Appendix: Replication Approach and Narrow Replication

In this replication, we use proprietary data from the International City/County Managers Association (ICMA) Alternative Service Delivery surveys from 1982 and 2017. Since the data are proprietary, we cannot share them directly. However, to aid in future replication of this research, here we present a detailed explanation of how we managed the datasets, including specific formulas and calculations. We used Microsoft Excel to manage, clean, and analyze the data. We are happy to assist other researchers interested in these steps, so please contact us if you have any questions.

Production Choice

1982: Data Gathering and Cleaning

The 1982 data are available by question on five separate worksheets. The columns are the questions from the survey (which ask about how different services are delivered), while the rows are the responses from each of the 1,779 jurisdictions that responded to the survey. To perform our analysis, we created separate worksheets for each of the service areas included in the study. These are shown in Table 1.

Table 1: Services and Question Numbers

Service	Type	Question No.
Residential Waste	Public Works	1
Street Repair	Public Works	4
Tree Trimming/Planting	Public Works	9
Cemetery	Public Works	10
Bus	Public Works	13
Paratransit	Public Works	14
Streetlight Operation	Public Works	19
Patrol	Public Safety	20
Fire Prevention	Public Safety	22
Emergency Medical Services	Public Safety	23
Ambulance Service	Public Safety	24
Vehicle Towing	Public Safety	26
Animal Shelter	Health and Human Services	30
Daycare	Health and Human Services	31
Child Welfare	Health and Human Services	32
Programs for Elderly	Health and Human Services	33
Public Housing	Health and Human Services	34
Hospital	Health and Human Services	35
Public Health	Health and Human Services	36
Drug/Alcohol Treatment	Health and Human Services	37
Mental Health	Health and Human Services	38
Recreation Services	Recreation and Arts	39
Arts Programs	Recreation and Arts	43
Libraries	Recreation and Arts	44
Museums	Recreation and Arts	45

To make these worksheets, we created a single Excel workbook with 25 blank sheets. In the first column of each blank sheet, we then inserted the CASEIDs from the survey, which are the unique identifiers for each respondent. We then matched survey responses from the original worksheets to the CASEIDs in our new workbook. Table 2 summarizes (for one service area) the answers that we matched to the CASEIDs (A-M).

Table 2: Questions Matched to CASEIDs

Survey Question	Service Delivery Description	VLOOKUP Formula
Q1A	Never Offered	=VLOOKUP(A3,'[ASD1982P1.xlsx]asd1982p1'!$A$1:$S$1780,**3**,FALSE)
Q1B	Other Government	=VLOOKUP(A3,'[ASD1982P1.xlsx]asd1982p1'!$A$1:$S$1780,**4**,FALSE)
Q1C	Employees	=VLOOKUP(A3,'[ASD1982P1.xlsx]asd1982p1'!$A$1:$S$1780,**5**,FALSE)
Q1D	Mix	=VLOOKUP(A3,'[ASD1982P1.xlsx]asd1982p1'!$A$1:$S$1780,**6**,FALSE)
Q1E	For Profit	=VLOOKUP(A3,'[ASD1982P1.xlsx]asd1982p1'!$A$1:$S$1780,**7**,FALSE)
Q1F	Neighborhood Org.	=VLOOKUP(A3,'[ASD1982P1.xlsx]asd1982p1'!$A$1:$S$1780,**8**,FALSE)
Q1G	Other nonprofit	=VLOOKUP(A3,'[ASD1982P1.xlsx]asd1982p1'!$A$1:$S$1780,**9**,FALSE)
Q1H	Franchise	=VLOOKUP(A3,'[ASD1982P1.xlsx]asd1982p1'!$A$1:$S$1780,**10**,FALSE)
Q1I	Subsidies	=VLOOKUP(A3,'[ASD1982P1.xlsx]asd1982p1'!$A$1:$S$1780,**11**,FALSE)
Q1J	Vouchers	=VLOOKUP(A3,'[ASD1982P1.xlsx]asd1982p1'!$A$1:$S$1780,**12**,FALSE)
Q1K	Volunteers	=VLOOKUP(A3,'[ASD1982P1.xlsx]asd1982p1'!$A$1:$S$1780,**13**,FALSE)
Q1L	Self-Help	=VLOOKUP(A3,'[ASD1982P1.xlsx]asd1982p1'!$A$1:$S$1780,**14**,FALSE)
Q1M	Incentives	=VLOOKUP(A3,'[ASD1982P1.xlsx]asd1982p1'!$A$1:$S$1780,**15**,FALSE)

To match the data, we used the VLOOKUP function in Microsoft Excel. Examples of these are offered in Table 2, though they would need to be adjusted, depending on the way worksheets are named in your data. This resulted in 25 worksheets (one for each of the services listed on table 1) that display CASEIDs (which identify each jurisdiction, n=1779) as well as their responses to the questions shown in Table 2, which are dichotomous indicators for whether each particular method of alternative service delivery is used in the jurisdiction.

On each worksheet, we also matched the CASEIDs to the jurisdiction's relevant geographic data, as shown in Table 3. These data were primarily used in this analysis to differentiate between cities and counties (using UTYPE), but other studies could do more with these data to describe geographical differences in the use of contracting. In particular, form of government, population, and size might be of interest.

Table 3: Geographic Data Matched to CASEIDs

Survey Question	Description	Sample Code
UJURIS	Name of Place	=VLOOKUP(A3,'[ASD1982P1.xlsx]asd1982p1'!$A$1:$IZ$1780,**242**,FALSE)
USTATE	State Abbrev.	=VLOOKUP(A3,'[ASD1982P1.xlsx]asd1982p1'!$A$1:$IZ$1780,**243**,FALSE)
UTYPE	City/County	=VLOOKUP(A3,'[ASD1982P1.xlsx]asd1982p1'!$A$1:$IZ$1780,**245**,FALSE)
U90POP	Total Population	=VLOOKUP(A3,'[ASD1982P1.xlsx]asd1982p1'!$A$1:$IZ$1780,**247**,FALSE)
UFOG	Form of Government (1-8)	=VLOOKUP(A3,'[ASD1982P1.xlsx]asd1982p1'!$A$1:$IZ$1780,**252**,FALSE)

With the addition of these geographic datapoints, our raw dataset was complete. We then needed to manipulate these data to recreate Ferris and Graddy's analysis.

1982: Data Analysis: Production Choice (Internal, External, Joint)

Replicating the production choice analysis required us to (1) determine which survey responses to include in the analysis and (2) develop a way to classify survey responses as internal, external, or joint provision. Ferris and Graddy provide no guidance on either front, requiring us to re-create their analysis using our own assessment of the data.

The first step was to determine which of the surveyed governments currently (in 1982) offered the service area in a way that qualified as internal (government employees only), external (contractors only), or joint (a mix of government employees and contractors). Table 4, which is included in the main document, describes generally how we did this. In essence, we dropped observations where respondents indicated the service was never (or not currently) offered, or was solely provided by subsidy, voucher, volunteer, self-help, incentives, or franchise. For reference, these correspond with questions A, H, I, J, K, L, M, O, P, Q, and R for each service area.

We kept all observations that listed services as being provided (at least in part) by other governments, government employees, a combination of government and contractor employees, for-profits, neighborhood organizations, and other nonprofit organizations. For reference, these correspond with questions B, C, D, E, F, and G for each service area.

To separate the two groups, we created an indicator variable for "Offered," which was specified as the following condition:

- Where a city answered "Never Offered" for question A, AND
- Where a city did not indicate the service was offered by any of the following:
    - Other governments, (B)
    - government employees, (C)
    - a combination of government and contractor employees, (D)
    - for-profits, (E)
    - neighborhood organizations (F), or
    - other nonprofit organizations (G).

The general Excel formula used for this was:

=IF(AND(C3=1,SUM(D3:J3=0)),0,1) → generates a 1 if cities offer a particular service

Using this variable, we were able to exclude observations where the service was not offered by the jurisdiction in a relevant way for our analysis. Summing this variable for each service generated our total "number of jurisdictions" count in our replication tables.

Then, we needed to categorize production choices into internal, external, and joint. Again, the general approach is shown in Table 4.

Internal *production occurs when only respondent organization employees are delivering the service.* This occurs when the following conditions are met:

1) The service is currently offered in the jurisdiction (as indicated by the previous section),
2) The respondent indicates that employees offer the service (C),
3) And where none of the following types of service providers are involved in delivery:
    a. Other governments (B),
    b. a combination of government and contractor employees (D)
    c. for-profits (E)
    d. neighborhood organizations (F), or
    e. other nonprofit organizations (G).

The general Excel formula used for this was:

=IF(AND(R3=0,E3=1,SUM(D3,F3,G3,H3,I3=0)),1,0)

External *production occurs when only organizations outside of the respondent organization are responsible for service delivery*. The occurs when the following conditions are met:

1) The service is currently offered in the jurisdiction (as indicated by the previous section),
2) The respondent indicates that one or more of the following types of organizations offer the service (C),
    a. Other governments, (B)
    b. for-profits, (E)
    c. neighborhood organizations (F), or
    d. other nonprofit organizations (G).
3) And where none of the following types of service providers are involved in delivery:
    a. Government employees (C),
    b. a combination of government and contractor employees (D).

The general Excel formulas used for this were:

=IF(AND(C3=1,SUM(D3:J3=0)),1,0) → is the service offered? (becomes R3)

=SUM(D3,G3,H3,I3) → sum of responses for all types of contractors (becomes Z3)

=IF(AND(Z3>0,F3=0,E3=0,R3=0),1,0) → F3 is government employees, E3 is joint delivery.

This combination of formulas leads to the final formula generating a 1,0 variable for responses where only contractors were used.

Joint *production occurs when both internal government employees and external contractors are involved in service delivery.* This occurs when the following conditions are met:

1) The service is currently offered in the jurisdiction (as indicated by the previous section),
2) The respondent indicates that one or more of the following types of service providers are involved in delivery:
    a. Government employees (C),
    b. a combination of government and contractor employees (D).
3) The respondent indicates that one or more of the following types of organizations also offer the service (C),
    a. Other governments, (B)

b. for-profits, (E)
c. neighborhood organizations (F), or
d. other nonprofit organizations (G).

The general Excel formulas used for this were:

=IF(AND(R3=0,E3=1,Z3>0),1,0) → Is the service offered, are employees used, are contractors used (becomes X3)

=IF(OR(X3=1,F3=1),1,0) → F3 is stated mix of employees

This final formula creates a 1,0 variable for conditions when joint production occurs.

Table 4: Categorization of Responses: Production Choice

Response	Interpretation (if selected alone)	w/ Other External	w/ Internal	w/ Joint
Step 1: Narrow Sample				
Blank (no responses)	Dropped			
Not offered	Dropped	Kept	Kept	Kept
Subsidy	Dropped	Kept	Kept	Kept
Voucher	Dropped	Kept	Kept	Kept
Volunteer	Dropped	Kept	Kept	Kept
Self-Help	Dropped	Kept	Kept	Kept
Incentives	Dropped	Kept	Kept	Kept
Franchise	Dropped	Kept	Kept	Kept
Step 2: Categorize Production				
Not offered	n/a (dropped)	External	Internal	Joint
Employees only	Internal	Joint	n/a	Joint
Employees in part	Joint	Joint	Joint	n/a
Other government	External	External	Joint	Joint
For-profit	External	External	Joint	Joint
Neighborhood organization	External	External	Joint	Joint
Other NPO	External	External	Joint	Joint

Using these three variables, we summed responses to get the number of jurisdictions offering services internally, jointly, or externally. We generated proportions by dividing the total for each production choice into the total number of jurisdictions offering the service:

=IF(AND(C3=1,SUM(D3:J3=0)),0,1) → generates a 1 if cities offer a particular service

=SUM(U3:U1781) → total jurisdictions

=SUM(W3:W1781) → total internal

=SUM(Y3:Y1781) → total joint

=SUM(AB3:AB1781) → total external

=W1782/U1782 → proportion internal

=Y1782/U1782 → proportion joint

=AB1782/U1782 → proportion external

Then we needed to calculate the same sums and proportions but for cities and counties, rather than for the total. To do so, we created a contingent summation:

=SUMIF(AM3:AM1781,1,W3:W1781) → AM is the UTYPE variable, where 1 indicates a city. This generated a count of cities offering internal services.

=SUMIF(AM3:AM1781,1,U3:U1781) → AM is the UTYPE variable, where 1 indicates a city. This generated a count of cities offering joint services.

=SUMIF(AM3:AM1781,1,AB3:AB1781) → AM is the UTYPE variable, where 1 indicates a city. This generated a count of cities offering external services.

We replicated this process, but for counties:

=SUMIF(AM3:AM1781,2,W3:W1781) → AM is the UTYPE variable, where 2 indicates a county. This generated a count of counties offering internal services.

=SUMIF(AM3:AM1781,2,U3:U1781) → AM is the UTYPE variable, where 2 indicates a county. This generated a count of counties offering joint services.

=SUMIF(AM3:AM1781,2,AB3:AB1781) → AM is the UTYPE variable, where 2 indicates a county. This generated a count of counties offering external services.

Then, we generated the total number of cities or counties offering the services:

=SUM(U1783, W1783, AB1783) → total counties

=SUM(U1784, W1784, AB1784) → total cities

Then, we divided the count of cities/counties offering internal, external, and joint services into the total number of cities/counties:

= AC1791/AF1791 → proportion internal

= AD1791/AF1791 → proportion joint

= AE1791/AF1791 → proportion external

2017: Data Gathering and Cleaning

We followed the same process for gathering and cleaning the data from 2017 as we did for 1982, with two notable differences, both based on changes to the data structure.

First, we had to match the 2017 questions to the 1982 questions. This mapping is shown in Table 5:

Table 5: Matching Questions (example)

1982 Survey Question	2017 Survey Question	Service Delivery Description
Q1A	Q15_1 (resp. 2 or 3)	Never Offered
Q1B	Q15_1_6	Other Government
Q1C	Q15_1_4	Employees
Q1D	Q15_1_5	Mix
Q1E	Q15_1_7	For Profit
Q1F	Q15_1_8	Neighborhood Org.
Q1G	Q15_1_8	Other nonprofit
Q1H	Q15_1_9	Franchise
Q1I	Q15_1_10	Subsidies
Q1J	N/A	Vouchers
Q1K	Q15_1_11	Volunteers
Q1L	N/A	Self-Help
Q1M	N/A	Incentives

Second, the 2017 survey identifies the service areas with different numbers:

Table 6: Matching Service Areas (1982-2017)

Service	Service Area	1982 No.	2017 No.
Paratransit	Public Works	14	15
Streetlight Operation	Public Works	19	N/A
Patrol	Public Safety	20	23
Fire Prevention	Public Safety	22	25
Emergency Medical Services	Public Safety	23	26
Ambulance Service	Public Safety	24	27
Vehicle Towing	Public Safety	26	29
Animal Shelter	Health and Human Services	30	34

Daycare	Health and Human Services	31	35
Child Welfare	Health and Human Services	32	36
Programs for Elderly	Health and Human Services	33	37
Public Housing	Health and Human Services	34	N/A
Hospital	Health and Human Services	35	42
Public Health	Health and Human Services	36	N/A
Drug/Alcohol Treatment	Health and Human Services	37	44
Mental Health	Health and Human Services	38	45
Recreation Services	Recreation and Arts	39	N/A
Arts Programs	Recreation and Arts	43	53
Libraries	Recreation and Arts	44	54
Museums	Recreation and Arts	45	55

As you can see, we had to drop some services, as ICMA either split or stopped asking about those services between 1982 and 2017. Those services are (using 1982 numbers):

- 19) Street lights – dropped from the dataset
- 34) Public housing – dropped from dataset, though homelessness services is now asked
- 36) Public health – split into related components, such as hunger, nutrition, in-home care
- 39) Recreation – split into facilities, maintenance, and programs

Other than these small changes, the data gathering and cleaning processes were the same for the 1982 and 2017 datasets.

2017: Data Analysis: Production Choice (Internal, External, Joint)

We followed the exact same analytical processes we developed for analyzing the 1982 data. The goal was to replicate our process exactly to ensure comparability across time periods.

Sector Choice

Our sector choice analysis used the same datasets as the production choice analysis, so there is no need to go into depth describing how we gathered and cleaned the starting dataset. The only difference is that for this analysis we included only jurisdictions that were exclusively using external partners to deliver services. To do this, we dropped all analyses where "external" from the previous analysis was not a "1" (indicating external only). That is, jurisdictions that reported joint and internal production were dropped from the analysis, and only external production was kept. This approach mimics Ferris and Graddy's 1986 approach, as we were able to replicate their initial findings almost exactly using these observations. This leaves some uncertainty about what happens in joint production, but that is an area for future scholarship.

Categorizing the sector of the different vendors was relatively straightforward.

1) *Contracts with other governments*: affirmative responses to question B ("Your government has a contract or agreement with another government or authority to provide the service.")

    a. *Sample Excel code*: =IF(B3 = 1),1,0) → generates 1 for other government
2) *Contracts with for-profits*: affirmative responses to question D ("Service is provided using for-profit firm.")
    a. *Sample Excel code*: =IF(D3 = 1),1,0) → generates 1 for for-profit
3) *Contracts with nonprofits*: affirmative responses to question E ("Service is provided using neighborhood organization.") OR question F ("Service is provided using other non-profit organizations.")
    a. *Sample Excel code*: =IF(OR(E3 = 1, F3 = 1),1,0) → generates 1 for nonprofit

Table 7: Categorization of Responses: Sector Choice

Response	Interpretation
Step 1: Narrow Sample	
Internal	Dropped
Joint	Dropped
External	Kept
Step 2: Categorize Sector	
Other government	Other government
For-profit	Profit
Neighborhood organization	Nonprofit
Other non-profit	Nonprofit

Table 7 describes the initial data cut and how we categorized the contracts based on sector.With the initial data cut out of the way, we will focus on explaining how we analyzed the data to describe how governments have chosen to allocate contracts across sectors. The sectors of interest here are other governments, nonprofits, and for-profits.

1982 Data Analysis: Selection Choice (For-Profit, Nonprofit, Other Government)

Replicating the sector choice analysis required us to generate counts of the numbers of jurisdictions using each type of contractor. To do so, we used the following process:

First, we generated counts of the jurisdictions using other governments:

- *Sample Excel Code*: =SUM(B3)

Second, we generated counts of the jurisdictions using for-profits:

- *Sample Excel Code*: =SUM(D3)

Third, we generated counts of the jurisdictions using nonprofits:

- *Sample Excel Code*: =SUM(G3) → G is a column that combines neighborhood organizations and other nonprofits into a single 1,0 indicator for use of nonprofits. See above for more details.

Fourth, we generated a count of the total number of jurisdictions included in the dataset.

This allowed us to develop counts and proportional use (which could exceed 100% across all categories) of the different sectors.

To calculate proportions, we divided the counts of each sector into the total number of jurisdictions in the dataset (that is, the total number of jurisdictions using external partners only).

- *Sample Excel Code*: =SUM(B3)/SUM(L3) → proportion of jurisdictions using other governments
- *Sample Excel Code*: =SUM(D3)/SUM(L3 → proportion of jurisdictions using for-profits
- *Sample Excel Code*: =SUM(G3)/SUM(L3 → proportion of jurisdictions using nonprofits

This approach gave us the numbers for all jurisdictions, but we still needed to generate counts and proportions for cities and counties. We again did this with contingent summation:

=SUMIF(AM3:AM1781,1,B3:B1781) → AM is the UTYPE variable, where 1 indicates a city. This generated a count of cities using other governments.

=SUMIF(AM3:AM1781,1,D3:D1781) → AM is the UTYPE variable, where 1 indicates a city. This generated a count of cities using for-profits.

=SUMIF(AM3:AM1781,1,G3:G1781) → AM is the UTYPE variable, where 1 indicates a city. This generated a count of cities using nonprofits.

We replicated this process, but for counties:

=SUMIF(AM3:AM1781,2,B3:B1781) → AM is the UTYPE variable, where 2 indicates a county. This generated a count of cities using other governments.

=SUMIF(AM3:AM1781,2,D3:D1781) → AM is the UTYPE variable, where 2 indicates a county. This generated a count of cities using for-profits.

=SUMIF(AM3:AM1781,2,G3:G1781) → AM is the UTYPE variable, where 2 indicates a county. This generated a count of cities using nonprofits.

Then, we generated the total number of cities or counties offering the services:

=SUM(B1783, D1783, G1783) → total counties

=SUM(B1784, D1784, G1784) → total cities

Then, we divided the count of cities/counties using other governments, for-profits, and nonprofits as contractors into the total number of cities/counties:

= AB1791/AH1791 → proportion internal

= AD1791/AH1791 → proportion joint

= AG1791/AH1791 → proportion external

2017 Data Analysis: Selection Choice (For-Profit, Nonprofit, Other Government)

We followed the exact same analytical processes we developed for analyzing the 1982 data. The goal was to replicate our process exactly to ensure comparability across time periods.

Comparing 2017 to 1982

A key part of our analysis was comparing our 2017 findings to our 1982 findings. To do this, we subtract across our worksheets. For example, in the main document's production choice replication table, we have the following row:

Table 8: Excerpt from Manuscript Table 3 (Production Choice)

Column	1	2	3	4	5	6	7	8	9	10
		No.	+/-	% +/-	Int.	+/-	Jnt.	+/-	Ext.	+/-
Residential Waste	All	1036	-223	-17.7	29.1	-24.4	5.8	-7.9	65.1	32.4
	City	913	-244	-21.1	30.0	-26.3	4.8	-8.5	65.2	34.8
	County	123	21	20.6	22.6	0.1	12.9	-5.7	64.5	5.7

Five of these columns are the result of the analysis described above. Column 1 identifies whether the data is for the full set, cities, or counties. Column 2 is the raw count of jurisdictions included in the analysis (process described on page 3 of this guide). Columns 5, 7, and 9 present the proportion of jurisdictions offering services internally, jointly, and externally. The process of generating these numbers is described on pages 3-7 of this guide. In addition to these, there are 5 columns that describe the change from 1982 to 2017. Those were calculated as follows:

- Column 3 (jurisdiction +/-): The difference between the number of jurisdictions in 2017 and the number of jurisdictions in 1982.
    - *Formula*: *2017 count of jurisdictions (column 2) – 1982 count of jurisdictions*
- Column 4 (% change in jurisdictions): The proportional change in number of jurisdictions between 2017 and 1982.
    - *Formula: 2017 difference (shown as +/-, column 3) / 1982 count of jurisdictions*
- Column 6 (+/- percent change in *internal* production): The percentage point difference between internal production in 2017 and 1982.
    - *Formula: 2017 internal production percentage (column 5) – 1982 internal production percentage*
- Column 8 (+/- percent change in *joint* production): The percentage point difference between joint production in 2017 and 1982.
    - *Formula: 2017 joint production percentage (column 7) – 1982 joint production percentage*

- Column 10 (+/- percent change in *external* production): The percentage point difference between external production in 2017 and 1982.
    - *Formula: 2017 external production percentage (column 9) – 1982 external production percentage*

Table 9: Excerpt from Manuscript Table 4 (Sector Choice)

Column	1	2	3	4	5	6	7	8	9	10
		No.	+/-	% +/-	OG	+/-	FPO	+/-	NPO	+/-
Residential Waste	All	710	179	33.7	10.0	-10.2	90.0	-3.0	0.0	-1.5
	City	620	159	34.5	8.0	-12.4	92.8	-1.3	0.0	-1.3
	County	90	20	28.6	24.4	5.8	77.8	-7.9	0.0	-2.9

We use essentially the same comparison methodology in the Sector Choice table (example shown in Table 9). Column 1 identifies whether the data is for the full set, cities, or counties. Column 2 is the raw count of jurisdictions included in the analysis (process described on page 3 of this guide). Columns 5, 7, and 9 present the proportion of jurisdictions using other governments, for-profits, and nonprofits. The process of generating these numbers is described on pages 9-11 of this guide. In addition to these, there are 5 columns that describe the change from 1982 to 2017. Those were calculated as follows:

- Column 3 (jurisdiction +/-): The difference between the number of jurisdictions in 2017 and the number of jurisdictions in 1982.
    - *Formula*: *2017 count of jurisdictions (column 2) – 1982 count of jurisdictions*
- Column 4 (% change in jurisdictions): The proportional change in number of jurisdictions between 2017 and 1982.
    - *Formula: 2017 difference (shown as +/-, column 3) / 1982 count of jurisdictions*
- Column 6 (+/- percent change in use of other government contractors): The percentage point difference between use of other governments as contractors, 2017 and 1982.
    - *Formula: 2017 percentage of governments with contracts with other governments (column 5) – 1982 percentage of governments with contracts with other governments*
- Column 8 (+/- percent change in *joint* production): The percentage point difference between use of for-profits as contractors, 2017 and 1982.
    - *Formula: 2017 percentage of governments with contracts with for-profits (column 7) – 1982 percentage of governments with contracts with for-profits*
- Column 10 (+/- percent change in *external* production): The percentage point difference between use of nonprofits as contractors, 2017 and 1982.
    - *Formula: 2017 percentage of governments with contracts with nonprofits (column 9) – 1982 percentage of governments with contracts with nonprofits*

In these tables, negative results show a reduction in a production or sector choice, while positive numbers show an increase. For reference, the 1982 replications can be found at the end of this Appendix. Note that we compared our 2017 findings to our 1982 replication rather than to Ferris and Graddy's initial findings, to ensure the same exact method was used in both years.

Narrow Replication

The following tables present Ferris and Graddy's results (Table 10 and Table 12), as well as our narrow replication using the 1982 data (Table 11 and Table 13). Our article largely focuses on changes from 1982 to 2017, but we include these for scholars interested in seeing the accuracy of our replication and the original results of the study we replicated. As before, we are happy to answer any questions about the approach or the results of our analysis.

Appendix: Original (Ferris and Graddy) and Narrow Replication (Brunjes and Anguelov)

Table 10: Ferris and Graddy's Production Choice Table (1982 data)

Service		Number of Jurisdictions	Internal (Solely Public)	Joint (Public Employees and Contracting Out)	External (Solely Contracting)
Public Works					
Residential Waste	All	1234	56.9	9.6	33.5
	City	1126	59.1	9.6	31.3
	County	108	33.3	10.2	56.5
Street Repair	All	1639	69.4	27.9	2.7
	City	1398	69.1	28.3	2.6
	County	241	71.4	25.3	3.3
Tree Trimming	All	1395	63.6	28.5	7.9
	City	1215	61.3	30.3	8.4
	County	180	78.9	16.7	4.4
Cemetery	All	678	78.2	9.6	12.2
	City	611	81.3	8.5	10.1
	County	67	49.3	19.4	31.3
Bus	All	478	29.1	20.5	50.4
	City	400	31.8	17.3	51
	County	78	15.4	37.2	47.4
Paratransit	All	488	28.7	24.2	47.1
	City	406	30.3	21.9	47.8
	County	82	20.7	35.4	43.9
Street Lights	All	1149	37	17.2	45.8
	City	1065	37.2	16.8	46
	County	84	34.5	22.5	42.9
Public Safety					
Police Patrols	All	1518	85.4	10.8	3.8
	City	1266	85.9	10.5	3.6
	County	252	83.3	12.3	4.4
Fire Prevention	All	1284	85.7	6.7	7.6
	City	1155	88.8	4.8	6.4
	County	129	57.4	24	18.6
Emergency Medical Services	All	1125	56.2	18.4	25.4
	City	953	57.9	17.8	24.2
	County	172	46.5	21.5	32
Ambulance	All	994	43.5	14.2	42.4
	City	832	44.2	13.9	41.8
	County	162	39.5	15.4	45.1
Vehicle Towing	All	1194	12	10.6	77.4
	City	1060	11.1	10.3	78.6
	County	134	18.7	13.4	67.9

Health and Human Services					
Animal Shelter	All	1462	69.2	10	20.8
	City	1218	69	9.5	21.5
	County	244	70.5	12.3	17.2
Daycare	All	383	12.5	14.9	72.6
	City	281	11.7	11	77.2
	County	102	14.7	25.5	59.8
Child Welfare	All	520	45.2	22.5	32.3
	City	276	31.9	21	47.1
	County	244	60.2	24.2	15.6
Elder Programs	All	1006	42	35.2	22.8
	City	765	43.7	35.3	21
	County	241	36.9	34.9	28.2
Public Housing	All	579	29.5	14	56.5
	City	495	29.5	13.9	56.6
	County	84	29.8	14.3	56
Hospital	All	344	22.4	7	70.6
	City	229	13.1	3.5	83.4
	County	115	40.9	13.9	45.2
Public Health	All	671	38.9	24.1	37
	City	438	27.9	25.1	47
	County	233	59.7	22.3	18
Drug Treatment	All	554	20.4	24.4	55.2
	City	347	14.4	23.1	62.5
	County	207	30.4	26.6	43
Mental Health	All	457	20.1	21.9	58
	City	237	10.1	15.2	74.7
	County	220	30.9	29.1	40
Recreation and Arts					
Recreation	All	1218	70.4	21	8.6
	City	1068	71.3	20.8	8
	County	150	64	22.7	13.3
Arts	All	526	29.1	33.1	37.8
	City	451	31.7	34.8	33.5
	County	75	13.3	22.7	64
Libraries	All	1022	58.5	11.9	29.6
	City	819	59.1	11.6	29.3
	County	203	56.2	13.3	30.5
Museums	All	377	34.7	16.4	48.8
	City	289	34.9	17.3	47.8
	County	88	34.1	13.6	52.3

Table 11: Production Choice Narrow Replication (Anguelov and Brunjes, using 1982 data)

Service		Number of Jurisdictions	+/-	% change	Internal (Solely Public)	+/-	Joint (Public Employees and Contracting Out)	+/-	External (Solely Contracting)	+/-
Public Works										
Residential Waste	All	1259	25	2.0	53.5	-3.4	13.7	4.1	32.7	-0.8
	City	1157	31	2.8	56.3	-2.8	13.3	3.7	30.4	-0.9
	County	102	-6	-5.5	22.5	-10.8	18.6	8.4	58.8	2.3
Street Repair	All	1661	22	1.3	63.9	-5.5	33.4	5.5	2.6	-0.1
	City	1425	27	1.9	63.9	-5.2	33.5	5.2	2.5	-0.1
	County	236	-5	-2.2	64	-7.4	32.6	7.3	3.4	0.1
Tree Trimming	All	1457	62	4.4	53.3	-10.3	39.1	10.6	7.5	-0.4
	City	1281	66	5.4	51.3	-10	40.7	10.4	8	-0.4
	County	176	-4	-2.2	68.2	-10.7	27.3	10.6	4.5	0.1
Cemetery	All	692	14	2.1	70.4	-7.8	17.6	8	12	-0.2
	City	627	16	2.6	74.5	-6.8	15.6	7.1	9.9	-0.2
	County	65	-2	-2.9	30.8	-18.5	36.9	17.5	32.3	1
Bus	All	486	8	1.7	27.4	-1.7	23	2.5	49.6	-0.8
	City	413	13	3.2	29.8	-2	20.6	3.3	49.6	-1.4
	County	73	-5	-6.4	13.7	-1.7	37	-0.2	49.3	1.9
Paratransit	All	507	19	3.9	21.5	-7.2	33.1	8.9	45.4	-1.7
	City	420	14	3.5	22.6	-7.7	31	9.1	46.4	-1.4
	County	87	5	6.1	16.1	-4.6	43.7	8.3	40.2	-3.7
Street Lights	All	1193	44	3.8	32.2	-4.8	23.7	6.5	44.1	-1.7
	City	1113	48	4.5	32.5	-4.7	23.4	6.6	44.1	-1.9
	County	80	-4	-4.8	27.5	-7	28.8	6.3	43.8	0.9
Public Safety										
Police Patrols	All	1657	139	9.2	73.7	-11.7	22.8	12	3.4	-0.4
	City	1392	126	9.9	75.2	-10.7	21.3	10.8	3.4	-0.2
	County	265	13	5.2	66	-17.3	30.6	18.3	3.4	-1
Fire Prevention	All	1425	141	10.9	73.5	-12.2	19.6	12.9	6.8	-0.8

	City	1280	125	10.8	78.4	-10.4	15.9	11.1	5.7	-0.7
	County	145	16	12.4	31	-26.4	52.4	28.4	16.6	-2
Emergency Medical Services	All	1193	68	6.0	44.8	-11.4	31.3	12.9	23.9	-1.5
	City	1016	63	6.6	46.8	-11.1	30.5	12.7	22.7	-1.5
	County	177	5	2.9	33.9	-12.6	35.6	14.1	30.5	-1.5
Ambulance	All	1046	52	5.2	35.9	-7.6	23.8	9.6	40.2	-2.2
	City	882	50	6.0	37	-7.2	23.2	9.3	39.8	-2
	County	164	2	1.2	30.5	-9	26.8	11.4	42.7	-2.4
Vehicle Towing	All	1206	12	1.0	7.9	-4.1	15.5	4.9	76.6	-0.8
	City	1079	19	1.8	7.5	-3.6	14.7	4.4	77.8	-0.8
	County	127	-7	-5.2	11	-7.7	22	8.6	66.9	-1
Health and Human Services										
Animal Shelter	All	1192	-270	-18.5	38.1	-31.1	14.5	4.5	47.4	26.6
	City	995	-223	-18.3	35.6	-33.4	14.2	4.7	50.3	28.8
	County	197	-47	-19.3	50.8	-19.7	16.2	3.9	33	15.8
Daycare	All	396	13	3.4	7.1	-5.4	22.7	7.8	70.2	-2.4
	City	294	13	4.6	7.1	-4.6	18.4	7.4	74.5	-2.7
	County	102	0	0.0	6.9	-7.8	35.3	9.8	57.8	-2
Child Welfare	All	536	16	3.1	28	-17.2	40.7	18.2	31.3	-1
	City	294	18	6.5	13.3	-18.6	41.5	20.5	45.2	-1.9
	County	242	-2	-0.8	45.9	-14.3	39.7	15.5	14.5	-1.1
Elder Programs	All	1143	137	13.6	19.2	-22.8	60.7	25.5	20	-2.8
	City	897	132	17.3	18.2	-25.5	63.5	28.2	18.3	-2.7
	County	246	5	2.1	23.2	-13.7	50.4	15.5	26.4	-1.8
Public Housing	All	592	13	2.2	21.6	-7.9	23.1	9.1	55.2	-1.3
	City	509	14	2.8	21.4	-8.1	22.8	8.9	55.8	-0.8
	County	83	-1	-1.2	22.9	-6.9	25.3	11	51.8	-4.2
Hospital	All	348	4	1.2	18.7	-3.7	11.5	4.5	69.8	-0.8
	City	233	4	1.8	11.2	-1.9	6	2.5	82.8	-0.6
	County	115	0	0.0	33.9	-7	22.6	8.7	43.5	-1.7
Public Health	All	701	30	4.5	26	-12.9	38.7	14.6	35.4	-1.6

	City	466	28	6.4	14.8	-13.1	40.3	15.2	44.8	-2.2
	County	235	2	0.9	48.1	-11.6	35.3	13	16.6	-1.4
Drug Treatment	All	569	15	2.7	11.4	-9	34.8	10.4	53.8	-1.4
	City	367	20	5.8	5.2	-9.2	34.6	11.5	60.2	-2.3
	County	202	-5	-2.4	22.8	-7.6	35.1	8.5	42.1	-0.9
Mental Health	All	467	10	2.2	14.3	-5.8	28.9	7	56.7	-1.3
	City	251	14	5.9	4.8	-5.3	23.1	7.9	72.1	-2.6
	County	216	-4	-1.8	25.5	-5.4	35.6	6.5	38.9	-1.1
Recreation and Arts										
Recreation	All	1422	204	16.8	52.3	-18.1	40.3	19.3	7.4	-1.2
	City	1263	195	18.3	53.4	-17.9	39.9	19.1	6.7	-1.3
	County	159	9	6.0	44	-20	43.4	20.7	12.6	-0.7
Arts	All	607	81	15.4	12.2	-16.9	55	21.9	32.8	-5
	City	527	76	16.9	13.5	-18.2	57.9	23.1	28.7	-4.8
	County	80	5	6.7	3.8	-9.5	36.3	13.6	60	-4
Libraries	All	1125	103	10.1	50.7	-7.8	22.5	10.6	26.8	-2.8
	City	914	95	11.6	52	-7.1	21.6	10	26.5	-2.8
	County	211	8	3.9	45	-11.2	26.5	13.2	28.4	-2.1
Museums	All	418	41	10.9	25.1	-9.6	30.9	14.5	44	-4.8
	City	325	36	12.5	24.6	-10.3	32.6	15.3	42.8	-5
	County	93	5	5.7	26.9	-7.2	24.7	11.1	48.4	-3.9

Table 12: Ferris and Graddy's Sector Choice Analysis (1982 data)

Service		Number of Jurisdictions	Other Government	For Profit	Nonprofit
Public Works					
Residential Waste	All	532	20.1	90	1.5
	City	460	20.4	90.9	1.3
	County	72	18.1	84.7	2.8
Street Repair	All	501	16.6	88.8	2.2
	City	432	15.3	90.3	1.9
	County	69	24.6	79.7	4.3
Tree Trimming	All	508	13.4	88.4	6.9
	City	470	11.9	90	6.6
	County	38	31.6	68.4	10.5
Cemetery	All	148	18.9	51.4	44.6
	City	114	14	56.1	44.7
	County	34	35.3	35.3	44.1
Bus	All	339	62.9	35.7	15.6
	City	273	62.6	35.2	15.4
	County	66	63.6	37.9	16.7
Paratransit	All	348	46.6	36.8	36.5
	City	283	46.3	40.3	33.6
	County	65	47.7	21.5	49.2
Street Lights	All	724	36.6	69.8	3.3
	City	669	36.3	70.3	2.7
	County	55	40	62.6	10.9
Public Safety					
Police Patrols	All	221	38.9	21.7	52
	City	179	35.8	24	53.6
	County	42	52.4	11.9	45.2
Fire Prevention	All	184	73.4	4.9	30.4
	City	129	76	5.4	28.7
	County	55	67.3	3.6	34.5
Emergency Medical Services	All	493	45	37.3	29.2
	City	401	45.6	38.9	26.7
	County	92	42.4	30.4	40.2
Ambulance	All	562	35.8	53	22.8
	City	464	35.1	53.7	22.4
	County	98	38.8	50	24.5
Vehicle Towing	All	1051	2.7	98	1
	City	942	2.7	98.1	0.8
	County	109	2.8	97.2	1.8
Health and Human Services					
Animal Shelter	All	450	61.8	20.2	28.7

	City	378	62.4	21.4	26.7
	County	72	58.3	13.9	38.9
Daycare	All	335	21.2	45.7	52.8
	City	248	16.9	49.2	52.4
	County	87	33.3	35.6	54
Child Welfare	All	285	54	9.8	49.1
	City	188	53.2	8.5	48.9
	County	97	55.7	12.4	49.5
Elder Programs	All	583	43.2	8.1	63
	City	431	42.9	7.4	62.4
	County	152	44.1	9.9	64.5
Public Housing	All	408	62.7	19.6	27.7
	City	349	63.6	20.1	26.4
	County	59	57.6	16.9	35.6
Hospital	All	267	33.7	40.1	37.8
	City	199	27.1	44.7	40.2
	County	68	52.9	26.5	30.9
Public Health	All	410	52.4	13.4	49.8
	City	316	51.6	12.3	50.3
	County	94	55.3	17	47.9
Drug Treatment	All	441	43.1	8.8	61
	City	297	45.1	7.7	58.2
	County	144	38.9	11.1	66.7
Mental Health	All	365	47.7	9.3	57.8
	City	213	47.4	8.5	56.3
	County	152	48	10.5	59.9
Recreation and Arts					
Recreation	All	361	36.3	17.7	60.9
	City	307	35.2	17.8	61.9
	County	54	42.6	18.5	55.6
Arts	All	373	21.4	13.7	80.4
	City	308	20.8	14.9	80.2
	County	65	24.6	7.7	81.5
Libraries	All	424	76.2	2.1	29.5
	City	335	75.5	2.1	29.6
	County	89	78.7	2.2	29.2
Museums	All	246	32.1	7.3	69.1
	City	188	28.2	7.4	71.3
	County	58	44.8	6.9	62.1

Table 13: Sector Choice Narrow Replication (Anguelov and Brunjes, using 1982 data)

Service		Number of Jurisdictions	+/-	% change	Other Government	+/-	For Profit	+/-	Nonprofit	+/-
Public Works										
Residential Waste	All	531	-1	-0.2	20.2	0.1	93	3	1.5	0
	City	461	1	0.2	20.4	0	94.1	3.2	1.3	0
	County	70	-2	-2.8	18.6	0.5	85.7	1	2.9	0.1
Street Repair	All	501	0	0.0	16.6	0	88.8	0	2.2	0
	City	433	1	0.2	15.2	-0.1	90.3	0	1.8	-0.1
	County	68	-1	-1.5	25	0.4	79.4	-0.3	4.4	0.1
Tree Trimming	All	508	0	0.0	13.4	0	88.8	0.4	6.9	0
	City	471	1	0.2	11.9	0	90.4	0.4	6.6	0
	County	37	-1	-2.6	32.4	0.8	67.6	-0.8	10.8	0.3
Cemetery	All	148	0	0.0	18.9	0	51.4	0	44.6	0
	City	116	2	1.8	13.8	-0.2	56.9	0.8	44	-0.7
	County	32	-2	-5.9	37.5	2.2	31.3	-4	46.9	2.8
Bus	All	339	0	0.0	62.8	-0.1	37.5	1.8	15.6	0
	City	278	5	1.8	62.2	-0.4	36.3	1.1	16.2	0.8
	County	61	-5	-7.6	65.6	2	42.6	4.7	13.1	-3.6
Paratransit	All	348	0	0.0	46.6	0	37.4	0.6	36.5	0
	City	285	2	0.7	46.3	0	41.1	0.8	33.7	0.1
	County	63	-2	-3.1	47.6	-0.1	20.6	-0.9	49.2	0
Street Lights	All	723	-1	-0.1	36.5	-0.1	73	3.2	3.3	0
	City	673	4	0.6	36.4	0.1	73.4	3.1	2.8	0.1
	County	50	-5	-9.1	38	-2	68	5.4	10	-0.9
Public Safety										
Police Patrols	All	221	0	0.0	38.9	0	21.7	0	52	0
	City	182	3	1.7	35.7	-0.1	24.2	0.2	53.8	0.2
	County	39	-3	-7.1	53.8	1.4	10.3	-1.6	43.6	-1.6
Fire Prevention	All	183	-1	-0.5	73.8	0.4	4.9	0	30.6	0.2
	City	129	0	0.0	76.7	0.7	5.4	0	28.7	0

	County	54	-1	-1.8	66.7	-0.6	3.7	0.1	35.2	0.7
Emergency Medical Services	All	492	-1	-0.2	45.1	0.1	37.8	0.5	29.3	0.1
	City	403	2	0.5	45.7	0.1	39	0.1	27	0.3
	County	89	-3	-3.3	42.7	0.3	32.6	2.2	39.3	-0.9
Ambulance	All	562	0	0.0	35.8	0	53.2	0.2	22.8	0
	City	469	5	1.1	35	-0.1	53.9	0.2	22.4	0
	County	93	-5	-5.1	39.8	1	49.5	-0.5	24.7	0.2
Vehicle Towing	All	1051	0	0.0	2.7	0	98.1	0.1	1	0
	City	950	8	0.89	2.7	0	98.2	0.1	0.8	0
	County	101	-8	-7.3	2	-0.8	97	-0.2	2	0.2
Health and Human Services										
Animal Shelter	All	680	230	51.1	53.2	-8.6	24.1	3.9	33.7	5
	City	593	215	56.9	53.6	-8.8	25	3.6	31.9	5.2
	County	87	15	20.8	50.6	-7.7	18.4	4.5	46	7.1
Daycare	All	335	0	0.0	21.2	0	45.7	0	52.8	0
	City	252	4	1.6	17.1	0.2	49.2	0	52	-0.4
	County	83	-4	-4.6	33.7	0.4	34.9	-0.7	55.4	1.4
Child Welfare	All	285	0	0.0	54	0	10.2	0.4	49.1	0
	City	192	4	2.1	53.6	0.4	8.9	0.4	48.4	-0.5
	County	93	-4	-4.1	54.8	-0.9	12.9	0.5	50.5	1
Elder Programs	All	583	0	0.0	43.2	0	8.2	0.1	63	0
	City	437	6	1.4	43.2	0.3	7.6	0.2	62.5	0.1
	County	146	-6	-3.9	43.2	-0.9	10.3	0.4	64.4	-0.1
Public Housing	All	408	0	0.0	62.7	0	19.9	0.3	27.7	0
	City	353	4	1.2	63.5	-0.1	20.4	0.3	26.3	-0.1
	County	55	-4	-6.8	58.2	0.6	16.4	-0.5	36.4	0.8
Hospital	All	267	0	0.0	33.7	0	40.4	0.3	37.8	0
	City	202	3	1.5	27.2	0.1	44.6	-0.1	40.6	0.4
	County	65	-3	-4.4	53.8	0.9	27.7	1.2	29.2	-1.7
Public Health	All	410	0	0.0	52.4	0	14.4	1	49.8	0
	City	320	4	1.3	51.9	0.3	13.8	1.5	50	-0.3

	County	90	-4	-4.3	54.4	-0.9	16.7	-0.3	48.9	1
Drug Treatment	All	441	0	0.0	43.1	0	8.8	0	61	0
	City	302	5	1.7	45	-0.1	7.9	0.2	58.3	0.1
	County	139	-5	-3.5	38.8	-0.1	10.8	-0.3	66.9	0.2
Mental Health	All	365	0	0.0	47.7	0	9.6	0.3	57.8	0
	City	219	6	2.8	47.5	0.1	8.7	0.2	56.2	-0.1
	County	146	-6	-3.9	47.9	-0.1	11	0.5	60.3	0.4
Recreation and Arts										
Recreation	All	361	0	0.0	36.3	0	19.9	2.2	60.9	0
	City	309	2	0.7	35	-0.2	20.1	2.3	62.1	0.2
	County	52	-2	-3.7	44.2	1.6	19.2	0.7	53.8	-1.8
Arts	All	373	0	0.0	21.4	0	15	1.3	80.4	0
	City	309	1	0.3	20.7	-0.1	15.9	1	80.3	0.1
	County	64	-1	-1.5	25	0.4	10.9	3.2	81.3	-0.2
Libraries	All	424	0	0.0	76.2	0	2.4	0.3	29.5	0
	City	337	2	0.6	75.7	0.2	2.4	0.3	29.4	-0.2
	County	87	-2	-2.3	78.2	-0.5	2.3	0.1	29.9	0.7
Museums	All	246	0	0.0	32.1	0	8.1	0.8	69.1	0
	City	190	2	1.1	27.9	-0.3	7.9	0.5	71.6	0.3
	County	56	-2	-3.5	46.4	1.6	8.9	2	60.7	-1.4