When Does Privatization Reduce Costs and Improve Quality? Theory and Evidence from Service Contracting*

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Abstract

I develop and test a model of service contracting in residential youth care. Private facilities have an incentive to prolong treatment periods and to cut costs, whereas public facilities have an incentive to get rid of the most troublesome teenagers. Since quality is hard to measure, providing a private facility with strong incentives for quality implies that the owner must bear risk, raising the price for high levels of quality. The empirical results support the model's predictions. Private facilities have lower per-day cost of treatment for low levels of quality, but higher per-day cost for high levels of quality. Though public facilities generally have a higher level of quality, the most troublesome teenagers have a lower probability of treatment breakdown in private facilities. Finally, treatment periods are much longer in private facilities, implying that total cost of treatment is twice as high in the private sector. There are no significant differences between private and public provision in teenagers' post-treatment outcomes once non-random selection of teenagers is controlled for. Cost-benefit analysis suggests that public provision is superior to private provision due to its lower total costs.

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1 Introduction

Many services that have traditionally been produced by governments are to an increasing extent provided by private firms. Some of the more controversial cases are prisons, juvenile correctional facilities and hospital care. The standard view in the theoretical literature on privatization is that ownership matters because contracts are incomplete (Sappington and Stiglitz, 1987; Schmidt, 1996; Hart, Shleifer and Vishny, 1997; Shleifer, 1998). As every potential contingency cannot be included in a contract, the residual control rights conferred by ownership matters. The government has a stronger bargaining position toward the managers of public firms than owners of private firms. This implies that its is hard to provide managers of public firms with strong incentives to improve efficiency. On the other hand, private firms' stronger incentives to cut costs may imply that they ignore aspects of quality which are hard to specify in a contract. As a result, economic theory predicts that private provision will save costs, but that this may come at a loss in allocative efficiency.

In this paper, I study privatization of residential youth care in Sweden. As residual claimants, owners have strong incentives both to increase revenue by filling their treatment places and to cut costs. Public facility managers receive a fixed wage and have no financial incentives to attract or keep teenagers at their facility, nor to reduce costs. I develop a model of residential youth care based on the multi-task framework by Holmström and Milgrom (1991) that builds on these basic insights. The predictions of the model differ from the standard view in the privatization literature in a number of respects.

First, it might be costly to provide owners of private facilities with strong incentives to improve quality. Private facilities have incentives to invest in quality primarily because the higher is quality, the more able are facilities to fill their treatment places. Yet the ability to fill treatment places depend on outcomes that only partly reflect the facilities effort on quality. This implies that owners of private facilities are exposed to risk. Managers of public facilities receive a fixed a fixed wage regardless of outcomes and are not exposed to risk. The cost of risk is larger the more important is quality for the ability to attract and keep teenagers. As a result, the model predicts that private facilities will be cheaper for low levels of quality, but might be more expensive for high levels of quality. In addition, as contracts on quality are incomplete, a municipality may have to give a private facility rents in order to obtain a certain level of quality. By increasing the price of treatment,

teenagers become more valuable to private facilities, which increases their incentives to provide a high level of quality.

Second, managers of public facilities have an incentive to get rid of the most troublesome teenagers. In contrast, owners of a private facilities have incentives also to treat troublesome teenagers. Hence, differences in task attractiveness may eliminate the advantage of allocative efficiency under public provision.

Third, private firms' stronger incentive to fill their treatment places implies that they should try to prolong treatment periods. If facilities have private information on treatment progress and the social services that place teenagers at facilities are unwilling to stop treatment prematurely, we would expect a longer duration of treatment in private facilities.

The model's predictions are tested on a data set of Swedish teenagers placed in residential youth care in 1991. The data set contains extensive information on the teenagers' treatment history, family background and diagnosed problems such as violent behavior or drug addiction. This is important as it allows me to control for nonrandom selection of teenagers into facilities based on these characteristics.

I use personnel density as a measure of effort on quality to test the hypothesis that private facilities are cheaper for low levels of quality, but more expensive for high levels of quality. As expected, private facilities have lower per-day cost of treatment for low levels of personnel density, but higher per-day cost for high levels of personnel density.

There are several indications that private facilities put less effort on quality than public facilities. Private facilities have significantly lower personnel density, engage in less ambitious treatment programs and have a personnel force with a comparably low level of education. Moreover, the frequency of treatment breakdowns is higher in private facilities. However, for teenagers with severe problems, the risk of a treatment breakdown is higher in public facilities than in private facilities. While teenagers with violent behavior experience almost the same probability of treatment breakdown as non-violent teenagers in private facilities, the breakdown frequency for violent teenagers is three times that of non-violent teenagers in public facilities.

I find evidence of a strong positive effect of privatization on the duration of treatment. On average, duration of treatment in private facilities is twice that in public facilities. As the average per-day cost of treatment is only ten percent lower in private facilities, this implies that the total cost of treatment in private provision is almost double that of

public facilities.

Finally, I use data on post-treatment outcomes at the age of 25 to evaluate the long-term effects of youth care. Controlling for teenager characteristics, there are no significant differences between teenagers treated at private or public facilities in terms of criminal record, economic self-reliance and educational attainment. This suggests that the longer duration of treament in private facilities compensates for the lower level of quality. Yet as post-treatment outcomes are similar, but total cost is twice as high under private provision, cost-benefit analysis strongly suggests that public provision of youth care is superior for most teenagers.

The most extensive previous study on privatization of residential youth care is the paper by Bayer and Pozen (2005) on juvenile correctional facilities in Florida. Their results are similar to this paper. Using the recidivism rate of young offenders as their measure of quality, they find that private for-profit facilities have both significantly lower quality and costs than private non-profit and state-owned facilities, whereas county-owned facilities had both lower costs and higher quality than private for-profit facilities. Moreover, they find that juvenile offenders in private for-profit facilities had more severe problems than those in public facilities and that the duration of treatment was significantly longer in private facilities. Interestingly, they also report a result which supports the view that public facilities may shun troublesome teenagers: individuals serving especially long sentences have lower recidivism rates when released from a for-profit facility.[1]

The rest of the paper is structured as follows. I describe the market for residential youth care in Sweden in the next section. The model is presented in Section 3 and its predictions discussed in Section 4. I discuss the data in Section 5 and the selection of teenagers into facilities in Section 6. Section 7 discusses the empirical strategy and the results are presented in Section 8. Section 9 concludes the paper.

[1] In a study on English children's homes, Gibbs and Sinclair (1998) found that residents in private homes were more "difficult" than those in public homes, but the result on quality was ambigous and they did not consider cost. Moreover, there were only eight private homes in their sample, making it difficult to draw any strong conclusions from their study. At the time of their study (1996), there were 202 registered private children's homes in England.

2 Residential youth care in Sweden

Residential care is the most comprehensive measure for youth at risk which the Swedish social services can undertake. In November 2000, about 3,300 Swedish children and teenagers were staying in approximately 500 facilities.[2] The reasons for placement vary, as does the age of the children, but most are teenagers with problems at home, drug addiction, a criminal record or violent behavior. There are two different types of residential youth care facilities in Sweden. The first type, *§12-homes,* are all publicly owned and mainly used for youth convicted for violent crimes. In this study, I focus only on the other kind of facility, *HVB-homes*, which has less security and a high degree of privatization. In general, the children in HVB-homes have a less heavy criminal record than those in §12-homes.

In the early 20th century, most residential facilities in Sweden were managed and financed by private organizations, with little involvement from the government. This changed with the rise of the welfare state in the 1950's and 1960's, and in 1980 only four percent of residential facilities were privately owned.[3] In 1982, a new law made it possible for private firms to run HVB-homes. The share of private facilities increased steadily during the 1980's and 1990's, along with an overall increase in the demand for residential youth care. In the year 2000, more than 2,000 children lived in a privately owned HVB-home, whereas slightly less than 800 lived in a publicly owned HVB-home.[4] Although there are some formal requirements to be fulfilled when setting up a facility, entry barriers seem to be relatively low (an observation that supports this assumption is the low level of education among employees in private facilities).[5]

The responsibility to act when children experience some kind of social problem lies at the municipality level, the lowest tier in Swedish government. It is the municipality social service that acts as buyer in the market for residential youth care. Though each placement must be confirmed by a policitical committee, the decisions are prepared and implemented by social welfare secretaries, employed by the municipality. At the seller side, public facilities are managed both by municipalities and county administrative boards

[2]Swedish National Audit Office (2002) and National Board of Health and Welfare (NBHW), 2001. [SoS-rapport (2001:8)].

[3]Sallnäs (2000).

[4]National Board of Health and Welfare (NBHW), (2001). [SoS-rapport (2001:8)].

[5]Swedish National Audit Office (2002).

(CAB), whereas private facilities are run both by firms and non-profit organizations, such as church communions. In principle, a municipality that desires publicly provided youth care can thus either set up its own facility, or buy care from another municipality or CAB. In practice, trade across municipalities and CABs is quite limited: In my data, 93.3 % of placements in a municipality facility were done by the municipality owning the facility and 91.5 % of placements in a CAB facility were done by a municipality within the same county. When trade does occur, "outside" municipalities seem to be offered the same price as "insiders".

To get a notion of the social services' working practices, I conducted interviews with social welfare secretaries from nine different municipalities during 2005. Several concerns limit the set of available treatment options for a particular teenager. First, the facility's treatment program should fit the needs of the teenager. Second, the social services might be concerned that the distance between the facility and the teenager's home should either be sufficiently long (reduces risk of recidivism and escape) or short (cheaper to monitor the facility and easier to intergrate a teenager back to a normal life in his or her home environment). Third, social services are often unwilling to place teenagers that already know each other in the same facility as this might make it harder for a teenager to break with destructive behavior. In addition, as residential youth care is the most far-reaching and expensive intervention for youth at risk, the social services often abstain from undertaking it until other options have been exhausted. This implies that decisions about residential youth care often have to be taken in a rush. Moreover, information on available facilities and existing treatment options is often scarce. This is particular problem for small municipalities that place few teenagers.[6] According to Sallnäs (2005), 87 percent of 97 interviewed private facility managers thought that the municipalities' previous experiences of their own facility were the most important factor by which they learned about the facilities. In the absence of personal experience, references are typically collected from other municipalities.

There is no standardized contracting procedure between buyers and sellers in the market for residential youth care, and it is up to the municipality and facility to negotiate the contractual terms.[7] However, Swedish law limits the set of tasks that a municipality

[6] A quote from the interviews illustrates this point: "In our municipality, one teenager may get a serious problem of drug addiction every five years or so. Then we have to learn everything about the market for residential youth care all over again."

[7] In connection to the interviews, I was able to study a number of actual contracts. It is uncertain

could contract out. For example, it is not possible for a municipality to let a private facility take final responsibility for the treatment. A "standard" contract stipulates what kind of treatment the teenager is should undergo and how it is supposed to be documented, how contacts between the social services and the facility should proceed, the price of treatment and period of notice. Facilities are typically compensated per day of treatment. The treatment fee is negotiated between buyer and seller. Most contracts entail few direct incentives for quality provision.[8] In case of public provision, facilities are run by an employed manager. Public facilities can be separate legal entities (i.e., firms) or separate units within the municipality organization. To the best of my knowledge, managers of public facilities all get a fixed salary and there are no public managers with explicit incentive contracts. At a direct question, most interviewed social secretaries stated that the main difference between private and public youth care facilities was the private facilities' stronger incentive to fill their treatment places.

Why do not municipalities and facilities sign explicit contracts on quality? One reason for this is that many aspects of residential care are inherently difficult to quantify and might even be subject to secrecy (an example is therapy). Moreover, there is considerable ambiguity as to exactly what constitutes good youth care; there is an abundance of different theories on how problematic teenagers should best be treated, with relatively little agreement on basic principles (Sallnäs 2000).[9],[10] In addition, facilities are typically situated at some distance from the municipality center, increasing the cost of monitoring. Another difficulty stressed by several of the interviewed social welfare secretaries is that treatment quality is highly sensitive to changes in the personnel force.[11]

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how accurate these contracts are as indicators of a typical contract in 1991, the year the teenagers in our data set were first placed in residential youth care. However, virtually all of the interviewed social welfare secretaries said that contracting procedures have become more rigorous since the early 1990's. As a concrete example of this, many social welfare secretaries mentioned that the period of notice is shorter today than in the early 1990's. Another example is that the municipalities since January 1st 2002 are required by Swedish law to establish a plan for the treatment which has to be signed by the municipality, the teenager's parents and the facility. In this way, the state is thus forcing the municipalities to sign more explicit and elaborate contracts.

[8] However, some contracts stipulate a direct cut in treatment fees should the teenager run away or the facility not undertake the treatment stated in the contract.

[9] See Andreassen (2003) for a survey of the research on youth care.

[10] A common view expressed both in the literature (e.g. Sallnäs 2000) and in the interviews is that *which* method is used is not as important as the fact that *some* method is used. In the words of one of the interviewed social secretaries: "The personnel of the facility need something to hold on to. A theory can provide that."

[11] One of the interviewed social welfare secretaries said that: "It takes a long time to get to know

However, there are also indications that the social services put little effort into writing contracts and monitoring facility performance. According to Sallnäs (2005), 60 percent of 97 interviewed managers at private facilities said that the social services "rarely" or "never" asked for evaluations or follow-ups of treatment quality when placing a teenager at the facility. The Swedish National Audit Office (2002) argues that the municipalities' and CABs' lack of adequate follow-up and monitoring of quality is a major problem of Swedish residential youth care. In a extensive survey of the research on youth care, Andreassen (2003) conclude that a large fraction of residential youth care is not undertaken according to the established principles of effective treatment.

One explanation for the low emphasis put on monitoring facility performance is that municipality bureaucrats have weak incentives. Alternatively, some social workers might not believe that explicit contracts and monitoring visists are important. Few social workers have received training in economics or business administration and the literature on youth care in Sweden does not contain much discussion about incentives and contracts. Social workers have to learn about good contracting procedures by experience, but since many municipalities are small and place few teenagers, this takes a long period of time. During the interviews, many of the social welfare secretaries emphasized that they follow up their placements more closely today than in the early 1990's, partly because the law now obliges them to do so and partly because of an increase in experience and professionalism.

3 Model

In this section, I develop a model of residential youth care based on the multi-tasking model by Holmström and Milgrom (1991). The purpose of this model is to derive testable predictions on the behavior of different facility management types. The basic intuition can be summarized as follows: Private facilities are more able to fill their treatment places the higher is the level of quality. Because prices are above marginal cost, teenagers are valuable to private facilities, and owners of private facilities are willing to put effort on quality, treat particularly troublesome teenagers and lie to the social services about

a facility, and once you do it's not the same anymore." The same social secretary also said that they deliberately choose to work with few facilities in order to get more accurate information, thereby sacrificing a larger set of treatment options.

treatment progress to be able to fill their treatment places. As residual claimants, they also have strong incentives to cut costs. In contrast, managers of public facilities have no financial incentives whatsoever. Therefore, their primary concern is not to have to treat the most troublesome cases.

The model's most basic assumption is thus that facilities cannot costlessly replace teenagers. In the model, facilities treat one teenager one time and then the world ends. Owners of private facilities maximize the profits from that single teenager, whereas managers of public facilities minimize their cost of effort.

Consider a municipality that must buy residential youth care for a certain teenager. Let the severity of a teenager's problem be indexed by u, where higher u implies a more troublesome teenager. The agent is a manager in case youth care is organized in-house or an owner of a private facility. The agent can invest effort in three different tasks. The first task (t_q) improves treatment quality and the second (t_c) reduces its costs. The third task (t_u) is to give particular care to troublesome teenagers, i.e., those for which $u > 0$. The effect of each investment lasts the entire treatment period.

The three tasks differ in their inherent attractiveness. Engagement in cost reductions and quality improvements entails a cost $C(t)$ for the service provider, where $t = t_q + t_c$. The cost function, $C(t)$, is strictly convex, twice continuously differentiable and minimized at $t^* > 0$, i.e., people are assumed to exert some effort even in the absence of financial incentives. In contrast, treating troublesome teenagers entails a cost $D(t_u)$, where $D'(0) > 0$.

The outcome of the cost reducing task is certain, but effort on cost reductions is not observable to the social services. The cost reduction is given by a function $S(t_c)$ which is increasing, strictly concave and twice continuously differentiable in t_c. Total cost is thus decreasing in $S(t_c)$.

For each teenager, the social service believes that there is a certain optimal duration of treatment, T^*. For all $t \leq T^*$, every day spent at the facility gives a benefit $B(t_q, \psi)$ which is increasing and strictly concave in t_q for $\psi > 0$. The parameter ψ thus denotes the public agency's valuation of youth care quality. The benefit from an additional day at $t > T^*$ is equal to zero. Let p denote the per day cost of treatment and T the total

duration of treatment. The total (perceived) surplus from treatment is then given by

$$\begin{aligned} (B(t_q, \psi) - p) T \text{ for } T &\leq T^* \\ (B(t_q, \psi) - p) T^* - p(T - T^*) \text{ for } T &> T^* \end{aligned}$$

It is clear that the optimal solution to this problem is $T = 0$ if $B(t_q, \psi) < p$ and $T = T^*$ if $B(t_q, \psi) > p$.

What determines T^*? Let the social services pre-treatment expected optimal duration of treatment be denoted by β. However, the social service's perception of T^* is updated during the course of a placement. Specifically, I assume that the social service receives a noisy signal of the agent's effort on service quality, $q = t_q + \varepsilon$ where $\varepsilon \sim N(0, \sigma_\varepsilon^2)$. If the signal is below the expected level of quality, the social services shorten the duration of treatment. If the signal is higher than the expected level of quality, the social services prolong treatment. Let α_1 denote the extent to which municipalities react to the quality signal. That is, T^* is a function of $\alpha_1 (q - E(q))$.[12]

In addition, facilities obtain a private signal $S \in \{-1, 0, 1\}$ on the optimal duration of treatment. $S = -1$ implies that treatment should be shortened by γ days and $S = 1$ that treatment should be prolonged $\gamma > 0$ days. Facilities in turn send a signal $I \in \{-1, 0, 1\}$ with the same interpretation as S to the social services. The social services have a symmetric prior distribution on S. The social services perception of optimal duration of treatment is then given by

$$T^* = \alpha (q - E(q)) + \beta + \gamma E[S \,|I, \text{Ownership}].$$

Treatment can also break down for reasons not controlled by the municipality. For example, the teenager might run away from the facility. I assume that the risk of treatment breakdown is decreasing in quality. I incorporate this in the model by letting the actual

[12] I thus separate the municipalties' willingness to pay for quality (ψ), and its reaction to low (or high) levels of quality (which is given by α_1). A motivation for this assumption is that reacting to observed quality requires effort on the social secretary's behalf (for example, if q is low the social welfare secretary may have to find another treatment place for the teenager in question). If the social secretary care for quality subject to the constraint that he doesn't have to work hard, α_1 may be low while ψ is high. Another argument for separating ψ from α_1 is that the willingness to pay for quality is limited by the social services budget, which is decided upon by politicians, whereas actions are taken by employed bureaucrats. Hence, whereas the politicians' preferences determine ψ, it is the social welfare secretary's preferences that determine α.

duration of treatment, T, be an increasing function of $\alpha_2 q$, where α_2 is a constant strictly larger than zero.[13] Treatment breakdown is a particular problem for the most troublesome teenagers. However, facilities could alleviate this problem by giving escape-prone teenagers extra attention. Let u denote the severity of a particular teenagers problems and t_u the facility's effort to cater to his particular needs. I assume that troublesome teenagers have their duration of treatment shorthened by $(u - t_u)$ days. To keep the model simple, I ignore uncertainty in this case. The actual duration of treatment, T, is then given by

$$\begin{aligned} T &= T^* + \alpha_2 q + \min\{t_u - u, 0\} \\ &= \alpha_1 (q - E(q)) + \beta + \gamma E[S|I, \text{Ownership}] + \alpha_2 q + \min\{t_u - u, 0\}. \end{aligned}$$

The service provider's utility is defined as $u(x) = -e^{-rx}$, where r is a measure of risk aversion and x is the financial return minus the cost of effort. I assume that $r > 0$, which implies that the agent is risk averse.

There are only two contractual parameters in the model: the share of profits that befalls the agent, $\lambda \in [0, 1]$, and the price of treatment p. I assume that the social service cannot commit to the duration of treatment, nor sign contracts with explicit incentives for quality provision or cost reductions. The facility's total revenue from a particular teenager is pT. Since p fixed at the starting day of treatment, T determines revenue once treatment has started.

We get $x = \lambda[pT + S(t_c)] - C(t) - D(t_u)$ and the manager/owner's expected utility is

$$E\{u[\lambda[pT + S(t_c)] - C(t) - D(t_u)]\} = u(CE),$$

where CE is the certainty equivalent. Let $\alpha = \alpha_1 + \alpha_2$. Solving for CE, we get

$$\begin{aligned} CE &= \lambda\left[p[\alpha t_q - \alpha_1 E(q) + \min\{t_u - u, 0\} + \gamma E[S|I, \text{Ownership}] + \beta] + S(t_c) - \frac{1}{2} r \sigma_\varepsilon^2 (p\alpha)^2\right] \\ &\quad - C(t) - D(t_u), \end{aligned}$$

[13] This formulation implies that should have T censored at T^* whenever $T > T^*$. To simplify the model, I disregard censoring and allow that $T > T^*$. One way to motivate this assumption is that there might be extra benefits from being far away from the point where treatment breaks down. An example would be obtaining a reputation for high levels of quality.

where $\frac{1}{2}r\sigma_{\varepsilon}^{2}\left(p\alpha\right)^{2}$ is the agent's risk premium. I refer to the product $r\sigma_{\varepsilon}^{2}$ as the cost of risk. The agent's outside option is normalized to zero, implying that the participation constraint is $CE \geq 0$.

In this model, the difference between public and private provision is that the owner of the private facility is the residual claimaint to the firm's profits whereas managers of public facilitities just receive a fixed wage. Consequently, we have that λ is equal to one for the owner of the private facility and zero under public provision. This assumption reflects the institutional features in the market for residential youth care, but it can also be given a theoretical foundation. If the government retains ownership, contracts on profit sharing could be manipulated ex post. Though it might be possible to write contracts that restrict the government's scope for opportunistic behavior, this is costly. The corner solutions that follows just by handing over ownership, $\lambda \in \{0,1\}$, might then be cheaper to attain than any point in the interior, $\lambda \in (0,1)$.

3.1 Public facility

Since $\lambda = 0$ under public provision, the manager's maximization problem is reduced to

$$\max_{t_q,t_c,t_u} \quad -C\left(t\right) - D\left(t_u\right).$$

Since the agent is indifferent between the two tasks he just minimizes his cost function with respect to total effort. This gives the optimality condition $t_q + t_c = t^*$ where $C'(t^*) = 0$ and $t_u = 0$. The municipality's maximization problem is then

$$\begin{aligned} \max_{t_q,t_c} \quad & B\left(t_q,\psi\right) + S\left(t_c\right) \\ \text{s.t.} \quad & t_q + t_c = t^*. \end{aligned}$$

Assuming an interior solution, the solution to this problem is

$$\left(t_q^m, t_c^m, I\right) = \begin{cases} \left(t_q, t_c\right) |\, B_{t_q}\left(t_q,\psi\right) = S'(t_c). \\ I = S \end{cases}$$

Hence, the public agency decides how this effort should be divided between cost reductions and quality, but the manager cannot be induced to put effort on troublesome teenagers.[14]

[14] We could think of this assumptions as the agent having lexicographic preferences where his first

3.2 Private facility

Since cost savings are unobservable and the owner of the private firm is the residual claimant to the firm's profits, we have that $\lambda = 1$. Let $p\alpha = \widetilde{\alpha}$, $p\omega = \widetilde{\omega}$, $p\gamma = \widetilde{\gamma}$ and $p\beta = \widetilde{\beta}$. The agent's maximization problem is then

$$\begin{array}{ll} \max_{t_q,t_u,t_c} & \widetilde{\alpha}t_q - \widetilde{\alpha}_1 E\left(q\right) + p\min\left\{t_u - u, 0\right\} + \widetilde{\gamma}E\left[S\left|I, \text{Private}\right.\right] \\ & +\widetilde{\beta} + S(t_c) - \frac{1}{2}r\sigma_\varepsilon^2\widetilde{\alpha}^2 - C\left(t\right) - D\left(t_u\right). \end{array}$$

In the interior solution with $u > 0$ and $p < D'\left(u\right)$, we get

$$\left(t_q^o, t_c^o, I\right) = \begin{cases} \left(t_q, t_c\right)\left|\, \widetilde{\alpha} = S'(t_c) = C'\left(t\right)\right. \\ t_u\left|\, p = D'\left(t_u\right) \text{ and}\right. \\ I = 1 \end{cases}$$

It follows that t_q is increasing in $\widetilde{\alpha}$, t_c is decreasing in $\widetilde{\alpha}$ and t_u increasing in p up to $t_u = u$. Intuitively, as the incentive for quality provision gets stronger, the owner increases total effort and reduces effort on cost reductions, implying that effort on quality increases. In addition to its effect on effort choice, $\widetilde{\alpha}$ affects the agent's risk-premium, given that there is uncertainty in the signal q (i.e. $\sigma_\varepsilon^2 > 0$). The owner will always send the signal that prolongs treatment. Ruling out any equilibria where signals are not interpreted literally, the owner always sends the signal $I = 1$.

For each level of quality, there is a unique $\widetilde{\alpha}$. Hence, for each α, there is a unique price that gives each feasible level of quality. By raising the price, the teenager becomes more valuable to the facility, implying that incentives for both quality provision and effort on troublesome teenagers increase.[15] For $u > 0$ and $t_u\left(p\right) < u$, the social service

priority is to maximize his own utility and his second priority to maximize his principal's utility.

[15] Is it always better to increase price for a given α? Since the agent could always choose not to change his level of effort, a sufficient condition for CE to be increasing in p is that the derivative of

$$\beta p - \frac{1}{2}r\sigma_\varepsilon^2\alpha^2p^2$$

with respect to p is strictly larger than zero. This is the case if

$$\beta > r\sigma_\varepsilon^2\alpha^2p$$

i.e., for sufficiently low p. This indicates a technical problem: Since the error term is normally distributed, $T < 0$ is in the support of possible T. We can think of this case as such a bad signal of quality that the facility loses some of the capability of filling future treatment places. However, a higher p would then

maximization problem is

$$\begin{aligned} \max_{p} \quad & \left(B\left(t_q\left(\widetilde{\alpha}\right),\psi\right)-p\right)\left(\alpha t_q\left(\alpha p\right)+\beta+t_u\left(p\right)-u\right) \\ \text{s.t.} \quad & CE \geq 0. \end{aligned}$$

3.3 Results

The highest possible level of quality from a public facility is simply $t_q^m = t^*$. In that case, the social service orders the manager of the public facility to spend all his efforts on increasing quality. Under private provision, the teenager in question becomes more valauble to the owner when price goes up, implying that the incentive for quality provision increases. It can be shown that for every $\alpha > 0$, there exists a price such that quality is higher under private provision than under public provision.

Proposition 1 *If $\alpha > 0$, the highest feasible level of quality is always higher under private provision.*

Proof are provided in the Appendix.

An increase in price also increases the owners incentive to put effort on troublesome teenagers. In contrast, managers of public facilities have no incentive to retain teenagers and therefore put in no such extra effort.[16]

Proposition 2 *Public facilities put no extra effort on troublesome teenagers, but private firms do if price is high enough.*

Private provision is always cheaper than public provision for the lowest level of quality, $t_q = 0$. In that case, the manager of the public facility sets $t_c^m = t^*$ and total cost is

mean that the facility loses more money in the future. In reality, this is of course unreasonable. The problematic assumption is not that $T < 0$, but that p would be the same in those (future) placements. The simplest way out of this problem is just to assume that that

$$\beta > r\sigma_{\varepsilon}^2\alpha^2 p$$

in the relevant parameter space.

[16] I am not the first to note the incentive problems due to troublesome teenagers. The Parliamentary Auditors (2002, p. 20) note that one motivation for creating one single principal for all *§12-homes* in Sweden in 1994 was the shortage of treatment for some criminal and violent teenagers since the facilities had the possibility to deny unwanted teenagers treatment places.

$C(t^*) - S(t^*)$. Since $C'(t^*) = 0 < S'(t^*)$, this is clearly a suboptimally low level of effort. In contrast, the owner of the private facility is the residual claimant to cost savings and sets $t_c^o = \underline{t} > t^*$ which is the efficient level of effort. However, the cost advantage of private provision might vanish for high levels of quality for two different reasons. First, as $\widetilde{\alpha}$ must increase in order to induce the private firm to exert more effort on quality, the risk premium $\left(\frac{1}{2} r \sigma_q^2 \widetilde{\alpha}^2\right)$ rises with the level of quality. Since private facilities are always cheaper for zero quality, private provision is cheaper than public facilities for low levels of quality, but more expensive for high levels of quality when $r\sigma_q^2$ is high.

Proposition 3 *There is a cost of risk $\widehat{r\sigma}_q^2$ such that private facilities are cheaper for no effort on quality, but more expensive for all levels of quality above a finite threshold $\widehat{t}_q$. If $\widehat{t}_q > 0$, private facilities are cheaper for all quality levels below $\widehat{t}_q$.*

The second reason is that since effort on quality is a function of $\widetilde{\alpha} = \alpha p$, social services with low α must set a higher price to obtain a certain level of quality, implying that private facilities earn a rent.

Proposition 4 *For every positive level of quality, there exists some $\overline{\alpha} > 0$ such that private provision is more expensive than public provision for all $\alpha < \overline{\alpha}$.*

Since a private facility always wants to prolong treatment, a rational social welfare secretary only adjust the duration of treatment according to information from public facilities. This information advantage of public provision does not show up in a lower price, but since the duration of treatment is adjusted to the actual benefit of treatment, the total surplus is larger.

Proposition 5 *Suppose the social service believes that $S = I$. Public facilities then set $S = I$, whereas private facilities always set $S = 1$. It follows that a rational social service will only believe the signals of public facilities.*

4 Predictions

It is reasonable to assume that the cost of risk is high in youth care. First, the fact that private facilities are typically small family-owned firms indicates that they are risk-averse. Second, outcomes in residential youth is arguably not a perfect signal of quality.

For example, since teenagers in youth care display a wide range of problems, one source of signal noise is just unobservable client characteristics.[17] Relatedly, teenagers are likely to be influenced by their peers in ways that are hard to disentangle from the facility's effort on quality. According to Proposition 3, private facilities should be cheaper for low levels of quality than for high levels of quality if the cost of risk is high. However, as shown in Proposition 4, private provision may also be more expensive because the only means by which the social service can provide owners of private facilities with incentives for quality is by raising the price.

P1: Controlling for teenager characteristics, private facilities are cheaper for low levels of quality but more expensive for high levels of quality.

If there are strong complementarities between t_q and t_u, municipalities may choose to buy high-quality care for troublesome teenagers from private facilities. However, as we will see, there is no evidence of such complementarities in my data, and I therefore hypothesize that rational municipalities will buy residential youth care of generally lower quality from private facilities.

P2: Private facilities have a lower personnel density than than public facilities.

I use treatment breakdown as an additional proxy for quality. In terms of the model, a treatment breakdown occurs whenever $T < T^*$. We get that

$$P\left(T < T^* \left| u = 0\right.\right) = P\left(t_q - \alpha_2 < 0\right).$$

and

$$P\left(T < T^* \left| u > 0\right.\right) = P\left(\alpha_2 q + \min\left\{t_u - u, 0\right\} < 0\right).$$

If effort on quality is indeed higher under public provision, we should expect private facilities to have a higher breakdown frequency for non-troublesome teenagers. It is uncertain from a theoretical perspective whether breakdown frequency for troublesome teenagers will be higher in private or in public facilities as the effect of general quality is counteracted by a stronger inecntive to retain teenagers in private facilities. However, the

[17] See Table 1.

severity of a teenagers problems should be a stronger predictor for treatment breakdowns in public than in private facilities.

P3: Non-troublesome teenagers have a higher risk of treatment breakdown in private facilities than in public facilities.

P4: Teenagers with severe problems have a relatively higher risk of treatment breakdown in public facilities.

Finally, I consider the issue whether private facilities prolong the duration of treatment by giving inaccurate information on treatment progress. The expected duration of treatment under public ownership is given by

$$E\left(T^m\right) = \beta + \alpha_2 t_q - u.$$

Under private provision, expected duration of treatment is

$$E\left(T^o\right) = \beta + \alpha_2 t_q + \left(t_u\left(p\right) - u\right) + \gamma E\left[S\left|I, \text{Ownership}\right.\right].$$

For a given level of quality $t_q = t_q^m = t_q^o$, all teenagers should stay longer in private facilities, and the effect should be larger for troublesome teenagers. Note that if social services are perfectly rational, $E\left[S\left|I, \text{Ownership}\right.\right] = 0$ and so non-troublesome teenagers will have the same duration of treatment in private and public facilities once we control for quality. If $t_q^m > t_q^o$, a test of duration of treatment that does not fully control for quality will bias the test against finding an effect of private information. The main problem in testing the effect of overselling is that municipalities may select private or public ownership depending on their β.

P5: Teenagers stay longer in private than in public facilities.

Note that if *P5* is true, it is important to control for the incentive to prolong duration of treatment in the test of *P3* and *P4*.

The predictions derives above all refer to the behavior of private and public facilities. It is hard to derive a clear prediction as to the effect of post-treatment outcomes from this behavior. On the one hand, we expect private facilities to have a lower level of general

quality. On the other hand, public facilities prolong treatment. It is an open question whether the extra duration of treatment in private facilities benefits teenagers.

5 Data

I use a data set compiled by Vinnerljung, Sallnäs and Kyhle-Westermark (2001) at the National Board of Health and Welfare (NBHW) in Sweden. The data are based on the files of all Swedish adolescents (13-16 years of age) who were placed in residential youth care during 1991. However, those who were only placed temporarily or for the sole purpose of being examined before assigned to their final placement were excluded from the sample.[18] There are some missing observations where the files could not be found or were impossible to interpret.[19] The teenagers were followed as long as they were subject to residential care, or until their 18th birthday. I have used a subset of the original data set that only contains HVB-homes. My data set consists of 358 placements in 175 facilities (186 placements in 63 public facilities and 172 placements in 112 private facilities). The number of observations from a single facility varies from 1 to 10. Using NBHW registers, I have separated privately owned facilities run by firms (79) from those run by non-profit organizations (20).[20] There were 13 cases where I could not determine whether a facility should be considered "non-profit" or not.[21] The public facilities in the sample can be further divided into facilities owned by CABs (43) and municipalities (16). There were 3 public facilities in the sample that could not be classified either as a CAB

[18] Since some facilities did not receive any teenagers in 1991, our data set only covers a subsample of all HVB-homes in Sweden which were active in 1991.

[19] This was the case for about one in three placements from Stockholm and Malmö, Sweden's largest and third largest city, but only for about one in thirty placements from the rest of the country. According to Vinnerljung et al (2001), there is nothing that indicates that the missing files were concentrated on a certain group of children. Yet if Stockholm and Malmö differ systematically from the rest of the country in terms of the teenagers they place in residential care, the sample will not be fully representative.

[20] It is difficult a priori to estimate the incentives of non-profit facility managers. If the scrutiny from the organization is weak, or if the organization actually is motivated by profit (maybe to finance some other project), we would expect non-profit facilities to behave similarly to private firms. If the non-profit organization is instead driven by a zeal to provide good youth care and managers cannot reap any residual profit for themselves, they might resemble (or be superior to) public facilities. I will therefore control for non-profit ownership in the empirical analysis.

[21] As regarding placements; 107 were in private firms, 51 in non-profit organisations and 14 in facilities that could not be classified.

or a municipality facility.[22]

As shown in Table A1, the prevalence of teenagers with some kind of psychological disorder, drug addiction and criminal or violent behavior are all significantly higher in private facilities. Teenagers that have been subject to previous measures from the social services or have been investigated at §12-homes are more likely to end up in a private facility. The breakdown frequency[23] in private facilities (39.0 percent) is significantly higher than in public facilities (25.8 percent). The average duration of treatment is also longer in private facilities (20.7 months) than in public facilities (10.1 months). Part of this is reflected in a longer planned duration of treatment; which was 15.3 months in private and 11.0 months in public facilities.

Table A2 summarizes some of the basic facility characteristics. The difference between private and public facilities in terms of personnel density is remarkable, with a mean of 1.535 for public and .821 for private facilities. The average number of treatment places was 8.323 for public facilities and 7.637 for private facilities and average treatment cost per month was 50,645 SEK for public and 45,008 SEK for private facilities. Of public facilities, 26.7 % had a school at the facility, whereas this was the case for 16.7 % of private facilities. The teenagers in private facilities were more likely to stay in a facility where their problems matched the facility's speciality. The proportion of matches was 34.9 percent in private facilities compared to 16.7 percent in public facilities.[24] This is probably due to the higher concentration of teenagers with specific problems in private facilities. There is also a substantial difference as to the distance from the facility to the municipality center: whereas 8.1 percent of teenagers in public facilities stayed in a facility situated more than 100 kilometers away from the municipality center, this was true for 47.1 percent of the teenagers in private facilities.

[22] As regarding placements; there were 134 in CAB facilities, 48 in municipality facilities and 5 in facilities that could not be classified.

[23] The definition of breakdown is that "a placement is ended abruptly and without planning" [in the original Swedish: "I vår studie menas med sammanbrott att en placering i dygnsvård avslutas plötsligt och oplanerat." Vinnerljung, Sallnäs and Kyhle-Westermark (2001), p. 67]. This definition thus has a clearly negative connotation.

[24] An example of a matching is when a teenager with a drug addiction is placed in a facility specialized in treating teenagers with drug problems.

6 Selection of teenagers

As discussed above, teenagers in private facilities have more severe problems than teenagers in public facilities. Yet there might be other explanations for this than a direct effect of ownership. To study the selection process more thorougly, I run probit regressions for each of the nine teenager problem characteristics[25] on all three ownership variables (private, non-profit and CAB). In a second specification, I included controls for facility characteristics and geography dummies.[26] The results reported in Table A3, A4 and A5 show that the differences between private for-profit and municipality facilities are not sensitive to the inclusion of facility characteristics, though standard errors tend to increase. The difference between private for-profit and CAB facilities is sensitive to the inclusion of controls; the exceptions being *Psychological problem* and *Non-voluntary placement*. The results also show that teenagers in CAB facilities have more severe problems on average than those in municipality facilities. Finally, teenagers in non-profit facilities generally have less severe problems than those in private for-profit facilities, though the difference is only significant in two cases (*Investigated at §12-home* and *Non-voluntary placement*).

The main confounding factor between hard-to-treat teenagers and private ownership appears to be distance from facility to municipality center, which is statistically significant in almost all of the regressions.[27] One likely explanation for these results is that social welfare secretaries want to place teenagers with severe problems at facilities some distance from their home environment, thereby disqualifying the municipality's own facilities.[28] For example, among facilities situated less than 100 km from the municipality center, 20.0 % of teenagers in public facilities had experienced a previous breakdown compared to 28.6 % in private for-profit facilities. In private for-profit facilities situated more than 100 km from the municipality, 54.2 % of teenagers had experienced a previous treatment breakdown, compared to 33.3 % in the very few (15) placements in public facilities. It also

[25] I do not consider the variables *Age*, *Sex*, *Immigrant background* and *Parents meet teenager often* here.

[26] I do not include controls for municpality characteristics since they reduce the sample size and do not add significantly to the model's explanatory power. I include "personnel density" in the vector of facility characteristics but exclude the "match between one of teenager i's problems and facility j's speciality", since this variable is endogenous to the incentives for undertaking unattractive tasks.

[27] The correlation between private ownership and the "distance-dummy" (>100 km between facility and municipality center) is .44.

[28] The notion that teenagers with severe problems are best treated far from their home environment - at least for part of the treatment - was also expressed by several of the interviewed social welfare secretaries.

seems as if municipalities go for private provision when they abstain from using facilities owned by themselves or the county the belong to.

I also ran a regression of private ownership on a set of municipality characteristics. The results show that municipalities within Sweden's two largest cities, Stockholm and Gothenburg, are considerable less likely to place teenagers in private facilities and this is the case also if we exclude non-profit facilities from the sample. One likely explanation is that these municipalities are so large that they can provide an extensive set of treatment options within the municipality and county administration. However, the logarithm of municipality population is statistically insignificant when I control for geography dummies. Somewhat surprisingly, municipalities governed by right-wing coalitions are somewhat *less* likely to go for private provision than municipalities with a socialist majority, though the effect is statistically insignificant. The propensity to buy youth care from private providers is also unrelated to the share of spending on child care and elderly care that went to private providers in 1998.[29] As the correlation between the extent of service contracting in 1998 and right-wing majority is positive and statistically significant, I conclude that it is youth care that is the exception to the rule that right-wing majorities are more prone to use service contracting.

7 Empirical strategy

As shown above, selection of teenagers into private and public provision is not random and any empirical strategy that aims at establishing a causal effect of ownership on treatment outcomes must take this into account. Ideally, we would like to have a valid instrument for choice of ownership structure. A valid instrument would not only have to be exogenous with respect to teenager characteristics, but also with respect to those unobservable municipality and facility characteristics that affect outcomes. I have not found an instrument where one could argue convincingly that these criteria are met.[30] In the absence of a valid instrument, the key identifying assumption is exogeneity conditioning on the observables. I test the robustness of this assumption by subsequently adding vectors of covariates for teenager, facility and municipality characteristics. As we will see, the results are robust

[29] Data on the extent of service contracting in Swedish municipalities is not available prior to 1998.

[30] Among the instrument candidates I have considered are geography dummies (relevant, but hard to argue for exogeneity) and the share of other services that a municipality contract out (not relevant).

to such sensitivity analysis.

8 Results

8.1 P1: Cost

I use personnel density as a proxy for effort on quality, which has the advantage of giving a continuous relationship between quality and cost. There are two potential sources of bias in using personnel density as a proxy for effort on quality.[31] First, if private facilities use their personnel more efficiently, which theory suggests that they will, personnel density will underestimate the true effort on quality in private facilities. On the other hand, private facilities have a stronger incentive to overstate their actual personnel density.[32] Since these two sources of bias contradict each other, I cannot infer the direction of the total bias. Yet the analysis on treatment breakdowns (see below) indicates that, if anything, personnel density overestimates quality in private facilities (see Table 4).

I consider the following model for the price per month municipality h pays for placing teenager i in facility j

$$\begin{aligned} Price_{hij} \;=\; & \alpha_{hij} + \beta_1 Personneld_j \; + \beta_2 Private_j \; + \beta_3 Private_j * Personneld_j \\ & + \beta_4 Nonprofit_j + \beta_5 CAB_j + X\beta_j + Y\beta_i + Private_j * Y^*\beta_{ij} \\ & + Z\beta_h + \varepsilon_j + \varepsilon_i. \end{aligned} \tag{1}$$

where $Personneld_j$ is the personnel density of facility j, $Private_j$ is a dummy variable equal to one when j is a private facility (thus including both non-profit and for-profit facilities), $Nonprofit_j$ is a dummy equal to one when a private facility is owned by a non-profit organization and CAB_j is a dummy equal to one when a public facility is run by a CAB. X is a vector of facility characteristics, including number of treatment places and dummies for match between facility j's area of expertise and teenager i's problems, school at the facility, distance between facility j and municipality h exceeding

[31] Note that for the test of this hypothesis, it is sufficient that personnel density is a good proxy of *effort* on quality, it need not actually be a direct measure of *actual* quality.

[32] The difficulty in estimating the actual personnel density was stressed by several of the interviewed social welfare secretaries. In the words of one interviewed social welfare secretary: "We have to trust the CAB to monitor the facilities".

100 km and six regional dummies. Y is a vector of teenager characteristics, including thirteen variables for sex, age, immigrant status, treatment history, problem background and parental involvement. Y^* is a vector with a subset of teenager characteristics that denote particularly troublesome teenagers, i.e., teenagers for which $u > 0$.[33] Z is a vector of municipality characteristics, including the logarithm of municipality population in 1990 and a dummy for right-wing political majority in the municipality council. ε_j is an unobserved facility fixed-effect and ε_i is an individual level error term. I thus assume an additive error structure.

If my hypothesis is correct, β_2 (the difference in intercept on a price-personnel density line) should be negative and β_3 (the difference in slope) should be positive. The estimate of β_2 $\left(\widehat{\beta}_2\right)$ will have an upward bias if personnel density underestimates the true effort on quality in private facilities, or downward bias if personnel density overestimates effort on quality in private facilities. I include $Nonprofit_j$ and CAB_j to control for different intercepts between the two ownership sub-categories. Different interaction effects will be considered as an extension. I add the interaction effects $Y^* * Private_j$ as theory predicts that private facilities will put more effort on troublesome teenagers. Not controlling for this interaction effect would give an upward bias on $\widehat{\beta}_2$. I use linear instead of logarithmic form in the basic specification since there are strong a priori reasons to expect personnel density to affect costs in a linear fashion.[34]

Table 1 displays a number of different specifications of (1) where I subsequently add covariates to test the robustness of the results. Private firms are cheaper for low levels of quality, i.e., the "intercept" $\widehat{\beta}_2$ is negative, but the coefficient is not statistically significant in the basic regressions without controls for nonprofit and CAB facilities. From the second regression and onwards, I exclude three observations that have a large impact on the estimation of β_2. Once I control for differences between ownership sub-categories, private for-profit facilities have statistically significant lower costs for low quality than municipality facilities. The cost difference for "zero" personnel density varies between 11,126 and 12,722 SEK in the regressions without interaction effects for teenager characteristics. The direct ownership effect $\left(\widehat{\beta}_2\right)$ is strengthened to 17,753 SEK when I add the interaction effects between ownership and "troublesome" teenagers. The difference

[33] These characteristics are *Violent behavior*, *Previous breakdown* and *Multiple problems*.

[34] A potential problem with this specification is that we have no observation for zero personnel density. The difference in intercept, β_2, should therefore not be interpreted literally.

between private-for-profit and CAB facilities $\left(\widehat{\beta}_2 - \widehat{\beta}_5\right)$ is negative as expected but not statistically significant. I find no evidence of cost differences between for-profit and non-profit private facilities. The interaction effect, $\widehat{\beta}_3$, has the expected positive sign and is statistically significant in all specifications. Depending on the exact specification, an increase in personnel density by 1.0 increases the price by between 14,861 and 16,164 SEK more in private than in public facilities.

Table 2 shows the results from additional specification checks. I use the full specification without interaction terms between ownership and teenager characteristics in Table 1 (5) as my base case. First, I add interaction effects between non-profit and CAB facility ownership and personnel density. Neither of these extra interaction effects are statistically significant, though the interaction between non-profit and personnel density is positive and quite large. Second, to control for political preferences for private provision, I add an interaction term between private ownership and right-wing political majority in municipality h. This effect is negative, implying that right-wing municipalities pay *less* for privately provided youth care, but not statistically significant. Third, I add an interaction term between the size of the population in municipality h and privately provided youth care.[35] This effect is negative and statistically significant, indicating that large municipalities have market power. None of these three specifications change the thrust of the results for $\widehat{\beta}_2$, $\widehat{\beta}_3, \widehat{\beta}_4$ and $\widehat{\beta}_5$ displayed in Table 1.[36] Finally, we might expect the degree of risk aversion, r, to vary depending on the size of the private facility. In particular, we would expect the risk premium to be larger for small facilities. To check for this, I add to specification (1) above a term

$$\beta_6 Private_j * Personneld_j * \left(Places_j - \overline{Places}\right)$$

where $\overline{Places}$ is the average number of places at private facilities in the sample. In the basic regression, this term is negative and statistically significant whereas it is close to zero and no longer statistically significant in the full regression.

[35] To facilitate comparison with the specifications presented above, we normalize the interaction term around the mean of municipality size.

[36] [What happens if we include interaction effects between private facilities and teenager characteristics? From a theoretical perspective, that is actually the most reasonable specification]

Table 1. Cost per treatment month[37]

	Price (SEK)					
Variable	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS
Constant	30,491***	23,427***	28,744	36,230***	44,851	43,275***
	(8,598)	(9,137)	(8,155)	(11,931)	(13,597)	(13,221)
Personnel density	13,836***	18,421***	18,872***	18,665***	18,258***	19,541***
	(5,458)	(5,660)	(5,148)	(4,971)	(5,204)	(5,278)
Private	-11,723	-6,739	-11,180*	-11,126*	-12,722*	-17,753**
	(9,131)	(9,476)	(7,974)	(8,008)	(8,501)	(8,940)
Private* pers. density	16,022**	14,227**	15,390***	14,861***	16,164**	14,727**
	(6,855)	(6,640)	(6,120)	(6,292)	(7,204)	(7,254)
Nonprofit			1,299	1,303	921	745
			(4,859)	(5,261)	(5,466)	(5,472)
CAB			-6,605**	-6,662**	-5,524*	-5,846*
			(3,279)	(3,788)	(3,839)	(3,818)
Private*violence						-1,989
						(6,436)
Private*prev. break						-576
						(5,179)
Private*probl. index						3,482**
						(1,494)
Facility charact.	No	No	Yes	Yes	Yes	Yes
Geography dummies	No	No	Yes	Yes	Yes	Yes
Municipality charact.	No	No	No	Yes	Yes	Yes
Teenager charact.	No	No	No	No	Yes	Yes
p-value*			.649	.659	.515	.290
N	313	310	299	246	225	225
Number of clusters	135	132	125	112	108	108
R^2	.319	.369	.497	.542	.565	.581

** = p-value of test of "private"-coefficient equal to "CAB"-coefficient. [Should be one-sided]

If we consider the estimates in the full specification with interaction effects between ownership and teenager characteristics, which is the specification that fits the theory, private-for-profit facilities are equally expensive as municipality facilities at a personnel density of 1.21 and at a personnel density of .81 compared to CAB facilities. Still, 37.6 % of teenagers in private for-profit facilities stay in a facility with a personnel density

[37]Robust standard errors clusteres ad the facility level in parentheses. Regression (1) includes all available observations. The three most influential observations are excluded in regression (2)-(5). *** indicates significance at 1 %-level, ** at 5 %-level and * at 10 %-level in an one-sided test.

of .81 or more and 13.9 % in a facility with personnel density of 1.21 or more. As discussed above, municipalities may choose to buy high-quality care from private facilities if there are strong complementarities between t_q and t_u for troublesome teenagers. If this hypothesis is true, we would expect a positive correlation between personnel density and the severity of the teenagers' problems in private facilities. However, this does not seem to be the case: none of the "troublesome teenager" indicators I used above is significant in a regression with personnel density in private facilities as the dependent variable. A more likely explanation is that the social services want to place some teenagers far away from their own municipality and, with a restricted supply of public youth care, have no choice but to buy youth care from a private facility.

There is another puzzle in the data: as seen in Figure 1 and Figure 2 in the Appendix, the correlation between cost and personnel density is much stronger for private than public facilities. This is due entirely to a low correlation for CAB facilities (.218) and not for municipality facilities (.789).[38] CAB and municipality facilities have practically identical mean values for personnel density and cost of treatment, but CAB facilities have a much lower variance in personnel density and higher variance in cost.[39] A likely explanation for this discrepancy is that some CABs sponsor their facilities, thereby weakening the link between personnel density and cost. Note that it is not the presence of subsidies as such that would bias the estimates, but their possible correlation with personnel density.[40] If, for instance, CAB facilities with a high personnel density are more likely to receive subsidies, my price regression would underestimate the true cost of high-quality care in public facilities. Therefore, as a further robustness check, I run regression (1) excluding CAB facilities. Table A6 reports the results from reestimation of specification (2)-(5) in Table 1 plus a regression where I add an interaction term for private non-profit facility and personnel density. Except for the basic specification without any control variables, $\widehat{\beta}_2$ and $\widehat{\beta}_3$ are statistically significant and of similar size to the estimates in Table 1. The effect

[38] The pairwise correlation for private for-profit facilities is .690 and .514 for non-profit facilities.

[39] This is shown in the table below:

	CAB		Municipality	
	Mean	Std	Mean	Std
Cost	51,100	15,040	50,590	10,049
Personnel density	1.505	.274	1.517	.831

[40] Measurement error in the dependent variable (cost) increases standard errors but do not bias the estimates.

of private non-profit ownership, $\widehat{\beta}_4$, is not statistically significant in any specification.

Table 2. Cost per treatment month: Specification checks[41]

	Price (SEK)				
Variable	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS
Constant	42,676***	45,744***	2,074	23,427***	28,753**
	(13,761)	(13,690)	(14,886)	(9,152)	(13,997)
Personnel density	19,052***	17,492***	16,863***	18,421***	18,234***
	(3,481)	(5,144)	(5,195)	(5,670)	(5,113)
Private	-10,227*	-12,441*	-13,754*	-7,823	-12,789*
	(6,415)	(8,650)	(8,487)	(9,434)	(8,428)
Private ∗ pers. density	13,613***	17,002***	17,397***	15,841***	16,219**
	(5,377)	(7,198)	(7,125)	(6,303)	(7,206)
Nonprofit ∗ pers. density	13,008				
	(12,141)				
CAB ∗ pers. density	-926				
	(9,724)				
Private ∗ right wing		-5,335			
		(4,619)			
Private ∗ log (pop. 1990)			-4,851**		
			(2,158)		
Private ∗ pers. density ∗ places				-244***	-13
				(93)	(242)
Facility charact.	Yes	Yes	Yes	No	Yes
Municipality charact.	Yes	Yes	Yes	No	Yes
Teenager charact.	Yes	Yes	Yes	No	Yes
Geography dummies	Yes	Yes	Yes	No	Yes
p-value*	.706	.588	.317		506
p-value**	.159				
N	225	225	225	310	225
Number of clusters	108	108	108	132	108
R^2	.570	.570	.586	.382	.565

* = p-value of test of "private"-coefficient equal to "CAB"-coefficient. [Std. errors clust at fac. level]
** = p-value of test of "private*pers. dens"-coefficient equal to "CAB*pers. dens"-coefficient.

[41] Robust standard errors clustered on the facility level in parentheses. The three most influential observations are excluded from all regressions. *** indicates significance at 1 %-level, ** at 5 %-level and * at 10 %-level in an one-sided test.

8.2 P2: Personnel density

I measure effort on quality by personnel density (employees per treatment place). As above, we cannot be sure whether or not personnel density is a biased measure of effort on quality in private facilities. I use the following regression for personnel density in facility j with teenager i from municipality h:

$$Personneld_{hij} = \begin{array}{l} \alpha_{hij} + \beta_1 Private_j + \beta_2 Nonprofit_j + \beta_3 CAB_j \\ +X\beta_j + Y\beta_i + Z\beta_h + \varepsilon_j + \varepsilon_i \end{array} \quad (2)$$

where X, Y and Z are the same vectors of control variables as above. As shown in Table 3, private for-profit facilities have on average .60 less employees per treatment place controlling for our full set of covariates, and the coefficient is robust against different specifications. Non-profit private facilities have a bit higher personnel density, the coefficient varies between .14 and .21 depending on the specification, but it is not statistically significant in the full regression. There is no statistically significant difference between public facilities run by municipalities or CABs.

Table 3. Personnel density[42]

	Personnel density		
Variable	(1) OLS	(2) OLS	(3) OLS
Constant	1.521	1.562***	1.272***
	(.166)	(.172)	(.439)
Private	-.710***	-.661***	-.600***
	(.178)	(.179)	(.219)
Nonprofit	.208**	.185**	.138
	(.106)	(.106)	(.122)
CAB	-.018	.087	.159
	(.171)	(.159)	(.188)
Facility characteristics	No	Yes	Yes
Geography dummies	No	Yes	Yes
Municipality characteristics	No	No	Yes
Teenager charactistics	No	No	Yes
N	328	327	243
Number of clusters			
R^2	.327	.454	.484

8.3 P3-P4: Breakdown frequency

Apart from the impact of task attractiveness, which will be considered below, there are two potential sources of bias in using breakdown frequency as a proxy for quality. First, as private firms have stronger incentives to retain teenagers at their facility, holding quality, teenager characteristics and duration of treatment constant, treatment breakdowns should be less likely in private facilities. However, if private facilities manage to prolong treatment, the risk of an eventual breakdown could be higher under private provision. The total bias is thus uncertain. The probit regression for the breakdown probability of the placement of teenager i from municipality h in facility j is given by:

$$P\left(Break_{hij}=1 \mid x\right)=\Phi\left(\begin{array}{l}\alpha_{hij}+\beta_1 Private_j+\beta_2 Nonprofit_j+\beta_3 CAB_j \\ +X\beta_j+Y\beta_i+Z\beta_h+\varepsilon_j+\varepsilon_i\end{array}\right) \quad (3)$$

[42]Robust standard errors with cluster on the facility level in parentheses. Both specifications include all available observations. *** indicates significance at 1 %-level, ** at 5 %-level and * at 10 %-level in an one-sided test.

where $Break_{ij}$ is a dummy equal to one when treatment breaks down and X, Y and Z are the same vectors of control variables as above. As shown in Table 4, the ownership variable has the expected positive sign in all specifications. The estimates are robust to the inclusion of facility, teenager and municipality characteristics. The impact of ownership on treatment breakdown is substantial: In the full specification (3), treatment breakdown is 28.2 percentage units more likely to occur in a private-for-profit facility than in a municipality facility.[43] Nonprofit private facilities have lower breakdown frequency than private-for-profit facilities, but the coefficient is only significant in the specifications without teenager and municipality characteristics (1 and 2). Also note that CAB facilities have higher breakdown frequency than municipality facilities, although the difference is not statistically significant in specification 1-3. The difference between private-for-profit and CAB facilities $\left(\widehat{\beta}_1 - \widehat{\beta}_3\right)$ is statistically significant for specification 1-3. The estimated coefficients are robust against the inclusion of personnel density into the full specification, though the difference between private for-profit and CAB facilities is no longer statistically significant. This implies that differences in personnel density can only explain part of the differences in quality between private and public facilities.[44]

[43] Analytic derivatives evaluated at the mean of the covariates. A linear regression on the full specification (3) gives a coefficient of .247.

[44] The estimated coefficient on personnel density becomes significant at the 10 % level if we exclude the ownership-variables from specification 17. The estimated partial effect implies that an increase in personnel density by 1.0 decreases the probability of treatment breakdown by 10.1 percentage units.

Table 4. Breakdown frequency[45]

	Breakdown of treatment				
Variable	(1) Prob.	(2) Prob.	(3) Prob.	(4) Prob.	(5) Prob.
Constant	-.929	-.593*	-2.717**	-2.625**	-2.737**
	(.205)	(.351)	(1.375)	(1.399)	(1.386)
Private	.800***	.668**	.885***	.844**	.814**
	(.239)	(.317)	(.376)	(.386)	(.470)
Nonprofit	-.463**	-.384*	-.263	-.115	-.252
	(.235)	(.269)	(.358)	(.364)	(.363)
CAB	.354	.254	.437	.458*	.435
	(.242)	(.312)	(.349)	(.354)	(.351)
Places		-.002	-.017*	-.019*	-.017*
		(.009)	(.012)	(.012)	(.012)
School		-.174	-.382**	-.358*	-.382**
		(.205)	(.223)	(.229)	(.224)
Match		-.046	-.302	-.337*	-.299
		(.210)	(.239)	(.242)	(.238)
Distance		-.009	-.123	-.183	-.125
		(.187)	(.275)	(.285)	(.275)
Log (pop. 1990)			.110	.121*	.108
			(.094)	(.093)	(.093)
Political majority: right			.176	.221	.165
			(.183)	(.181)	(.192)
Personnel density				-.177	
				(.238)	
Exp. duration (months)					.006
					(.020)
Teenager characteristics	No	No	Yes	Yes	Yes
Geography dummies	No	Yes	Yes	Yes	Yes
p-value*	.013	.030	.068	.198	0.302
N	338	323	239	237	239
Number of clusters					
Psuedo-R^2	.033	.046	.226	.233	.226

H_0 : coeff. "ownership" = coeff. "CAB"

To correct for the possible bias arising from the private facilities' stronger incentives to prolong treatment, I calculated the expected duration conditioning on ownership and

[45]Robust standard errors clustered on the facility level in parentheses. Specification (1)-(5) includes all available observations. *** indicates significance at 1 %-level, ** at 5 %-level and * at 10 %-level in an one-sided test.

teenager characteristics and included that as a covariate in the regression. Adding expected duration to the full specification, $\widehat{\beta}_1$ is still statistically significant and the size is similar with a partial effect of 25.9 percentage units. However, the difference between private-for-profit and CAB facilities is no longer statistically significant. The effect of expected duration on the probability of treatment breakdown is small and not statistically significant.[46]

Not including interaction effects assumes that the effect of troublesome teenagers is the same in private and public facilities. That is, it controls for selection effects, but not the incentive effect, t_u. Hence, if t_u is higher in private facilities – as the theory predicts it will be – a regression that does not control for the interaction between task attractiveness and ownership will underestimate the effect of ownership on t_q. To test for different effects of troublesome teenagers, I included interaction terms between ownership and previous breakdown, violent behavior and multiple problems[47] in regression (3). With the exception of previous experience of youth care – which is strongly correlated with previous breakdown (.623) and therefore excluded – these three variables show the highest pairwise correlation with treatment breakdown, considering the whole sample.[48]

As shown in Table 5, the interactions with violence and previous breakdown are statistically significant and the effects are substantial. In the regression with the full set of controls, a "violent" teenager increases the risk of breakdown with 22.6 percentage units more in a public than in a private facility. The corresponding figure for previous breakdown is 17.7 percentage units.[49] The interaction effect with multiple problems is close to zero and not statistically significant. As expected, the general quality effect due to ownership increases substantially once we take task attractiveness into account; the partial effect of ownership on the risk of treatment breakdown is now 35.8 percentage units. As the interaction between multiple problems and private ownership is strongly correlated with private ownership (.76), we might expect it to inflate standard errors through multicollinearity. Therefore, I rerun the regression with only interactions for violence and

[46] When we control actual duration, then, as suspected, the estimated effect of private-for-profit facilities becomes even larger. In the full regression, the partial effect of $\widehat{\beta}_1$ is 38.7 percentage units and statistically significant at the 1 % level.

[47] The variable for multiple problems – "problem index" – is fairly strongly correlated with "addiction problems" (.682)

[48] Including "previous experience" in the regression do not change the results for the other variables and the coefficient of previous experience is close to zero and not statistically significant.

[49] Analytic derivatives evaluated at the mean of the covariates.

previous breakdown. The results are similar, though standard errors go down as expected.

Table 5. Quality and task attractiveness[50]

	Breakdown of treatment		
Variable	(1) Prob.	(2) Prob.	(3) Prob.
Constant	-2.081***	-3.101**	-3.103**
	(.559)	(1.386)	(1.384)
Private	1.159***	1.147**	1.219***
	(.435)	(.509)	(.425)
Nonprofit	-.478**	-.189	-.196
	(.286)	(.336)	(.335)
CAB	.431*	.466	.463
	(.304)	(.385)	(.385)
Private ∗ violence	-1.298**	-1.262**	-1.189***
	(.581)	(.620)	(.500)
Private ∗ previous breakdown	-.541*	-.779**	-.779**
	(.419)	(.443)	(.443)
Private ∗ problem index	.043	.039	
	(.159)	(.170)	
Facility characteristics	No	Yes	Yes
Municipality characteristics	No	Yes	Yes
Teenager characteristics	Yes	Yes	Yes
Geography dummies	No	Yes	Yes
p-value*	.042	.064	.002
N	253	239	239
Number of clusters			
Psuedo R^2	.205	.253	.253

H_0 : coeff. "ownership" = coeff. "CAB"

Though private providers have a lower level of general quality, our estimates imply that hard-to-treat teenagers may actually be better off in private facilities.[51] Just looking at mean values gives an idea of this. Whereas the incidence of treatment breakdowns

[50] Robust standard errors with cluster on facility in parentheses. The specification includes all available observations. *** indicates significance at 1 %-level, ** at 5 %-level and * at 10 %-level in an one-sided test. "Personnel density" is included in the regression.

[51] This of course requires that treatment breakdowns is an adequate measure of quality. A potential problem would be that the 'optimal' level of treatment breakdowns vary with teenager characteristics and that the frequency of treatment breakdowns is actually too low in private facilities, given the level of general quality.

was almost the same for violent and non-violent teenagers in private facilities (44.7 % compared to 37.3 %), violent teenagers in public facility were more than three times more likely to experience a treatment breakdown than non-violent teenagers (61.3 % compared to 18.7 %). Interestingly, Bayer and Pozen (2005) report a similar result: "While the large estimated recidivism gaps between for-profit facilities and the other facilities at the mean imply that most individuals would be better served by one of this other facility management types, white males serving *especially long sentences* may actually benefit from a for profit management regime" [emphasis added].

I also run linear regressions with treatment breakdown on violence, previous breakdown and our index of multiple problems for private-for-profit and public facilities separatedly.[52] The results in Table A7 show that whereas both previous breakdown, violent behavior and – to a lesser extent – multiple problems predict treatment breakdown in public facilities, they have no explanatory power in private facilities. The picture is the same when I include the full set of teenager characteristics: The regression for public facilities has an adjusted R^2 of .191, compared to $-.067$ for private facilities. Whereas the null hypothesis of jointly insignificant variables could be rejected at the 1 % level in both regressions with public facilities, it could not be rejected in any of the regressions with private facilities.

As another test of the theory, we can study data on who was the initiator when treatment broke down. If public facilities shun hard-to-treat teenagers, we would expect that public facilities are more prone to take the initiative in treatment breakdowns than private facilities, and especially so for teenagers with severe problems. As shown in Table A8, this is indeed the case. For example, public facilities took the initiative in 52.6 % of treatment breakdowns for teenagers who had experienced a previous breakdown, as opposed to 23.8 % for private facilities. Due to the small number of observations, this difference is only significant at the 10 %-level in a one-sided test.

Naturally, there are other possible ways of measuring quality, or effort on quality, than personnel density and treatment breakdowns. For example, in an extensive literature study of the research on youth care, Andreassen (2003) suggests that properly educated personnel is one of the most important factors for successful treatment. Unfortunately, my data set does not include information on the educational level of the personnel. Yet in a study of HVB-homes in the middle of the 1990's, Sallnäs (2000) found that half of the

[52] We hence exclude nonprofit facilities in this case.

private for-profit firms lacked personnel with "core competence" (defined as an education in psychology or social work), whereas this was true for 17 % of the private not-for-profit and only 5 % of the public facilities.

8.4 P5: Duration of treatment

To test if private provision prolong treatment periods, I run the following regression for the duration of treatment of teenager i from municipality h in facility j:

$$\begin{aligned} Duration_{hij} = \alpha_{ij} + \beta_1 Private_j + \beta_2 Nonprofit_j + \beta_3 CAB_j \\ + \beta_4 Break_i + \beta_5 Cost_i + X\beta_j + Y\beta_i + Z\beta_h + \varepsilon_j + \varepsilon_i \end{aligned} \quad (4)$$

where $Break_i$ is the breakdown-dummy from above, $Cost_i$ is treatment cost per month and X, Y and Z are the same vectors of control variables as above. As shown in Table 6, the effect of ownership on duration of treatment is substantial and statistically significant regardless of specification. The effect is strongest in the full specification with controls for teenager, facility and municipality characteristics where private for-profit ownership increased duration by 17.46 months compared to municipality facilities and 13.88 months compared to CAB facilities. Non-profit private facilities have 6.70 months shorter duration of treatment than for-profit private facilities in the full regression and the difference is statistically significant.[53] Further specification checks with exponential and Weibull duration models reported in Table A9 also indicate a statistically significant effect of a similar size of ownership on duration.[54]

Treatment might last longer in private than in public facilities not because incentives differ, but because municipalities, for some reason unobservable to us, consciously use private facilities for teenagers they want to be treated for a longer period of time.[55] To

[53] Adding interaction effects between private ownership and our indicators of troublesome teenagers (previous breakdown, violent behavior and multiple problems) increases the effect of private for-profit ownership slightly to 19.82 months in the full regression. All the interaction terms are small and none are statistically significant. This regression is not included in Table 15 or 16.

[54] [Exact effect]

[55] As we have already seen, this can not be explain by the teenager characteristics observable in our data. However, previous research [cite: Sallnäs + referens] on residential youth care in Sweden has found

control for this possibility, I included planned duration of treatment in each of the three first specifications in Table 6. Unfortunately, since we only have 108 observations on planned duration, the sample size is cut by approximately two thirds in each specification. The effect of private ownership on duration of treatment is nevertheless statistically significant in all three specifications, though the coefficient is reduced by up to 41 % in the specifications without the full set of controls and 23 % in the full specification.

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the correlation between the duration of treatment and observable teenager characteristics to be weak. In our data, the strongest pairwise correlations between planned duration of treatment and teenager characteristics were "previous experience of youth care" (.236), "drug addiction" (−.148) and "psychological problems" (.133).

Table 6. Duration of treatment[56]

	Duration (months)					
Variable	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS
Constant	9.035***	10.247***	3.335	4.521**	4.616**	7.571
	(2.058)	(2.086)	(13.628)	(1.921)	(1.964)	(28.384)
Private	12.842***	14.708***	17.455***	7.811**	8.667***	13.373**
	(2.624)	(2.588)	(3.227)	(3.526)	(3.489)	(6.689)
Nonprofit	-2.728	-3.876*	-6.696**	.679	.130	-.314
	(3.137)	(2.971)	(3.516)	(3.503)	(3.415)	(6.563)
CAB	1.520	2.234	3.578*	-.529	.469	-2.198
	(2.387)	(2.417)	(2.252)	(1.741)	(1.943)	(4.736)
Breakdown		-6.941***	-4.080**		-5.002**	-1.180
		(1.683)	(2.149)		(2.773)	(4.780)
Cost (10,000 SEK)			-.573			.403
			(.594)			(1.211)
Planned duration				.527***	.564***	.223
				(.117)	(.114)	(.179)
Facility charact.	No	No	Yes	No	No	Yes
Municipality charact.	No	No	Yes	No	No	Yes
Teenager charact.	No	No	Yes	No	No	Yes
Geography dummies	No	No	Yes	No	No	Yes
p-value* [write as $\widehat{\beta}_1 - \widehat{\beta}_2$]	.000	.000	.000	.015	.018	.035
N	336	336	226	104	104	72
Number of clusters	158	158	109	68	68	49
R^2	.152	.202	.385	.359	.382	.604

$* = H_0$: coeff. "ownership" = coeff. "CAB"

I rerun the duration regressions with imputed values for planned duration of treatment. I first run the three different specifications with separate variables for imputed and nonimputed values. Since the estimated coefficients on planned duration of treatment were similar in all three specifications[57] and the null hypothesis of equal coefficients for the imputed and non-imputed planned duration-variables could not be rejected, I combined imputed and non-imputed values into one "planned duration variable" and rerun

[56] Robust standard errors with cluster on facility in parenthesis. All available observations included. *** indicates significance at 1 %-level, ** at 5 %-level and * at 10 %-level in an one-sided test. "Personnel density" is not included in the regressions with facility characteristics.

[57] The estimated coefficients for each specification were (non-imputed values first): 1) .507/.535 2) .554/.635 and 3) .365/.409.

the specifications from Table 6. The results were very similar to those in the regressions without data on planned duration of treatment; the effect of private ownership was about one month lower in each specification compared to the comparable specifications above. This result indicates that whereas the teenagers for which I have data on planned duration of treatment do not differ systematically from the other teenagers, the *municipalities* that plan the duration of treatment in advance are less prone to let treatment continue for long periods of time than those that make no such plan.

The longer duration of treatment in private facilities implies that only considering cost per month underestimates the total cost difference between private and public provision of youth care. In my sample, the average total cost of treatment was 1,045,976 SEK for private-for-profit facilities and 886,409 SEK for private non-profit facilities compared to 479,667 SEK for public facilities.[58] This difference has two causes. First, as I have already argued, treatment periods are much longer in private facilities. Second, though average treatment cost per month is higher in public facilities, placements in public facilities last shorter time the more expensive the treatment, whereas there is no relationship between cost and duration of treatment in private facilities. It is of course uncertain how accurate these aggregate total cost measures are as indicators of actual "overselling". As an alternative, more conservative, measure, the average cost of prolonged treatment beyond plan is 247,716 SEK for private facilities.

8.5 Post-treatment outcomes

[Yet to be written]

9 Cost benefit analysis

[Yet to be written]

10 Conclusions

[Yet to be written]

[58] Among public facilities, treatment in CAB facilities was slightly more expensive (501,492 SEK) than in municipality facilities (425,282 SEK).

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12 Appendix

12.1 Tables and figures

12.1.1 Table A1. Summary statistics at the individual level

	Public		Private		
Variable	Obs	Mean	Obs	Mean	p-value*
% previous exp. of residential care	165	29.1	132	46.2	.002
% previous breakdown	180	21.1	165	40.6	.000
% psychological disorder	186	17.7	172	26.7	.040
% addiction	186	26.9	172	41.9	.003
% investigated at §12-home	186	5.9	170	10.6	.107
% non-voluntary (law)	186	23.1	171	35.7	.009
% violent behavior	186	16.7	172	22.1	.193
% criminal behavior	186	33.3	172	47.1	.008
Problem index	186	1.82	172	2.45	.000
% male	165	48.5	132	59.1	.069
% immigrant background	165	38.8	132	31.1	.166
Age (1991)	165	14.1	132	14.1	.685
% parents visit often (> once every second month = 1)	174	83.3	159	78.0	.216
% breakdown of placement	186	25.8	172	39.0	.008
Treatment length (months)	185	10.1	171	20.7	.000
Planned treatment length (months)	55	11.0	53	15.3	.061
Type of public owner (CAB = 1, municipality = 0)	181	.735	-	-	-
Type of private owner (nonprofit = 1, for-profit = 0)	-	-	158	.323	-
% school	183	.279	156	.282	.945
% match facility speciality - teenager problem	186	16.7	172	34.9	.000
Distance (>100 km = 1)	186	.081	172	.471	.000
Geo (facility): "Norrland"	186	.097	169	.160	.075
Geo (facility): "Svealand"	186	.371	169	.426	.290
Geo (facility): "Götaland"	186	.532	169	.414	.026
Geo (facility): "Stockholm"	186	.177	169	.047	.000
Geo (facility): "Göteborg"	186	.081	169	.006	.001
Geo (facility): "Malmö"	186	.022	169	.024	.891
Political majority in municipality (right = 1)	163	.399	128	.320	.167
Right maj.*Private fac.	-	-	128	.320	-

* H_0 : proportion private = proportion public alt. mean private = mean public

12.1.2 Table A2. Summary statistics II[59]

	Public				Private			
Variable	Mean	Sd	Min	Max	Mean	Sd	Min	Max
Pers. dens.*	1.535	0.729	0.25	5.00	0.821	0.465	0.14	3.08
Places*	8.323	6.054	4	46	7.637	6.286	2	46
Cost (month)	50,645	14,144	19,984	92,000	45,008	19,892	19,410	140,300
Log(pop. 1990)	11.39	.102	8.60	13.42	11.29	.103	8.72	13.42

* = Statistics at the facility level. Otherwise, I consider individual level statistics.

12.1.3 Table A3. Selection I[60]

	Prev. exp.		Prev. br.		Probl. index		Crime	
	(1) Prob.		(2) Prob.		(3) OLS		(4) Prob.	
Constant	-.876***	-.517	-.917***	-1.017***	1.518***	1.127***	-.518***	-.657*
	(.199)	(.441)	(.169)	(.432)	(.143)	(.385)	(.222)	(.461)
Private	.827***	.662**	.673***	.414*	.921***	.941***	.530**	.443*
	(.248)	(.336)	(.212)	(.308)	(.202)	(.278)	(.257)	(.333)
Nonprofit	-.329*	-.259	-.231	-.298	.012	.034	-.165	.069
	(.239)	(.287)	(.271)	(.316)	(.263)	(.311)	(.275)	(.287)
CAB	.448**	.619**	.182	.333	.430**	.508**	.132	.256
	(.243)	(.306)	(.226)	(.283)	(.213)	(.226)	(.249)	(.285)
Facility charact.*	No	Yes	No	Yes	No	Yes	No	Yes
Geography dummies	No	Yes	No	Yes	No	Yes	No	Yes
p-value**	.065	.881	.014	.777	.029	.150	.023	.448
N	279	272	326	316	338	327	338	327
Number of clust.					159	150		
Psuedo R^2/R^2	.0313	.060	.030	.095	.054	.103	.019	.044

* = includes personnel density, places, distance and school.

** = p-value of test of "private"-coefficient equal to "CAB"-coefficient (two-sided).

[59] At the individual level, the average personnel density per placement was 1.494 (185 obs) for the public facilities and 0.811 (101 obs) for the private facilities. The average number of places per placement was 9.022 (185 obs) for the public facilities and 6.584 (101 obs) for the private facilities.

[60] "Pr" = Probit regression. Robust standard errors with cluster on facility in parenthesis. All available observations included. *** indicates significance at 1 %-level, ** at 5 %-level and * at 10 %-level in an one-sided test.

12.1.4 Table A4. Selection II[61]

	Invest §12		Psych.		Violence	
	(1) Prob.		(2) Prob.		(3) Prob.	
Constant	-2.302***	-2.391***	-1.032***	-1.513***	-1.035***	-.519*
	(.573)	(.931)	(.208)	(.413)	(.183)	(.370)
Private	1.185**	1.204*	.478**	.739***	.245	-.076
	(.591)	(.850)	(.248)	(.293)	(.237)	(.328)
Nonprofit	-.498**	-.711**	-.221	-.124	-.054	-.059
	(.290)	(.371)	(.287)	(.355)	(.231)	(.276)
CAB	.897*	1.144*	.167	.215	.115	.075
	(.594)	(.831)	(.243)	(.257)	(.226)	(.254)
Facility ch.*	No	Yes	No	Yes	No	Yes
Geo. dum.	No	Yes	No	Yes	No	Yes
p-value**	.200	.842	.096	.042	.518	.593
N	337	319	338	327	338	327
No. of clust.						
Psuedo R^2	.048	.084	.014	.045	.003	.037

* = includes personnel density

** = p-value of test of "private"-coefficient equal to "CAB"-coefficient (two-sided).

[61] Robust standard errors with cluster on facility in parenthesis. All available observations included. *** indicates significance at 1 %-level, ** at 5 %-level and * at 10 %-level in an one-sided test.

12.1.5 Table A5. Selection III[62]

	Addiction		Non-vol.	
	(1) Prob.		(2) Prob.	
Constant	-.994***	-1.530***	-.728***	-1.974***
	(.273)	(.470)	(.294)	(.535)
Private	.722***	.851***	.528*	.713**
	(.299)	(.357)	(.322)	(.402)
Nonprofit	.163	.196	-.627**	-.726***
	(.216)	(.253)	(.295)	(.303)
CAB	.480*	.647**	.019	.124
	(.303)	(.342)	(.326)	(.351)
Facility ch.*	No	Yes	No	Yes
Geo. dum.	No	Yes	No	Yes
p-value**	.191	.386	.009	.030
N	338	327	337	326
No. of clust.				
Psuedo R^2	.031	.071	.031	.106

* = includes personnel density

** = p-value of test of "private"-coefficient equal to "CAB"-coefficient (two-sided).

[62] Robust standard errors with cluster on facility in parenthesis. All available observations included. *** indicates significance at 1 %-level, ** at 5 %-level and * at 10 %-level in an one-sided test.

12.1.6 Table A6. Specification checks II: Excluding CAB facilities[63]

	Price (SEK)				
Variable	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS
Constant	22,757***	25,282***	70,899***	71,905***	70,645***
	(7,547)	(7,190)	(17,989)	(21,013)	(19,959)
Personnel density	20,320***	20,616***	19,095***	18,330***	18,454***
	(4,573)	(4,070)	(3,189)	(3,688)	(3,618)
Private	-6,115	-10,405*	-12,792**	-16,737**	-16,103**
	(7,960)	(7,011)	(6,056)	(7,830)	(7,300)
Private ∗ pers. density	12,344**	15,184***	15,327***	15,944***	15,361***
	(5,750)	(5,216)	(4,711)	(6,593)	(6,267)
Nonprofit		2,155	1,423	3,155	-462
		(5,000)	(4,879)	(5,221)	(11,109)
Nonprofit ∗ pers. density					3,979
					(12,719)
Facility charact.	No	Yes	Yes	Yes	Yes
Municipality charact.	No	No	Yes	Yes	Yes
Teenager charact.	No	No	No	Yes	Yes
Geography dummies	No	Yes	Yes	Yes	Yes
N	179	172	136	121	121
Number of clusters	93	87	75	72	72
R^2	.502	.565	.639	.714	.714

[63]Robust standard errors clustered on the facility level in parentheses. The three most influential observations are excluded from all regressions. *** indicates significance at 1 %-level, ** at 5 %-level and * at 10 %-level in an one-sided test.

12.1.7 Table A7. Treatment Breakdowns[64]

	Breakdown of treatment (OLS)			
Variable	(1) Private	(2) Public	(3) Private	(4) Public
Constant	.342***	.073*	.325	-.135
	(.097)	(.050)	(.321)	(.145)
Previous breakdown	.088	.226***	-.002	.180*
	(.107)	(.083)	(.184)	(.135)
Violent behavior	.018	.294***	.025	.299**
	(.149)	(.108)	(.198)	(.144)
Problem index	.025	.047*	.066	-.010
	(.038)	(.032)	(.107)	(.050)
Non-voluntary			.016	-.101**
			(.130)	(.056)
Psych. problems			-.108	.089
			(.236)	(.108)
Addiction			.0822	.240**
			(.220)	(.127)
Invest. at §12-home			.230	.182
			(.190)	(.164)
Male			-.011	.130**
			(.163)	(.078)
Age (1991)			-.048	.002
			(.056)	(.034)
Immigrant			.223*	.140***
			(.149)	(.055)
Prev. exp.			.082	.111
			(.139)	(.091)
Criminal behavior			-.164	-.100
			(.213)	(.116)
Parents visit often			.071	.145*
			(.216)	(.090)
N	104	180	68	153
Number of clusters	77	61	56	57
R^2	.016	.194	.140	.260
Adj. R^2	$-.014$	.180	$-.067$	.191
p-value joint sig.	.655	.000	.237	.000

[64] Robust standard errors with cluster on facility in parentheses. The specification includes all available observations. *** indicates significance at 1 %-level, ** at 5 %-level and * at 10 %-level in an one-sided test.

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12.1.8 Table A8. Initiative to treatment breakdown

	All		Previous break.		Violence	
Initiative	Private*	Public	Private*	Public	Private*	Public
Facility	33.3	45.8	23.8	52.6	27.3	47.4
Social services	16.7	14.6	14.3	5.3	18.2	10.5
Teenager	45.8	31.3	61.9	36.8	45.5	31.6
Unclear	4.2	8.3		5.3	9.1	10.5
N	48	48	21	19	11	19

* = Excluding nonprofit facilities.

12.1.9 Table A9. Imputed values and survival analysis[65]

	Duration (months)				
	Imputed values for planned dur.			Survival analysis	
Variable	(1) OLS	(2) OLS	(3) OLS	(4) Exp.	(5) Weibull
Constant	2.967*	3.740**	2.900		
	(2.216)	(2.139)	(11.314)		
Private	11.887***	13.851***	16.267***	.327***	.227***
	(2.202)	(2.154)	(3.395)	(.076)	(.069)
Nonprofit	-2.417	-3.652**	-6.972**	1.423*	1.711**
	(2.179)	(2.112)	(3.111)	(.333)	(.528)
CAB	1.359	2.129	2.885	.762	.720
	(2.111)	(2.038)	(3.112)	(.195)	(.244)
Breakdown		-7.635***	-4.660**	1.360***	1.523***
		(1.471)	(2.004)	(.178)	(.267)
Cost (10,000 SEK)			-.806*	1.092**	1.121**
			(.537)	(.054)	(.076)
Planned duration	.507***	.553***	.365***		
	(.106)	(.103)	(.123)		
Facility charact.	No	No	Yes	Yes	Yes
Municipality charact.	No	No	Yes	Yes	Yes
Teenager charact.	No	No	Yes	Yes	Yes
Geography dummies	No	No	Yes	Yes	Yes
p-value*	.000	.000	.000	.001	.001
N	336	336	226	226	226
R^2	.206	.266	.411		
Number of clusters					
Log pseudo-likelihood				-301.37	-286.84

$* = H_0$: coeff. "ownership" = coeff. "CAB"

Comment imputed values: The imputed values for "planned duration" was computed using the "regmsng" command in STATA. The p-values for the null hypothesis of no difference for the coefficients for the original and the imputed values of "planned duration" were .812 (46), .477 (47) and .759 (48). Therefore, I rerun the regressions with the "noaux" option, implying that the imputed values were used directly in the "planned duration variable". These estimates are the ones reported above, but the full set of regressions are

[65] Standard errors in the regressions with imputed values on planned duration not adjusted for heteroskedasticity or clustered on the facility level. Standard errors in survival analysis adjusted for heterosekdasticity with cluster on the facility level. All available observations included. *** indicates significance at 1 %-level, ** at 5 %-level and * at 10 %-level in an one-sided test. "Personnel density" is not included in the regressions with facility characteristics.

available from the author on request.

12.2 Proofs

[Yet to be written]