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Privatization and quality: Evidence from elderly care in Sweden ☆

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ABSTRACT

Non-contractible quality dimensions are at risk of degradation when the provision of public services is privatized. However, privatization may increase quality by fostering performance-improving innovation, particularly if combined with increased competition. We assemble a large data set on elderly care services in Sweden between 1990 and 2009 and estimate how opening to private provision affected mortality rates – an important and not easily contractible quality dimension – using a difference-in-difference-in-difference approach. The results indicate that privatization and the associated increase in competition significantly improved non-contractible quality as measured by mortality rates.

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1. Introduction

Governments around the world increasingly rely on private contractors for the provision of goods and services.[1] One factor behind this trend is tighter budget constraints, and the hope of enjoying cost savings from the stronger incentives linked to private ownership and competition. However, precisely because of these stronger incentives, maintaining an appropriate quality level after opening to private providers may be a concern. For quality dimensions that can be verified at reasonable cost, degradation can be avoided by properly written and managed contracts. The risk of degradation is much higher for quality dimensions that are hard to verify, and hence not easily contractible. However, it is difficult to study the latter effect empirically: quality dimensions that are not contractible because they cannot be verified by third parties, i.e., courts, are also hard to measure for researchers.

In this paper we estimate the effect of opening to private provision a common service with important quality dimensions that are hard to contract upon: nursing-home care for the elderly.[2] As an outcome measure of quality we consider mortality rates, a performance indicator commonly used in the healthcare literature. Mortality was not included as an outcome measure in any of the several hundred contracts we have observed, most likely because it is too noisy at the contract level and to avoid inducing screening of residents. By studying the effects on mortality at the aggregate level we overcome the noise problem present at the contract level. By making the municipality the unit of analysis, rather than the individual home, we can also address the obvious selection effects that would otherwise risk biasing our results.

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[1] Public procurement from private contractors makes up 15–20% of GDP of developed countries and is on the rise (see, for example, http://ec.europa.eu/growth/single-market/public-procurement/index_en.htm).

[2] In Sweden, public sector procurement – including publicly held corporations that must adhere to the Procurement Act – is estimated at about SEK500 billion (€50 billion) per year, corresponding to 16 to 18% of GDP (Bergman, 2008).

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We focus on non-contractible quality because it is crucial for many important goods and services and because we know little about it compared to quality in measurable and contractible dimensions.[3] Contractible quality can be more easily controlled by the buyer, so that stronger incentives should align quality more closely with the buyer's preferences. Non-contractible quality is harder to control for the buyer, and is affected by a number of interacting forces that make its reaction to the opening to private provision an inherently empirical question.

Opening to private provision may cause unwanted quality degradation in non-contractible dimensions because of the stronger cost-cutting incentives of private contractors. However, their stronger investment incentives may compensate, generating innovation that lead to the opposite outcome.[4] Opening to private provision also introduces competition, which we know can have negative effects on non-contractible quality dimensions.[5] But competition may also stimulate innovation and improve providers' management practices, which may increase non-contractible quality, in particular if price is regulated.[6] Also, as long as buyers have some discretion, they can react to non-verifiable quality signals, reputation, brand names, and long-term informal relations. This links future sales to current performance and may strengthen sellers' incentives to maintain high quality.[7]

Our empirical analysis is based on a panel of all Swedish municipalities over a period of up to 20 years. In this period about one third of all municipalities privatized – wholly or partially – the provision of elderly care services. We use data on mortality by age group (60 to 64, 65 to 69, 70 to 74 and so forth, with the oldest age group covering those aged 95 and over) and municipality characteristics (population density, educational level, share of immigrants in the population aged 65 and above) covering the period 1990 to 2009. For the latter half of the period we have access to municipal-level data on the average cost per person in sheltered permanent accommodation (nursing homes), total expenditures for nursing homes and, by age group, the number of residents. We then surveyed the municipalities to establish whether elderly-care services were exclusively produced in-house, or if provision from private providers had been used at all during the two most recent decades and if so, during what periods. The survey was undertaken in 2009 and we obtained answers from all but six of the 290 municipalities.

The focus on the municipality level, rather than on the contract or nursing-home level, allows us to estimate the joint effect on mortality of opening to private provision and introducing competition. That is, our estimates capture the overall effect of the privatization process – the combined effect of both competition, effective or potential, and private service provision – in much the same way as studies of educational markets that are opened up to entry by private schools. Our identification strategy makes use of the within-municipality variation in policy. However, as the decision to procure is a choice by the municipality, we need to acknowledge this in the analysis. To this end, we deploy difference-in-differences-in-differences (DDD) strategies. We compare the changes in mortality for municipalities that opened to private provision with corresponding changes for those that did not. To take into account possible differences in mortality trends among municipalities, and the fact that privatization is a choice of the municipality, we compare changes in mortality within the population aged 70 and above with changes in mortality among those aged 60–69 years in the same municipality.

We find that mortality falls (by 1.6%) in the age groups affected by the introduction of private provision. The results correspond to an extension, by about four weeks, of the expected remaining two years of life upon admission to a nursing home. Privatization of elderly care services is also associated with a 1.7% reduction of the per-resident cost of service, but there is no reduction of total cost, suggesting that there is a balancing expansion in the number of beds.

The remainder of the paper unfolds as follows. Section 2 discusses the theoretical background and prior empirical research. Section 3 describes the characteristics of the elderly care industry in Sweden. Section 4 presents our data and reports some descriptive statistics. Section 5 describes our empirical approach. Section 6 presents our main results and Section 7 briefly concludes.

2. Theory and prior empirical studies

In this session, we first briefly review the theoretical literatures to which our study is related, then we discuss the closest previous empirical studies.

Contractual incentives. Opening to private provision introduces stronger incentives, both because of the characteristics of private providers and because of the introduction of competition. Holmstrom and Milgrom's (1991) classic study made clear that when non-contractible tasks are valuable, stronger incentives may backfire because they increase focus on observable, measurable tasks, crowding out effort on non-contractible ones. This argument 'per se' would predict lower non-contractible quality after privatization.

Hart et al. (1997) study a richer model focusing precisely on how the mode of public-goods production – in-house or by private suppliers – affects non-contractible quality provision besides innovation and cost efficiency, and achieve somewhat different results (see also Shleifer, 1998). They propose an incomplete-contracts model where a provider can make non-verifiable investments to increase (non-verifiable) quality or to reduce cost; the latter investment will, however, be associated with a fall in quality. An external supplier will be more prone to making both types of investments, but may tend to focus too much on cost savings, at the expense of quality. If non-contractible cost reductions have large deleterious effects on non-contractible quality and there is little scope for efficiency-enhancing innovation, then in-house government production may be preferred. Otherwise, provision by private suppliers should be preferred as it may lead to increased quality as well as lower costs.

Informal Relationships and Reputation. In standard market interactions, suppliers' incentives to degrade quality are also checked by the risk of losing future business. With repeat purchases, buyers may establish long-term supply relations, supported by threats to break those relations if the suppliers degrade quality (MacLeod, 2007; Malcomson, 2012). Absent repeat purchases, concerns over reputation, and brand-name value can still sustain quality provision (Bar-Isaac and Tadelis, 2008; Klein and Leffler, 1981). In the context of public procurement, however, these governance mechanisms are limited by accountability concerns (Kelman, 1990).[8]

[3] Many previous studies on procurement, outsourcing and privatization seek to estimate cost savings, while also controlling for changes in contractible quality dimensions.

[4] Hart, Shleifer and Vishny, 1997.

[5] Spulber, 1990; Manelli and Vincent, 1995.

[6] Bloom et al., 2010, Spence, 1975.

[7] See, e.g., MacLeod, 2007; Klein and Leffler, 1981. However, for accountability reasons public procurement regulation typically limits buyer discretion and with it the scope for such informal governance mechanisms (Kelman, 1990).

[8] Although a public contracting authority may commit to such schemes (Calzolari and Spagnolo, 2009; Iossa and Rey, 2014), it may not be possible or desirable to give it the necessary discretion due to the risk of corruption (Banfield, 1975). Indeed, in many countries a contracting authority is, in principle, not allowed to discriminate in favor of strong brand names or providers that performed well in the past on non-

Competition. In the absence of consumer choice and with reputational forces constrained by accountability regulation, if low non-contractible quality is associated with low costs, competition on price will tend to reduce quality (e.g. Spulber, 1990; Manelli and Vincent, 1995). Also, to the extent that intense price competition makes future sales less profitable, the prospect of future sales will be a weaker incentive to provide quality today (Stiglitz, 1989). However, Spence (1975) showed that price regulation could revert this negative effect of competition on quality. In line with this argument, Gaynor and Town (2011) present a model of a health-care market where quality increases with competition if prices are fixed, but where the effect is indeterminate if prices are set by the market. Competition may also improve managerial incentives and management practices, and through them the quality offered by the provider (Bloom et al., 2010). With competition may come an element of consumer choice that could sustain quality, again by linking future sales to current performance.[9] And, in sectors like elderly care, where agents are often intrinsically motivated ("mission oriented"), an increase in competition may improve overall performance through an increase in the heterogeneity of the services provided and an improved matching of employers' and employees' missions (Besley and Gathak, 2005).

Given the existence of sound theoretical arguments pointing in different directions, the relation between privatization and non-contractible quality is likely to be sensitive to the specifics of the market, which makes it an intrinsically empirical question.

2.1. Prior empirical research

While there is an extensive empirical literature on the effects of privatization on prices, access and contractible quality, relatively few studies have touched on the effects of privatization on hard-to contract quality dimensions. As already mentioned, an obvious explanation is the difficulty of subjecting a quality dimension that is hard to verify to measurement and quantitative analysis by researchers.

One topic that has, however, generated a relatively large empirical literature is the effect of school voucher programs on pupil performance (e.g. Hsieh and Urquiola, 2006, and Angrist et al., 2006) and choice of school (Angrist et al., 2002).[10] Here private provision goes hand-in-hand with intensified competition through consumer choice based on voucher systems; a typical finding seems to be that there is no significant effect on average pupil performance (MacLeod and Urquiola, 2013).

Some studies have focused on prison services.[11] Among these Bédard and Frech (2009) find that a 13% increase in contracted medical staff increased mortality by 1.3%. While they study the same outcome as we do, they do not have information on costs. They cannot, therefore, evaluate whether the reduction in quality, as measured by the increased mortality, was accompanied by strong cost savings.

Quantitative studies of quality in the US nursing-home industry have mainly focused on the difference between non-profit and for-profit facilities. Anderson et al. (2003), for example, report lower quality in for-profit care. Similarly, Amirkhanyan et al. (2008) find that for-profit providers violate quality standards more often than non-profit providers; and Chou (2002) finds that for-profit homes provide lower quality than non-profit rivals when the resident's position is weak (i.e., when the client has no living close relatives or has dementia), but not otherwise. In common with the current study, Chou uses mortality as the main indicator of quality.

A concern with all of these studies is that the estimated effect of the owners' objectives on quality may be affected by sample-selection bias. To address this concern, Grabowski and Stevenson (2008) focus on changes in quality following changes in owner objectives among US nursing homes. They find that transition from one category to another does not affect quality, and also that homes that change from for-profit to non-profit status tend to provide higher quality than homes that make the opposite transition. They conclude that the negative impact of for-profit status found in earlier studies is due to selection effects, rather than a causal effect of ownership status.

The effect of competition on quality in hospital care has attracted a substantial amount of research during the last decade, as surveyed by Gaynor and Town (2011). Many of these studies focus on markets with regulated prices and find that the quality of care – often measured by (inverse) mortality – increases significantly with hospital competition and/or decreases with hospital concentration (e.g. Kessler and McClellan, 2000; Gowrisankaran and Town, 2003; and Kessler and Geppert, 2005 for the US; Cooper et al., 2011; and Gaynor et al., 2013, for the UK). It is worth noting that an earlier study by Propper et al. (2008) studied a UK policy reform that introduced competition between 1991 and 1997, but with negotiated rather than fixed prices. The findings suggest that during this period, competition reduced quality in some dimensions that were not monitored.

Broadening the perspective to other markets, there exists a small, but growing empirical literature comparing the performance of in-house and outsourced water utilities where, arguably, quality is more easily measurable. Ménard and Saussier (2000) find no significant differences between in-house and outsourced water utilities, while Galiani et al. (2005) find that child mortality related to water quality fell significantly in Argentina in areas where water services were privatized. On the contrary, Borraz et al. (2011) find that in Uruguay it was the nationalization of water services that led to an improvement in sanitation rates, water quality and child mortality.

3. Our survey and the Swedish market for provision of nursing home for the elderly

The key data in this paper originate from a survey performed by us and it was undertaken in 2009. We surveyed all municipalities on what method they use to organize elderly care services: in-house production, traditional competitive procurement, voucher scheme, or a combination thereof. In a questionnaire[12] sent to the municipalities we asked what fraction of the beds was under in-house operation in 2008, and when procurement was first introduced for this service in the municipality. We also asked if there had been any changes to the mode of provision of nursing-home care for the elderly, other than the initial decision to procure from private providers. Due to the small number of voucher systems operational during the period we study, we do not distinguish between the two modes of private provision.

verifiable performance dimensions (see e.g. Dellarocas et al., 2006; and Spagnolo, 2012).

[9] See the literature on school vouchers, following Friedman (1955), and the literature on quasi markets, triggered by reforms of the British welfare systems around 1990; e.g., Le Grand (1991).

[10] While educational outcomes are partially observable through test results and grades, contracts are rarely conditioned on outcomes, except possibly the fraction passing a minimum standard. One reason is that explicit contracting based on outcomes is likely to distort efforts, e.g., 'teaching-to-the-test'.

[11] Possibly inspired by the lively UK debate and following the influential paper by Hart et al. (1997) cited above, which used prisons as an archetypical example.

[12] The questionnaire was sent to the head of the elderly care in the municipality and we reminded the respondents by mail once. This was followed with phone calls. We tried to reach the person in charge during approximately four weeks. The questionnaire is found online at http://www.journals.elsevier.com/journal-of-health-economics.

In total, 276 out of 290 municipalities are included in the data. Eight municipalities are excluded from the panel due to them being involved in a municipality split or merger, and six municipalities did not respond to our survey. At the time of our survey, 190 municipalities report neither having shifted nor having an intention to shift to private provision, i.e., they rely exclusively on in-house production during the entire time period studied. One municipality had already introduced private provision in 1990. Consequently, 85 municipalities reported that, at some point between 1990 and 2009, they shifted from in-house production to procurement and potentially an external provider. As noted, a tendering process does not guarantee that a private provider actually enters, although this is by far the most frequent outcome.[13] Note that even if no private provider enters the market there may be an effect on quality as the in house provider may increase its quality in response to potential competition.

Elderly care in Sweden is the responsibility of local governments at the municipal level. Close to 100,000 persons live permanently in nursing homes for the elderly, while more than 150,000 receive assisted living services at home. The provision of elderly care is an important part of the welfare system and it consumes a relatively large part of the Swedish public sector's resources. The cost of elderly care services – assisted living as well as care in nursing homes – was approximately SEK90 billion in 2008, or close to 3% of GDP. Of this, SEK 56 billion was for elderly care units.[14]

There are roughly 2600 nursing homes in Sweden, of which about 10% were privately operated in 2008.[15] Almost all of the supplying firms are owned by for-profit corporations; many of the owners are private equity firms. However, admittance decisions are made by the municipality.

In 2009, the elderly living at nursing homes constituted 6% of Sweden's senior citizens (i.e. the population aged 65 or more). This is less than in the Netherlands and Switzerland, about the same as in Norway and more than in UK/England, where the rate is about 5%. In the US, Germany and France, about 4% of the elderly population live in institutions. Between the 1990s and 2009, Sweden saw a sharp decrease in the rate of institutional care of elderly, while most other rich countries saw stable or increasing levels (Rodrigues et al., 2012). Senior citizens aged 80 or above make up 80% of the residents; in this age group, 16% of the population lives permanently in nursing homes. The fraction rises to about 50% for seniors above 95 years of age. More than two thirds of the residents are women and around three quarters of the residents have dementia.[16]

Variation within Sweden is high; the ratio between the municipality with the highest and the lowest proportion of its senior citizens in nursing homes is about 4:1. Northern and rural municipalities tend to have a higher proportion of their population in nursing homes, mainly due to an older overall population. Larsson et al. (2008) report that, among those aged 80 or more, the proportion living in nursing homes fell by about a quarter between 1995 and 2004, due to better health and to a policy shift toward providing more assistance at home in order to delay entry into nursing homes.

Admittance to a nursing home is a strong indicator of increased mortality risk. Based on a survey conducted in 1995, Larsson et al. (2008) report that while about 10% of the population aged 75 or more are living in elderly care units five years before their death, this rises to about 50% in the months prior to death.[17] Based on the same survey, they find that the average age when admitted to a nursing home is about 84 years. After about one year in a home, half of the individuals will have deceased.[18]

Procurement from private suppliers has become an important mechanism for organizing the provision of elderly care services in Sweden since the 1990s. Nursing-home service-provision contracts are awarded after a tendering procedure where the winner is nominated on the basis of lowest price, highest score for price and quality or for the time period studied, more unusually, highest quality for a given price. Once a winner has been nominated, the contract is essentially a per-resident fixed-fee contract with an average duration of close to four years. The procurer normally has an option to extend the contract once or twice, with an average total extension period of almost four years.[19] A private supplier cannot decide whom to accept, and nor does it have the right to decline if it has capacity (open spots), while the capacity is defined in the contract. Income-dependent fees cover on average 4% of the cost, with the municipalities paying the rest. Even when a nursing home is privately operated, the facility itself is usually owned by the municipality.

According to EU procurement regulation, any qualitative criteria that will be considered when public contracts are allocated must be verifiable and listed in the so-called contract notice (a document published by the contracting authority that contains the information on which potential suppliers base their bids). Contract performance clauses are also to be specified in the same document, while past performance information cannot be used for the selection of contractors. These rules limit considerably the possibility that quality is sustained by "the shadow of the future" (Spagnolo, 2012). However, prior to the Swedish 2008 Procurement Act, the Swedish legislation allowed a rather liberal interpretation, in the sense that the buyer had a relatively high degree of freedom to select the winner (Hyytinen et al., 2008).

The legislation allows the municipality's own production unit to participate in the tendering process on an equal footing with private providers, although the municipality may, of course, choose not to do so. Legislation that formally allows the organization of a voucher system was introduced in 2009, although a handful of municipalities had such systems in place earlier, possibly in violation of the rules.[20]

4. The data

Our key measure of (inverse) quality is the mortality rate. Mortality data across five-year age groups as well as municipality characteristics – i.e., population, population density, educational level (more than three years of university-level education), political preferences (distribution of seats on the local council) and share of population of immigrants aged 65 and over – were obtained from Statistics Sweden (SCB) for the period 1990 to 2009. Municipal-level data on the average cost per resident in nursing homes for the elderly and total expenditures for nursing homes for the period 2000 to 2009, and the number of residents for the period 1990 to 2009, were obtained from the National Board of Health and Welfare (NBHW).

[13] According to a more recent sample, the municipalities that own production units win about 10% of the tendered contracts; see Bergman et al. (2014).
[14] NBHW (2009).
[15] NBHW (2008). In addition, there are about 150 transitory (short-stay) nursing homes, with another 11,000 residents. The fraction of private provision has risen rapidly since, to more than 20% in 2012.
[16] SALAR (2007); NBHW (2009).
[17] The survey was conducted in 1995 on 567 elderly persons living in Stockholm. The individuals were followed until 2005.
[18] Personal communication with experts at SALAR.
[19] Bergman et al. (2014).
[20] Four municipalities introduced user choice in the early 2000s, one more followed in 2006 and another two in 2008–2009.

Table 1
Descriptive statistics, municipality characteristics, 1990–2009, for all municipalities, for municipalities that partially privatize provision and for those that maintain pure in-house production. Source: Statistics Sweden.

Variable/Year	Mean			Std.dev.	Min.	Max.	# Obs	|t-test|
	1990	2000	2009	2009	2009	2009	2009	2009
Population (inhabitants)	29,211.82	29,898.24	31,389.26	63,963.99	2,500	829,417	276	
Privatization	54,175.22	57,836.85	62,552.85	106,212.20	7,156	829,417	86	3.93
Pure in-house	17,792.40	17,252.34	17,283.64	15,416.58	2,500	95,798	190	
Population density (pop./km^2)	124.98	127.54	139.10	475.52	0.20	4,410.40	276	
Privatization	288.30	313.34	345.71	803.64	0.90	4,410.40	86	3.45
Pure in-house	50.27	43.44	45.57	101.70	0.20	876.30	190	
Share immigrants 65+	0.01	0.02	0.03	0.03	0	0.28	276	
Privatization	0.02	0.03	0.03	0.02	0.01	0.14	86	0.53
Pure in-house	0.01	0.02	0.03	0.03	0	0.28	190	
Higher education, share of adult pop.	0.04	0.06	0.10	0.04	0.05	0.29	276	
Privatization	0.06	0.09	0.13	0.05	0.06	0.29	86	7.94
Pure in-house	0.03	0.05	0.08	0.02	0.05	0.18	190	
Left-of-center share in local council	0.51	0.52	0.48	0.13	0.09	0.83	276	
Privatization	0.47	0.46	0.42	0.11	0.09	0.78	86	5.84
Pure in-house	0.53	0.54	0.51	0.13	0.22	0.83	190	

Notes: Population density is defined as the total population per square kilometer (km^2). Education is defined as the share of the total population with more than three years of university studies. Immigrant shares are the share of immigrants aged 65 and above, relative to the whole population in that age group. Total cost (in millions) and annual cost per resident (in 1000s) are measured at 1990 prices in Swedish kronor (SEK). The t-test is applied to the 2009 data.

Table 2
Descriptive statistics, nursing-home care, 2000–2009,[a] for all municipalities, for municipalities that partially privatize provision and for those with pure in-house production. Source: the National Board for Health and Welfare (NBHW).

Variable/Year	Mean			Std.dev.	Min	Max	# Obs	|t-test|
	1990	2000	2009	2009	2009	2009	2009	2009
Total cost for elderly care services (million SEK/year)		191.70	181.95	333.70	15.80	4596.99	282	
Privatization		401.68	297.54	501.80	44.10	2453.67	90	4.05
Pure in-house		149.94	127.09	197.57	15.80	4596.99	186	
Cost per nursing-home resident (SEK1000/year)		459.90	536.72	85.59	275.94	834.98	282	
Privatization		460.27	528.75	74.29	350.86	767.30	90	1.18
Pure in-house		460.35	541.73	90.54	275.94	834.98	186	
Nursing-home residents, share of elderly population	0.07	0.07	0.06	0.02	0.01	0.10	273	
Privatization	0.08	0.07	0.06	0.01	0.03	0.09	86	1.35
Pure in-house	0.07	0.07	0.06	0.02	0.01	0.10	190	
Share procured		0.13	0.26	0.25	0	1	86	

[a] Except nursing-home of residents, for which the period is 1990–2009.

4.1. Descriptive statistics

Table 1 provides summary statistics of socio-economic factors that will be controlled for in the empirical analysis. For simplicity, means are provided for three years: 1990, 2000 and 2009. Additional summary statistics are presented for 2009. All figures are reported for the full sample but also by type of provision: pure in-house or open to private provision.

Table 2 reports summary statistics for the total cost for nursing-home care, the cost per resident living in a nursing home, the share of the population aged 65 or more that live in nursing homes, and the share of beds procured in municipalities that have privatized.

From Table 1 we can clearly see that opening up to private provision is more prevalent in the more urban areas of Sweden. Municipalities that privatize tend to have a larger population and be more densely populated than those that have never procured. They have a more highly educated population and political preferences associated with fewer left-of-center seats in the local government (*t*-values for mean differences are provided in the table).

According to the values presented in Table 2, there are no statistically significant differences when it comes to the share of immigrants aged 65 and more in the population, average cost per resident, or the share of senior citizens living in nursing homes. The data on the share of senior citizens living in nursing homes are available for five-year age groups. The average annual cost per person is close to SEK 540,000 or, approximately, €60,000 (at the 2009 price level).

As seen in Table 2, there is a notable dispersion in the extent of privately provided care within the group that does procure at some point between 1990 and 2009, and the share of procurement clearly increased between 2000 and 2009. Furthermore, although not reported in the table, while in 2000 the highest share of procurement was 66%, we observe two municipalities with 100% external provision in 2009.

Fig. 1 shows the development of annual mortality rates for two age intervals: 60–69, and 70 and above.[21] Generally, there was a significant fall in mortality rates between 1990 and 2009 due to improved health in the population. Also, for all age groups, mortality rates tend to be markedly higher in municipalities that only have in-house production than in municipalities that privatized. Given the generally favorable socio-economic situation of municipalities that have allowed private providers, this is to be expected (i.e., a selection effect). Still, part of the difference may be a result of privatization (i.e., a causal effect). In the graphs, a municipality that begins procurement sometime between 1990 and 2009 is categorized as *privatization* in all years.

[21] Corresponding diagrams for 5-year age groups are shown in Bergman et al. (2012).

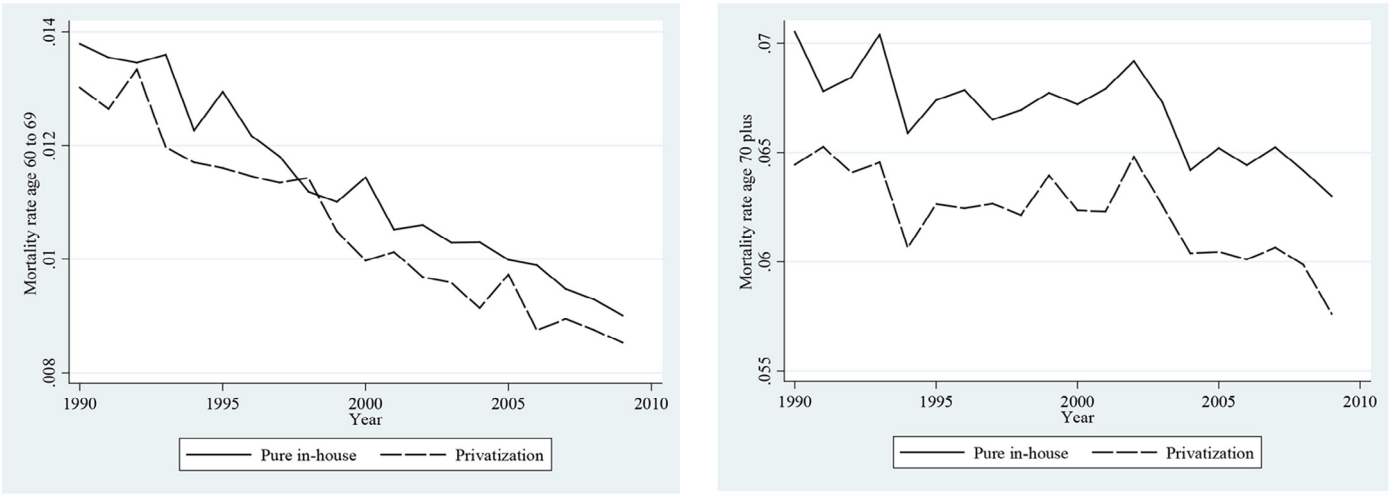

Fig. 1. Mortality rates for elderly in municipalities that have partially privatized provision and for other municipalities that did not ("pure in-house"). Left panel, 60–69 years of age, and right panel, 70 years and older.

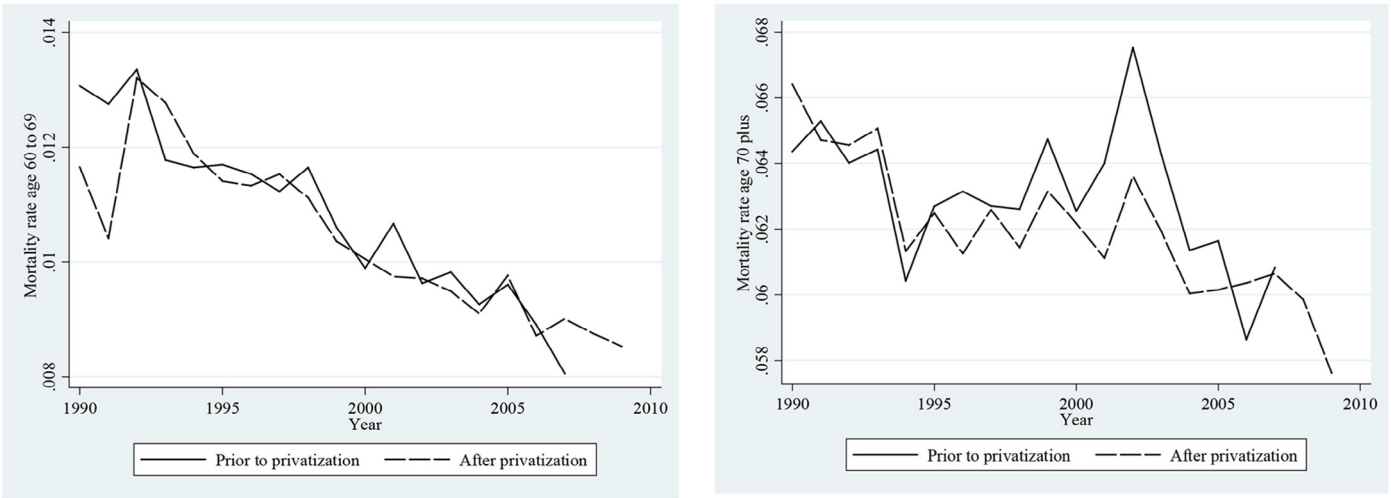

Fig. 2. Mortality rate for elderly in municipalities that shifted from pure in-house provision to privatization, prior to privatization (solid line) and after (dashed line). Left panel, 60–69 years of age, and right panel, 70 years and older.

Fig. 2 displays the average mortality rate for only those municipalities that, by 2009, had privatized the service. The solid (dashed) line represents the municipalities before (after) they opened to private provision. As mentioned, one municipality had already done so in 1990. All municipalities in our sample that eventually opened up the market during the period of study had done so by 2008; hence the line representing as yet pre-reform municipalities disappears after 2007. Visual inspection of the graphs suggests that privatization is associated with lower mortality rates, but only for the more senior age group, not for the group of 60–69 year olds.

5. Empirical approach

We identify the effect of opening elderly care services to private provision by comparing the municipality-wide changes in mortality following a shift to private provision, relative to contemporaneous changes in mortality among municipalities that maintained pure in-house provision.[22] As noted, using municipality-wide mortality rates avoids problems of selective referrals (or sorting), since fewer than two out of 1000 nursing-home residents receive elderly care outside of their home municipalities.

We use mortality as an objective and relevant measure of non-contractible quality. It is widely used as a quality indicator for medical and related services and it has the interesting property that it is observable to us, in the sense that it is amenable to econometric analysis. Furthermore and as noted, we know from direct inspection of contracts that it was not contracted upon. A likely reason is that it would be too noisy to use as a signal of quality at the nursing-home level.

The identification strategy uses shifts from pure in-house to private provision. Given the long-run positive trends in health and

[22] Sommers et al. (2012) use similar methods to assess the impact of expanded Medicaid eligibility.

resultant falling mortality rates (see Figs. 1 and 2), a simple before-and-after comparison will not yield an unbiased estimate of the effect. By using the mortality rate in municipalities with only in-house provision as a counterfactual for the mortality rate in the absence of privatization, we could potentially take these positive health trends into account in a difference-in-difference (DD) framework.

However, the regime is a choice variable for the municipality. The shift toward private provision could be due to a shock to the municipality that also had an impact on our measure of quality, i.e., the mortality rate. For example, a negative budget shock could trigger a transition to private provision *and* spending cuts that could also affect the health of the population in the municipality. This would invalidate the strict exogeneity assumption needed in a standard DD framework.

A further complication is that trends in mortality rates may differ between reforming and non-reforming municipalities. Some authors (e.g. Shkolnikov et al., 2012) have argued that the health status, and hence longevity, of the population living in more privileged areas has increased more than that of the population living in less privileged ones. Since the population in the municipalities shifting from pure in-house to private provision has a higher average socio-economic status, there is a relevant concern over diverging trends for the two groups.[23]

In order to take these potential complications into account, we use a difference-in-difference-in-difference (DDD) framework. We assume that the population below 70 years of age is not affected by the change in nursing-home provision. Under this assumption,[24] we can use those aged 60 to 69 to control for shocks and differences in trends that are correlated with the decision to procure.

We define the mortality rate M_{imt} as:

$$M_{imt} = \frac{No.\ of\ deceased_{imt}}{N_{imt}} \quad (1)$$

where $i = 1,\ldots,9$ represents age group, with each group comprising five years; $m = 1,\ldots,276$ represents municipality; $t = 1,\ldots,20$ corresponds to the period 1990–2009; and where the population size, N_{imt}, is measured at the end of year t.

The identifying assumption of our DDD framework is that in the absence of an effect from the introduction of private provision, the time pattern of the differences in mortality rates of those older than 69 against those younger than 70 for the municipalities that privatized should match that of municipalities that did not. In other words, the differences in differences should be zero in the absence of an effect from privatization.[25] While we cannot test this assumption directly, we can get an idea of whether the assumption is valid by comparing i) the difference in mortality rates between the group younger than 70 and those older than 69 in the years prior to the introduction of privatization with ii) a similar difference in mortality rates for those that have not (yet) allowed private provision of elderly care services. The result from this exercise is seen in the scatter plot displayed in Fig. 3.

Fig. 3. The mean difference in mortality rates between those older than 69 and those younger than 70, for the municipalities that have partially privatized provision at time 0 and for those that did not (yet) reform. The lines are estimated using LOESS with one degree of freedom.

There are two reasons for why this is a reasonable specification. From the age of 40 at least until the age of 90, the logarithm of mortality in general rises more or less linearly with age. For example, the annual mortality rate is approximately 1% at the age of 63 (68) and approximately 10% at the age 84 (87) for Swedish men (women).

From the scatter-plot smoother we can see that there are very small differences between the two groups. The mortality rates of the over 69 year olds are around 5.7 (5.4) percentage points higher at the beginning of the period and 5.4 (5.2) percentage points higher at the end of the period than they are for the younger age group for municipalities with private provision (pure in-house production). Given the small differences in levels, any functional-form assumption in a regression model used in the estimation should not be influential for the inferences.

We also cannot see any sharp difference in the year just before opening to private provision, which supports the strict exogeneity assumption. Fig. 4 provides a scatter-plot smoother for the difference between the two curves in Fig. 3, with the 95% confidence interval indicated. Importantly, we can see that by taking the difference, the decreasing trend in mortality is removed; the difference in mortality rates is basically flat. Overall, we conclude that the difference in levels is small and not statistically significant.

5.1. Analysis

Let P_{mt} be a step function that takes value 0 until the time municipality m shifts to privatization, and 1 afterward. Furthermore, let $I_{imt} = 1$ if the age group is above 69 years of age. The following model forms the basis for our analysis:

$$\mathrm{Ln}(M_{imt}) = \alpha_0 + \alpha_m + \alpha_t + \alpha_i + \beta_0 P_{mt} + \beta_1 P_{mt} I_{imt} + \beta_2 X_{mt} + u_{imt}, \quad (2)$$

Here α_m, α_t and α_i are municipal, calendar time and age group fixed effects, respectively, while u_{imt} is the error term. The parameter of interest is β_1. The ordinary least-squares (OLS) estimator of β_1 will, under the assumption of strict exogeneity, be an unbiased estimate of the effect of privatization.

[23] If we use a DD model in the estimation, given diverging trends in mortality, the estimates could be downward biased, i.e. we could find a negative effect even though there is no effect from the privatization. In a DD model with fixed year effects we would use the within-municipal variation in mortality (i.e. before–after). However, the problem with this approach is that would not be able to control for the fact that the timing of privatization is endogenous. If the timing were due to a budget deficit the DD estimate could be biased upward, i.e. the estimate could be positive even though there is no effect from privatization.

[24] Note that if the population below 70 is affected, but less so than older cohorts, the analysis below provides a lower bound of the effect.

[25] As explained in detail below we believe it is reasonable to assume a potential effect on mortality to be proportional to the baseline for all age groups. This means that the DDD model is specified in logs rather than levels. The maintained identification assumption is then that improvements in mortality in the old elderly are proportional to, rather than equal to, improvements in mortality in the young elderly. We have, however, estimated models both in logs and levels and the results are robust to model specification.

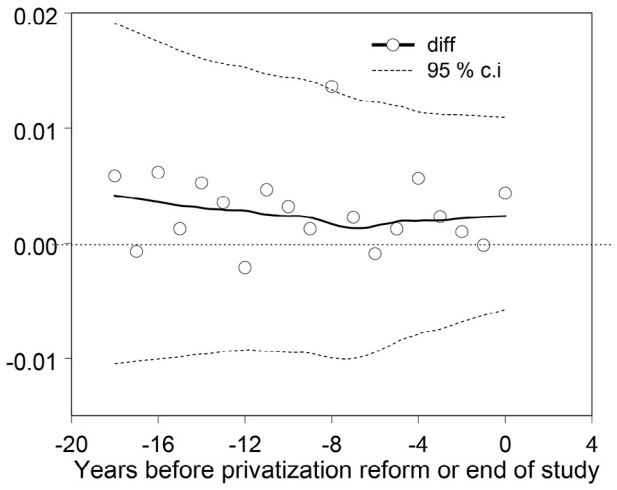

Fig. 4. The mean difference in mortality rates between those older than 69 and those younger than 70 for the municipalities that have partially privatized provision at time 0 against the corresponding mean difference of those that did not (yet) reform. The lines are estimated using LOESS with one degree of freedom.

Note also that the shift, P_{mt}, takes place at different time periods and not, as in traditional DD and DDD models, at the same time period for all of the treated groups. The primary advantage is that the inference from our model is less susceptible to common shocks, which may plague the traditional DD and DDD models (Bertrand et al., 2004).

Our specification implies equal proportional effects on the mortality rate for all age groups affected by privatization. There are two reasons for why this is a reasonable specification. From the age of 40 at least until the age of 90, the logarithm of mortality in general rises more or less linearly with age. For example, the annual mortality rate is approximately 1% at the age of 63 (68) and approximately 10% at the age 84 (87) for Swedish men (women).[26] For this reason we prefer a logarithmic model in the estimation of the effect of privatization.[27] The second reason is that the share of each age group that lives in nursing homes is highly correlated ($\rho > 0.99$) with the per-age-group average mortality rate.

We include in X_{mt} the population density, the share of the population with more than three years of university studies, the share of immigrants aged over 64 and, finally, the share of the seats on the local council held by left-of-center parties. The inclusion of socio-economic factors is motivated by, for example, Gallo et al. (2000) and Shkolnikov et al. (2012). The former find that the job-market situation has a negative and significant effect on physical and mental health, after controlling for other socio-economic factors, while Shkolnikov et al. (2012) find evidence of increased differences in mortality rates between population groups with different levels of education. The job-market situation is not included in our model, however, because it is only available from 1993 onward. Also, education and employment are highly correlated (0.45) and education and average income are also highly correlated (0.89). The correlation between average employment and average income is 0.61.

The main advantage with the model specification (2) is that, given the graphs displayed in Figs. 2 and 3, it is transparent with respect to the identification strategy. In order to test the model specification we estimate a model in which – in addition to the three main fixed effects – we also control for all three second-order interactions. This specification allows for more flexible control of potential differences-in-difference in trends across municipalities with pure in-house production and those that open to private provision. To this end, we specify and estimate the following model:

$$\mathrm{Ln}(M_{imt}) = \alpha_0 + \alpha_t + \alpha_i + \alpha_p + \alpha_{pt} + \alpha_{it} + \alpha_{ip} + \beta_1 P_{mt} I_{imt} + u_{imt} \quad (3)$$

Here sub index $p = 1$ if a municipality ever privatized and $p = 0$ otherwise, where $\alpha_p, \alpha_{pt}, \alpha_{it}$, and α_{ip} are privatizing-municipality, privatizing-municipality-by-time, age-by-time and age-by-privatizing-municipality fixed effects, respectively. Note that this specification is a complement to the specification in (2). In (3) the focus is on "non-parametric" control for differences over time between municipalities with pure in-house production and those that, at some point, privatize. Unfortunately data here do not allow for the municipal fixed effects and time varying municipal covariates that we used to control for potential difference in trends across municipalities in (2).

Table 3
Estimation results of effects of privatization on (log) mortality (DDD).

	(1)	(2)	(3)	(4)
Estimate	−0.006	−0.013**	−0.016***	−0.016***
	(0.007)	(0.006)	(0.006)	(0.006)
Age-group fixed effects	Yes	Yes	Yes	Yes
Municipal fixed effects		Yes	Yes	Yes
Calendar-time fixed effects			Yes	Yes
Control variables				Yes

Notes: Estimation of the model displayed in equation (2) is performed with weighted least squares (WLS) using the size of the population as weights. Standard errors, displayed within parentheses, are estimated by clustering at the municipality level. Control variables are the population density, education, the employment rate, and the share of immigrants aged 65 and above.
*p < 0.1, **p < 0.05, ***p < 0.001.

6. Results

In this section, we first present results for mortality (DDD model) and then for costs (DD model).

6.1. Mortality

Expressions (2) and (3) specify the models used in the estimation of the effects of privatization on mortality over the period 1990 to 2009.[28] Estimation of models (2) and (3) is performed with weighted least squares (WLS). The (square root of the) population size is the natural weight as each individual living in Sweden should have the same weight. An analysis without weights would give more weight to individuals living in smaller municipalities. Inference is performed with standard errors that are estimated under the assumption of within-municipality level correlations (i.e. within-municipality clustered standard errors).

The results from the estimation of model (2) with different sets of controls are displayed in Table 3. In column (1) we only control for age. Column (2) gives the result when we add municipal fixed effects and in column (3) we additionally control for calendar time. Column (4) provides the results from the full model given in Equation (2).

From column (1) of this table we can see that when we do not control for the municipality, the estimate is small and statistically insignificant. The results from the specifications in columns

[26] SCB, see: www.scb.se/statistik/_publikationer/BE0701_1986I03_BR_BE51ST0404.pdf.
[27] As a sensitivity analysis we also estimated models with mortality rates in levels; as expected given the graphs displayed in Fig. 2, the results are robust to this change in specification.
[28] Due to lack of data on the employment rate for the first three years, a shorter panel is used when municipal control variables are included.

Table 4
Estimation results of the effects of privatization on (log) mortality (DDD).

	(1)	(2)	(3)
Estimate	–0.023***	–0.015***	–0.019***
	(0.004)	(0.004)	(0.005)
Age, municipal, time fixed effects	Yes	Yes	Yes
Age-by-year fixed effects	Yes	Yes	Yes
Age-by-privatization municipality fixed effects		Yes	Yes
Privatization-by-year fixed effects			Yes

Notes: Estimation is performed with weighted least squares (WLS) using the size of the population as weights. Standard errors are displayed within parentheses. They are estimated by clustering at the municipality level.
*p < 0.1, **p < 0.05, ***p < 0.001.

Table 5
Results from the regression of privatization on (log) cost per resident living in nursing homes (DD).

	(1)	(2)	(3)
Estimate	0.105**	–0.019*	–0.017*
	(0.011)	(0.007)	(0.007)
Municipal fixed effects	Yes	Yes	Yes
Calendar-time fixed effects		Yes	Yes
Control variables			Yes

Notes: Estimation is performed with OLS. Standard errors are displayed within parenthesis. Control variables are share of seats held by left-wing parties in the local council, share of population with more than three years of university education and share of immigrants among the population aged 65 or more.
* p < 0.1, **p < 0.05, ***p < 0.001.

(2)–(4), however, are all statistically significant and of the same magnitude. The point estimates with and without control variables are virtually the same and suggest that allowing private providers to compete for contracts would reduce the mortality rate by 1.7%. That the effect is similar with and without control variables suggests that selection based on unobservables should not be a problem in our analysis (cf. Altonji et al., 2005).

As a sensitivity analysis we have also estimated model (3), which provides us with more flexible control for potential differences in mortality trends between municipalities that are related to socio-economic factors. The results are displayed in Table 4. In addition to the fixed effects, we have successively added second-order interaction terms. In column (1) we have added age-by-year effects, column (2) includes age-by-privatization fixed effects and, finally, column (3) presents the results from the fully specified model (3).

The results are once again very stable and also very close to the results displayed in Table 3. The results from the preferred model (column 3) suggest that the introduction of private provision would reduce the mortality rate by 1.6%.

We have found that the opening of elderly care services to private provision results in a reduction of the mortality rate by about 1.6% in the affected population. The question, then, is how this effect should be interpreted. In the relevant age groups, only around one person out of nine lives in a nursing home, and the average spell in a nursing home is around two years. Under the simplifying assumption of no time dependence, this means a yearly death hazard of 50%. Then, under the assumption that all of the effect stems from increased health among those living in nursing homes, we get a reduction in hazard rates from 50% to 48.3%. This means that a reform that introduces private provision and competition increases longevity from 2 to around 1/0.483, corresponding to an average increase in longevity of around 4 weeks.

6.2. Costs

We have also estimated the effect of the reform on the costs for municipalities. As explained in the data section, this variable is only available from 2000. We treat the costs per person living in an elderly home as the dependent variable. The primary reason for using this variable instead of the total cost is that the observed change in quality from privatization affects the demand for elderly care services, which in itself has a direct effect on total cost (more weeks in elderly care). As a sensitivity analysis, however, we also estimated the effect on total cost. In this analysis the unit of interest is the municipality and we therefore estimate the effects on the (log) cost using the municipal fixed-effect ordinary least squares (OLS) estimator. In this analysis we cannot control for shocks causing municipalities to privatize or not, which the DDD design allowed for. Instead a DD design is used. The results on cost should therefore be seen as complementing the above analysis on mortality by only providing suggestive evidence of effects on cost.

The results from the estimation are displayed in Table 5. From this table we can clearly see that when we control for calendar-time fixed effects, the effect of competition decreases the cost per resident. This result is stable when we add control variables to the regressions.

In Table 6 the corresponding results in which we regress the shift on log total cost are displayed. From this table we can see an initial increase in total cost, but this effect disappears when controls are added.

6.3. Summing up

Taking the effect on mortality also into account, our results indicate that opening of nursing-home care for the elderly to competitive private provision – at least to some extent – increases quality, while at the same time decreasing the cost per resident. The shift has no effect on the total cost of elderly care services. The effect on the per-person total cost is most likely outweighed by a relative increase in time spent living in nursing homes.

7. Discussion and conclusions

Somewhat contrary to our expectations, we find evidence suggesting that non-contractible quality – as measured by (inverse) mortality rates – increases with a shift to private, competitive provision. We arrive at our results after controlling for municipality characteristics, year effects and socio-economic factors using a difference-in-difference-in-difference approach. This means that we can control for differences in levels between municipalities, for common time trends, and also for municipal-specific trends – to the extent that different age groups in relative terms follow the same trends within a municipality. Furthermore, since our study is based

Table 6
Results from the regression of privatization on (log) total cost (DD).

	(1)	(2)	(3)
Estimate	0.018	0.014	–0.008
	(0.007)	(0.007)	(0.007)
Municipal fixed effects	Yes	Yes	Yes
Calendar-time fixed effects		Yes	Yes
Control variables			Yes

Note: Estimation is performed with OLS. Standard errors are displayed within parentheses. Control variables are share of seats held by left-wing parties in the local council, share of population with more than three years of university education and share of immigrants among the population aged 65 or more.
* < p < 0.1, **p < 0.05, ***p < 0.001.

on municipal-level data, we avoid bias due to selection effects at the nursing-home level.

Municipalities that begin to privatize elderly-care services experience a reduction in mortality rates and these improvements are concentrated in the age groups where nursing-home residency is common. Per-capita costs did not go up, so we can conclude that, in Sweden, the privatization of elderly care services has increased a form of non-contractible quality (reduced mortality rates) while simultaneously reducing costs per resident. A simple explanation for these results, consistent with Hart et al. (1997), is that, even in this industry, efficiency gains dominated cost-cutting incentives when production was partially transferred to private suppliers. A non-exclusive explanation is that it was the increase in competition associated with privatization that improved quality of service, for example by triggering improvements in management practices and the ousting of under-performing managers.

As mentioned earlier, during most of the study period the public procurement rules were rather liberal in Sweden, in the sense that the buyer had a relatively high degree of discretion in the selection of contractors. This may also have allowed buyers to maintain quality through informal reputational threats ("the shadow of the future").[29] The fact that procured elderly care expanded rapidly during this period may have further boosted the importance of future sales relative to current profitability. It will be interesting to see if our result holds up in a few years, under the EU's revised and stricter rules aimed at limiting discretion and encouraging cross-border entry, and when the market has left the first expansionary phase.

Appendix: Supplementary material

Supplementary data to this article can be found online at doi:10.1016/j.jhealeco.2016.06.010.

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[29] This explanation would match well Bandiera et al.'s (2009) finding that in Italy, the more autonomous is the purchasing body (the more discretion it enjoys), the better is its procurement performance, both in terms of higher value for money and of lower corruption.

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