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ECONOMIC VALUE OF RURAL BACKYARDS IN THE MUNICIPALITY OF MARITUBA, METROPOLITAN REGION OF BELÉM, STATE OF PARÁ, BRAZILIAN AMAZON

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ABSTRACT

In large cities with problems related to space, environmental degradation, pollution, and social problems of income and food distribution, insecurity and unemployment, alternatives are sought that generate a new profile for urban and/or peri-urban areas. In this context, Urban Agriculture is the theoretical reference of this article, practiced in the backyards of the municipality of Marituba, State of Pará. The aim of this article is to simulate the value of economic, environmental, social and cultural services in these backyards. The methodology used was the Snowball sample technique for data collection in 22 backyards. The Contingent Valuation Method was used based on the Disposition to Accept (DAA). The simulation resulted in an DAA value of R\$ 2,460.00 (US\$657,56), which can be justified by the possibility of a fixed income, since farmers are aging and having difficulty in receiving the retirement aid, with the backyard often being the main source of income for families. Thus, it is concluded that the social and economic importance of the backyards for the municipality studied is noticeable and, therefore, future work that will contribute to regional development is indicated by research involving the study of the relationships of urban and/or peri-urban agriculture and its impacts on the diet of the residents, in order to verify the nutritional influence of productive backyards.

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INTRODUCTION

The socioeconomic and environmental context of large cities and metropolitan regions is shaped by environmental degradation, pollution of soil, water and air, as well as social problems of income and food distribution, accompanied by insecurity and unemployment. Given all these problems, alternatives are needed to enable other ways of living and enjoying urban spaces. In this context, the Urban Agriculture can contribute to food production and welfare conditions in cities. Historically, there has been an attempt to move away from agriculture and urban environment from an incompatible perspective of the adoption of agricultural practices in urban areas; nevertheless, Urban Agriculture (UA) is a component of urban ecosystems around the world (Aquino and Assis, 2007). According to Mougeot (2000), the definition of the main elements of UA are: developed economic activity type; category and subcategory of the products (food and non-

food); locational particularity (intra-urban or peri-urban); type of area where it is conducted, characteristic of the production systems, product targeting and production scale. This way of producing has aroused interest in researchers, public policy managers and the society in general, because in places where it was successfully developed, it played an important role in feeding urban populations, since it helped to face situations of socioeconomic vulnerability. UA-related actions have been discussed by research and studies, such as the one performed in 2003, by the International Center for Research for Development (Centro Internacional de Pesquisa para o Desenvolvimento - CIID), in partnership with the Urban Management Program for Latin America and the Caribbean (Programa de Gestão Urbana para a América Latina e Caribe - PGU-LAC /UN- HABITAT, Ecuador) and the program entitled: "Promotion of Sustainable Development" (Peru), which together brought several proposals for the implementation of Urban Agriculture as an engine for sustainable municipal development. According to this study, despite the

importance of UA for local development, there are still many restrictions that hinder its development, such as restriction of access to land, water sources, service and capital. Other limitations are of technical nature, such as health risk due to the use of pesticides, organic residues or untreated wastewater and lack of hygiene in the marketing process. In Brazil, recently, some actions have been initiated on the subject, such as the creation of Ordinance N^o. 467, in February 2018, whose main purpose was to launch the main directions for Urban and Peri-Urban Agriculture in the country. The perspective is to standardize the various aspects of UA, and thus, make it more sustainable. In this construction, the government must be involved, taking its role in recognizing its importance for municipal development and encouraging it by the creation of policies and incentives focused on population priorities. Just as important is citizen participation making this construction process more democratic and participatory. Given this, the agriculture practiced in backyards in Marituba, Metropolitan Region of Belém, state of Pará, has great potential for agroecological transition with the perspective of implementing production systems with less impact on the environment, maintaining productivity and using resources available in the production unit, by the reuse of organic waste from domestic or industrial origin (bakeries, butchers, breweries, sugarcane bagasse, kitchen waste). Additionally, the proximity to the consumer market, availability of fresh products, and easy access to labor are important elements for the growth of this activity (Gnau, 2002).

The goal of this article is to estimate the value of economic, environmental, social and cultural services in these rural backyards in the municipality of Marituba, Metropolitan Region of Belém, state of Pará. The methodology employed was the Snowball sample technique for data collection in 22 backyards. This research is justified by observing the context of rural backyards in the municipality, where agriculture is carried out in an urban area with food production for a wide range of consumers. This agriculture, despite the proximity of consumer market and availability of inputs, still faces difficulties related to infrastructure and public policies. The results of this research can subsidize public policies to encourage urban agriculture, as well as the implementation of actions aimed at the maintenance and development of production in the municipality, such as affordable interest loans, access to courses to improve agricultural techniques from an agroecological perspective, incentive to environmental regularization, in addition to participation in institutional market programs such as the Food Acquisition Program (Programa de Aquisição de alimentos - PAA) and the National School Feeding Program (Programa Nacional de Alimentação Escolar - PNAE).

MATERIAL AND METHODS

Characterization of the municipality of Marituba, State of Pará: Marituba was developed as a result of the Belém-Bragança Railway. The occupation of the municipality occurred by provincial Government policies that were implemented in the second half of the 20th century and aimed at the integration of the region of Bragantina by the railway. At that time there was a large area separating the current areas of Bragantina, Guajarina and Salgado from the urban center, Belém, and which, therefore, had to be urgently populated (Rebello; Homma, 2017). The first peoples to arrive in the region, in mid-April 1875, were from French, Italian and Spanish origin and gave rise to several agricultural centers, among them: Apeú, Castanhal and Inhangapi. These municipalities are part of the Bragantina Zone. Colonization, in addition to aiming at conquering the area, also sought fertile and arable land for agricultural production that would eventually supply the inhabitants of the provincial capital, which was in full expansion (IBGE, Cidades, 2018). Marituba village was founded in 1907 by Dr. Swindeler, director of the company responsible for the Railway construction, with some workers and residents. The toponym Marituba derives from an indigenous language (Nhengatu), whose meaning is: "abundant place of Maris or Umaris", a tree from the Icacináceas family that produces edible fruit.

Tuba denotes an abundant place, thus, the union of the two expressions gave rise to Marituba's name. At that time, the economic life of Marituba village revolved around the railroad, as a large part of the population worked on its construction or maintenance, and a small part supported itself from the farm and charcoal production for distribution in the great center, Belém, where they embarked on the freight train. They also produced firewood for the Railroad, and also for certain companies, such as Pará Elétrica, the first company to invest in electricity in Belém. Extractive activities prevailed over the years, and until the mid-1940s. Trade was supported by interests of the railroad and rudimentary subsistence agriculture, generally for self-consumption, such as cassava, rice and corn (IBGE, Cidades, 2018). Marituba lands were owned by the municipality of Belém; nonetheless, with the creation of the municipality of Ananindeua in 1943, these lands were annexed to the new municipality. In 1961, it became part of the municipality of Benevides, and it was only designated as a municipality with the publication of the State Law N^o. 5,857, on September 22, 1994 (Marituba, IBGE, 2018). Currently, the municipality of Marituba composes the Belém Metropolitan Region (BMR) and has an estimated population of 129,321 people, with a demographic density of 1,047.44 inhabitants/km², according to data from IBGE (2018). It is limited to the municipalities of Benevides (to the north), Santa Bárbara do Pará (to the east), Acará and Belém to the south, and Ananindeua to the west. It is 13 km distant from the state capital, Belém, through the Federal Highway BR 316, and its location is 24 meters above sea level, located at the geographic coordinates: Latitude: 1°21'19" South, Longitude: 48°20'36" West.

The selection of the municipality for this research occurred due to its context and strong agricultural connections, as reported by Santos and Silva (2007), who highlighted that three of the largest neighborhoods in the municipality produced mainly leafy vegetables and had this agricultural activity as their main source of income. In this perspective, the study aims to portray the current profile of producers in the municipality and use the contingent valuation method (CVM) to value farmers' preferences in relation to the backyards. The field research was conducted between the months of December 2018 and January 2019, and the data was obtained by the application of a questionnaire in 22 rural backyards in Marituba. Direct observation was also used to complement information. The questionnaire was designed based on similar research standards in the literature (VIEIRA, 2009; BARBOSA VILAR et al., 2010).

The surveys were conducted personally in homes or backyards. The questions were divided into five blocks: (1) general characteristics of the backyards, (2) socioeconomic profile, (3) environmental profile, (4) cultural profile and (5) contingent valuation. In this article, the data collected in the last block will be presented and discussed, that is, the contingent valuation topic, that aimed to directly and/or indirectly value the possible services generated by rural backyards in the municipality of Marituba. The questionnaire was chosen because it is an important tool in the search for answers to research questions, since it has an ordering of questions, enabling quick and accurate answers, and also, facilitating the acquisition of inaccessible questions using other methodologies (Marconi; Lakatos, 2003). Thus, it was the instrument chosen to report the aims of this study. Each block was tasked with responding to the general and specific goals of the research. Due to the lack of official information about the registration of regional producers, we decided to design the sample as Snowball sample. It is a technique in which one interviewee indicates the other (Bayley, 1994) and so on, until a repetition is detected in the observed profiles and / or the research goals reached. This sampling is of the non-probabilistic type and uses chains of references, that is, it is not possible to define the probability of selection of each participant in the survey or research (Vinuto, 2016). This practice is widely used in groups that are difficult to access or that do not have an exact number (BERNARD, 2005) and that was why it was chosen, given the difficulty in obtaining the sample that represented the farmers in Marituba and that, at the same time, makes the use of CVM (Vieira, 2009). In total, 22 farmers were interviewed, covering the neighborhoods of *Uriboca*, *São Francisco*, *Almir Gabriel* and *Bela Vista*.

Step of contingent valuation method simulation: After observing the available methods and based on the Manual for economic valuation of environmental resources (Serôa da Motta, 1998), the following stages were used in the research in order to simulate the valuation, since sample calculation was not used neither statistic procedures: (a) valuation object selection, (b) valuation measure, (c) elicitation form, (d) payment instrument (or vehicle), (e) interview form and (f) sample design. The purpose of the simulation was to value the 22 backyards observed in the municipality of Marituba; the valuation measure chosen initially was the disposition to pay (DAP); however, after a pre-test, it was discovered that this method would not be the most appropriate, as farmers felt difficulties in responding to the fictitious situation portrayed. Therefore, the disposition to accept or receive (DAA) was used, where the farmer was put in the situation of accepting a monthly payment, as a way to alleviate a disadvantage, which would mean to stop working in the backyard. This type of valuation, according to Sêroa da Motta (1998, p.34) "can often be higher than DAP when the person, facing a possible reduction in the environmental resource availability, realizes that substitution possibilities between the highly valued environmental resource and other goods and services at its disposal." The elicitation form chosen was the "Payment Card", due to its characteristics (Table 1). The payment or compensation instrument, with which the DAA was assessed, according to the experience in the pre-test, considered values close to the monthly revenue that farmers themselves acquire with their production, thus giving greater accuracy to the methodology.

Table 1. Number of respondents and values indicated by farmers in backyards in Marituba, 2018

| Interviewee | Values (US\$) |
|--------------------|---------------|
| 1 | 320.77 |
| 2 | 748.45 |
| 3 | 801.91 |
| 4 | 801.91 |
| 5 | 935.57 |
| 6 | 534.61 |
| 7 | 427.69 |
| 8 | 400.96 |
| 9 | 801.91 |
| 10 | 801.91 |
| Mean | 657.57 |
| Standard deviation | 215.03 |

It is noteworthy that one of the goals of the questionnaire was to obtain data to apply the contingent valuation method (CVM) in view of the maximum disposition to accept (DAA) of producers in compensation when they stop producing in backyards. For simulation purposes, a hypothetical market was designed, considering the following situation: "Suppose a public agency removes all the productive assets from your backyard for an urban infrastructure construction of public interest, in return you would receive a monthly amount, how much would you be willing to accept to stop producing in your backyard? After the question, cards with options of values were presented.

Studies that have used the contingent valuation method (CVM): The search for economic development led to the demand for a new vision within management sciences. An example of this is the creation of Environmental Economics, which, although recent, already has several researches, and it analyzes the endeavor to assist in policies created by economic agents. Environmental Economics is derived from neoclassical economics, the basis of which was grounded on principles of well-being utility theories and ended up introducing debates on environmental issues into economic theory, and actions began to be developed to internalize environmental damage and the concept of property rights (FURTADO, 2010). In this research, one of the environmental economic elements was used. That is, valuation of natural resources, and its tools. They aim at measuring the negative externalities, mainly the environmental ones that are the result of productive processes. These externalities, according to Paulani and Braga (2000, p.81), are "costs arising from economic activity and

which are not valued by the market [...] such as pollution of rivers, air, native forests' reduction, among other impacts". To measure the economic value of rural backyards, the contingent valuation method (CVM) was used, in order to determine farmers' preferences regarding the benefits derived from backyards. This technique, as long as the person is able to understand the environmental variation presented, allows them to reveal their disposition to pay (DAP) or disposition to accept (DAA), and in this context the method can be considered appropriate (SERÔA DA MOTTA, 1998). Also according to the author, DAP seeks the value of a "payment to measure a positive variation in availability, while DAA measures compensation for a negative variation" (SERÔA DA MOTTA, 1998, p. 33).

These two measures can be regulated by mechanisms such as new taxes, tariffs or fees, or higher rates on existing ones; direct charge for use; or donation to a charity fund or a non-governmental organization, in the case of DAP. DAA, in turn, can be measured by new subsidies or an increase in the level of existing ones; direct financial compensation; or increase in equity via works or replacement (SERÔA DA MOTTA, 1998). CVM aimed to obtain a disposition to accept (DAA) from backyard farmers based on a fictitious market. This measure can even show the value of existing goods and services that do not have prices in the conventional market (LEE, 1998). The disposition to accept (DAA) is one of the basic concepts that arose from the benefit: "for avoiding damage or environmental damage" (LEE, 1998 p. 14). That is, it is related to compensatory variation (PESSOA; RAMOS, 1998). Because it is a very dynamic and flexible procedure justified by its theoretical character, CVM can be used in various situations regarding environmental problems, which allows its applicability in the valuation of various intangible goods and services. However, in order to guarantee its results, the questionnaire must be constructed precisely in order to rule out biases and it is necessary to use different tools, such as photographs, graphics, and also precise and objective questions with the intention of attenuating communication noise and avoiding interviewee's exhaustion. The questionnaire applied in this research has a specific block for this purpose. According to Faria and Nogueira (1998), CVM offers several ways to build the hypothetical market and to estimate the environmental value. This methodology can be adapted according to the needs of the analysis, and can be divided into: direct methods, such as: open-ended, bidding game and payment cards; and indirect methods, such as: referendum, referendum with follow-up. The bidding game method (Auction Games) mimics an auction, where the respondent is presented with different values and starts with an average value, equivalent to his maximum DAP (or minimum DAA) and is asked: "Would you pay (would you receive) a US\$ X worth of (to give up) the good or service?" (VIEIRA, 2012; FARIA; NOGUEIRA, 1998).

The non-interactive methodology that also aims to capture the true inclination to pay for interviewees is the Payment Card. It presents, according to Serôa da Motta (1998, p. 46), "cards with different values, or representation of consumer goods of equivalent value, and the interviewee chooses the value that reflects his DAP or DAA. It is a more recommendable way when it comes to populations with a low monetization degree". The Referendum or dichotomous choice is the methodology that questions the following: "Would you be interested in paying (or receiving) US\$ X for (or to give up) the good or service?" Here, the amount is modified at intervals to assess the frequency of responses to the different bids shown. Responses to questionnaires of this type lead to binary results, which can be organized by yes (equals 1) or not (equals 0) (Serôa da Motta, 1998; VIEIRA, 2012). Referendum with follow-up, according to Serôa da Motta (1997), is the most sophisticated form of dichotomous preference, depending on the answer to the initial question; a second interactive question is created. "For example, if the interviewee answers that he/she is inclined to pay US\$ X, he/she will then be asked if they would pay US\$ 2X (or US \$ 0.5X if they answered "no" in the initial question)" (Serôa da Motta, 1998, p 46). Although the dynamics of these methodologies are already widely used, there is still a need for improvement. According to Beluzzo Jr. (1999), the main premise in opposition to CVM refers to the

responses that are obtained by interviews, as they can be skewed tending to be directed to the specific form of each method. This is due to the fact that the method is more abstract, which can inhibit the true DAP and DAA. For authors favorable to the model, the solution would be “the careful structuring of its application”, thus reducing

he uses an international bibliographic survey on the frequent flaws in the use of the contingent valuation study in underdeveloped countries. The author focused on Whittington's studies (2002), whose premises he discusses, “the poor execution and administration of research; poorly designed scenarios; and lack of validity tests” (Vasconcelos,

Chart 1. Elicitation methods and their positive and negative points

| Methods | Positive points | Negative points |
|----------------------------------|--|---|
| Open-ended | Greater capture of information in relation to the others, since the values obtained are direct expressions of the people (MAIA, 2004). | High rate of null responses or protests because there is no reference to assist the interviewee at the moment, when he/she will assign value to the property (MAIA, 2004). |
| Bidding game | Ensures great chances of measuring all consumer surpluses (LEE, 1998, p.41). | The initial value determination may imply the appearance of bias (MAIA, 2004) |
| Payment Card | Enables more simplified statistical analysis of data (FARIA; NOGUEIRA, 1998) | They obtain little information from each respondent, thus losing efficiency (KERR, 2000). |
| Referendum | It allows less occurrence of strategic bids by interviewees who aim to defend their interests or benefit from the free provision of the good (“the hitchhiker problem”) and come close to the true market experience that generally defines their actions of consumption at a previously defined price (SERÔA DA MOTTA, 1998). | High level of “zero” responses, as well as in relation to the requirement for larger samples, compared to other formats for the same level of significance (LEE, 1998, p. 43). |
| Referendum with follow-up | They offer a second value to referendum issues and for this reason the estimates obtain efficiency gains | Tendency to induce responses insofar as the interviewee may feel obliged to accept the subsequent values (obedience bias) or deny them for admitting that the first value is “correct” (bias from the starting point) (SERÔA DA MOTTA, 1998). |

Source: Serôa da Motta, 1998; Lee, 1998; Faria; Nogueira, 1998; Kerr, 2000; Maia, 2004.

biases (BELUZZO JR., 1999, p. 4). Regarding direct and indirect methods, some authors point out their positive and negative points, as described in Chart 1. Several studies used elicitation methods to calculate CVM and there are still several points to be discussed. As noted in Chart 1, positive reports obtaining more information and the acquired values can directly express trends of interviewees, considering the open format for capturing values. This method is more vulnerable to strategic behavior, where it is more common to overestimate or underestimate the assessment technique because the interviewees do not have references to base themselves on choosing a value and, as a consequence, there is a high frequency of invalid answers to the question. Another important point in the ways of capturing CVM values are the initial bids estimated by the researcher and used in the Referendum, which can influence the interviewees' responses, admitting another way of biasing results, in addition to those already mentioned. In general, CVM has been used in different works aiming at valuing social, economic and environmental benefits that may guide policies, plans or projects. Carson (2012) states that until 2011 more than 7,500 works had been published on this topic, in addition to 25 books, mainly in Europe and USA. In Brazil, studies have been published where CVM was used. The work of Serra et al. (2004) was performed with the purpose of applying contingent valuation to verify whether people who travel along the Parque Pantanal Road would be willing to pay tolls touse that road. The result showed that the average individual DAP would be around R\$ 7.07. The author considered the method's limitations, and also concluded that it is possible to establish a value for the use of an environmental asset and for this reason this methodology is very used as an international standard, such as the National Oceanic Atmospheric Administration (NOAA).

Another important work was carried out by Vieira (2009), where the author obtained the Total Economic Value (TEV) of rural backyards in Goiânia, and was able to calculate the direct value of use of backyards by DAP. The result obtained shows that this value of use reached a monthly average of R\$ 420.70. The author emphasized the DAP related to cultural and environmental aspects, and the results showed again the relevance of the role of backyards for farmers in the region. The hypothetical question used in the research was moving from the house, and the producers indicated an average DAP of R\$ 493.75, very close to the city rents and the economic aspects. In conclusion, Vieira (2009) showed the importance of this type of valuation, mainly as a basis for policies to encourage family farming, such as in the research. The research from Vasconcelos (2012) chose the discussion of CVM validity and reliability, focusing on problems found in its application in underdeveloped countries. In the research

2012, p. 23). He also intended to discuss theories related to the causes of the most common biases and the way to alleviate or overcome difficulties of this type of method. On the other hand, Sanguinet (2017) used the logistic regression model in order to assess the consumer profile and the disposition to pay for certified apples. The results indicated that most consumers do not value apples for their quality derived from food safety (certified apple) during purchase. There was also a need to improve DAP assessment, in theoretical and empirical terms, in relation to consumers. The mentioned works show the importance that the contingent valuation method has acquired in the research and that in order to take advantage of this survey, it is necessary to clarify all points that may be obscure and for this, the methodology chapter will be of great importance.

RESULTS AND DISCUSSION

The socio-economic characteristics of the 22 interviewed farmers showed that 36% were from other municipalities in the state of Pará, and the rest was distributed among those born in Marituba (31%) and other states (32%). More than 50% of the respondents (54%) were female, while 45% were male, which indicates that the majority of the sample was composed of women. The interviewees' age ranged between 38 and 74 years, with a mean of 52.64, and the standard deviation of 9.42 years. Regarding education, more than half of the interviewees (54%) did not finish elementary school, whereas 23% completed high school with a record of illiterate producer. Although producers are of advanced age, only 18% are retired, 32% receive the Bolsa Família and 50% of the interviewees do not receive any type of government assistance. That said, the research aimed to simulate the economic valuation of urban backyards in Marituba. The values presented in the results (Table 1) obtained in the previous visit to the farmers were pointed out by them, without interference from the interviewer, and then, these values were presented to the 22 farmers interviewed later. Considering the suggested averages ranging from US\$ 320.76 to US\$ 935.55, an average of US\$ 657.56 was obtained. The standard deviation obtained was US\$ 215.02, indicating that the data were widely dispersed between the values. The average obtained can be understood as the monthly amount that the farmer should receive as a compensation for not producing in his backyard. To certify the results, the hypothetical bias, in a way, was mitigated due to rigorous behavior of the interviewed farmers, including pondering about investment costs and total monthly family income. From the 22 respondents, 12 responded that they did not accept a monthly income to compensate for their disconnection with the backyard, while 10 accepted this compensation. Within the universe that accepted the

DAA, 4 indicated the maximum disposition to accept, while 6 accepted the minimum. Based on the profile and farmers' report, empirically, it was possible to identify that age can have a strong influence on the acceptance of the disposition to accept, since most of the farmers (95%) are over 40 years old and many are in poor health, which prevents them from continuing demanding physical strength activities, such as those practiced in the country, making it impossible for the farmers to continue performing their tasks and to provide income for their families. Although a considerable part of the interviewees agreed to receive the DAA, the choice of the highest values presented by the cards was not predominant. The country data can substantiate this lack of interest in choosing the highest values because most of the farmers maintain feelings of satisfaction in working in their backyard, which can be evidenced by the high number of interviewees with experience in agriculture and who also live in the environment of the productive backyard. Therefore, what can be seen is that farmers did not value their backyards monetarily, as they attribute symbolic value, such as the pleasure of working on the land and also for improving self-esteem, giving importance to the habits of their ancestors. In other words, other reasons make them want to work with agriculture, even though the activity has all its specificities, especially in an urban environment.

CONCLUSION

The study of productive backyards, in the municipality of Marituba, shows a typical urban agriculture context in the Amazon. The valuation simulation of productive backyards verified a DAA of US\$ 657.56, a scenario showing that this value can be justified in terms of obtaining a fixed income, since farmers are aging and there is still a difficulty in receiving the retirement aid, with the backyard often being the main source of household income. There was also a strong bond between farmers and backyards, since most of them did not choose the highest DAA value, indicating a more emotional than properly economic value that these places provide in their lives, such as the feeling of pleasure when working with the land and the memories of their ancestors. The backyards studied by Aguiar and Barros (2012) also show characteristics in addition to the economic benefits, since they conserve the biological and socio-cultural diversity of populations that surround them; where plants or cultures selected by them have high diversity and low species density. In general, urban farmers in Marituba suffer from the same problems as rural farmers, since they face the problem of production runoff, despite the proximity to highways. Most of them do not have their own transport or a cooperative or association that offers this infrastructure. The backyards in Marituba are important for the region and should be valued by public entities and institutions. The farmers expressed their interest in implementing a fixed fair, with products from backyards, organized and managed by farmers in partnership with public entities.

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