Economics Bulletin

Volume 37, Issue 1

Residential Water Demand and Price Perception under Increasing Block Rates

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Abstract

We estimate residential water demand for Mexico´s Northern Border state of Nuevo León using data from the National Household Survey. Employing Shin's (1985) price perception model and instrumental variables (IV) techniques to deal with simultaneity problems, our findings indicate that households in the region respond to a 'perceived' price which is considerably lower than actual water prices. Elasticity estimates for price and income are consistent with theory and previous findings in the literature.

We gratefully acknowledge the comments and suggestions from an anonymous referee, which were helpful to improve this article. Of course, the authors remain solely responsible if there should be any errors. The views expressed in this paper are those of the authors, and not necessarily those of the Banco de México.

Citation: René Cabral and Luciano Ayala and Victor Hugo Delgado, (2017) "Residential Water Demand and Price Perception under Increasing Block Rates", *Economics Bulletin*, Volume 37, Issue 1, pages 508-519

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Submitted: September 09, 2016. **Published:** March 20, 2017.

1. Introduction

Sustainable use of our natural resources has become a major concern over the past few decades. Population growth, coupled with the reduction of available freshwater supplies and increasing infrastructure costs are jeopardizing future generations' access to clean potable water. At the same time, the impact of climate change creates higher peak demands and lower supplies which exacerbate scarcity, especially among the most vulnerable sectors of society. All these problems have prompted authorities around the globe to place a new emphasis on water demand management, using pricing schemes and other demand control strategies.

Nuevo León is an arid state with a growing urban population. Its capital, Monterrey, has a population of approximately 4 million (80% of Nuevo León's residents). Abrupt changes in temperature and droughts in the region are exacerbating water scarcity and setting important challenges to water administrators. Local and national authorities have plans for a massive infrastructure project called Monterrey VI, which contemplates the construction of a 372 km water pipeline to transport water from the Pánuco River to the Cerro Prieto dam.[1]

However, this project focuses on the supply of water and does not address water demand issues that might well, if unattended, re-establish the water shortage problem in the region. Public policies addressing demand and the proper use of water in Nuevo León are limited to water saving campaigns and school programs. Even if one is inclined to think they have a positive effect on water savings - although difficult to measure empirically (Syme et al. 2000; Renwick and Archibald 1998) - there is a wide range of other possible actions to encourage water saving; subsidization of water-saving appliances, discretional rationalization of water flows in periods of scarcity and, of course, setting prices that ensure proper water use and long-term availability are among them.

The present study represents an effort to understand in more detail the way in which consumers' perception of water prices affects their decisions regarding water usage in the state of Nuevo León. As far as we know, this is the first empirical study of residential water demand that has been conducted for Nuevo León and the results herein could be used as a benchmark for future research and public policy in other entities with similar price schemes.

One of the main issues to be solved when analyzing water demand is the non-linearity of its prices. The rate schedule in Nuevo León, as in many others entities, consists of a set of increasing marginal prices for several consumption blocks. This multi-part structure in tariffs creates an endogeneity problem because prices and quantities are chosen simultaneously. In this paper, a Two-Stage Least Squares (2SLS) approach is employed to solve this issue. We test Shin's (1985) price perception model across households in the state of Nuevo León and find evidence that the price perceived by consumers is lower than the real price they pay. Based on this evidence, we conclude that if tariffs were easier to understand, consumers will use less water because they will be responding to a more realistic price. Additionally, our price and income elasticity estimates are consistent with theory and previous literature; marginal prices have a negative impact on the quantity of water demanded, and increases in household income result in higher water

[1] Due to its cost and polemic environmental impact, ever since its conception, this controversial project has been under public scrutiny and its startup has been delayed now for more than 18 months.

consumption (see, for instance, Espey and Shaw (1997), Hoglund (1999), Gaudin et al. (2001), Wichman (2014) and Yoo et al. 2014, among others).

The rest of this paper is organized as follows. Section 2 presents a brief literature review. Section 3 describes the data employed and presents some descriptive statistics. Section 4 presents the modelling framework and empirical specification. Section 5 shows the empirical results under alternative specifications. Finally, section 6 concludes with some remarks on our findings.

2. Literature on residential water demand and price perception

A number of studies have examined the demand for water in different cities. For instance, Arbues et al. (2004) use a dynamic panel approach to estimate the impact of price, income and household composition on water use employing household data from the city of Zaragoza, Spain. Their price elasticity estimates imply that an increase in prices should reduce usage, though the impact is small because elasticity is close to zero. Hoglund (1999) estimates short-run and long-run price elasticities to assess the impact of a new tax on residential water consumption. Using a database of Swedish communities, she finds that a 5% increase in price would result in a 1% decrease in water consumption. Nieswiedomy and Molina (1989; 1991) test Shin's (1985) price perception model using monthly individual consumption for households in Denton Texas; they analyze the same set of households for a period with increasing marginal prices (1976-1980) and for a period with decreasing marginal prices (1981-1985). Their results show that consumers under decreasing tariff schemes tend to respond to average prices, while increasing block rates tend to make consumers react to marginal prices. Binet et al. (2014) also use Shin's model to estimate price perception under an increasing, multi-step pricing scheme in France. Their findings indicate that consumers underestimate the price of water and thus consume more than what is economically rational.

As far as we know, there are at least three studies on residential water demand for Mexico. Avilez-Polanco et al. (2015) estimate the optimal price for water under a context of natural monopolies. Using official data from the local water authorities and a survey in the city of La Paz, Baja California, they estimate a price elasticity of -0.56. Jaramillo-Mosqueira (2005) estimated price elasticities for a central region of Mexico using instrumental variables (IV) and a discrete continuous choice (DCC) approach. His elasticity estimates under IV indicate a similar size as that found in Avilez-Polanco (2011); however the DCC approach conveys an elasticity of -0.22, almost half of the IV method. Using a dynamic function of Shin's model, Hernandez et al. (2015) find that consumers respond to average perceived prices and not marginal prices in the Biosphere Reserve El Vizcaino, in Mexico.

3. Data

We obtained water expenditure data from Mexico's Income Expenditure Household Survey (ENIGH, as per the Spanish acronym) for the years 2004 and 2012 in the state of Nuevo León. For 2004, our sample consists of 2,407 households and contains information regarding water consumption, prices, income and other socio-demographic features (around 24% of the sample is from rural areas). The sample was originally for over 3,000 households, but due to lack of information on water expenditure or no water connection, some observations were dropped. Part of the analysis was also performed on the same survey for the year 2012, although the size of the sample is considerably smaller for that year (only 191 households) and could be deemed as small to analyze demand adequately. Because of this, we ended up discarding this year from this paper and focus on the information for 2004.[2]

Based on the household's reported expenditure on water, the amount of water consumption (in cubic meters: m^3) is established as well as its matching marginal price. The water rate schedule was obtained from the National Tariff System, which is compiled by Mexico's National Water Commission. The rate schedule for Nuevo León consists of several marginal prices for different consumption blocks and is different for urban and rural areas. Table 1 shows the rate schedule in Nuevo León for urban and rural areas in 2004. It shows three different categories, two for the rural areas (B and C) and one for the urban area (Monterrey).

Table 1: Rate schedule in Nuevo León

Consumption Rank (m^3)	Rural (Non-Metropolitan)				Urban (Metropolitan)	
	C	B	Expenditure B	Expenditure C	Marginal Price	Expenditure
1 to 6	0.5	0.79	23.85	24.00	0.79	27.24
7 to 15		1.72	47.86		5.20	74.06
16 to 20					4.19	95.00
21 to 25	5.64	5.75	105.32	80.40	8.75	138.75
26 to 30					9.38	185.63
31 to 35	6.4	6.52	170.44	144.40	9.58	233.51
36 to 40					10.46	285.80
41 to 45	7.35	7.48	245.30	217.84	11.35	342.56
46 to 50					12.33	404.19
51 to 55	8.53	8.96	354.91	303.14	11.74	468.62
56 to 60					12.89	535.95
61 to 70			424.51	388.44	13.47	676.30
71 to 80			514.11	473.74	14.04	822.60
81 to 90			623.71	559.04	14.63	975.38
91 to 100			693.32	644.34	15.28	1134.75
101 to 110			782.93	729.64	16.62	1300.98
over 111			-	-	32.40	-

Notes: For the rural areas there are three different types of categories, determined by socioeconomic factors established by the government of Nuevo Leon (A, B, C), and one for the metropolitan area. In this paper we only consider three categories: C, B and Monterrey. The expenditure columns show the maximum amount that the household has to pay within a certain rank (water and fixed cost). This table is a simplified form; in the actual rate schedule we have a specific amount of expenditure for each m^3.

The tariff that the household faces depends on their location. Category C is assigned to households in localities with high marginality and B with medium marginality; this is determined

[2] The results for 2012 were consistent with those of 2004 and are available from the authors upon request.

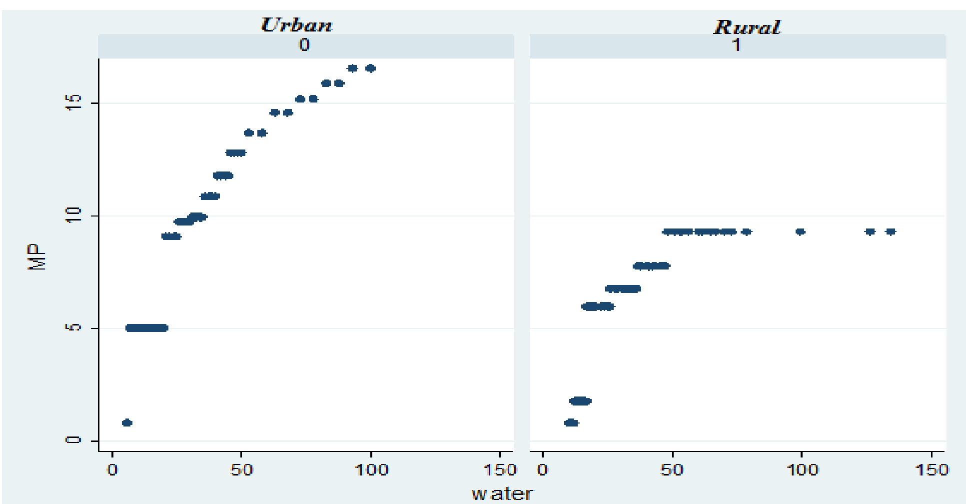
by the Nuevo León state government. Although there is no information available about which category the municipality belongs to, as well as the locality of the household, we used the population as a reference to assign categories; this data is also given in the ENIGH 2004. For example, if the household is in a locality with a population lower than 2,500, the household is in category C, but if it is outside the metropolitan area with a population higher than 2,500 then the household is in category B. In the urban area there is just one category for all the municipalities in the Metropolitan area of Monterrey.

Table 1 also reports the maximum water expenditure for different consumption blocks. This variable is helpful to relate the water consumed, the marginal price and the average price. For example, if the reported expenditure on water was $200 pesos, and if the household is in the metropolitan area, then we know that the water volume used by the household was between 31 m^3 and 35 m^3, its marginal price is $9.58 and the average price is given by the expenditure divided by the quantity consumed. Therefore, the table is helpful to relate expenditure with the marginal price.

In order to assign the precise quantity, water expenditure is related with the tariff for each cubic meter. For the last example, with an expenditure of $200 pesos, there might be two possibilities according to the tariff schedule: a) The bill for 31 m^3 is $195.21 ($185.63 plus the marginal price of $9.58), and b) the bill for 32 m^3 is $204.78. Since we do not have data for liters, then we conclude that the consumption is 31 m^3; this means that the household will only consume 32 m^3 when the expenditure is at least $204.78.

Although the tariff structure in Nuevo León considers water expenditure for up to 200 m^3, the vast majority of the population uses no more than 50 m^3. In our sample, the average consumption was about 24 m^3 including both rural and urban areas. Figure 1 shows a histogram of water usage, and it is noticeable that most of the observations in this survey do not report a water consumption over 50 m^3.

Figure 1. Water Usage Histogram



Source: ENIGH 2004

In our analysis, the average price was calculated by simply dividing the total water bill by the amount of water used. The education of the head of household and family income is included in the analysis as a proxy for socioeconomic status, and to capture the effect of household composition we include the number of residents and the proportion of household members over the age of 18. Some of the housing characteristics relevant for water usage were the number of bathrooms, age of the house, sewerage connection and whether or not water flow is continuous. The selection of these variables as determinants of water demand is based on the literature and their availability in the ENIGH.[3]

Table 2. Descriptive statistics

Variable	Description	Units	MEAN	SD	N
Q	Quantity of water used	m^3	24.08	18.362	2407
MP	Marginal price	$000/month	6.479	3.371	2407
AP	Average price	$000/month	5.16	1.706	2407
Y	Monthly income	$000/month	14,277	16,126	2407
Edu_head	Level of education	Category	5.86	2.565	2407
Residents	Number of residents	Whole	3.947	1.768	2407
Proportion_18	Proportion of household members over 18 years old	Whole	0.176	0.202	2407
Continuous_water	1 if water has a continuous flow (24/7); 0 otherwise	Dummy	0.957	0.202	2407
Bathrooms	Number of bathrooms	Whole	1.444	0.813	2407
House_age	Age of house	Category	4.288	1.327	2407
Rural	1 if it is a rural area; 0 otherwise	Dummy	0.221	0.415	2407
Sewer	1 if is connected to public sewerage; 0 otherwise	Dummy	0.915	0.277	2407

Notes: This table shows the descriptive statistics of the sample used in the regression. Since we do not consider the missing values, we lose 107 observations, dropping out when there is no value for continuous water and number of bathrooms. The variable Rural stands for whether or not the household is located in the metropolitan area.

Table 2 presents some descriptive statistics of the main variables employed in the empirical analysis. The average water consumption per month in m^3 is 24.08, the marginal average price is

[3] Please refer to Arbués et al. (2003) and Worthington and Hoffman (2008) for a review of the literature on residential water demand.

6.48 and the mean for average price in the sample is 5.16. The monthly income reported across the sample is 14,277 pesos. Schooling for the head of the household[4] is 5.86, the average number of residents is nearly 4, while the proportion of people over 18 is 0.176. More than 90% of the households in the sample have a continuous water supply (24/7) and an average of 1.44 bathrooms, while the average house age is between 11 and 20 years. Finally, nearly one quarter of the households in the sample are located in rural areas and 91.5% are connected to public sewerage.

4. The model

The model we estimate is based on Shin's (1985) price perception model. In this framework, the price perception (P*) is a function of marginal price (MP), average price (AP) and a price perception parameter (k):

$$P^{*} = MP(AP/MP)^{k} \tag{1}$$

where the ratio of AP/MP is expected to capture the income effect from the rate structure premium (RSP) and the price perception parameter is expected to be nonnegative.[5] In the case of $k=0$, consumers respond only to marginal price; if $k=1$, then consumers respond only to average price; when $0<k<1$ the consumer's perceived price lies between marginal and average price. Under an increasing block pricing structure with a small fixed charge, a value of k larger than one means that the perceived price is less than average price and marginal price (P*<AP<MP).[6]

The empirical model estimated is of the log-linear form, and is specified as follows:

$$\ln W_i = \alpha + \beta \ln MP_i + \gamma * k * \ln\left(\frac{AP_i}{MP_i}\right) + X_i\Phi + \varepsilon_i \tag{2}$$

where W_i represents the amount of water consumed by household i, MP_i and AP_i are the marginal and average prices paid by the household, and X_i is a vector with the households' socio-demographic characteristics: monthly income, education of the head of household, number of residents, proportion of household members over 18 years old, continuous water supply, number of bathrooms, house age, whether it is in a rural or urban area and whether or not it has sewerage services.

Following the results in recent theoretical and empirical literature, we expect income to have a positive effect on water demand. Education of the household head is expected to have a negative impact on demand given that, as education increases, it is more likely that water conservation practices are fostered in the household. The number of residents is expected to be increasing on water demand but the proportion of adults (residents above 18) is expected to have

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[4] The ENIGH survey asks the respondent to express who the household head is. According to this, the household head could be male or female, not necessarily the father of the household.

[5] Under multipart tariff systems, it is hard to determine the effect of the intra-marginal rates (i.e. the rates that do not correspond to the current level of consumption). Hence, Taylor (1975) and Nordin (1976) suggested that the intra-marginal rates will affect consumer behavior through an income effect, such effect will be captured by introducing a *difference* variable –the RSP– which is the difference between the bill paid and what consumers would have paid if they had been charged the marginal price on all their units of consumption.

[6] A fixed charge is considered as "small" when it does not make the RSP positive under increasing block pricing systems. In our sample the fixed charge accounted, on average, for 14% of the total bill, creating a negative value for the RSP. Please see Nieswiadomy and Molina (1991) for more details.

a diminishing effect provided they spend less time in the household than those under 18.[7] Continues water and number of bathrooms is expected to have a positive effect on water demand along with the house age. The latter factor gives rise to water leaks and other problems that augment the household demand of water (for additional details on the intuition behind the use of these control variable see, for instance, Worthington and Hoffman(2008), Russell and Fielding (2009) and House-Peters and Chang (2011), among others).

In some studies, the RSP is included as a separate variable (Barkatullah 1996), while others have used "virtual" income (monthly income minus RSP) to allow for the income effect caused by the RSP (Jaramillo-Mosqueira 2005). In the present data, the RSP accounts on average for 0.4% of total income, so this effect is probably too small to be measured. Instead, since we decided to include unadjusted monthly income, the effect of the RSP should be reflected through price perception.[8]

The simultaneous determination of quantities and prices in water demand makes instrumental variables (IV) models preferable to ordinary least squares (OLS). IV estimations produce consistent and unbiased estimators when suitable instruments are used in the estimation of water demand. Good instruments for the endogenous variables (MP and AP/MP in this case) will have to be correlated with prices, but uncorrelated with the error term ε_i. In other words, instruments ought to be correlated with marginal and average prices, but they are not supposed to affect the quantity of water used.

In the state of Nuevo Leon water prices for rural areas are significantly lower than in urban areas. Also, tariffs for houses connected to public sewerage are different from those which are not connected. Hence, it can be inferred that there is a clear correlation between marginal prices and the variables *rural* and *sewer*. Provided that factors such as the connection of a house to public sewer or if the house is located in a rural area do not affect water usage, these two variables were employed as instruments for prices along with population density in the municipality in which the household is located. Presumably, less populated communities have a higher degree of marginality so authorities tend to charge lower prices for utilities in such areas.

Our two stage IV estimations proceed as follows. In the first stage, natural logs of MP and AP/MP were regressed on the instruments and the rest of the explanatory variables. In the second stage these estimates, along with their respective error terms, were used in equation (2) to obtain the final results. For the empirical analysis we used the ivreg2 command in STATA. Such command provides a set of tests to ensure the validity of the instruments. Among these we have endogeneity tests, over-identification tests and weak identification tests. We report the results of these tests in order to validate that those instruments fit properly in our estimations.[9]

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[7] The literature has used alternative approaches to capture differences in consumption across age groups. For instance, studying water demand in Spain, Martínez-Espiñeira (2002, 2003) use as regressor the proportion of the population under the age of 19 and over 65 years, while Hadjispirou et al. (2002) analyzing water demand in Cyprus control for both number of adults and number of children.

[8] Regressions were also run using virtual income and the results were practically the same, this could be regarded as evidence for the insignificance of the income effect caused by the RSP.

[9] Terza (1986) has criticized IV techniques when used for analyzing multi-part tariff structures because they supposed a linearization of the rate schedule. However, in the case of Nuevo León we have a great number of marginal prices (more than 13) for blocks that increase very rapidly (price increases every 5 m^3), thus the linearization of marginal prices in this case does approach the actual rate schedule, as can be appreciated in Figure 1.

Table 3. Water demand estimations

	Panel A: Estimates				
	OLS	IV			
	(1)	(2)	(3)	(4)	(5)
Log of (AP/MP)	0.700***	-0.878***	-0.710***	-1.394***	-0.937***
	(0.089)	(0.157)	(0.207)	(0.287)	(0.148)
Log of MP	1.070***	-0.472***	-0.396***	-0.597***	-0.485***
	(0.071)	(0.058)	(0.079)	(0.083)	(0.057)
Log of income	0.088***	0.159***	0.164***	0.117***	0.153***
	(0.015)	(0.022)	(0.023)	(0.029)	(0.021)
Education of household head	-0.009***	-0.009*	-0.010**	-0.011**	-0.010**
	(0.003)	(0.005)	(0.005)	(0.005)	(0.005)
Residents	0.035***	0.077***	0.079***	0.061***	0.075***
	(0.005)	(0.008)	(0.009)	(0.011)	(0.008)
Proportion of residents over 18	-0.163***	-0.329***	-0.333***	-0.284***	-0.323***
	(0.044)	(0.059)	(0.060)	(0.064)	(0.059)
Continuous water	0.004	0.117**	0.114**	0.087*	0.113**
	(0.043)	(0.047)	(0.048)	(0.050)	(0.047)
Bathrooms	0.054***	0.130***	0.127***	0.132***	0.130***
	(0.010)	(0.019)	(0.019)	(0.021)	(0.020)
House age	0.018***	0.034***	0.035***	0.029***	0.034***
	(0.007)	(0.008)	(0.009)	(0.009)	(0.008)
Sewage	-0.304***				
	(0.051)				
Rural	0.858***				
	(0.046)				
Constant	0.349**	1.630***	1.467***	2.295***	1.709***
	(0.153)	(0.249)	(0.290)	(0.392)	(0.237)
No. Observations	2407	2407	2407	2407	2407
Adjusted R^2	0.581	0.273	0.265	0.264	0.283
k		1.86	1.79	2.34	1.93
		Panel B: Specification tests			
Durbin-Wu-Hausman test		724.44	481.72	673.51	720.91
p-value		[0.000]	[0.000]	[0.000]	[0.000]
Kleibergen-Paap LM test		36.578	28.271	14.178	39.533
p-value		[0.000]	[0.000]	[0.000]	[0.000]
Kleibergen-Paap F test		18.884	14.018	7.194	14.049
Stock-Yogo (10% critical values)		7.03	7.03	7.03	13.43
Hansen J test					3.515
p-value					[0.061]

Notes: The variable for density is generated by the population for each municipality in 2005, divided by the area of the municipality; information provided by the National Institute for Federalism and Municipal Development (INAFED).

5. Empirical results

Table 3, Panel A, describes the estimations of equation (2) under different panel data methods. Heteroscedasticity robust standard errors are reported across all the estimations. In order to illustrate the problems that arise due to endogeneity, column (1) presents the estimations of our model under OLS. As expected, the average to marginal price ratio and the marginal price itself present in this case a positive and significant coefficient. As mentioned earlier, this is due to the endogeneity and simultaneous definition of quantity demanded and tariff paid for water demand. As for the IV estimations in columns (2) to (5)[10], the average to marginal price ratio and the marginal price show the negative expected signs and are statistically significant at the 1% level. In addition every one of the explanatory variables present the expected sign and are also statistically significant (income, education of the household head, number of residents in the household, proportion of residents over 18, number of bathrooms, house age, and continuous water).

In Panel B of Table 3, we report a battery of specification tests for our IV estimations. The Durbin-Wu-Hausman is a regressor endogeneity test. The null hypothesis of this test is that OLS estimates do not deviate significantly from IV estimates; its rejection indicates that IV techniques are required. As expected, in all our estimations in columns (2) to (5) the tests suggest that the use of IV is necessary. The Kleibergen-Paap LM test null hypothesis implies that the model specified is under identified, while the Kleibergen-Paap F test null hypothesis indicates that the model is weakly specified. For columns (2) to (5) both tests suggest that the models estimated are correctly specified. In addition, for column (5), the only model in which the number of instruments exceeds the number of endogenous regressors, Panel B reports the Hansen J test of over-identified restrictions. According to the test results, we are unable to reject the null that the over-identification restrictions are valid at the standard 5% level. In summary, all the tests reported suggest that our alternative specifications are well defined.

Table 4. Wald test for k=0 and k=1

Test		(2)	(3)	(4)	(5)
k=1	Chi^2 statistic	26.36	37.44	123.53	114.68
	p-values	(0.000)	(0.000)	(0.000)	(0.000)
k=0	Chi^2 statistic	12.34	38.71	63.23	166.35
	p-values	(0.004)	(0.000)	(0.000)	(0.000)

The price perception parameter *k* provides important information about the way in which consumers respond to prices. In Table 3, at the bottom of Panel A, we report the value of *k*, noting that under any of our four IV specifications *k* is larger than unity, ranging from 1.79 to 2.34.[11] In

[10] Across columns (2) to (5) we combine our three instrumental variables in different ways. Column (2) uses as instruments two dichotomous variables, a dummy variable that registers whether a household is located in a rural area and another dummy that is equal to one when the household has sewage service. In columns (3) the instruments are population density and a dummy for sewage services availability, while in (4) the instruments are population density and the dummy for rural area. Finally, column (5) uses as instrument all three variables, sewage, rural and density, as instruments.

[11] Following an anonymous referee's suggestion, we tried introducing average temperature as another control variable in our model. Unfortunately, since there were no weather stations at every single state's municipality by the time our data was collected, we loss

Table 4 we report Wald tests for the null hypotheses that k=0 and k=1.[12] For every model under columns (2) to (4), we find evidence against the null hypothesis which suggests that k is effectively larger than unity. Ultimately, this implies that the price perceived by the consumer is lower than the average price and marginal price (P*<AP<MP). This result is relevant because price misperception might lead to suboptimal decisions about water consumption. The results here suggest that the consumer might be underestimating the true price of water, which ultimately leads to a higher water demand. This finding opens the possibility for authorities to consider alternative policy measures, which focus on the demand side, to generate appropriate incentives to promote a more efficient use of water by the state population.

6. Conclusions

The efficient and sustainable use of water is of paramount importance for the future of cities in Northern Mexico and in many other latitudes around the world where water is scarce. Understanding better how residential water demand behaves can be useful to define the best way in which policymakers can effectively address this problem. In this paper we employ Shin's (1985) price perception model to estimate residential water demand in the state of Nuevo León. By employing alternative estimation techniques and dealing properly with endogeneity, the results show that there are misperception problems for the consumer of residential water. The results presented consistently suggest that the consumer might be underestimating the true price of water, which ultimately leads to a higher demand. To deal with price misperception problems, authorities could focus on demand rather than on supply-oriented policies, for instance, providing better information about the price individuals pay for the water they consume in their monthly bills, and perhaps developing campaigns that explore non-pecuniary normative messages, appeal to prosocial behavior and social comparison to influence consumers' demand for water.[13]

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a significant number of observations. Despite this, we estimated the model and observed that the results remain pretty much the same with price perception coefficient slightly falling to 1.5. Those estimations results are available from the authors upon request.

[12] The parameter k is obtained as the ratio of the log of (AP/MP) over the log of MP (see equation (1)).

[13] For instance, field experiments recently carried out by Ferraro and Price (2013) suggest that social comparison messages produce better results in water saving than technical information and could be as effective as increasing tariffs.

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