke and Tummers 2018; Michael Auerbach and Thachil 2020). The advantages of this method are threefold. First, it simultaneously tests multiple theories in one model, so effects of these theories can be compared with a common standard (Hainmueller et al. 2014). Second, it requires respondents to trade-off between different attributes by the force choice outcome measurement, which improves realism relative to traditional factorial experiments (Hainmueller et al. 2015). Finally, the multiple information environment of conjoint experiment reduces the concerns about social desirability, and the experimental purpose thereby is hard to detected by respondents (Bansak et al. 2021). Based on these characteristics, conjoint experiment is an ideal technique to isolate mechanisms from multiple network theories and test hypotheses on individual officials.

Data Collection and Sample Representativeness

The current study targets municipal officials in the United States, which include elected officials (mayors, councilors, or the equivalent) and municipal managers (city managers, assistant city managers, or the equivalent). These public officials often serve as policy makers and government representatives in managing networks. Therefore, their leadership can largely shape organizational collaborative actions (Butler et al. 2017; McGuire and Silvia 2010).

To build the sample pool of municipal officials, I collected their names, gender, and

email addresses from municipalities' official websites. The sample pool included large and medium size American municipalities having population above 30,000 (1352 municipalities in total). About half of the United States' population are living in these areas. Municipalities without email addresses for public officials were removed from this study. I used Qualtrics to create the survey and sent it out to municipal officials via emails. To increase response rate, one initial invitation with two friendly reminders were fielded in two months (from April to early June, 2021). Appendix C reports the email invitation context.

Finally, 9928 emails have successfully arrived this sample pool of municipal officials[2]. For effective responses, 772 municipal officials responded at least one conjoint proposal comparison task and provided party affiliation and ideology information[3]. The overall response rate was about 8%, which was comparable with other recent surveys that using similar samples(e.g., Lee and Stecula 2021; Malhotra et al. 2019; Shaffer et al. 2020). The final sample covered 49 states and the District of Columbia; 533 (39%) municipalities had at least one official effectively responded to the survey[4]. Appendix D provides the full description of the sample characteristics.

The final sample were broadly representative of the whole sample pool. To test the sample representativeness, I collected municipal level demographic data from the U.S. Census Bureau 2019 American Community Survey, including population, median household income, home value, labor force participation, unemployment rate, and information of ethnicity distribution (Black and White population). I also calculated municipalities' female official ratio in the contact information collection process. With this information, I compared municipalities of these variables that had at least one respondent and municipalities without respondent by two sample t-tests. Although responded municipalities have slightly higher female official ratio and White population, there were few statistical differences between responded and no-response municipalities. Figure 1 shows the visualized results.

[2]10288 emails were sent. Among them, 16 were failed to arrive, 344 were bounced back.
[3]Overall, 987 respondents had opened the survey and answered at least one question, so the response rate was 10%. However, 772 among them were effective response that can be used in analysis.
[4]Delaware is the only State without any effective response.

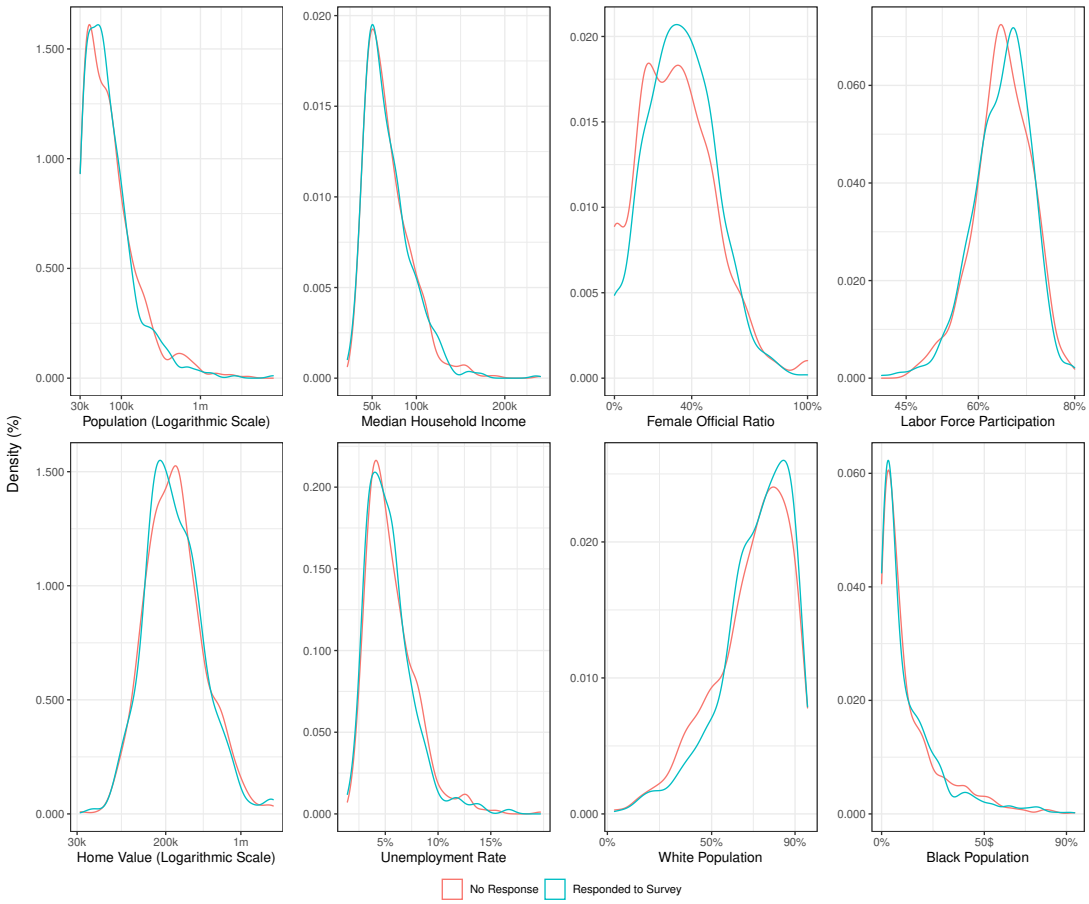

Figure 1: Representativeness of Municipal Officials Who Responded

Results

Descriptive Summary

The final sample contained 772 individual officials (39% female, 78% White, Mage = 57), 674 of them were elected officials and 98 of them were municipal managers. The respondents totally completed 4534 program proposal evaluations. As above mentioned, the measurement of ideological homophily effect needs to match respondents' ideology and the party affiliation showed in the program proposals, which assumes that respondents' ideology overlap with their partisanship. Figure 2 validates this assumption, in which most of Democrats were liberals and most of Republicans were conservatives in the sample.

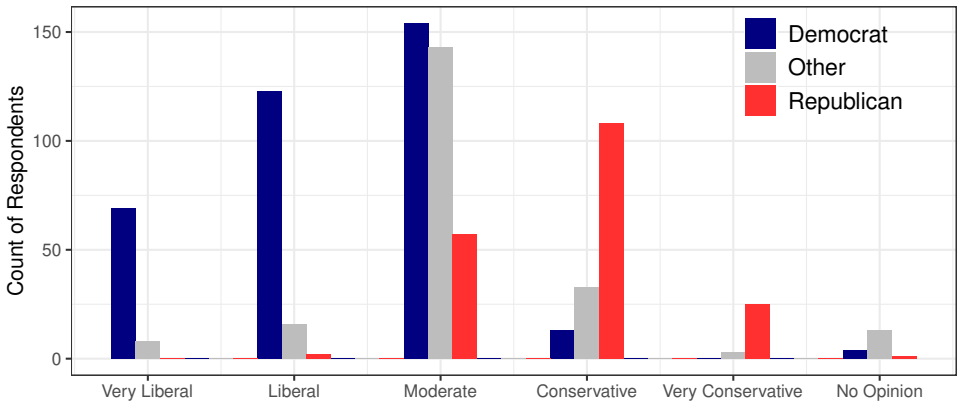

Figure 2: Party Affiliation and Ideology of Municipal Officials Who Responded

Note: The final sample contained 363 Democrats, 193 Republicans, and 216 respondents who identified themselves either "Independent" or "Other Party".

Main Findings

Average marginal component effect (AMCE) is the standard estimation strategy in conjoint experiments (Hainmueller et al. 2014). In the fully randomized context, AMCE is identical to coefficient in a linear probability model. For example, we can compare the marginal effect on collaboration formation between "good collaborative experience" and "bad collaborative experience", holding all other possible attribute components at average levels.

Table 3 shows the main findings of this study. Model (1) estimates overall effects for the four attributes, and we use it to test hypotheses H1a, H1b, H2, and H4. Model (2) tests H3 by estimating the interaction effect between respondents' self-partisanship identity and the party cue attribute. Model (3) validates the results in Model (2) by interacting respondents' self-ideology with the party cue attribute. In general, these models support H1a, H2, H3, and H4.

H1a assumes that municipal officials will prefer lower cost when comparing collaborative partners. Results in Model (1) support this hypothesis. Respondents were 23% (p = 0.00) less likely to form partnership with cities that costed them $750,000, when compared to the cities that costed them $250,000. Similarly, respondents were 7% ($p = 0.00$) less likely to form partnership with cities that costed them $500,000, when compared to the cities that

Table 3: Probability of Intergovernmental Collaboration

	(1)	(2)	(3)
H1a & H1b: Self vs Partner's Cost (Ref: 250:750)			
750:250	$-0.230\ (0.017)^{***}$	$-0.228\ (0.017)^{***}$	$-0.228\ (0.017)^{***}$
500:500	$-0.070\ (0.017)^{***}$	$-0.069\ (0.017)^{***}$	$-0.070\ (0.017)^{***}$
H2: Benefit (Ref: 200 Jobs)			
800 Jobs	$0.343\ (0.016)^{***}$	$0.341\ (0.016)^{***}$	$0.341\ (0.016)^{***}$
500 Jobs	$0.198\ (0.016)^{***}$	$0.197\ (0.016)^{***}$	$0.197\ (0.016)^{***}$
Program Proposed by (Ref: Democrats)			
Republicans	$-0.024\ (0.014)$	$-0.120\ (0.019)^{***}$	$-0.247\ (0.040)^{***}$
H3: Ideological Homophily			
Republicans×Self Republican		$0.205\ (0.033)^{***}$	
Republicans×Self Other		$0.159\ (0.032)^{***}$	
Republicans×Conservatism			$0.077\ (0.014)^{***}$
H4: Collaborative Experience (Ref: Bad)			
Good	$0.360\ (0.017)^{***}$	$0.360\ (0.017)^{***}$	$0.361\ (0.017)^{***}$
No	$0.240\ (0.017)^{***}$	$0.239\ (0.016)^{***}$	$0.239\ (0.017)^{***}$
Self-Partisanship (Ref: Self-Democrat)			
Self Republican		$-0.098\ (0.019)^{***}$	
Self Other		$-0.099\ (0.018)^{***}$	
Conservatism			$-0.034\ (0.008)^{***}$
Constant	$0.232\ (0.019)^{***}$	$0.285\ (0.021)^{***}$	$0.330\ (0.031)^{***}$
R^2	0.205	0.214	0.211
Observation	4534	4534	4534

Note: Conservatism is coded from a scale from 1 (very liberal) to 5 (very conservative). Standard errors are in brackets (clustered by individuals). $^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

costed them $250,000. The magnitudes of cost aversion increase when costs change from low to high. However, the model does not detect the effect of fair sharing of costs (H1b). To support H1b, the component "500:500" should has at least the same level of the magnitude as "250:750", which means that fair sharing of cost is equally important as the lowest self-cost in a partnership. However, "250:750" was more preferred than "500:500" in the model, as above mentioned.

H2 assumes that municipal officials will prefer high benefit when comparing collaborative partners. This hypothesis is also supported in Model (1). Respondents were 34% ($p = 0.00$)

more likely to prefer the collaborative programs that offered them 800 job creations, when compared to the programs that offered them 200 job creations. Similarly, respondents were 19% ($p = 0.00$) more likely to prefer the programs that offered them 500 job creations, when compared to the programs that offered them 200 job creations. Respondents' collaborative willingness became stronger when benefits increase.

Regarding to ideological homophily, H3 assumes that municipal officials will prefer partners that in the same party as them. Results in Model (2) support this hypothesis. Relative to Democrat respondents, Republican respondents were 20% ($p = 0.00$) more likely to form partnership when the program was proposed by Republicans rather than Democrats in the partner city. Model (3) generates similar findings as Model (2). When respondents' self-conservatism increased by 1 degree, the probability of them preferring Republican proposed programs increased by 8% ($p = 0.00$).

Finally, Model (1) supports the relational trust hypothesis (H4), which assumes that municipal officials will prefer collaborative partners that they have good interactions before. Respondents were 36% ($p = 0.00$) more likely to prefer the collaborative programs when they had good rather than bad working experiences with the partner cities. Even for cities that had no interaction before, respondents were 24% ($p = 0.00$) more likely to form partnership with them than cities with bad interactions.

To make better comparisons of effects from the testing theories, the next section reports the subgroup analysis by respondents' party affiliations. By doing so, we can not only simultaneously compare treatment effects of different theories, but also test any heterogenous effect across partisanship subgroups.

Subgroup Analysis by Party Affiliation

The left panel of Figure 3 shows the AMCE results for Democrat respondents, Republican respondents, and other respondents (including who were independent or from other parties). The right panel of Figure 3 shows the difference-in-AMCE results between each

subgroup, using Democrat respondents as the reference group. The difference-in-AMCEs were identical to the interaction coefficients between respondents' party affiliation and each attribute in a linear probability model.

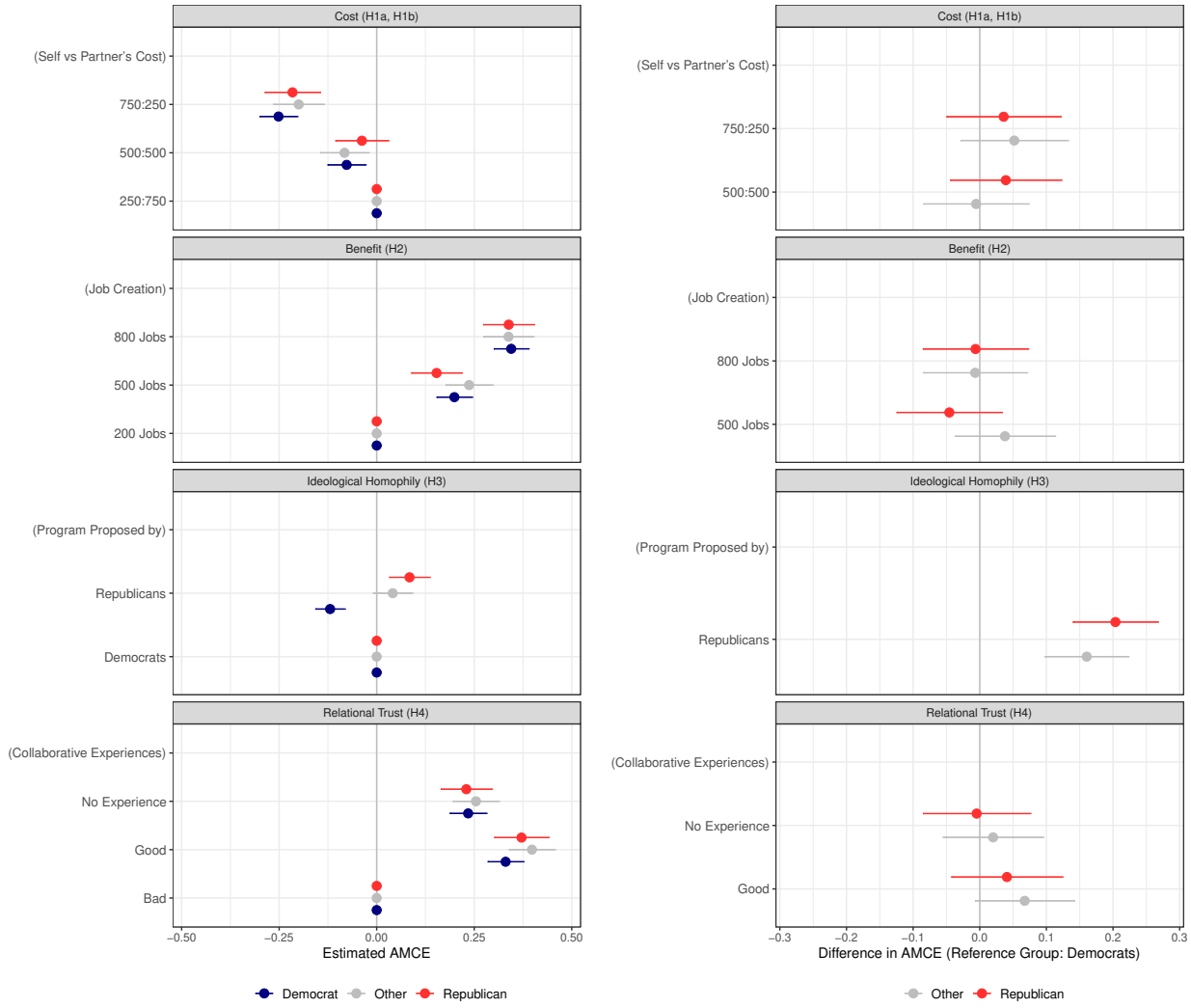

Figure 3: Subgroup Analysis by Party Affiliation
Note: Bars are 95% confidence intervals.

In the left panel, both Republican respondents and Democrat respondents expressed stronger preferences to their ideological matched collaborators, and the effects were similar: 12% ($p = 0.00$) among Democrats and 8% ($p = 0.00$) among Republicans. By contrast, other respondents had no preference toward either party. These results further confirm the ideological homophily hypothesis (H3). The right panel indicates that respondents from different

party affiliations had similar preferences of each attribute component, except for ideological homophily. Although the ideological homophily was prominent in the result, it had relatively smaller effects than other attributes. The theories of rational choice (cost/benefit analysis) and social capital (relational trust) contributed more than 25% of effects in explaining respondents' collaborative decisions.

It is worth noting that respondents from different party affiliations had diverse views on fair sharing of cost. The effects of Cost aversion among Democrats and others were consistent with the full sample analysis, but Republicans did not express preference difference between "500:500" and "250:750" (effect = 4%; $p = 0.27$). Although the statistical difference between Democrats and Republicans on cost fairness was not significant with the Difference-in-AMCE measurement, this variable is worth to be further study. Therefore, I conducted an interaction analysis between cost and collaborator's party in each party affiliation subgroup in the next section.

Exploratory Analysis

Analysis in this section has not been pre-registered, because it was an exploratory and post-hoc analysis that based on the above subgroup analysis by party affiliations. The purpose of this exploratory analysis is to further understand the effects of cost fairness and ideological homophily on municipal officials' collaboration decisions. Figure 4 combines the interaction results of cost and party in each partisan subgroup. Republicans showed consistent indifference between "500:500" and "250:750" cost options, regardless collaborators' party affiliation. In contrast, rational cost calculation predicted Democrats' collaboration decisions when the collaborators were also Democrats. Surprisingly, they showed indifference between the fair but more expensive option and the unfair but cheaper option when the collaborators were Republicans. Other respondents did not show heterogenous preferences on collaborators from either party. This exploratory analysis suggests a potential for future study to make in-depth investigations about the relations between ideological homophily and

fairness on the willingness of intergovernmental collaboration.

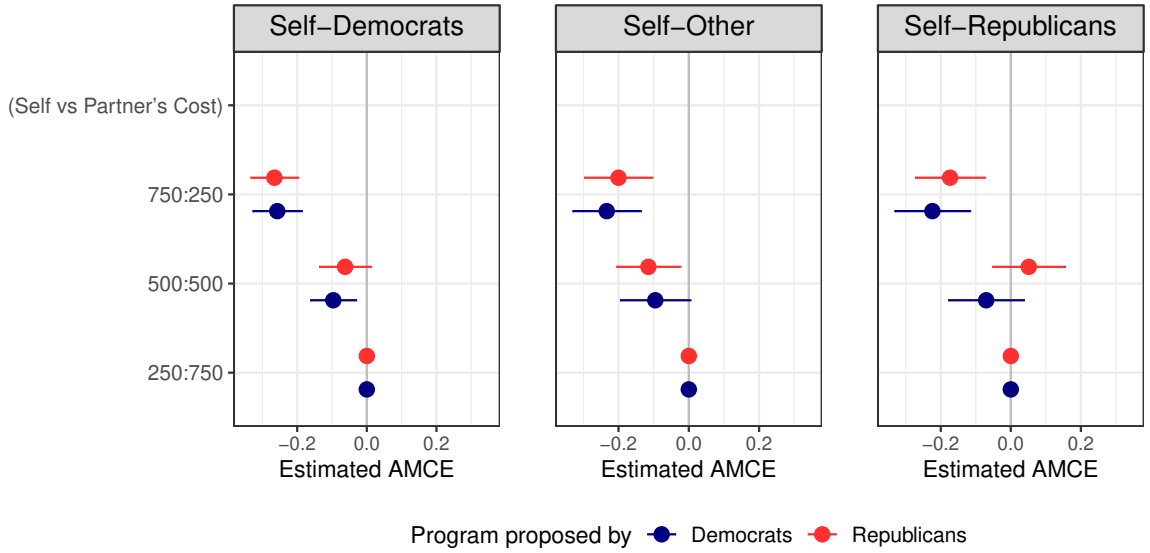

Figure 4: Attribute Interaction: AMCE of Cost Conditional on Ideological Homophily
Note: Bars are 95% confidence intervals.

Robustness Check

In addition to the above analyses, I performed multiple robustness checks in the appendices. First, I practiced the standard diagnostic tests of conjoint experiment in Appendix E. Specifically, I display the frequencies of attribute components to check the randomization, the carryover effect across three comparison tasks, and the comparison between left- and right-hand program proposals. There was no systematic bias from the results of these tests, which encouraged that the findings in this study were robust.

Second, I conducted additional subgroup analyses (Appendix F) by respondents' ideology categories (liberal, moderate, and conservatives) and government position (elected or municipal manager). I did not detected systematically difference for each subgroup, which again confirm the findings' validity of this study.

Discussion and Conclusion

Intergovernmental collaboration and network formation are driven by diverse theoretical factors, but network scholars have yet to systematically theorize and compare the explanatory power between different theories. Inspired from Berry et al. (2004) categorization of network research traditions, I offer the first systematic comparison of three fundamental theories, which have very different assumption about human behavior. In order to advance the network scholarship, I provide new evidence of these theories from micro level data, which demonstrate how municipal officials make decisions of intergovernmental network formation.

The main contribution of this study is that it validates the fundamental network theories at public official level. The experimental evidence indicates that costs/benefits analysis under rational calculation, ideological homophily, and relational trust built on prior interaction are jointly important to explain public officials' collaborative willingness. As I mentioned at the outset, these theories are not mutually exclusive. They demonstrate the complexity of human decision-making and encourage public administration scholars to develop more careful comparisons on these theories.

The findings from this study complement and extend earlier scholarship on network formation. They bridge the network theories across different units of analysis. Although previous studies often test the probability of network activities at organizational or network levels, data were often generated from surveys. Network analysis of collaborative governance aggregated survey responses to organizational measurements then tested the interorganizational behaviors. This strategy helped network scholars to measure many environmental and institutional factors that affect network formation, but whether these perceived measurements can accurately predict actual behaviors of organizations remain unknown. In addition, we have relatively few evidence about the collaborative motivations of public officials before network start. On these grounds, results from this study fill this research gap. They suggest the theoretical consistency between individual officials' collaborative willingness and

organizational behaviors that have been repeatedly tested in the network literature.

Moving beyond the traditional network literature, this study also discuss the explanatory power of political motivated reasoning and its ideological homophily effect on government actions. Although some scholars argue that this effect is stronger among politicians than normal citizens (Baekgaard et al. 2019; Christensen and Moynihan 2020), results from this study state that its explanatory power is weaker than the rational calculation and social capital consideration in intergovernmental collaboration decisions. Therefore, we should test this theory in different institutional scenarios to extend its theoretical reliability.

In addition, the exploratory analysis in this study recommends a complex interaction between municipal officials' party affiliation and the preference on fair sharing of cost. Republicans express similar preferences between cost fairness and cost aversion, while Democrats only express the similar preference between these two options when facing Republican collaborators. Regarding Democrats have relatively low trust level to Republicans, this result implies that cost fairness is more important when Democrats perceive higher levels of collaboration risks from the Republican collaborators. Fair sharing of cost can be a signal to Democrats that the bargaining power could be more balance in the collaboration process, given the power dynamic is critical in a collaboration relation (Provan and Kenis 2008). However, alternative explanations of this phenomenon could exist. Therefore, we should further investigate the theoretical mechanisms between ideological homophily and cost fairness on collaboration decisions in the future.

In a broader sense, this article is the first to provide a proactive worldview of intergovernmental network formation by investigating public officials' collaborative willingness before the actual network has been formed. By investigating network theories with the conjoint experimental method, this study integrates the two important areas: behavioral public administration and collaborative governance. With a representative sample and constructive analysis, I believe that the findings of this study advance public administration theory from a new angle.

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Supplemental Information

Contents

Appendix A Pre-registration Report

Have any data been collected for this study already?
No, no data have been collected for this study yet

What's the main question being asked or hypothesis being tested in this study?

i Rational Choice Hypothesis: Local governments are more likely to form collaborations with partners which offer lower costs and higher benefits.

ii Political Homophily Hypothesis: Local governments are more likely to form collaborations with partners which share the same party affiliation.

iii Institutional Trust Hypothesis: Local governments are more likely to form collaborations with partners which they shared good collaborative experiences in history.

Describe the key dependent variable(s) specifying how they will be measured.
Choice: We will code choice as a dummy variable: 1 or 0, based on whether the participants select the program profile.

How many and which conditions will participants be assigned to?
We employ a choice-based conjoint design to obtain a more comprehensive picture of local government officials' opinions on collaboration partner selection. A hypothetical sustainable development program scenario will be introduced. I will ask subjects to compare 3 pairs of program proposals from different cities and indicate which city (in each pair) they are more willing to collaborate with. Each program profile includes 4 attributes:

1. Cost of the program: you pay: $250,000; this city pays $750,000/you pay: $500,000; this city pays $500,000/you pay: $750,000; this city pays $250,000 (theory: Cost)
2. Job creation: 200/500/800 jobs (theory: Benefit)
3. The program is proposed by either Democrats/Republicans (theory: Political Homophily)
4. Collaborative experience with this city: good/bad/no experience (theory: Institutional Trust)

Specify exactly which analyses you will conduct to examine the main question/hypothesis.
Analyses will be based on the standard practices in the conjoint experimental design:

i Average Marginal Component Effect (AMCE).

ii Marginal Means (MM).

Any secondary analyses?
We will conduct subgroup analyses by participants' characteristics, such as partisanship and ideology.

How many observations will be collected or what will determine the sample size? No need to justify decision, but be precise about exactly how the number will be determined.
This survey will be sent to American municipal government officials, including mayor, council members, and city managers. Based on power analysis of the conjoint attribute design, minimal requirement for sample size is 300.

Anything else you would like to pre-register? (e.g., data exclusions, variables collected for exploratory purposes, unusual analyses planned?)
Subjects' demographic information will be collected after they have answered the questions regarding key dependent variables. The information is collected for detecting the heterogeneity of the treatment effect.

Appendix B Survey Instruments

First, the respondents saw an introduction to the sustainable development program vignette.

Introduction

We are interested in the intergovernmental collaborative decisions of American local governments. In the following part, we will show you several **hypothetical** decision-making situations and ask you to provide opinions. Please try to be honest in answering the questions. Describe what you would **really** do if a similar situation occurs in your working live. Remember that your answers to all questions in this survey will be kept **completely confidential**.

Assuming you and your municipal government plan to collaborate with another city on an interlocal sustainable development program. The potential benefits of the program include:

- Economic development
- Community development
- Environmental protection

Based on your consideration for the best option to develop your municipality, please evaluate the following hypothetical city partners and their proposals. In total, you are asked to evaluate 3 pairs of cities in 3 separate pages. Please provide your choice in each pair.

Note: There is **no** right or wrong answer to any comparisons.

Next, the respondents completed three pairs of comparison task like the following.

Suppose you can only collaborate with one out of the two cities:

Program Attributes:	**City A**	**City B**
The program will create	500 jobs in your city	800 jobs in your city
The program is proposed by	Democrats	Republicans
Your previous working experiences with this city	Good	No experience
Cost of the program	You pay: $250,000; This city pays: $750,000	You pay: $500,000; This city pays: $500,000

Please indicate which city do you prefer to collaborate with:

City A | City B

→

Next, the respondents answered political background questions and demographic questions.

Generally speaking, do you usually think of yourself as a...

- Democrat
- Republican
- Independent
- Other party (please specify)

How would you describe your political views as of today?

- Very liberal
- Liberal
- Moderate
- Conservative
- Very Conservative
- No opinion

How many years have you been in your current government position?

- Less than 1 year
- Less than 5 years
- Less than 10 years
- More than 10 years

Do you consider yourself to be...

- White, not Hispanic or Latino
- Black, not Hispanic or Latino
- Hispanic or Latino
- Asian, not Hispanic or Latino
- Other

Which of the following best describes your gender identity?

- Male
- Female

- Non-binary/third gender
- prefer not to say

Your age: _____

What is the highest level of education you have completed?

- Less than high school
- High school/GED
- Some college
- 2-year college degree
- 4-year college degree
- master degree
- doctoral degree
- Professional Degree (JD, MD)

Appendix C Email Invitation Context

Subject line: Survey Research Invitation

Dear [Job Title] [Last Name]

As local governments have more opportunities and pressures to collaborate with other local governments, local government scholars seek to understand optimizing contexts based on your opinion as a local government [elected official/manager]. I value your perspective and I invite you to complete a very short and anonymous survey (about 3 minutes). This survey is conducted by researchers at [institution name]. The purpose of this survey is to study the intergovernmental collaborative decisions of American local governmental officials.

Follow this link to the survey: [survey link is here]

You are being invited to participate in this survey because you are currently serving or formerly served as an [elected official/manager] in an American local government. We will keep the information you provide confidential. Your participation in this study is completely voluntary. You may choose not to take part in it or you may stop participating at any time.

Thank you very much for your consideration of and participation in this research study, the results of which will be shared with you via email after we finish this study.

Your sincerely

Appendix D Sample Characteristics

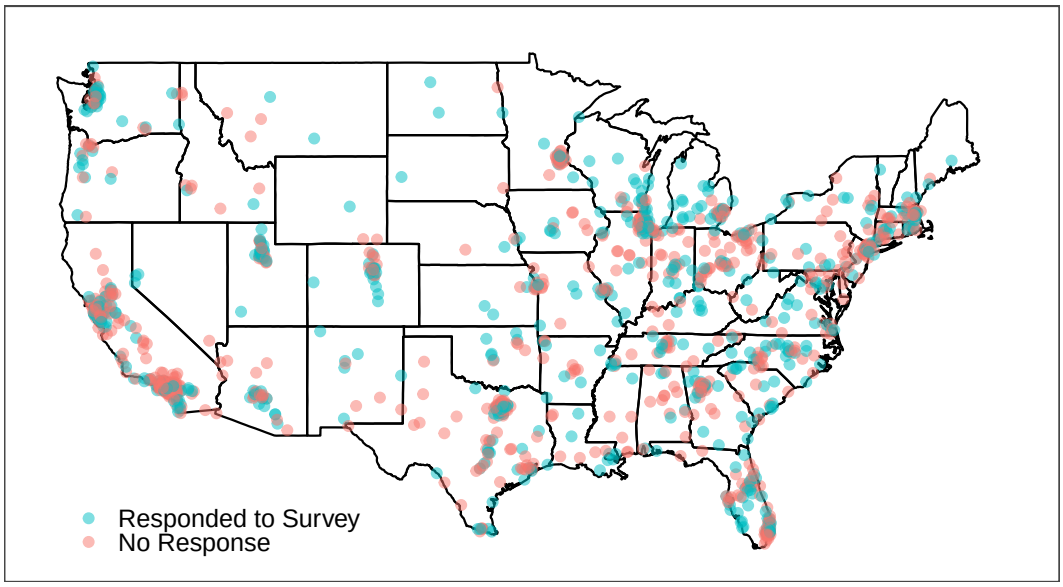

Figure D.1: Geographic Location of Survey Respondents

Table D.1: Descriptive Summary

	Mean	SD	Min	Max
City Level Variables				
Population (in 1000)	117.09	397.70	30.07	8336.82
Median houshold income (in $1000)	67.83	26.40	21.92	235.28
Female official ratio	34.24	17.92	0.00	100.00
Labor force participation	64.91	5.92	39.90	79.90
Home value (in $1000)	299.11	255.25	40.44	2000.00
Unemployment rate	5.36	2.25	1.40	16.90
White percentage	71.18	17.01	5.60	95.50
Black percentage	12.98	15.64	0.10	91.80
Individual Level Variables				
Democrats	0.47	0.50	0.00	1.00
Republicans	0.25	0.43	0.00	1.00
Ideology	2.89	0.97	1.00	5.00
Tenure	2.52	0.97	1.00	4.00
White	0.78	0.41	0.00	1.00
Black	0.09	0.29	0.00	1.00
Hispanic	0.07	0.26	0.00	1.00
Asian	0.02	0.15	0.00	1.00
Other	0.03	0.18	0.00	1.00
Female	0.39	0.49	0.00	1.00
Age	56.51	12.59	19.00	89.00
Grad School	0.57	0.49	0.00	1.00

Appendix E Conjoint Diagnostic Tests

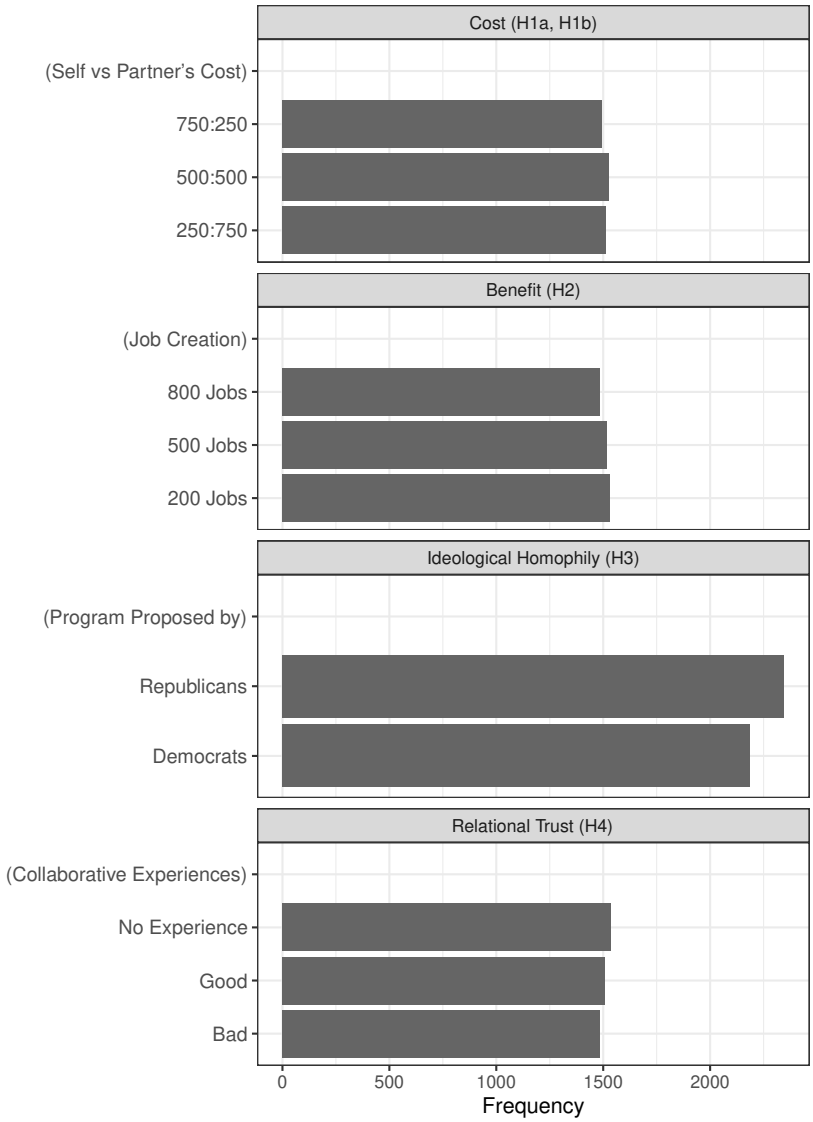

Figure E.1: Frequency of Attribute Components

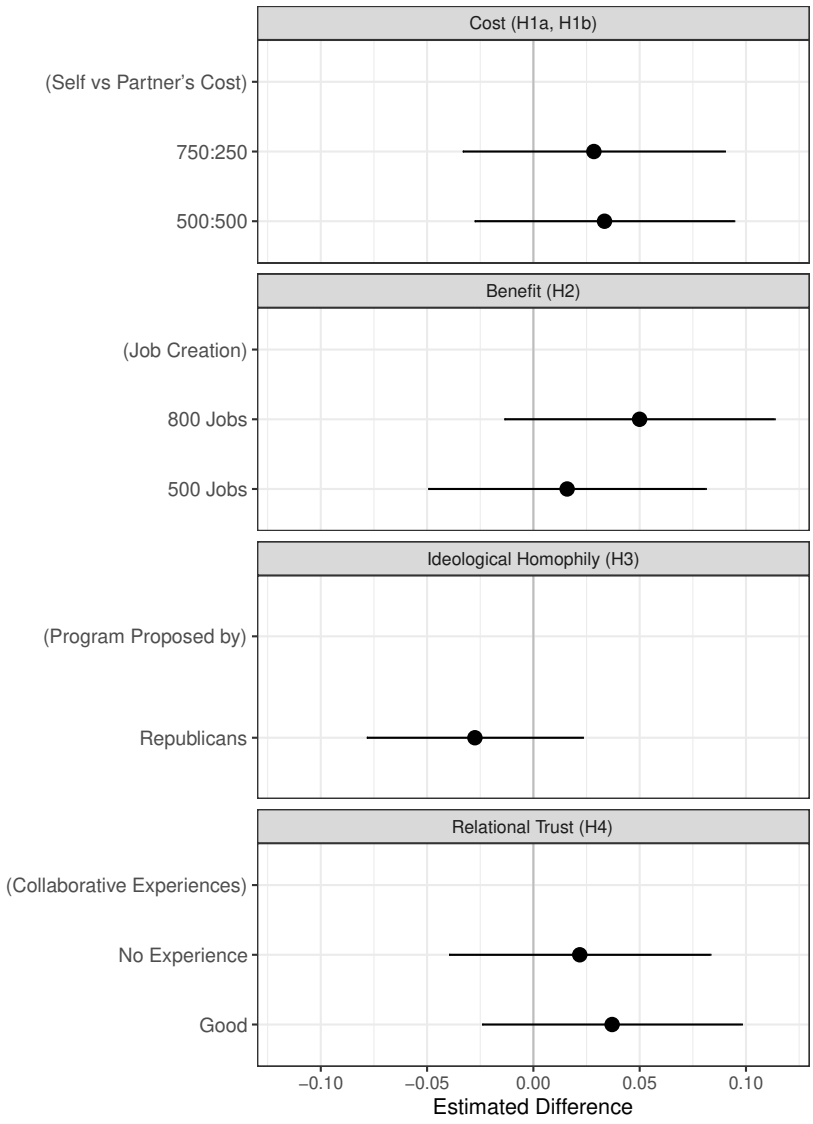

Figure E.2: Left-Right Effect

Note: Bars are 95% confidence intervals.

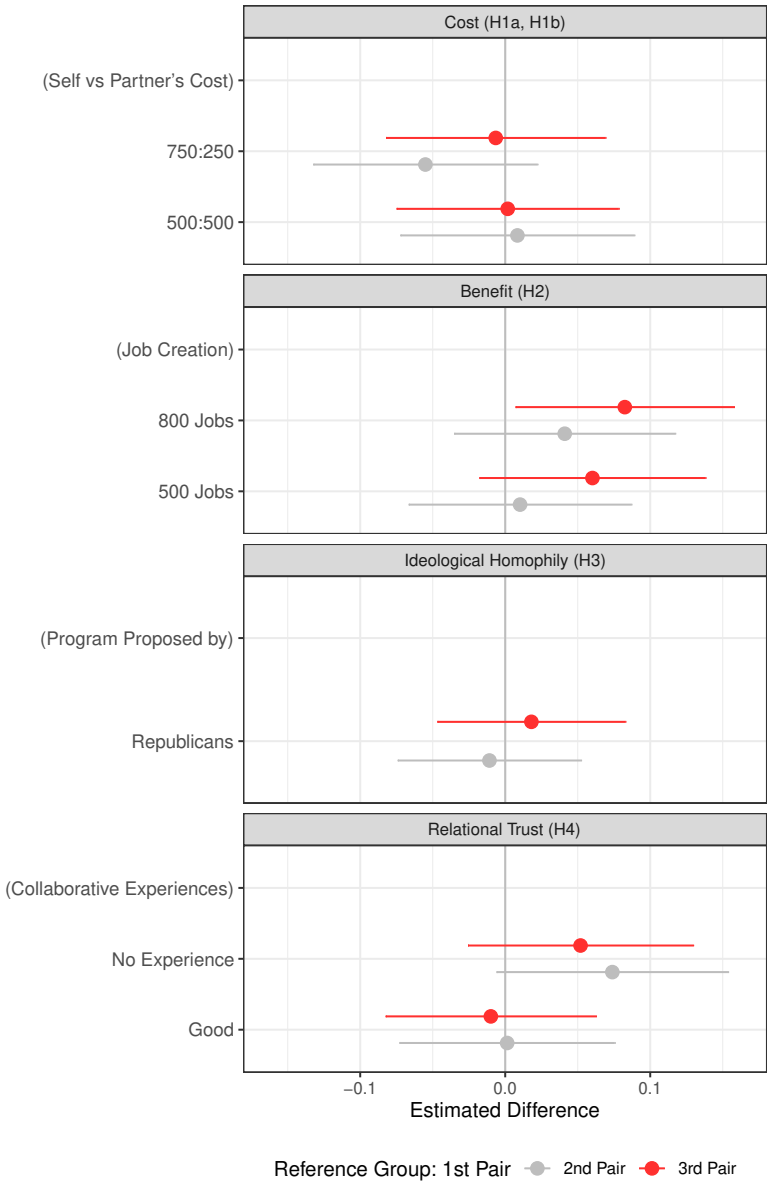

Figure E.3: Carryover Effect

Note: Bars are 95% confidence intervals.

Appendix F Additional Subgroup Analysis

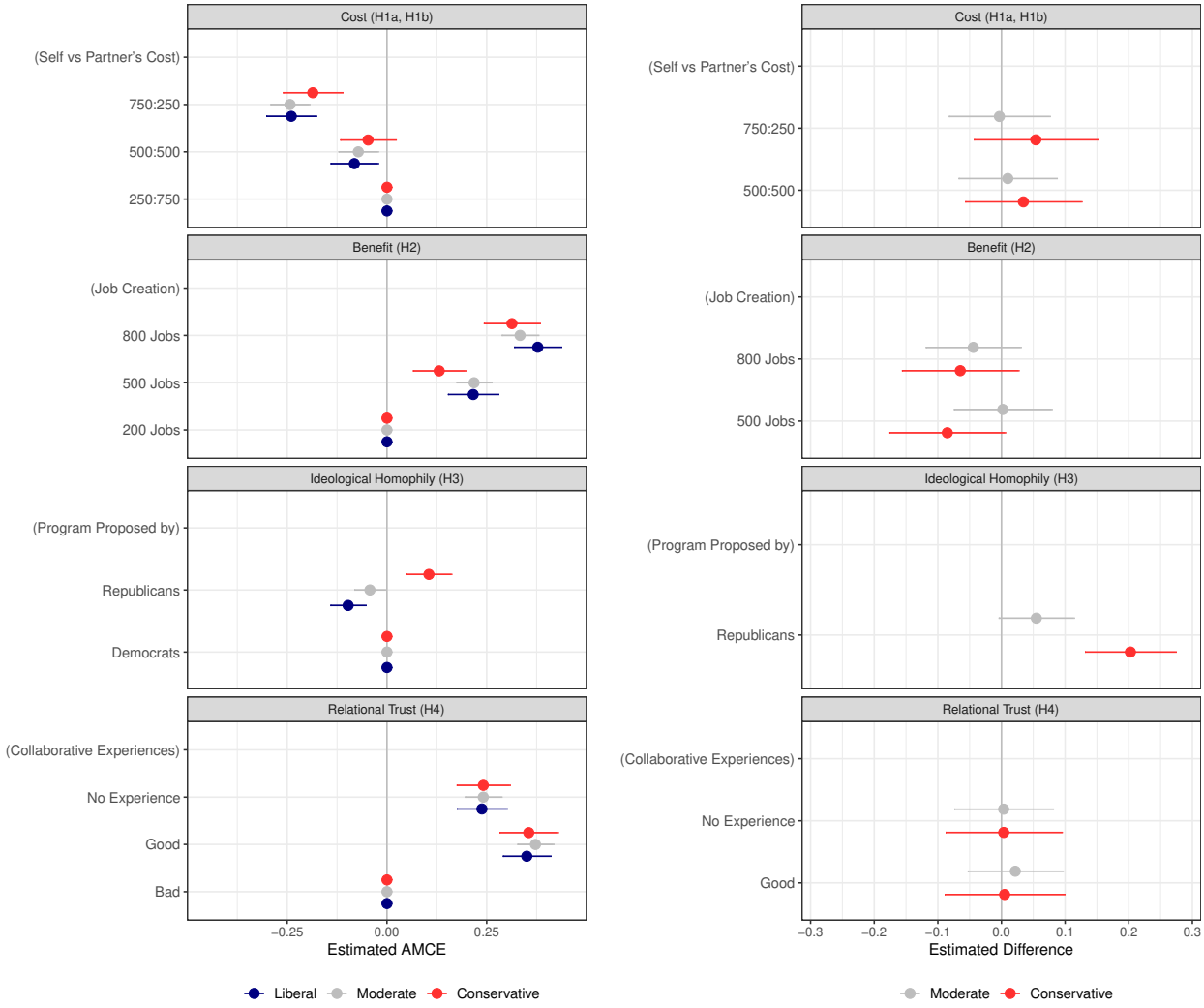

Figure F.1: Subgroup Analysis by Ideology

Note: Bars are 95% confidence intervals.

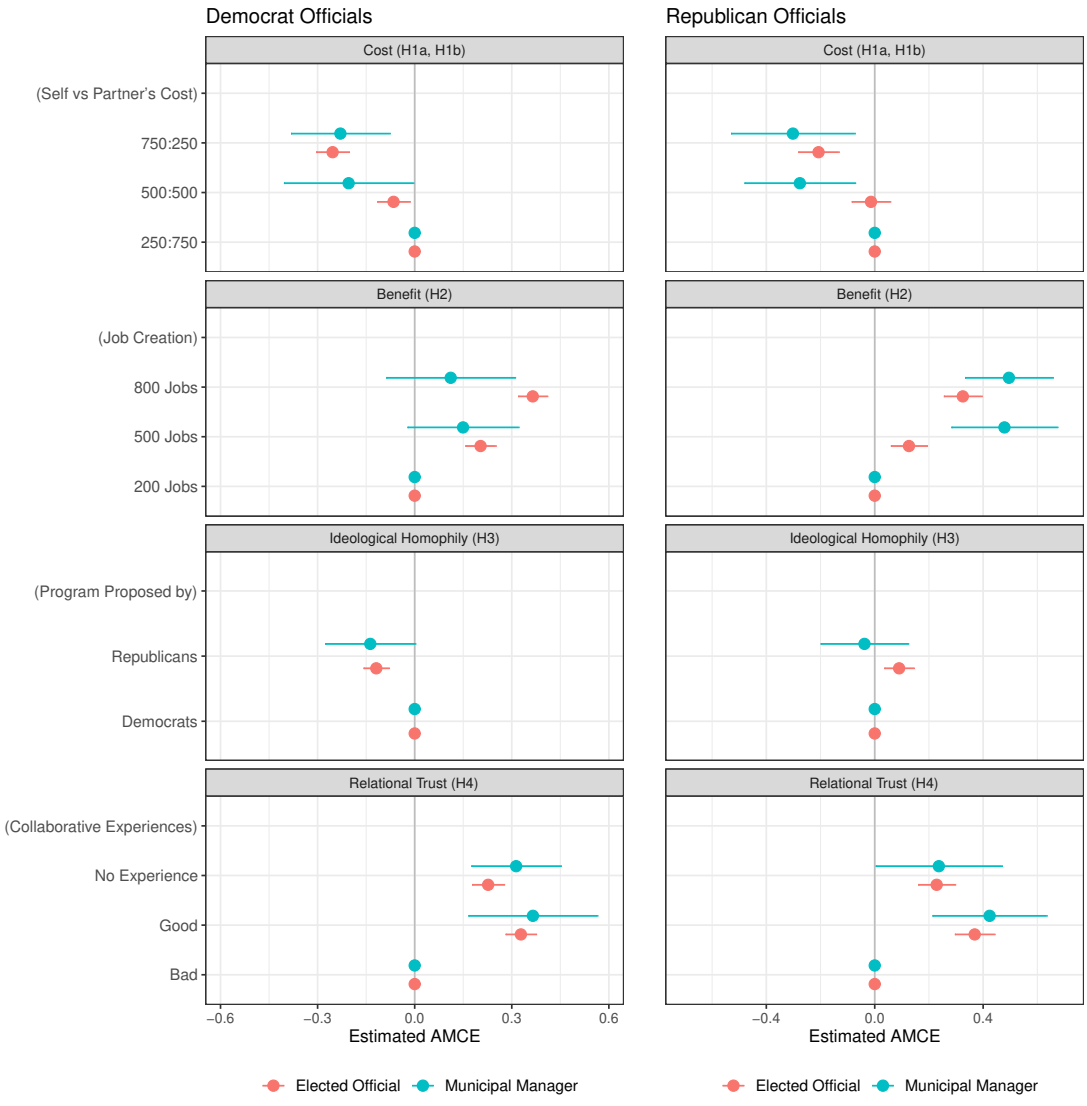

Figure F.2: Subgroup Analysis by Government Positions

Note: Bars are 95% confidence intervals.