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International Water Contracts and Household Outcomes: Evidence from Albania

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Abstract

In mid-2003, four of 36 Albanian political districts entered into management contracts with Berlinwasser International AG for the provision of water supply. Using 2002 and 2005 data from the World Bank's Living Standards Measurement Study for Albania, we assess the results of this contracting out of supply on various household outcomes including continuity of water supply, hours per day of water availability, water price, water source, water quality, and incidence of diarrhea. Using a difference-in-difference approach and controlling for a variety of household characteristics, our results suggest that consumers in contracted districts experience no significant change in hours per day of service though privatization comes with average price increases of 13-17 percent. In a multinomial logit framework, we find that consumers in contracted districts are significantly less likely to use water from an outdoor tap, a public tap, or a spring/well but far more likely to report obtaining water by truck. Households receiving piped water in contracted districts are 29 percentage points more likely to report their subjective water quality as “unsuitable for drinking", though estimates suggest no significant change in the incidence of diarrhea in contracted districts.

JEL Codes: H51, L33, O12, O13

Keywords: Albania, household, management contract, privatization, water supply

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1. INTRODUCTION

Privatization of public infrastructure has been embraced as a central goal by international financial institutions, bilateral donors, and development agencies since the late 1980s. While a general consensus has emerged arguing that sectors such as telecommunications and electricity should be privately-operated, the water sector is more controversial. Anecdotal and often polemic reports of the costs and benefits of water privatization are considerable, but there have been relatively few empirical studies on the household impact of privatization. We hope to bring some clarity to this matter by examining the Albanian move to privatize some districts in 2003.

Proponents of privatization and its variations, such as private sector partnerships (PSPs), emphasize the importance of the market, fiscal discipline, and increased investment as benefits of privatization. Through efficiency gains, improved management, and better access to capital, the private sector has been reported to improve performance, increase investment, and extend access to water by providing new connections and infrastructure. Moreover, the transition to private management can relieve the state of fiscal burdens in troubled sectors. As such, both developed and developing nations have looked to the private sector when the government has failed to provide adequate supplies of water. In the past two decades, dozens of municipalities have moved from public to private water provision either through full privatization or management contracts.

On the other hand, opponents often criticize privatization as a matter of principle: they hold that water is a common good that should not be in the hands of the private sector, and since it is essential to survival, it should be treated as a human right rather than as a commodity. Therefore, opponents of privatization argue that it is the government's obligation to provide universal low cost access to this vital resource. Moreover, critics point to the withdrawal of the private sector in cases where the risk-return ratio is prohibitively high, arguing that private companies have little incentive to supply water to poor regions, which, due to illegal connections and poor collection rates, remain unprofitable for suppliers (World Bank 2004).

While member countries of the United Nations are unanimously committed to increasing access

to safe drinking water in developing countries, there is little consensus on exactly how to achieve this goal. An increasingly popular choice for developing countries is to create a private-sector partnership (PSP) in their failing water sectors, as was the case in Albania in 2003. As part of its economic transition, Albania committed to a massive effort to decentralize public works, and in June 2003, under the guidance of the World Bank, four of Albania's 36 political districts entered into management contracts with the German water supply corporation, Berlinwasser International AG, to oversee water provision.

This paper examines the impact of privatization of water supply in these four districts. We evaluate the impact in terms of a variety of household outcomes including continuity of water supply, hours per day of water availability, water price, water source, water quality, and incidence of waterborne illness.

2. LITERATURE REVIEW

2.1. Multi-Industry Studies

While privatization of public energy utilities has occurred on a large scale, the developing world has experienced relatively few cases of water supply privatization. Instead, most of the privatization literature focuses on firm-level studies across a range of industries. Megginson et al. (1994) examine firm performance for 61 companies in 18 countries during the period from 1961 to 1989. D'Souza and Megginson (1999) compare operating performance of 85 companies in 28 countries between 1990 and 1996. Both studies document increases in output (real sales), profitability, operating efficiency, capital investment, and dividend payments. Both studies show a decrease in leverage, and Megginson et al. (1994) report an increase in the median level of employment. However, both studies fail to differentiate the results between developing and developed countries, leaving the potential for unexplained heterogeneity in the data. Moreover, they are studies of firms in a variety of sectors and therefore provide little explanation for specific industries, such as water supply.

In contrast, Boubakri and Cosset (1998) examine only developing countries. Between 1980

and 1992, they review 79 companies in 21 developing countries and find significant increases in post-privatization output (real sales), operating efficiency, profitability, and capital investment. They, too, describe a decrease in leverage and an increase in employment, although below the level of statistical significance. In a later study, Boubakri and Cosset (2002) examine 16 African companies between 1989 and 1996. As before, they find increased capital investment, but document statistically insignificant increases in profitability and insignificant decreases in operating efficiency, and output and leverage.

Other studies argue that the impact of privatization is more nuanced and can potentially hurt the poor due to job losses, increased prices and reduced access to services. LaPorta and Lopez-de-Silanes (1999) examine privatization of nonfinancial Mexican firms over the period 1983-1991 and note that privatized firms have operating profit to sales ratios 24 percent higher than before privatization. They find that this increased profitability in part from higher prices and laid-off workers (often-identified channels for potential social losses), but the majority of the increase in post-privatization profitability comes from increased productivity. Bayliss (2002) argues that the impact of privatization is, indeed, complex and that while a private firm may increase efficiency and capital investment, there will be losers if prices increase and non-payers are disconnected. Instead of blanket privatization studies, she argues in favor of a case-by-case approach.

Although multi-national, multi-industry studies have proven to be most influential, single industry studies employing similar methodology can highlight differences that are often hidden in aggregate data. Even firm-level studies limited to developing countries may hide differences across sectors and across different countries or regions. The next section examines only the literature pertaining to water sector privatization.

2.2. Sectoral Studies

Few sectoral studies for developing countries have focused on the water industry; telecommunications and other industries that have been especially affected by privatization have garnered more

attention. Studies focusing on the water sector are divided among descriptive case studies and empirical work. Empirical work generally suggests that privatization improves economic performance, while the case studies report less universal benefits.

In a review of privatization in developing countries, Gray (2001) finds that water privatization improved coverage and increased connections by 66 percent in Bolivia. In Buenos Aries, Argentina, Cartagena, Colombia, and Gdansk, Poland, Gray (2001) highlights significant improvements in labor productivity. Alcazar, et al. (2000) similarly find that following concession contracts in Buenos Aires, investment increased almost 2.5 times, operating efficiency improved, and product and service quality were markedly higher. Moreover, they conclude that there were social and external benefits as a result of increased coverage; nearly 1.5 million additional people have access to clean piped water and will no longer be forced to consume polluted well or ground water.

Galiani, et al. (2005) examine the impact of water privatization in Argentina on infant mortality between 1991 and 2000, a period during which Argentina privatized 30 percent of the country's water companies. Using three different measures, they estimate that the infant mortality rate dropped by 5-7 percent in privatized regions, and up to 24 percent in the poorest of those regions, resulting in an aggregate decrease in childhood mortality of 375 deaths per year. Moreover, they find that operating efficiency, capital investment and access all increased, while prices did not.

Other studies argue that efficiency gains or new connections may not translate into widespread quality of life improvements. Unregulated private companies with market power, many have argued, would pursue profit-maximization strategies that may cause quality of life reductions among some subsets of consumers. Estache, et al. (2001) argue that privatization may hurt the poor if prices rise (even to market-price) or investment is focused only on high-income areas; in other words, private providers may neglect to take into account the marginal social effects of their decisions. In these cases, efficiency increases come at the cost of quality of life, often for the poorest segments of society. Carillo et al. (2007) compare outcomes in two Ecuadorian cities—Guayaquil (privatized) and Quito (public). They find that several measures of quality of service decreased in Guayaquil, particularly among the lowest income quintile of households, but they note that several trends, including rural-

to-urban migration, make Quito's households an unsuitable control group for Guayaquil's.

A 2004 Poverty and Social Impact Analysis (PSIA) of Albania produced by the United Nations Development Programme (UNDP) finds that service quality is better in privatized cities while access to water and sanitation is better in cities without private supply. Although there have been various similar case studies of the Albanian water reform, there have yet to be any household level empirical studies of the impact of water privatization in this region. We seek to fill that gap.

In the analysis that follows, we find little evidence that Albania's management contracts had a significant impact on the probability of continuous service or the number of hours per day of service for those households served by water pipes. We find strong evidence that households in management contracts experience higher prices and that they often switch away from piped water service toward service by water truck. Household respondents in areas covered by management contracts are statistically more likely to report that their water quality is "not good for drinking, but good for everything else" but seem to experience no significant change in rates of diarrhea.

3. THE ALBANIAN CASE FOR PRIVATIZATION

From the late 1970s until just a few years ago, waning domestic funding for Albania's water supply infrastructure left the antiquated system unable to meet the country's growing demand. From the end of World War II until reform in 1991, the water sector operated under the central government, and the Ministry of Construction was responsible for the water supply sector, including the regulation of all key powers such as tariff rates, investment, billing, and collection. Local utilities were responsible for very little, and were forced to accept controls and counterproductive incentives mandated by the capital. Within this state-run economy, the water sector's cost effectiveness was low: politically-motivated, artificially low water tariffs did not generate enough revenue for the water utilities to cover the operating and maintenance costs; few incentives were offered to improve performance; and the low tariffs led consumers to waste water (World Bank 2003).

Despite being blessed with abundant natural water resources, without effective management

or proper maintenance, eventually much of Albania's water supply infrastructure reached the end of its useful life, and in most regions it had deteriorated beyond the point of cost-effective repairs. By 1991, huge leakages and an increasing number of illegal taps accounted for water losses between 50 and 70 percent in most regions. This dilapidated supply network was ill-equipped to deal with the urbanization of the late 20th century, and in 1991 water was provided only two to four hours per day on average.

3.1. Background

The development and subsequent decline of the Albanian water supply sector can be divided into four stages. The first stage began in the 1930s when the first aqueducts were constructed by Italian companies, creating a network of limited extensions in some of the central Albanian cities. Despite its age and deterioration, some of the 1930s infrastructure is still used to provide water.

The second stage (1950-1978) involved a rapid expansion of water supply and services in urban areas. Aid by socialist Eastern European countries, and later by China, helped fund Albania's rapid development during this era. Along with international aid, the central government funded public infrastructure, and the quality of services improved dramatically in urban areas during this phase.

The third phase (1978-1991) was characterized by the Chinese withdrawal of aid as a result of the political freeze between China and Albania, marking the beginning of Albania's decade-long period of isolation from foreign aid and investments. Lack of funding and equipment led to the progressive and massive deterioration of water supply facilities and infrastructure across the country. As the water sector deteriorated, leakages increased. Without proper maintenance, meters stopped functioning and revenue collection became impossible. During this phase, piped water supply to households declined from continuous to intermittent and the few new facilities and systems that were built were poorly designed, increasing the chance for contamination and waterborne disease. Moreover, low water tariffs, insufficient allowances for operators, and deteriorating equipment led to widespread consumer and commercial waste.

The fourth phase (1992-2003) marked the end of the usable life for most of the water supply infrastructure, which had deteriorated beyond the point of cost-effective repairs in most regions. However, this period also marked the beginning of water reform in Albania. Following the collapse of the communist leadership in 1991, support from the Albanian government increased along with foreign aid (World Bank 2003).

3.2. World Bank Involvement and Management Contracts

In 1994, the World Bank initiated long-term support for Albania's water sector in an attempt to reform, repair, and rebuild the water supply sector; extend access to clean water to the poor in both urban and rural areas; and to begin wastewater and sewage treatment. Along with this support came the World Bank's endorsement of private-sector partnerships (PSPs) for the water sector.

The first World Bank project in Albania was the Durres Water Supply Rehabilitation Project, which was approved in 1994 and closed in 2000. It was designed to provide crucial investment needed to rehabilitate existing facilities in Durres, a region of approximately 220,000 people. The primary goal of the Durres project was to fund local water institutions and ensure sustainability at the local level. The next project, the Water Supply Urgent Rehabilitation Project, followed in 2000 and funded similar rehabilitation endeavors in the regions of Fier, Lezhe, and Sarande, with the estimated benefits of the project to reach another 140,000 people. These first two projects focused on the most vulnerable parts of the water supply.

Following these two projects, the Municipal Water and Wastewater Project in 2003, was also designed to assist the same four regions, but also had a central goal of introducing private-sector participation to Albania. The World Bank facilitated pilot projects and studies to evaluate the prospect of transition to private sector participation, and a condition to receive aid from the Municipal Water and Wastewater Project was that a private operator had to be appointed in each of the four districts (World Bank 2005).

Under further guidance from the World Bank, the Government of Albania began to decentralize public works, including the country's water utilities. Effective January 1, 2002, the law on "Organization and Functioning of Local Governments" (OFLG) stipulated that the authority of and responsibility for the water sector would be transferred to the local governments. Despite frequent setbacks, the Government of Albania continued this decentralization process among public works with complete functional and fiscal autonomy as the end goal, and in June 2003, the Government of Albania entered into 5-year management contracts with Berlinwasser International AG in the regions of Durres, Fier, Lezhe, and Saranda. These management contracts provide a fixed fee and a performance incentive fee, which are co-financed by the Government of Albania and the World Bank. Berlinwasser was given the responsibility for the entire operation and maintenance of the water sector in the regions of Durres, Fier, Lezha, and Saranda. It has complete freedom for day-to-day management decisions, but the Government of Albania has retained the financial responsibility, including price setting, although Berlinwasser makes tariff recommendations.

4. THE DATA

The data for our empirical analysis come from the 2002 and 2005 Albania Living Standards Measurement Study (LSMS), conducted by the Albanian Institute of Statistics (INSTAT), with technical assistance from the World Bank. The 2002 Albania LSMS was in the field between April and early July of 2002, and the 2005 LSMS was in the field between May and early July.

Both surveys were based on the updated sampling frame provided by the Population and Housing Census (PHC) in April 2001, which divided Albania into approximately 450 Enumerated Areas (EAs). Both the 2002 and 2005 surveys used four survey instruments to collect information: a household questionnaire, a diary for recording household food consumption, a community questionnaire, and a price questionnaire. Surveys were completed every three years in Albania with annual panel studies in the years in between. The panel surveys conducted in 2003 and 2004 were based on a sub-sample of approximately half the households from the 2002 survey, and the content of the panel questionnaires was also reduced to shorten the survey. Moreover, the intervening two

years are very close to the privatization event itself, complicating identification. We, therefore, employ only data from 2002 and 2005.

4.1. Albania LSMS Sampling Design

The sampling design for the 2002 and 2005 Albania LSMSs are strictly related to one another. In 2002, a stratified two stage cluster sampling design was employed with the Primary Sampling Units (PSUs) represented by the EAs from the PHC, and the Second Stage Sampling United (SSUs) represented by each household. EAs are stratified according to their location in one of four geographic areas: mountainous, coastal, central, or in the capital, Tirana.

The 2002 LSMS divided the sample into 450 EAs with eight households per EA, for a total of 3,600 households. The selection of EAs was carried out within each stratum through a Probability Proportional to Size (PPS) design, where the size was represented by population of households within each EA. Instead of a PPS design, the second stage was conducted by systematic sampling whereby 12 households were initially selected, with eight households forming a base case and four alternative households.

The sampling design for 2005 is similar to the sampling design used in 2002. A selection of 455 new sample EAs was based on the PHC, just as in 2002. However, the EAs have been updated to reflect population changes and migration flows, which were particularly relevant in Tirana and Durres. Tirana was oversampled with an extra sample of 25 EAs, bringing the total number of EAs to 480 and the total sample to 3,850 households. Therefore, there are 480 PSUs that were selected using a PPS design. The second stage selection was conducted again by systematic sampling, just as in 2002: an initial sample of 12 households was first selected, with 8 households forming a base case and 4 alternative households.

5. ESTIMATION STRATEGY AND RESULTS

We estimate the impact of management contracts on a variety of different outcomes: the continuity of household water supply, number of hours per day of water availability (in cases where the household reports continuous service), average household water expenditures in winter months, average household water expenditures in summer months, the water source chosen by the household, household-reported water quality, and incidence of diarrhea. In some cases, such as hours of continuous service per day, these outcomes are simple quantitative variables. In such cases, we use a standard difference-in-difference approach in an ordinary least squares framework. In other cases, such as whether a household receives continuous water service, the regressand is dichotomous and qualitative. In these cases we use logistic pseudo-maximum-likelihood estimation (pMLE). Finally, in a third group of cases, for example the source of water for a household, the dependent variable is polychotomous and qualitative. In these cases, we employ multinomial logistic pMLE. In each case, we attempt to isolate the "treatment effect" of the private provision of water supply. Since the estimated coefficient on an interaction term in nonlinear models is not generally equal to its marginal effect, we report the marginal effects on odds ratios and on relative risk ratios in our binary logistic and multinomial logistic estimations, respectively (Ai and Norton 2003).

To compensate for the non-random nature of the sample design, each household is assigned a probability weight that was used in calculations in order to obtain results relevant on the national or stratum level. These weights reflect the likelihood of such a household randomly appearing within the entire population of households. We use these weights in each estimation and in calculations of sample means. In each estimation we also stratify the sample by region and cluster standard errors at the level of the enumerated area to account for the particular features of the LSMS sampling design.

Table 1 provides an overview of both the independent and dependent variables. Our variable of interest, the interaction of MC and YR2005, measures whether or not the household is located in a region where water supply is operated by Berlinwasser at a time when management contracts were in effect. In assessing the impact of Albania's management contracts, we control for a wide variety

of household characteristics including household income, the highest level of education attained by any household member, the number of household members, the type of dwelling, and whether the World Bank classifies the household as rural or urban. Because the rural versus urban distinction is a fairly coarse classification method, we also use the distance to the nearest doctor as a proxy for distance to an urban area. Table 2 shows the construction of the education variable.[1]

To examine the differences between those districts covered by management contracts in 2005 and those not covered, we present summary statistics in Table 5. The differences are generally small. Even before privatization, households in management contract districts tend to pay more for water. In 2002, households in management contract districts appear to be situated closer to city centers (as proxied by distance to a doctor), though by 2005 this difference no longer attains statistical significance. After privatization, the gap between water costs in privatized and non-privatized districts widens, and the household-reported quality in privatized districts becomes significantly lower.[2] Finally, in the 2005 data, households in management contract districts have lower average educational attainment and are more likely to live in single family homes rather than large apartment buildings.

Table 6 reports the marginal effect of the explanatory variables on the odds that a household reports continuous water service. The logit specification is

$$P(Continuity_{h,t} = 1|\mathbf{x_{h,t}}) = \frac{\exp(\mathbf{x'_{h,t}}\beta)}{1 + \exp(\mathbf{x'_{h,t}}\beta)}$$

where $\mathbf{x_{h,t}}$ represents the matrix of household and time characteristics. Our point estimates suggest that a household is approximately 6 percent more likely to report continuous service if it is in a management contract district in 2005, but this result is below the threshold of statistical significance. The positive coefficient on YR2005 suggests that the overall time trend is toward more

[1]Although the classifications extend to 9, in practice only categories 0-6 are observed in survey responses. This allows us to treat this variable as strictly ordered and to remain agnostic on, for example, whether a post-graduate degree from an Albanian university should represent greater education than a standard university degree earned abroad.

[2]Higher values indicate lower subjective water quality.

households experiencing continuous service. Education, the only other explanatory variable with a precisely estimated coefficient, suggests that every additional level of education completed raises by 1.3 percent the probability that a household will have continuous water supply.

We present OLS difference-in-difference estimation of the effects of management contracts on hours of service in Table 7. The estimated equation is

$$\begin{aligned} Hours_{h,t} &= \beta_0 + \beta_1 MC_h * YR2005_t + \beta_2 * AvgExp_{h,t} + \beta_3 * Doc_{h,t} + \beta_4 * Income_{h,t} + \\ &\quad \beta_5 * Education_{h,t} + \beta_6 * Members_{h,t} + \beta_7 * Urban_{h,t} + \beta_8 * AptUnder15_{h,t} + \\ &\quad \beta_9 * Apt15Plus_{h,t} + \beta_{10} * MC_h + \beta_{11} * YR2005_t + \varepsilon_{h,t}, \end{aligned}$$

where again h indexes households and t subscripts indicate the period of the observation. The sample in this case is limited only to households that report obtaining water from a piped source. Again, the impact of management contracts seems to be in the expected direction but is imprecisely estimated. As one might expect, urban households experience significantly greater hours of service than their rural counterparts. Similar to the effects on continuity, more educated households tend to experience longer hours of water service. In this estimation we also include average expenditure as an explanatory variable since one reason a household might experience longer hours of service might be simply because they pay for a higher level of service.

As in most privatization episodes, Albanian water prices rose significantly in 2005 in the regions covered by management contracts. Tables 8 and 9 report that in regions operated under management contract, winter water expenditure is approximately 17 percent higher and summer water expenditure is approximately 13 percent higher than in non-contract districts. Similarly to the estimation of hours of service, we estimate

$$\begin{aligned} Expenditure_{h,t} &= \beta_0 + \beta_1 MC_h * YR2005_t + \beta_2 * Doc_{h,t} + \beta_3 * Income_{h,t} + \beta_4 * Education_{h,t} + \\ &\quad \beta_5 * Members_{h,t} + \beta_6 * Urban_{h,t} + \beta_7 * AptUnder15_{h,t} + \beta_8 * Apt15Plus_{h,t} + \\ &\quad \beta_9 * MC_h + \beta_{10} * YR2005_t + \varepsilon_{h,t}. \end{aligned}$$

Each additional household member adds about 9 percent to household expenditures, and urban households tend to pay about 40 percent more than do rural households, perhaps because rural

households are more likely to have the option of obtaining their water from non-piped, non-metered sources. Overall, water prices increase between 13 and 17 percent from 2002 to 2005, higher than the overall rate of CPI inflation in Albania. This increase in the real cost of water may reflect increased willingness on the part of even non-privatized municipalities to bring water tariffs in line with average costs. Households with higher income and higher education spend more for water.

We find strong and precisely estimated effects of privatization on the water source elected by a household. Table 3 lays out the various water sources possible as survey responses, and Table 10 reports the logistic estimation of the marginal effect of the explanatory variables on water source. The multinomial logit takes the following form

$$P(Source_{h,t} = j|\mathbf{x_{h,t}}) = \frac{\exp(\beta_{\mathbf{j}}'\mathbf{x_{h,t}})}{\sum_{\mathbf{k=1}}^{\mathbf{7}} \exp(\beta_{\mathbf{k}}'\mathbf{x_{h,t}})} \quad \text{j} = 1, 2, ..., 7.$$

We use Source=1 (running water inside the dwelling) as our base case. The management contract interaction term causes precisely estimated decreases in the relative risk of a household getting their water from sources 2, 3, or 5—running water outside the dwelling, public tap, and spring or well, respectively. However, looking at the results for Source=4, we see that living in a district covered by a management contract in 2005 doubles the relative probability of obtaining water from a water truck. Since non-contract districts tend to have lower water tariffs, this may be a result of simple arbitrage opportunities between contract and non-contract districts.[3]

Other explanatory variables play a significant role here, too. If we think of water from an indoor tap as the most preferred water source, it is not surprising that income has a significant negative marginal impact on most of the other water source categories. Like income, where education has a statistically significant effect, that effect is to reduce the relative probability of outcomes other than piped water inside the dwelling. After controlling for income, additional household members make it significantly more likely that a household will obtain water from a tap outside the dwelling,

[3]It is worth noting here that Albania is a relatively small country. Albania is slightly smaller than Maryland, which has 24 political districts (counties). Thus, Albanian districts are smaller, on average, than counties in a state with relatively small counties. This adds to the plausibility of the arbitrage argument.

a public tap, or a spring or well. As expected, urban households are significantly more likely to have running water within the dwelling.

Table 11 shows the results of the multinomial logistic estimation of water quality for households using a private tap either within or outside their dwelling.[4] Compared to the base case of water being reported as "good for drinking", the relative risk that households in management contract regions report that the water they get from their main source is "not good for drinking, but good for everything else" increases by 29 percent, and this result is significant at the 1 percent level. Households urban areas (whether measured by the World Bank's classification or by distance to a doctor), households living in large apartment buildings, and households with a higher level of education also are significantly more likely to report water that is not good for drinking. One potential explanation for these results with respect to education might be that more educated households are more likely to be aware of the shortcomings of their piped water. Three years of progress from 2002 to 2005 decrease by 9 percentage points the relative risk of households reporting water quality that is "not good for drinking, but good for everything else" but increase by 0.8 percentage points the relative risk of households reporting water that is "not good for anything".

To verify the robustness of these results, we re-estimate them using only 2005 respondents and only 2005 respondents who obtain their water from a private tap within or outside their dwelling. These results are reported in Tables 12 and 13, respectively. As in the previous specification, we obtain precisely estimated positive marginal effects of the management contract interaction term on the relative risk of water unsuitable for drinking. The magnitudes of the marginal effects diminish slightly, but in no case do management contracts appear to lead to less than an 18 percentage point increase in the relative risk of water unsuitable for drinking. As in the earlier specification, more educated households have a statistically significantly increased rate of reporting water unsuitable for drinking.

[4]The estimating equation here is precisely analogous to that used in the estimation of source and is suppressed for ease of exposition.

Despite reporting reduced water quality, households in regions operated under management contract appear to be at no statistically significantly higher risk of diarrhea.[5] Table 14 reports that households with privately supplied water have about a 0.4 percent decreased risk of experiencing an incidence of diarrhea in the previous four week period compared to households receiving publicly supplied water, but this result fails to surpass even the 10 percent level of statistical significance. As expected, high income households tend to report fewer incidences of diarrhea, while households with more members tend to report more incidences. To verify this result, we re-estimate using only those households with piped water supply to their dwelling (Table 15), and again, no statistically significant effect on diarrhea incidence can be found.

At first glance, it appears puzzling that households would report lower water quality but that we would not be able to discern an effect of privatization on diarrhea incidence (often a waterborne illness). We offer four potential explanations. One explanation is simply that diarrhea might have measurement error. Given some people's discomfort in discussing the topic, it seems plausible that the survey respondent may not know the true incidence of diarrhea in the household. Another possibility is that households in privatized regions are simply more critical of their running water due to the higher prices.[6] Two alternate possibilities hinge on the possibility that households that rate their water as undrinkable may simply not drink it. That is, households in privatized districts may be more likely to purchase bottled water for drinking or to boil or treat their tap water in some other way prior to drinking.

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[5]Here, the estimating equation here is precisely analogous to that used in the estimation of continuity and is again suppressed for ease of exposition.

[6]Though we have no evidence of such a stipulation in the Berlinwasser contract, one could imagine Berlinwasser sending out periodic assessments of the quality of the water supply in districts they serve. One might also imagine that news outlets pay more attention to documenting the water quality in newly-privatized districts. In either of these hypothetical situations we might observe changes in the subjective evaluation of water quality with little change in health outcomes.

6. CONCLUSIONS

In this study, the contracting out of Albania's water supply between the years of 2002 and 2005 yielded statistically significant increases in price and decreases in reported quality. The privatization also induced significant changes to households' choice of water source. In particular our estimates suggest a doubling of the relative probability of receiving water by truck in districts covered by management contracts. Point estimates suggest that contracted districts experience greater levels of continuous water supply and more hours of supply. On the other hand, point estimates also suggest that management contracts may have led to slightly higher incidence of diarrhea. We find few reasons for a household to prefer privately provided water, at least in the Albanian case. In short, our effort has reaffirmed what the contentious debate on water privatization suggests: privatization is no panacea.

These results are not without caveats. Although we have employed data from well-before the management contract with Berlinwasser International AG took effect, the 2005 data may not account for the full effect of privatization as it certainly takes time for a private company to develop and implement a strategy to remedy decades of mismanagement. Using data from only one-and-one-half to two years after signing a management contract may not allow for enough time to capture the full effect of privatization. More time series data—possibly covering more privatization events—would allow more precise inference. With more comprehensive health data, one might examine outcomes other than diarrhea incidence. Finally, our model also does not attempt to account for nor to explain the choice of management contract regions. It is possible that some of the changes we observed were part of the reason why certain prefectures contracted out their water supply, while others retained public management. However, we do not regard this potential endogeneity as a particularly forceful critique, given the similarity of the contracted regions to the non-contracted regions along many of the dimensions we measure.

We believe that our results raise a number of interesting avenues for further research. One of these relates to perception. In particular, we remain curious about the cause of the perceived decline in water quality without supporting evidence in terms of health outcomes. Do people in transition

economies simply hold privatized utilities to a higher standard? Another, broader, question relates to the policies and institutions necessary to see tangible benefits from water privatization. The results in various political and geographic contexts are so varied that it would be difficult to offer a policymaker a firm recommendation on whether to privatize. Deeper investigation of the institutions common among the privatization episodes that yielded improved household outcomes would make an important contribution to the literature.

Table 1. Variable Definitions

Variable	Type	Definition
Dependent Variables		
Continuity	Dichotomous Qualitative	HH receives continuous service
Hours	Quantitative	HH hours per day of service
Winter Exp.	Quantitative	HH avg. winter expend./mo. for water (000)
Summer Exp.	Quantitative	HH avg. summer expend./mo. for water (000)
Source	Polychotomous Qualitative	HH principal water source
Quality	Polychotomous Qualitative	HH subjective water quality
Diarrhea	Dichotomous Qualitative	HH memb. experienced diarrhea in past 4 wks.
Independent Variables		
Doc	Quantitative	HH distance to nearest doctor in km.
Income	Quantitative	HH Income in (000 of new leks)
Members	Quantitative	Number of household members
Education	Quantitative	Highest level of educational attainment in HH
Average Exp.	Quantitative	HH avg. monthly water expenditure
Urban	Dummy	HH is in an urban area
SingleFam	Dummy	HH dwelling is a single family home
AptUnder15	Dummy	HH dwelling is a building with <15 units
Apt15Plus	Dummy	HH dwelling is a building with ≥ 15 units
MC	Dummy	HH is in a management contract district
YR2005	Dummy	Observation is from year 2005

Table 2. Codes for Education Variable

Code	Highest Diploma Attained
0	None
1	Primary 4 years
2	Primary 8-9 years
3	Secondary general
4	Vocational 2-3 years
5	Vocational 4-5 years
6	University—Albania
7	University—abroad
8	Post-graduate—Albania
9	Post-graduate—abroad

Table 3. Codes for Water Source Variable

Code	Source
1	Running water inside dwelling
2	Running water outside dwelling
3	Public tap
4	Water truck
5	Spring/well
6	River/lake/pond
7	Other

Table 4. Codes for Water Quality Variable

Code	Source
1	Good for drinking
2	Not good for drinking, but good for everything else
3	Not good for anything

Table 5. Means by Sub-Group

Variable	Overall	MC	No MC	Difference
2002				
Continuity	0.327	0.302	0.331	-0.0291
Hours	9.90	9.36	10.0	-0.636
Winter Exp.	0.361	0.409	0.351	0.0574***
Summer Exp.	0.363	0.411	0.354	0.0576***
Source	2.24	2.44	2.20	0.239
Quality	1.22	1.29	1.21	0.0745
Diarrhea	0.00825	0.00573	0.00873	-0.00300
MC	0.158	1.00	0.00	1.00***
Doc	18.5	15.3	19.1	-3.81**
Income	23.0	24.3	22.8	1.52
Members	4.28	4.24	4.29	-0.0495
Education	2.50	2.66	2.47	0.186
Urban	0.456	0.498	0.448	0.0497
SingleFam	0.689	0.700	0.0687	0.0132
AptUnder15	0.171	0.149	0.175	-0.0253
Apt15Plus	0.130	0.133	0.130	0.00319
N=	3599	496	3103	
2005				
Continuity	0.401	0.403	0.400	0.00214
Hours	11.3	10.7	11.4	-0.685
Winter Exp.	0.458	0.578	0.434	0.144***
Summer Exp.	0.476	0.587	0.454	0.133***
Source	2.20	2.48	2.14	0.333
Quality	1.20	1.40	1.17	0.232***
Diarrhea	0.0104	0.00674	0.0111	-0.00436
MC	0.160	1.00	0.00	1.00***
Doc	18.8	17.3	19.1	-1.81
Income	32.1	31.3	32.2	-0.946
Members	4.44	4.46	4.44	0.0129
Education	2.57	2.39	2.60	-0.211**

Table 5—Continued

Variable	Overall	MC	No MC	Difference
Urban	0.486	0.499	0.483	0.0158
SingleFam	0.726	0.800	0.712	0.0880*
AptUnder15	0.153	0.134	0.156	-0.0219
Apt15Plus	0.115	0.0578	0.126	-0.0682***
N=	3840	496	3344	

Note. — Data are weighted in proportion to their expected probability in the overall population. ***, **, and * represent statistical significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Table 6. Logistic Estimation of the Marginal Impact of Management Contracts on the Odds Ratio of Continuity of Water Service

Variable	Marginal Effect	Std. Err.
MC*YR2005	0.0646	(0.0919)
Doc	0.000475	(0.00068)
Income	0.000182	(0.00049)
Education	0.0126**	(0.00606)
Members	-0.00666	(0.00496)
Urban	0.0356	(0.0343)
AptUnder15	0.00111	(0.0294)
Apt15Plus	0.0310	(0.0409)
MC	-0.0537	(0.0623)
YR2005	0.0557*	(0.0320)
N = 6656		
F(10, 909) = 1.86		
Prob > F = 0.0476		

Note. — Data are stratified by region type, clustered at the level of the "enumerated area" in Albania's LSMS data, and weighted in proportion to their expected probability in the overall population. ***, **, and * represent statistical significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Table 7. Difference-in-Difference Estimation of the Impact of Management Contracts on Hours of Service

Variable	Coefficient	Linearized Std. Err.
C	11.4***	(1.25)
MC*YR2005	1.13	(2.24)
Avg. Exp.	-2.54	(1.74)
Doc	0.0226	(0.0346)
Income	0.0230	(0.0364)
Education	0.261*	(0.148)
Members	-0.0500	(0.147)
Urban	2.03**	(0.978)
AptUnder15	-0.772	(0.706)
Apt15Plus	-0.287	(0.864)
MC	1.47	(1.66)
YR2005	0.521	(0.853)
N = 3889		
F(11, 672) = 1.46		
Prob > F = 0.1432		
$\bar{R}^2 = 0.0168$		

Note. — Data are stratified by region type, clustered at the level of the "enumerated area" in Albania's LSMS data, and weighted in proportion to their expected probability in the overall population. ***, **, and * represent statistical significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Table 8. Difference-in-Difference Estimation of the Impact of Management Contracts on Log Winter Expenditure (Source≤2)

Variable	Coefficient	Linearized Std. Err.
C	-1.87***	(0.0776)
MC*YR2005	0.168**	(0.0825)
Doc	0.000399	(0.00161)
Income	0.000240*	(0.000123)
Education	0.0264***	(0.00771)
Members	0.0928***	(0.00814)
Urban	0.420***	(0.0501)
AptUnder15	-0.0734***	(0.0272)
Apt15Plus	0.00463	(0.0304)
MC	0.186***	(0.0514)
YR2005	0.131***	(0.0379)
N = 3713		
F(10, 650) = 28.21		
Prob > F = 0.0000		
$\bar{R}^2 = 0.244$		

Note. — Data are stratified by region type, clustered at the level of the "enumerated area" in Albania's LSMS data, and weighted in proportion to their expected frequency in the overall population. ***, **, and * represent statistical significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Table 9. Difference-in-Difference Estimation of the Impact of Management Contracts on Log Summer Expenditure (Source≤2)

Variable	Coefficient	Linearized Std. Err.
C	-1.85***	(0.0794)
MC*YR2005	0.127	(0.0831)
Doc	0.00076	(0.00179)
Income	0.000222*	(0.000117)
Education	0.0229***	(0.00811)
Members	0.0936***	(0.00825)
Urban	0.392***	(0.0525)
AptUnder15	-0.0580**	(0.0277)
Apt15Plus	0.0217	(0.0309)
MC	0.192***	(0.0509)
YR2005	0.174***	(0.0397)
N = 3710		
F(10, 649) = 27.07		
Prob > F = 0.0000		
$\bar{R}^2 = 0.236$		

Note. — Data are stratified by region type, clustered at the level of the "enumerated area" in Albania's LSMS data, and weighted in proportion to their expected probability in the overall population. ***, **, and * represent statistical significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Table 10. Multinomial Logistic Estimation of the Marginal Impact of Management Contracts on the Relative Risk Ratio of Various Water Sources

Variable	Marginal Effect	Std. Err.
Source = 2		
MC*YR2005	-0.110***	(0.0113)
Doc	0.000480	(0.00054)
Income	-0.00214***	(0.0006)
Education	-0.0192***	(0.00411)
Members	0.00421	(0.00296)
Urban	-0.135***	(0.0190)
AptUnder15	-0.0718***	(0.013)
Apt15Plus	-0.130***	(0.0124)
MC	-0.0150	(0.0268)
YR2005	-0.000285	(0.0158)
Source = 3		
MC*YR2005	-0.0545***	(0.0075)
Doc	0.000533**	(0.00024)
Income	-0.000956***	(0.00037)
Education	-0.00715***	(0.00248)
Members	0.00571***	(0.00179)
Urban	-0.0966***	(0.0264)
AptUnder15	-0.0360***	(0.00865)
Apt15Plus	0.0200	(0.0531)
MC	0.0151	(0.0241)
YR2005	-0.0108	(0.0129)
Source = 4		
MC*YR2005	1.00***	(0.00012)
Doc	0.0000168**	(0.00001)
Income	1.81e-06	(0.00001)
Education	-0.000340**	(0.00016)
Members	-6.51e-06	(0.00011)
Urban	-0.00172**	(0.00084)
AptUnder15	0.00110	(0.00134)
Apt15Plus	0.0000753	(0.00102)

Table 10—Continued

Variable	Marginal Effect	Std. Err.
MC	-0.0257**	(0.0107)
YR2005	-0.00117	(0.00088)
Source = 5		
MC*YR2005	-0.141***	(0.0174)
Doc	0.00127**	(0.00057)
Income	-0.00120**	(0.00054)
Education	-0.0207***	(0.00475)
Members	0.00948***	(0.00365)
Urban	-0.216***	(0.0333)
AptUnder15	-0.0863***	(0.0165)
Apt15Plus	-0.187***	(0.0177)
MC	0.0191	(0.0470)
YR2005	0.0184	(0.0256)
Source = 6		
MC*YR2005	-1.82e-12	(0.00000)
Doc	1.94e-14	(0.00000)
Income	9.07e-16	(0.00000)
Education	-3.58e-14	(0.00000)
Members	-1.88e-14	(0.00000)
Urban	-8.56e-06	(0.00001)
AptUnder15	-3.50e-14	(0.00000)
Apt15Plus	-4.10e-12	(0.00000)
MC	-6.44e-14	(0.00000)
YR2005	-1.23e-13	(0.00000)
Source = 7		
MC*YR2005	-7.04e-06*	(0.00000)
Doc	-1.02e-07	(0.00000)
Income	-2.04e-07	(0.00000)
Education	-1.75e-06	(0.00000)
Members	2.26e-06*	(0.00000)

Table 10—Continued

Variable	Marginal Effect	Std. Err.
Urban	9.66e-06*	(0.00001)
AptUnder15	-0.00116*	(0.00064)
Apt15Plus	-4.04e-06	(0.00000)
MC	0.0000756	(0.00006)
YR2005	-4.11e-06	(0.00001)
N = 6656		

Note. — Data are stratified by region type, clustered at the level of the "enumerated area" in Albania's LSMS data, and weighted in proportion to their expected probability in the overall population. ***, **, and * represent statistical significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Table 11. Multinomial Logistic Estimation of the Marginal Impact of Management Contracts on the Relative Risk Ratio of Perceived Water Qualities (Source≤2)

Variable	Marginal Effect	Std. Err.
Quality = 2		
MC*YR2005	0.289***	(0.105)
Doc	-0.00147*	(0.00081)
Income	0.0000722	(0.00011)
Education	0.0388***	(0.00443)
Members	-0.00394	(0.00375)
Urban	0.0827***	(0.0276)
AptUnder15	0.0247	(0.0242)
Apt15Plus	0.0805***	(0.0297)
MC	-0.179***	(0.0146)
YR2005	-0.0907***	(0.0268)
Quality = 3		
MC*YR2005	-1.24e-06	(0.00000)
Doc	-4.96e-09	(0.00000)
Income	-7.46e-09	(0.00000)
Education	1.14e-07	(0.00000)
Members	-1.81e-08	(0.00000)
Urban	6.23e-09	(0.00000)
AptUnder15	-1.74e-07	(0.00000)
Apt15Plus	-7.76e-08	(0.00000)
MC	0.987***	(0.0114)
YR2005	0.00718**	(0.00323)
N = 5027		

Note. — Data are stratified by region type, clustered at the level of the "enumerated area" in Albania's LSMS data, and weighted in proportion to their expected probability in the overall population. ***, **, and * represent

statistical significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Table 12. Multinomial Logistic Estimation of the Marginal Impact of Management Contracts on the Relative Risk Ratio of Perceived Water Qualities (2005 Respondents)

Variable	Marginal Effect	Std. Err.
Quality = 2		
MC*YR2005	0.272***	(0.0545)
Doc	-0.000648	(0.00068)
Income	0.0000371	(0.00005)
Education	0.0247***	(0.00541)
Members	-0.00325	(0.0045)
Urban	0.0514	(0.0334)
AptUnder15	0.00823	(0.0320)
Apt15Plus	0.0562	(0.0387)
Quality = 3		
MC*YR2005	-0.000305	(0.00177)
Doc	-0.0000291	(0.00005)
Income	-0.000165***	(0.00005)
Education	0.00121**	(0.00048)
Members	-0.000496	(0.00036)
Urban	0.00202	(0.00219)
AptUnder15	-0.00228	(0.00151)
Apt15Plus	-0.00253	(0.00173)
N = 3709		
F(16, 461) = 6.59		
Prob > F = 0.0000		

Note. — Data are stratified by region type, clustered at the level of the "enumerated area" in Albania's LSMS data, and weighted in proportion to their expected probability in the overall population. ***, **, and * represent statistical significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Table 13. Multinomial Logistic Estimation of the Marginal Impact of Management Contracts on the Relative Risk Ratio of Perceived Water Qualities (2005 Respondents, Source≤2)

Variable	Marginal Effect	Std. Err.
Quality = 2		
MC*YR2005	0.179***	(0.0556)
Doc	-0.00230**	(0.00109)
Income	1.96e-06	(0.00005)
Education	0.0245***	(0.00557)
Members	-0.000995	(..)
Urban	0.0501	(0.0353)
AptUnder15	0.0437	(0.0338)
Apt15Plus	0.0838**	(0.399)
Quality = 3		
MC*YR2005	0.000307	(0.00115)
Doc	-0.0000562	(0.00004)
Income	-0.0000451**	(0.00002)
Education	0.000489	(0.00037)
Members	-0.000127	(0.00017)
Urban	-0.000211	(0.00057)
AptUnder15	-0.000570	(0.00069)
Apt15Plus	-0.000126	(0.00087)
N = 2785		
F(16, 410) = 17.90		
Prob > F = 0.0000		

Note. — Data are stratified by region type, clustered at the level of the "enumerated area" in Albania's LSMS data, and weighted in proportion to their expected probability in the overall population. ***, **, and * represent statistical significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Table 14. Logistic Estimation of the Marginal Impact of Management Contracts on the Odds Ratio of the Incidence of Diarrhea

Variable	Marginal Effect	Std. Err.
MC*YR2005	-0.00361	(0.00393)
Doc	0.0000232	(0.00003)
Income	-0.000143***	(0.00005)
Education	0.000700	(0.00074)
Members	0.00245***	(0.00048)
Urban	0.000117	(0.00248)
AptUnder15	0.000455	(0.00302)
Apt15Plus	0.00702	(0.00545)
MC	-0.000722	(0.00435)
YR2005	0.00202	(0.00229)
N = 6656		
F(10, 909) = 4.58		
Prob > F = 0.0000		

Note. — Data are stratified by region type, clustered at the level of the "enumerated area" in Albania's LSMS data, and weighted in proportion to their expected probability in the overall population. ***, **, and * represent statistical significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Table 15. Logistic Estimation of the Marginal Impact of Management Contracts on the Odds Ratio of the Incidence of Diarrhea (Source≤2)

Variable	Marginal Effect	Std. Err.
MC*YR2005	0.00180	(0.00984)
Doc	0.0000164	(0.00004)
Income	-0.0001428***	(0.00005)
Education	0.000710	(0.00066)
Members	0.00223***	(0.00046)
Urban	0.00120	(0.00253)
AptUnder15	0.000585	(0.00281)
Apt15Plus	0.00637	(0.00491)
MC	-0.00422	(0.00352)
YR2005	0.00237	(0.00226)
N = 5027		
F(10, 808) = 5.98		
Prob > F = 0.0000		

Note. — Data are stratified by region type, clustered at the level of the "enumerated area" in Albania's LSMS data, and weighted in proportion to their expected probability in the overall population. ***, **, and * represent statistical significance at the 1 percent, 5 percent, and 10 percent level, respectively.

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