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# Sustainability Policy Objectives, Centralized Decision Making, and Efficiency in Public Procurement Processes in U.S. Local Governments

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**Abstract:** Some U.S. local governments are leveraging public procurement to meet their sustainability goals. However, does the simultaneous pursuit of multiple sustainability objectives potentially slow down the speed of procurement processes? We suggest that the simultaneous pursuit of multiple sustainability objectives through procurement is related to decision making speed. Additionally, we argue that centralized decision-making structures might moderate this relationship. Drawing on a representative sample of more than 200 U.S. local governments, we demonstrate that for low-cost purchases, as the number of policy objectives increases, so too does the average length of time for approval. We also find evidence of an interactive relationship between decision-making structures and the number of existing sustainability policies pursued simultaneously. For routine low-cost and routine high-cost purchases, we find evidence that as the centralization of procurement decision making increases, the marginal effect of purchasing complexity on approval times decreases. These findings offer important evidence about how pursuing multiple sustainability objectives affect decision-making efficiency and how decision-making structures might facilitate U.S. local governments' integration of sustainability objectives into their existing internal processes.

**Keywords:** sustainable public procurement; sustainable public purchasing; social sustainability; public administration; procurement decision making

## 1. Introduction

Government procurement is a pre-eminent activity in the United States with local governments purchasing approximately \$1.72 trillion of goods annually [1,2]. In the U.S., approximately 10 percent of GDP is spent on public procurement activities, and more than 60 percent of these public procurement expenditures are occurring at the state and local level [3]. Purchased items include materials for building and road construction, administrative supplies, electronics, and numerous other products.

When procuring these products, one of government's primary objectives is efficient decision making because efficiency facilitates the timely provision of public goods and services and helps fulfill its public commitments. However, the scale and scope of government procurement also have significant sustainability consequences. While government purchases have a significant carbon footprint [4], they can also have an impact on a range of other social, environmental, and economic outcomes. Therefore, many governments are using procurement policies to pursue an array of sustainability goals [5–7]. These objectives include promoting purchasing from historically disadvantaged groups, specifically minority-, women-, or veteran-owned businesses [1,5,8,9]. They also include supporting community economic development that benefits local small businesses or spurs local innovation [1,10].

Other sustainability objectives include pursuing purchasing choices with reduced impacts to the natural environment [1,5,8–13]. The pursuit of these multiple policy objectives simultaneously is likely to reduce administrative efficiency [14]. However, this proposition has not received much empirical inquiry.

This paper contributes to increasing work considering the role of structure [15] specifically in public organization procurement processes [16–21]. We will argue that U.S. local governments with centralized decision making can enhance organizational efficiency because procedural activities are conducted at scale. Scaled activities allow U.S. local governments to specialize certain functions because of the enhanced routinization and learning infrastructures that come with it. Centralization may also reduce procedural errors and distractions related to other administrative tasks, which can help organizations adapt quicker when faced with more complex tasks [18,22,23], such as incorporating multiple sustainability objectives into decision processes.

This research addresses two questions. First, does the presence of multiple sustainability policy objectives affect the efficiency of the local government procurement process in terms of the speed of purchase approval? Understanding this relationship provides a theoretical vehicle for considering how multiple goals and objectives affect efficiency of internal processes. Our second question asks: Does centralization of local government decision making in the procurement process moderate the relationship between the governments' pursuit of multiple sustainability policy objectives and the speed of purchasing approvals? Addressing this question offers critical information about how decision-making structures might facilitate a local government's integration of sustainability policies and goals into its existing internal processes.

To assess these questions, we use original survey data from finance directors in more than 200 U.S. local governments and conduct seemingly unrelated regression analyses. We demonstrate that for low-cost purchases, as the number of policy objectives increases, so too does the average length of time for approval. We also find evidence of an interactive relationship between decision-making structures and the number of existing sustainability policies pursued simultaneously. For routine low-cost and routine high-cost purchases, we find evidence that as the centralization of procurement decision making increases, the marginal effect of purchasing complexity on approval times decreases. These findings offer important evidence about the complex relationship between U.S. local governments pursuing multiple sustainability objectives and decision-making efficiency and how local governments' decision-making structures can facilitate their integration of multiple sustainability objectives into their procurement processes.

## 2. Literature and Hypotheses

### 2.1. Public Procurement and Efficiency

Public procurement is a process involving multiple activities through which public organizations acquire goods, services, and supplies from outside sources [1,24] (p. 329). Its importance is illustrated by the sheer size of public expenditures, accounting for 17 percent of global GDP [25]. Because of its enormous economic impact, and that it is a major activity of government, public procurement has evolved into a highly professionalized practice [1]. Numerous professional associations have developed standards and best practices for public purchasing. Within the U.S., these organizations include the National Institute for Governmental Purchasing, the National Association of State Procurement Officials (NASPO), the National Council for Public Procurement and Contracting, and public procurement associations in nearly every state. Additionally, professional associations with broader missions, such as the International County/City Managers Association, offer members information about best practices in public purchasing, procurement innovation, and purchasing management.

Procurement is often assessed by its efficiency. Efficiency relates to the ratio of work performed in a process and whether the process is making the most of available resources [26,27]. One way to measure efficiency in procurement processes is the timeliness—or time delay—of purchases [28,29].

The lead time is the duration between the initiation of a process and its execution. Longer durations can interrupt the latter stages of the organization's production process [30] and result in delays in product and service delivery. Related to public procurement, reducing the time to execute a purchase minimizes opportunity costs and allows for faster conversion of a purchase into a public good or service. Despite calls for more attention to procurement [31], our knowledge of the different factors that might affect the timeliness and efficiency of procurement processes is limited, especially when multiple policy objectives are being achieved simultaneously.

## 2.2. Sustainability Objectives in Public Procurement

Increasingly, public procurement is being leveraged to pursue multiple policy objectives beyond typical efficiency goals [5,32]. The motivation for pursuing multiple policy objectives is that, as stewards of public resources, public agencies operate in a political and social context [33] that is characterized by greater external stakeholder participation in organizational processes [34,35]. For this reason, procurement is seen as a policy tool to pursue sustainability objectives [7–9,36], especially in local governments.

Sustainable public procurement (SPP) is the process whereby governments include social and environmental criteria in the purchasing of goods and services. It can be implemented at all levels of government. At the local level, to realize social objectives related to supporting minority- or women-owned business, cities might include preferential scoring (assigning additional points to designated firms) in the vendor selection process or creating set asides of specific expenditures [8,9,36]. U.S. local governments have also started establishing procurement preferences for businesses that are veteran-owned [37]. In addition to targeting specific groups that receive preferences as a means of promoting social equity in the procurement process, local government procurement can also stimulate small businesses and promote the development of locally owned businesses by purchasing their goods and services [10,38,39]. Local governments are also using their procurement processes to pursue environmental sustainability objectives by adding environmental criteria to the purchases of products and services in order to reduce water and energy use, reduce packaging waste, and cut carbon emissions [11,40,41].

While many potential policy tools exist to promote sustainability objectives, there is considerable heterogeneity among U.S. local governments in the number and types of sustainability objectives simultaneously pursued through these policies [42]. Some local governments pursue many of these objectives in their procurement processes, while others choose not to pursue any. What is missing from this discussion is whether pursuing multiple sustainability objectives simultaneously through procurement has bearing on procurement efficiency, specifically the speed of procurement processes.

We argue that as U.S. local governments pursue more sustainability objectives through procurement policies, their procurement systems and the tasks within them become increasingly complex. Complexity, here, refers to the number of performance dimensions associated with a task and the ambiguity and uncertainty that comes with an increase in those dimensions [43]. We also recognize that there is no clear consensus on what defines a complex task and several common conceptualizations of the construct exist [44] (p. 40). Other definitions focus on the person-task interaction and the skill and knowledge requirements of the task [45] or consider complexity as psychologically subjective and experienced by the individual performing the task [46]. In this paper, we argue that increases in the number of sustainability objectives being pursued simultaneously in the procurement process intensifies the complexity and, thus, the time required to complete the task. This is because of increases in the time and effort needed to assess different performance configurations and to determine which configuration is most likely to lead to the optimal outcome that appropriately considers the multiple potentially conflicting sustainability criteria as required by the various policies.

As the number of sustainability objectives governing the procurement system increase, more factors must be considered prior to approving purchasing decisions and this, in turn, increases the time required to make a purchasing decision. Procurement officers will need to put more

effort into searching and identifying among alternatives that might potentially meet the different policy objectives. Furthermore, sustainability objectives often involve unclear evaluation criteria or performance dimensions that are interrelated in complicated or conflicting ways [44] (p. 40). Since multiple choices might lead to similar outcomes, more time may be required to obtain purchasing information, to process it, and to weigh trade-offs among different choices [47]. These increases in informational needs can lead to increases in the transaction costs associated with decision making and, ultimately, slow decision-making processes [48]. For these reasons, we argue that pursuing multiple sustainability objectives increases the complexity of a local government's procurement process, which will reduce efficiency related to the time required for purchase approval:

**Hypothesis 1.** *The number of sustainability objectives a local government pursues through the procurement process is positively associated with the duration of purchase approval processes.*

While pursuing multiple sustainability objectives may increase the complexity of a local government's procurement process, we suggest that these inefficiencies may be moderated if decision making is centralized. These relationships are discussed further below.

### 2.3. Centralization of Decision Making and Procurement Efficiency

Local government procurement processes are structured and coordinated in a variety of ways [32,49], some of which may better accommodate the tradeoffs between navigating complex values systems reflected in procurement policies and administrative efficiency. For instance, in some local government procurement systems, the approval of procurement requests might be completely decentralized. In a decentralized decision-making system, local government procurement decisions are made within each operational unit. By contrast, in a highly centralized decision-making system, local government procurement decisions would be made within a single division, typically the finance department, which processes and conducts all procurement activities across the entire organization.

Centralization refers to the locus of authority to make decisions affecting the organization [50]. Centralized activities are typically thought to increase organizational efficiency [18]. Centralization can lead to greater strategic planning and decision making and increase efficiency by centralizing activities and dividing work by functional expertise [51]. Additionally, centralization often leads to more specialized skills and capabilities in terms of routinization and learning infrastructures. These capabilities help organizations adapt quickly when faced with more complex tasks [18,22,23].

We expect that centralization should enhance organizational efficiency because procurement activities are conducted at scale. The agency is better able to pool resources, both human and technological, making procurement a specialized function. This might reduce approval delays that are a function of procedural error or a function of an individual completing procurement activities alongside other administrative tasks, and thus facilitate the implementation of organization-wide procurement practices and strategies [18,23]. Repeated decision making in centralized structures might also promote experiential learning and organizational adaptation, as well as reduce lower-level employee uncertainty in decision making [18,52]. All these factors should reduce the amount of time necessary for U.S. local governments to procure goods and services:

**Hypothesis 2.** *The centralization of procurement decisions in local governments is negatively associated with the duration of purchase approval processes.*

U.S. local governments with centralized procurement may be positioned to better accommodate and integrate multiple sustainability objectives into procurement processes. This is because centralization allows local governments to systematically integrate the complexity associated with pursuing multiple sustainability objectives into existing routines and procedures and promote organization-wide learning that can be used in subsequent decisions [18]. As we hypothesize above, increases in the number of sustainability objectives in the procurement process increases the complexity of procurement and,

thus, the time required to complete the task. Centralized procurement systems are likely to reduce the burden of navigating complex rules or policy systems on a case-by-case basis and facilitate the integration of learned knowledge into existing routines and processes [21]. Moreover, centralization can facilitate the development of new routines around searching for information and systematically weighting different decision-making criteria. Each of these factors can increase efficiencies in U.S. local governments' purchasing by reducing purchasing delays associated with the complexity of a procurement process:

**Hypothesis 3.** *Centralization moderates the relationship between the number of sustainability objectives a local government pursues through the procurement process and the duration of approval times—as the centralization of procurement decision making increases, the marginal effect of purchasing complexity on approval times decreases.*

### 3. Data and Methods

#### 3.1. Data

The data for this study come from an original survey and the U.S. Census Bureau's American Community Survey (ACS). Surveys were sent to finance directors, public works directors, and environmental services/program directors in a representative set of 791 U.S. cities with populations over 25,000. If cities did not have one of these specific positions (or an equivalent), the survey was sent to individuals in positions whose information was available. Prior to distributing the final survey, 41 stakeholders with expert knowledge related to local government and different aspects of public procurement were asked to review the survey and offer feedback. The survey was then revised and pilot tested among directors in 93 local governments with populations over 25,000 that were selected at random. The results of the pilot test led to refinements of a few questions prior to the survey's finalization.

The survey was administered in spring 2017 over a period of eight weeks. Department directors received an initial letter informing them of the survey. Approximately one week later, the survey was sent to participants electronically using Qualtrics Survey Software™. Nonrespondents received up to four email reminders, two postcard reminders, and two phone call reminders. A total of 616 department directors responded to the survey for an overall response rate of 33.8%. For our analysis, we focus on the 281 responses from finance directors (35% of the sample frame) because they have a broad view of their city's procurement processes, structures, and relevant technologies. In addition, we expect that the finance department directors would have the most complete knowledge of procurement policies and processes within their cities. This is especially important to us since we are interested in the complexity of U.S. local governments pursuing multiple social objectives through procurement and the time it takes to purchase products.

After cases with missing data were removed from our analyses, we analyzed between 220 and 224 responses (~27% of sample frame), depending on which dependent variable was assessed.

#### 3.2. Dependent Variables

*Duration of the Approval Process.* To understand how local government procurement officers distinguish among the types of purchases they make, we conducted focus groups. In the discussions with procurement officers, they used language regarding routine (or repeated), cost thresholds, and technical specifications as key attributes that distinguished different types of purchases. Our goal was to distinguish different types of purchases in our survey instrument using simple verbiage that would be commonly understood among the respondents in the context of public procurement, and the focus group process guided how we distinguished among different types of purchases made by local governments.

To measure the duration of local governments' procurement approval processes, we asked finance directors a series of questions related to three broad categories of purchases: (1) Routine,

low-cost purchases of products/services; (2) routine, high-cost purchases of products/services; and (3) non-routine, high-cost purchases that require technical specifications. These three categories account for variations in local government purchases. Modeling them separately allows for the possibility that hypothesized relationships are heterogeneous among outcomes since some types of purchases (e.g., low-cost) might be highly routinized regardless of both decision-making centralization and the complexity of pursuing multiple policy objectives. In contrast, the nature of high-cost purchases might be more idiosyncratic.

Thresholds for the three broad categories of purchases typically relate to a specific dollar amount. However, since different cities have different thresholds, we prompted respondents to define these thresholds on their own. Additionally, we clarified that routine refers to regular, repeated purchases. We also clarified that technical specifications are the explicit characteristics of a purchase that describe the user's product and service requirements.

Following our definitions of the three types of procurement activities, we asked respondents to, "Please indicate how much time (in weeks) is typically required between a purchasing request being made by your department and the actual approval of the request" [53]. Respondents provided a response on a sliding scale ranging from zero (less than one week) to 52 weeks for each of the three categories of items (routine, low-cost; routine, high-cost; non-routine, high-cost). A visual review along with statistical tests for skewness and kurtosis reveal that the data are not normally distributed and have a positive skew. To account for this, we will analyze the natural log transformation of the responses. Since the units are in weeks, we added a constant of 1 to the time values for our analyses. As a robustness check, we ran models adding a constant term of 0.001 to the time values, and the results were substantively similar in terms of effect size and significance. In addition, we ran models that included the inverse hyperbolic sine transformation of the dependent variables and generated substantively similar results.

### 3.3. Independent Variables

*Sustainability Policy Objectives.* The first independent variable in the model we refer to as the number of sustainability policy objectives. This variable captures the extent to which local governments are simultaneously pursuing multiple sustainability priorities through procurement. To construct this variable, we assigned a "1" value to an affirmative response stating the presence of a policy giving preference or priority to the following: (a) To purchases from minority-owned businesses; (b) to purchases from women-owned businesses; (c) to purchase environmental or green products or services; (d) veteran-owned business; (e) locally owned business; (f) and small businesses. We then created a summative index of the items for each respondent. The scores range from "0" to "6", with a "0" reflecting no pursuit of sustainability objectives in procurement, while a "6" reflects the pursuit of all the possible sustainability policy objectives collected using the survey instrument. Together, the items have a Cronbach's alpha of 0.73.

*Centralization of Procurement Decision Making.* Responses are on a five-point Likert-scale and reflect a respondent's agreement with the statement, "The finance department conducts all purchasing." Responses range from "1" (Strongly disagree) to "5" (Strongly agree), with a five indicating the highest level of decision centralization in the finance department.

### 3.4. Control Variables

*Organization Size.* As organizations increase in size, we can expect increases in the division of labor, increases in the levels of hierarchy involved in coordinating and controlling organization activities, and increases in the number of individuals involved in organization planning and processes [54]. Larger organizations are thus more complex, introducing additional process costs to its internal operations [55,56]. We include the population of the community to reflect the size of the local government we are analyzing. Given the positively skewed distribution of the variable and the likely non-linear relationship, we log the variable in our statistical analyses.

*Rules.* The existence of formal rules, regulations, and policies pertaining to agency activities can increase the time required for public agencies to conduct internal operations and processes [57]. The greater the density of rules (or red tape) that characterize the internal operations in local government, the greater the number of procedural steps that will be required prior to actions being taken [53]. Red tape can also hinder organizational effectiveness [58,59]. Rule compliance requires more time and effort, as well as can lead to procedural delays in administrative processes. We use a perceptual measure reflecting the respondent's perception of rule density as an indicator of internal rule and regulation density. Employees responded on a five-point Likert agreement scale ("1"-Strongly Disagree; 5-Strongly Agree) to the following statement: *My department has too many rules and procedures.*

*E-Procurement.* With respect to technology, e-procurement systems are increasingly used in public procurement [60–63]. E-procurement is defined as:

"... the use of integrated and wide area (commonly web-based) network communication systems in part or all of the purchasing process. The procurement process encompasses the initial need identification and specification by users, through the search, sourcing and negotiating stage of contracts and order placement and on to include mechanisms that register receipt, trigger payment and support post-supply evaluation" [60] (p. 369)

We include a dummy variable to indicate whether the city has e-procurement system in place. "1" reflects the presence of an e-procurement system, while "0" indicates that such a system is not present.

*Citywide Contracts.* We include a dummy variable to indicate whether the city utilizes citywide contracts in the procurement process. "1" reflects the presence of citywide contracts, while "0" indicates that such contracts are not present.

*Contextual Controls.* In addition to the main independent variables of interest, we include a number of controls to help capture the organizational and community context, as well as other factors that could affect the speed of purchase approvals in the procurement process. We include a *state dummy variable* to capture state-effects on the procurement times. To capture more about the community context, we include community demographic characteristics: *percent black*, *percent white*, and *percent poverty*. We include a perceptual measure of the department's overall *financial standing* as well as the *amount of time on procurement* the director reports spending on procurement during an average week and the number of employees they supervise. Finally, we include controls for the *frequency of interaction w/the city's executive* and *frequency of interaction with council members*.

### 3.5. Control Variables

We chose to use seemingly unrelated regression (SUR) to estimate our models [64] (Zellner, 1962). To determine the appropriateness of the SUR model, we test the independence of the error terms across the three models using a Breusch-Pagan test to determine whether the residuals for each observation are correlated across the three models. Based on the results of the test (chi-square = 196.86;  $p = 0.000$ ), we can reject the hypotheses that correlations among the error terms is zero. In this case, we can maximize efficiency in estimating our models by combining information (e.g., correlation of the error terms) from the three different equations. We report the estimated coefficients, robust standard errors, and the significance-level of the coefficients from three models. Descriptive statistics for all the independent and dependent variables are provided in Table 1.

**Table 1.** Descriptive statistics.

	Obs	Mean	Std. Dev.	Min	Max
Time to Procure Routine, Low-Cost Items (weeks)	221	1.25	2.16	0	20
Time to Procure Routine, High-Cost Items (weeks)	220	5.25	6.38	0	55
Time to Procure Non-Routine, High-Cost Items (weeks)	224	9.52	8.56	0	55
Sustainability Policy Objectives (#)	224	1.55	1.66	0	6
Centralization	224	1.99	1.08	1	5
Use of Citywide Contracts	224	0.81	0.39	0	1
E-Procurement	224	0.29	0.45	0	1
Department Rules	224	2.48	0.85	1	5
Freq. of Interaction w/City's Manager/Executive	224	4.18	1.08	1	5
Freq. of Interaction w/Council Members	224	3.37	1.30	1	5
Tenure w/City	224	10.57	8.55	0	37
# of Employees Supervised	224	8.36	8.75	0	51
Hours Spent on Procurement	224	12.42	14.15	0	40
Population(log)	224	11.08	0.84	10.04	14.75
Financial Standing	224	4.00	0.91	1	5
Poverty Rate (%)	224	0.11	0.07	0.02	0.37
Percent White (%)	224	0.78	0.17	0.16	1.00
Percent Black (%)	224	0.12	0.15	0.00	0.77

We use "Freq." as the abbreviation of "Frequency" to save space in the tables.

#### 4. Analysis and Results

In Table 2, we present the results of our SUR models predicting the duration of approval times (logged) for the three types of purchases: *Routine, low-cost*; *routine, high-cost*; *non-routine, high-cost*. To assess model fit, we report r-square values from OLS estimates as well as the number of observations in each model.

**Table 2.** Seemingly unrelated regression (SUR) results with robust SEs.

	(1) Routine, Low-Cost			(2) Routine, High-Cost			(3) Nonroutine, High-Cost		
	$\beta$	se	sig.	$\beta$	se	sig.	$\beta$	se	sig.
Sustainability Policy Objectives	0.172	0.053	0.001	0.095	0.060	0.112	0.094	0.068	0.166
Centralization	0.071	0.049	0.148	0.070	0.057	0.219	-0.003	0.067	0.967
Sustainability Policy Objectives X Centralization	-0.061	0.020	0.003	-0.061	0.024	0.012	-0.043	0.029	0.140
<i>Controls</i>									
Use of Citywide Contracts	0.054	0.091	0.555	-0.072	0.106	0.498	-0.018	0.125	0.886
E-Procurement	0.210	0.086	0.014	0.154	0.107	0.148	0.117	0.113	0.298
Department Rules	0.070	0.046	0.130	0.146	0.055	0.008	0.123	0.063	0.052
Freq. of Interaction w/City's Manager/Executive	-0.016	0.046	0.729	-0.024	0.060	0.696	0.039	0.063	0.537
Freq. of Interaction w/Council Members	0.052	0.040	0.195	0.048	0.058	0.406	0.032	0.060	0.601
Tenure w/City	-0.006	0.004	0.127	0.003	0.005	0.581	0.005	0.005	0.302
# of Employees Supervised	-0.006	0.004	0.130	0.008	0.005	0.095	0.012	0.006	0.030
Hours Spent on Procurement	0.003	0.003	0.322	0.011	0.004	0.016	0.011	0.004	0.015
(ln)Population	0.169	0.052	0.001	0.220	0.071	0.002	0.131	0.074	0.076
Financial Standing	-0.018	0.036	0.617	-0.022	0.047	0.635	-0.002	0.059	0.978
Poverty Rate	-0.288	0.662	0.664	-0.316	0.713	0.658	1.432	0.777	0.065
Percent White	0.074	0.409	0.855	0.070	0.461	0.880	-0.035	0.551	0.949
Percent Black	0.148	0.483	0.760	0.463	0.581	0.425	-0.466	0.638	0.465
State Dummies	Included			Included			Included		
Constant	-1.583	0.728	0.030	-0.537	0.943	0.569	0.396	1.058	0.708
Obs	221			220			224		
F	1.790			2.440			1.840		
Prob > F	0.003			0.000			0.002		
R-squared	0.374			0.450			0.377		

In Model 1, *sustainability policy objectives* has a positive, statistically significant coefficient ( $\beta = 0.172$ ;  $p = 0.001$ ) when predicting the approval times of *routine, low-cost purchases*. This finding offers evidence in support of Hypothesis 1, which states that *the number of sustainability objectives a local government pursues through the procurement process is positively associated with the duration of purchase approval processes*. The coefficient estimate of the relationship between *centralization* and duration of approval times for *routine, low-cost purchases* is positive ( $\beta = 0.071$ ), which is in the opposite direction than expected, but



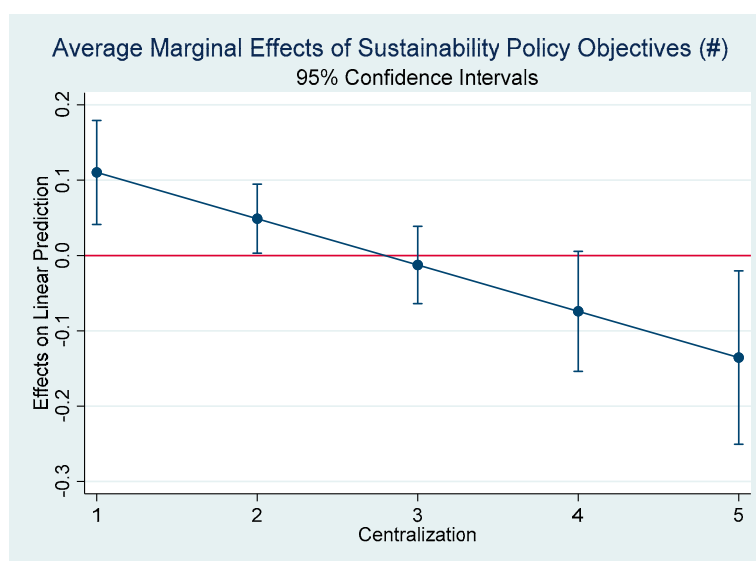
not statistically significant ( $p = 0.148$ ). The finding fails to support Hypothesis 2, which states that *the centralization of procurement decisions in local governments is negatively associated with the duration of purchase approval processes*.

Importantly, the coefficient on the interaction between *sustainability policy objectives* and *centralization* is negative and statistically significant ( $\beta = -0.061$ ;  $p = 0.003$ ). The finding suggests that the relationship between *sustainability policy objectives* and approval times is conditional on the level of *centralization*. It offers support for Hypothesis 3, which states that *centralization moderates the relationship between the number of sustainability objectives a local government pursues through the procurement process and the duration of approval times—as the centralization of procurement decision making increases, the marginal effect of purchasing complexity on approval times decreases*.

We illustrate the nature of the interactive relationship to facilitate our substantive interpretation of the findings. Table 3 and Figure 1 demonstrate the marginal effect of a one-unit increase in *sustainability policy objectives* on the number of weeks needed to conduct a *routine, low-cost purchase* at each level of our *centralization* measure. Since our dependent variable is in log units, we exponentiate the marginal effects to get percent changes in the average approval times of *routine, low-cost purchases*. Substantively, we demonstrate the average marginal effect of an increase in *sustainability policy objectives* at each level of *centralization*. The marginal effects are bound in 95% confidence intervals. Such a figure is important as the coefficient estimate of *sustainability policy objectives* in Model 1 ( $\beta = 0.172$ ;  $p = 0.001$ ) would only occur when *centralization* has a value of “0”, a hypothetical impossibility in our data.

**Table 3.** Marginal effect of unit change in sustainability policy objectives on duration of routine, low-cost purchases at each centralization value (1–5).

Centralization Value	dy/dx	Delta-Method Std. Error	z	p	Exp(dy/dx)	% Change in Mean Duration Time of Routine, Low-Cost Purchases (Weeks)
1	0.110	0.035	3.13	0.002	1.117	11.66%
2	0.049	0.023	2.09	0.037	1.050	5.01%
3	-0.013	0.026	-0.48	0.631	0.988	-1.25%
4	-0.074	0.041	-1.82	0.069	0.929	-7.13%
5	-0.135	0.059	-2.31	0.021	0.873	-12.67%



**Figure 1.** Average Marginal Effect on Routine, Low-Cost Purchases.

Table 3 and Figure 1 clearly show that as *centralization* increases, the initial positive effect of *sustainability policy objectives* decreases in magnitude. The graph provides evidence that at higher levels

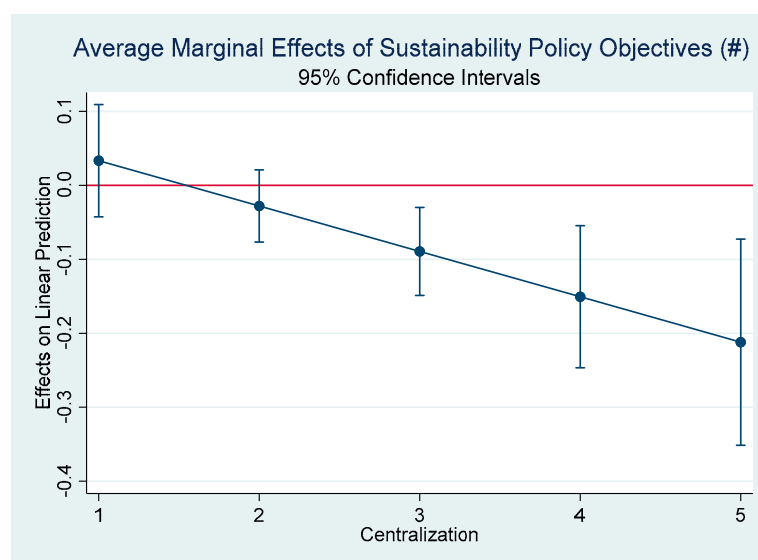
of *centralization*, the relationship is actually negative and an increase in *sustainability policy objectives* actually decreases the duration of approval times for *routine, low-cost purchases*. Table 3 shows us that a unit change in sustainability policy objectives when *centralization* is “1” increases the average duration of the procurement process by approximately 11.66 percent. In contrast, when *centralization* has a value of “5”, the average approval time decreases by 12.67 percent.

In Model 2, *sustainability policy objectives* has a positive but imprecise ( $p$ -value = 0.112) coefficient ( $\beta = 0.095$ ) when predicting the approval times of *routine, high-cost purchases*. The estimate of the relationship between *centralization* and purchase times is positive ( $\beta = 0.070$ ) but is not statistically significant ( $p = 0.148$ ). Thus, we do not find support for direct effects of *sustainability policy objectives* or *centralization* in this model (Hypothesis 1 or Hypothesis 2).

However, the coefficient on the interaction between *sustainability policy objectives* and *centralization* is negative and statistically significant ( $\beta = -0.061$ ;  $p = 0.024$ ). The relationship suggests that the nature of the relationship between *sustainability policy objectives* is, in fact, conditional on the level of *centralization*. To better understand the relationships among these variables and the support for Hypothesis 3, we calculate the marginal effects and present them in both Table 4 and Figure 2.

**Table 4.** Marginal effect of unit change in sustainability policy objectives on duration of routine, high-cost purchases at each centralization value (1–5).

	dy/dx	Delta-Method Std. Error	z	p	Exp(dy/dx)	% Change in Mean Duration Time of Routine, Low-Cost Purchases (Weeks)
1	0.033	0.039	0.86	0.388	1.034	3.40%
2	-0.028	0.025	-1.12	0.262	0.972	-2.76%
3	-0.089	0.030	-2.94	0.003	0.915	-8.54%
4	-0.151	0.049	-3.07	0.002	0.860	-13.99%
5	-0.212	0.071	-2.98	0.003	0.809	-19.10%



**Figure 2.** Average Marginal Effects—Routine, High-Cost Purchases.

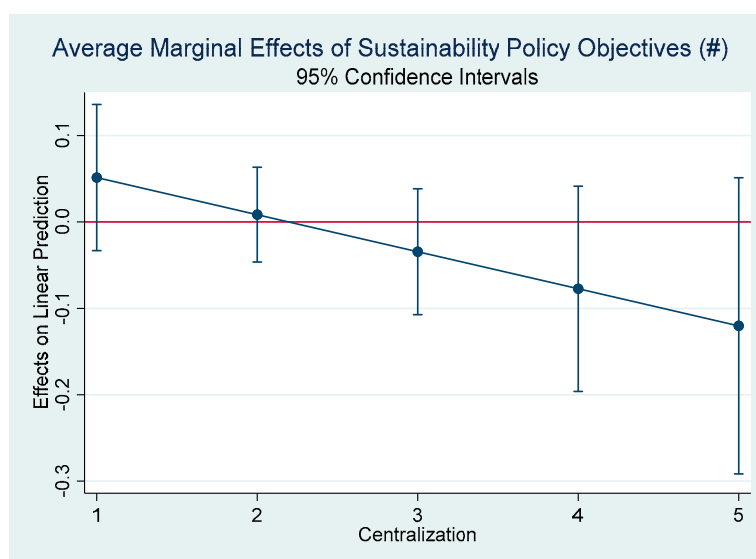
Table 4 and Figure 2 both demonstrate that as *centralization* increases, the marginal effect of a unit-increase in *sustainability policy objectives* decreases and, ultimately, the effect becomes negative and statistically significant. At the lowest level of *centralization*, an increase in the number of *sustainability policy objectives* we estimate will result in a 3.4 percent increase in the duration of approval times for *routine, high-cost purchases*. However, the effect is not statistically significant. What is interesting, however, is the extent to which *centralization* decreases the average duration of approval time as

centralization increases. When *centralization* has value of “5”, a unit increase in the number of *sustainability procurement policy objectives* leads to an average decrease in the duration of approval times of 19.10 percent—an effect that is statistically significant.

Finally, Model 3 in Table 2 estimates the effects of our independent variables on the duration of approval times for *non-routine, high-cost purchases*. In the model, we see that none of our coefficients on sustainability policy objectives, centralization, or the interaction between sustainability policy objectives and centralization. Table 5 and Figure 3 demonstrate the insignificant relationships and lack of support for all three hypotheses we observe in this model.

**Table 5.** Marginal effect of unit change in sustainability policy objectives on duration of non-routine, high-cost purchases at each centralization value (1–5).

Centralization Value	dy/dx	Delta-Method Std. Error	z	p	exp(dy/dx)	% Change in Mean Duration Time of Routine, Low-Cost Purchases (Weeks)
1	0.051	0.043	1.19	0.234	1.053	5.27%
2	0.008	0.028	0.30	0.761	1.009	0.85%
3	−0.034	0.037	−0.92	0.355	0.966	−3.38%
4	−0.077	0.061	−1.28	0.202	0.926	−7.44%
5	−0.120	0.088	−1.37	0.169	0.887	−11.33%



**Figure 3.** Average Marginal Effects—Non-Routine, High-Cost Purchases.

## 5. Discussion and Conclusions

This research asks whether the presence of multiple sustainability policy objectives affects the efficiency of the local government procurement process in terms of the speed of purchase approval and whether centralization of local government decision making in the procurement process moderates the relationship. We find that for low-cost purchases, as the number of policy objectives increases, so too does the average length of time for approval. However, U.S. local governments with centralized decision making can mitigate the effects.

Our research offers at least two contributions to the literature. First, to our knowledge, this is the first empirical study that assesses the potential tradeoffs between local governments’ pursuing multiple sustainability objectives and decision-making efficiency. Understanding this relationship is important because, increasingly, governments are using procurement policies as tools to pursue an array of sustainability objectives [5,7,42,65]. In the U.S. alone, about 28 percent of local governments have implemented policies with sustainability objectives [42]. These policies include set asides

for historically disadvantaged groups and local small businesses, and selection preferences for environmentally preferred vendors and products. While, anecdotally, research has suggested that pursuing multiple sustainability objectives reduces purchasing efficiency, the relationship had not been examined empirically.

Our findings offer evidence for this efficiency tradeoff, especially for routine low-cost purchases, which are typically made very quickly. These purchases are likely to have a greater path dependence associated with them. That is, once a local government identifies a low-cost product that meets its quality and price criteria, if that product is likely to be purchased routinely, it is less likely to reassess its purchase choice to consider other criteria. Doing so comes with greater transaction costs related to obtaining information and reconsidering purchases that formerly were acceptable. By contrast, non-routine purchases necessarily involve greater internal scrutiny because they occur infrequently. Including sustainability criteria along with other criteria associated with non-routine purchases therefore appears to have less effect on purchasing efficiency. Similarly, while routine high-cost purchases occur frequently, they are expensive. Local governments are therefore more likely to continually consider additional information in the purchase of these products. Including sustainability criteria along with this other information therefore has less effect on purchasing efficiency. These findings suggest that local governments focused on purchasing efficiency may be in a better position to apply their sustainability objectives to non-routine purchases and routine, high-cost purchases.

The second contribution of our research relates to U.S. local governments' decision-making structures. As the world is becoming increasingly complex, organizations need to understand how structure and design might help them accommodate this complexity. While we did not find evidence of a direct effect of centralization on process approval times, centralized decision-making emerged as a critical moderator of the relationship between the number of policy objectives and the duration of approval time for routine high-cost and routine low-cost purchases. Centralization of decision making allows local governments to systematically integrate the complexity associated with pursuing multiple sustainability objectives into existing routines and procedures and promote organization-wide learning that can be used in subsequent decisions [18]. Centralized procurement systems might minimize the burden of navigating complex rules or policy systems and facilitate the integration of learned knowledge into existing routines and processes [46]. Furthermore, the importance of centralization for navigating complex policy objectives might be more pronounced in routine processes, providing some explanation of the null-results observed in the model of non-routine, high-cost purchases which are more likely to be rare or idiosyncratic.

As with all research, this study has limitations that must be considered. We must recognize the threat posed by common methods biases to our statistical inferences [66]. However, our concerns of this threat are mitigated by the fact that most of our variables reflect responses to discreet and objective questions (e.g., the presence of a policy; time durations). That said, measurement error is always an issue, and while we do not have reasons to expect systematic over or underreporting on our variables of interest, we recognize it as a possible limitation. While we employ relevant control variables and obtain good overall explained variance, the threat of omitted variable bias remains. Additionally, the cross-sectional nature of our data only allows us to identify associations among the variables of interest and we must rely on theory for understanding the likely causal sequencing of relationships [67]. While an obvious limitation, such studies are important for establishing preliminary relationships among variables and are an important step for additional research. Prospective research would benefit from considering the longitudinal relationship between local governments' pursuing multiple sustainability objectives in the procurement process and purchasing efficiency. Our hope is that this research offers a justification for pursuing such a study.

Related to measurement, there might be other ways of operationalizing some of our variables of interest. For example, while we investigate a centralized procurement structure, future research might build on work that conceptualizes a hybrid purchasing structure. Research from the Netherlands suggests that different procurement mechanisms being used simultaneously in a local government may

yield differential results in meeting sustainability objectives [17]. Thus, future work might not look at the general tendencies toward centralization/decentralization in a procurement system, but also explore the extent of centralization/decentralization regarding specific types of purchases. Similarly, future research might adopt more nuanced conceptualizations of purchases, such as those distinguished by risk-impact (or complexity of supply) and cost (or profit) impact in the Kraljic Matrix of Procurement (bottleneck items, strategic items, non-critical items, leveraging items) [68].

More research is needed to consider the trade-offs among the different policies and sustainability objectives, and the balance between efficiency, effectiveness, and quality in outcomes [69–71]. While the time to complete purchases is an important part of a public service production process, capturing the value of time, it does not tell us about the quality or ultimate effectiveness of the purchase. Also, there are tradeoffs among the different social, economic, and environmental sustainability objectives that should be considered in future work [72–75]. Moreover, we might see similar trade-offs among other objectives and the balance between efficiency, effectiveness, and quality in outcomes that are unrelated to sustainability. Future research might consider supplier accountability, corruption avoidance, and information availability. Unfortunately, we do not have an indicator of the relative importance (or weight) assigned to each sustainability goal. Nor do we have a measure of the sincere commitment to a policy's goals or objectives (versus going through the motions of simply checking the box). Future work might examine the different weights given to different sustainability policies by looking at specific assessment criteria used in the selection process and the relative effects of those assessment criteria on different sustainability outcomes. Indeed, sustainability objectives are often embedded within selection criteria. Such studies could be beneficial for identifying best practices in situations characterized by multiple, competing decision criteria.

Future research would benefit from evaluating the actual purchases made by U.S. local governments. While accessing these data will likely require a close relationship to a limited number of local governments, sustainability scholars could learn a great deal from assessing actual purchasing data. Topics of interest include the extent to which product sustainability certifications are used in the purchasing process, whether different interventions (e.g., employee training and incentives) increase the sustainability-related purchases, and what types of sustainable purchasing policies (social, economic development, environmental) are more effective than others.

Finally, where we show that, on average, centralization increases the efficiency of procurement processes characterized by the simultaneous pursuit of multiple sustainable procurement objectives in U.S. local governments, future work should consider other cultural and national contexts. What would be particularly interesting is cross-comparative research that uses a similar instrument to assess local governments' structures and how they relate to multiple procurement objectives and procurement efficiency. Additional qualitative and quantitative work can be used to provide a more nuanced understanding of the factors affecting not only efficiency but also the effectiveness and quality of sustainable procurement processes around the world. For instance, centralization may increase the speed of procurement, but it can lead to procurement cartels, corruption, and a lack of accountability [76], which could have the effect of undermining sustainability objectives. Furthermore, in some centralized procurement structures, steps taken to combat corruption, such as the rotation of officials in Germany [77], might undermine the accrual of knowledge useful for navigating simultaneous policy objectives at once. Future studies of efficiency might more directly consider factors associated with sustainable procurement policy implementation and success [78,79].

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