

CONTRACTING WITH ENDOGENOUSLY INCOMPLETE COMMITMENT: ESCAPE CLAUSES*

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October 12, 2026

Abstract

Can a principal benefit from endogenously limiting its commitment to a mechanism proposed to an agent? We consider this question in the context of an escape clause stipulating conditions when the agent may cancel an agreement in exchange for a revised offer by the principal. Net benefits of incomplete commitment arise under constrained contracting where the maximal number of ex-ante contracts is smaller than the number of potential agent types. Introducing an escape clause improves contract fit at the cost of dynamic inefficiency. We establish fundamental properties of optimal escape clauses and discuss trade-offs involved in their design.

JEL classification: *D82, D84, D86.*

Keywords: *Constrained contracting, endogenously incomplete commitment, escape clauses, ratchet effect, stochastic revelation principle.*

*We thank Federico Boffa, George Deltas, Eberhard Feess, Richard Green, Cloda Jenkins, Jakub Kastl, David Sappington, Roland Strausz, and Renkun Yang for comments and discussion, as well as audiences at the 2020 Conference on Mechanism and Institution Design, the 2020 Econometric Society World Conference, GAMES 2021 and the PET 2022 International Conference. Financial support from Jan Wallanders och Tom Hedelius stiftelse (P15-0305) is gratefully acknowledged. Declarations of interest: none.

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1 Introduction

A fundamental aspect of contracting concerns the degree of commitment to the contract. If this commitment is incomplete, then parties have the power to change the conditions of the contract after interaction has begun. Such discretion is well-known to cause decisions *ex post* that are undesirable *ex ante*, a phenomenon known as a *ratchet effect* (Weitzman, 1980; Freixas et al., 1985) in mechanism design. For instance, an agent that has revealed itself to be low-cost can subsequently be exploited by the principal through a reduction in the compensation payment. To reduce such contractual opportunism, the agent manipulates the information it reveals to the principal thereby reducing the expected efficiency of the contract.

The general lesson is that a principal only can lose from incomplete commitment and should avoid it if possible. Yet, it is easy to find examples of contracts that feature incomplete commitment by design. This observation points to an important lacuna in contract theory. Most of the existing literature analyzes the *consequences* of incomplete commitment by treating it as exogenous. Our paper investigates the *sources* of incomplete commitment by asking why a principal would deliberately enter clauses into an agreement that reduce its own commitment power. In doing so, we treat commitment as endogenous.

Provisions that limit contract commitment are found, for instance, in the regulation of water companies in England and Wales. There, companies can request a so-called interim determination if operating conditions change substantially between price reviews. The regulator may subsequently adjust the price limit if the changes in costs amount to at least 10 percent of the company’s turnover.¹ The regulation of electricity distribution networks in the United Kingdom is another example of a mechanism that allows ex-post adjustment of network tariffs. A re-opener mechanism decides “within a price control period, on additional allowances to deliver a project or activity once there is more certainty” (Ofgem, 2022, Section 6). Similarly, the framework for regulating electricity distribution networks in Sweden permits the regulator to modify compensation during the regulatory period by request of a regulated company if circumstances warrant a substantial increase in that company’s revenue cap.² Importantly, these regulations do not prescribe exactly how remuneration should be changed after a company has requested a reassessment. That decision is at the discretion of the regulator.³

¹See ofwat.gov.uk/regulated-companies/price-review/interim-determinations/.

²The Swedish Electricity Act, Ellag (1997:857) 5 kap. 20§; see riksdagen.se/sv/dokument-och-lagar/svensk-forfattningssamling/ellag-1997857-sfs-1997-857.

³The United Kingdom regulation of electricity distribution networks contains additional, prespecified uncertainty mechanisms such as automatic indexation and pass-through of costs, referred to as Z-factor adjustments (Sappington and Weisman, 2010). The Swedish regulation of electricity distribution networks does not place any limitations on the revised contract other than it being a revenue cap.

The conditions above are examples of an *escape clause*. In a more general sense, this is “a statement in a contract that allows you to break all or part of the contract under particular conditions.”⁴ Escape clauses imply that instances might occur when the agent first communicates with the principal after which the principal takes an action, a sequence of events that may trigger a ratchet effect. Incomplete commitment is endogenous because the circumstances that allow ex-post contracting are described already upfront in the mechanism presented by the principal to the agent.⁵ We analyze commitment in mechanism design in the context of escape clauses because of their practical and policy relevance. We examine the following questions, framed in the context of regulating a monopoly with unknown cost (Baron and Myerson, 1982):

- What are the contractual implications of introducing an escape clause?
- When does an optimal mechanism feature endogenously incomplete commitment?
- Which trade-offs do the principal face when designing an escape clause?

Our analysis builds on the premise that the principal cannot offer and enforce an unlimited number of state contingent ex-ante contracts without cost. A principal with that capacity could specify a full commitment mechanism upfront that maximized its expected surplus subject to all relevant incentive compatibility and individual rationality constraints by the agent. The concrete friction is that contracting is *constrained* by an upper limit on the number of different contracts the principal can offer the agent upfront. This limit is smaller than the number of pay-off relevant states of the world as measured by the set of possible cost realizations of the agent. Real-world agreements seldom prescribe allocations for all possible states of the world. Relevant to our analysis, agreements between regulatory authorities and regulated companies usually are one-size-fits-all.⁶ The

⁴This definition is from the Cambridge Dictionary; see dictionary.cambridge.org/dictionary/english/escape-clause.

⁵Escape clauses are found also in trade agreements (Bagwell and Staiger, 2005; Beshkar and Bond, 2017) and in fiscal policy frameworks (Halac and Yared, 2014). In those contexts, escape clauses are safeguards that allow temporary deviations from an agreement in particular circumstances. We analyze escape clauses that permanently terminate an initial agreement. Such stipulations are common in international investment agreements at a macro level as well as in real estate and venture capital agreements at a micro level. A related provision is a break clause, typically featured in tenancy agreements, by which a party can end a contract prematurely. Similarly, common law in most countries specify rights to terminate a contract. Termination clauses apply if one of the contracting parties cannot fulfill its contractual obligations. Contracts sometimes allow so-called termination for convenience which “gives the parties the right to terminate the contract without any reason or penalty”; see sumimize.com/resources/contract-termination. These types of clauses usually do not require the principal to make a subsequent contract offer. But the principal generally cannot lose from proposing a new contract after a previous agreement has ended, so activation of these clauses plausibly leads to ex-post contracting.

⁶Mobile subscription plans with different monthly allowances, mortgage loans with different interest rate maturities, and electricity retail contracts with hourly, monthly or yearly average prices, are other examples of menus of contracts with a limited number of offers.

constraint on contracting is treated as exogenous in most of the paper. However, we provide a foundation for constrained contracting by permitting direct contracting costs in the discussion section.

Incomplete commitment causes the standard revelation principle to break down (Laffont and Tirole, 1988) because of the ratchet effect. This complication is solved by applying a stochastic revelation principle developed by Bester and Strausz (2001). It delivers an optimization program where the principal maximizes expected surplus subject to standard incentive compatibility and individual rationality constraints, plus additional sequential rationality conditions and contracting constraints. A Perfect Bayesian Equilibrium (PBE) incorporates the possibility of strategic misrepresentation of marginal costs by the agent and opportunistic behavior by the principal.

We formulate the model in Section 2. The agent (the monopoly firm) can be one of a finite number I of marginal cost types. The principal (the regulatory authority) offers a menu consisting of at most $K < I$ different contracts upfront. This mechanism may also contain an escape clause defined in terms of a subset of cost reports that nullify the ex-ante menu and entitle the agent to an ex post contract offer by the principal.

We start the analysis in Section 3 by considering the polar case of severely constrained contracting where the principal only can offer one single contract upfront ($K = 1$). This case establishes a main insight emerging from our analysis: An ex-post contract can be better suited (from the principal's perspective) to the specific circumstances of the agent than a constrained ex-ante contract, despite the dynamic inefficiency caused by the ratchet effect under ex-post contracting. To understand this result, recall that in the standard framework the principal can increase expected surplus by reducing the contracted output below the first-best efficient level for an agent with a relatively high marginal cost. Doing so reduces the informational rent the agent can earn by exaggerating its cost, thereby enabling the principal to diminish contracted transfer payments to an agent with a relatively low marginal cost. From this second-best viewpoint, the output of an agent with high marginal cost is excessive both in a constrained ex-ante environment and under ex-post contracting. In the constrained case, the distortion arises because the contract bundles lower-cost types with the high-cost type. In the ex-post case, output is too high because the agent's informational rent is sunk when the principal makes its contract offer. Under severely constrained contracting, we show that output is always more distorted in the best possible (from the principal's viewpoint) ex-ante contract than in the sequentially rational ex-post contracts. Pure ex-post contracting under which the principal does not offer any contract upfront thus delivers strictly higher expected surplus than the best possible single ex ante contract.

Section 4 extends the analysis to the general case of constrained contracting ($K \geq 1$).

We show that any incentive optimal escape clause applies to high marginal cost realizations of the agent. This result vindicates the view of an escape clause as a stipulation covering circumstances that are unfavorable for the agent, precisely as the ones found in water and electricity regulation. We also show that simultaneously upward- and downward-binding incentive compatibility constraints severely limit the flexibility of ex-post contracting: The principal offers at most two different ex-post contracts in equilibrium, no matter how broadly defined the escape clause is. Despite the limited flexibility of ex-post contracting, we establish robust circumstances under which an escape clause increases the expected surplus of the principal. This happens, for instance, if the principal places sufficient weight on efficiency relative to rent extraction. The output of the least efficient agent participating in the mechanism then exceeds the first-best efficient quantity produced under ex-post contracting, which in turn exceeds the second-best efficient output. An incentive optimal escape clause balances two opposing effects: On the one hand, broadening the clause to include a marginally more efficient cost type improves the contract fit for that marginal cost type. On the other hand, a broader escape clause increases dynamic inefficiency by increasing the excessive ex-post quantity produced by the agent.

Section 5 explores four extensions of the main model. We first provide a foundation for endogenously constrained contracting through direct contracting costs. Mookherjee and Tsumangari (2014) show how time-consuming communication creates contracting costs when the available time until a decision must be made is limited. A fixed time budget would likewise constrain contracting in our setting if surplus-increasing contract additions were time-consuming. However, a principal can buy time by applying additional resources. To account for this possibility, we assume that every contract addition has a constant marginal cost. Importantly, the cost of specifying an ex-ante contract arises *regardless* of whether this contract stipulation is actually used, whereas the cost of specifying an ex-post contract only arises *after* the agent has activated the escape clause. As a result, the principal can save on expected contracting costs by reducing ex-ante contract stipulations in favor of ex-post contracting. With this formulation, our model can sustain constrained contracting and endogenously incomplete commitment in equilibrium.

In the main analysis, we treat K as the maximal number of different contracts contained in the menu offered to the agent upfront. Our second extension offers an interpretation in which K is modeled as a restriction on contract complexity measured as the maximal number of binding incentive compatibility and individual rationality constraints. A third extension derives a sufficient condition for when a mechanism in which the agent self-selects from a menu of ex-ante contracts complemented by a general escape clause is close to incentive optimal. The explanation is that all but one cost report that activate the escape clause in the original mechanism are equally (un)informative because of uniform

randomization.⁷ The fourth extension discusses an escape clause relative to another type of safeguard, the renegotiation clause. In particular, the two clauses generate completely different individual rationality constraints by the agent.

Section 6 concludes the paper. All proofs are in a separate self-contained appendix (Tangerås and Gick, 2026) attached as supplementary material to this article.

Related literature Our paper contributes to mechanism design with incomplete commitment. Commitment issues arise in a multitude of contracting problems. The seminal contributions by Freixas et al. (1985) and Laffont and Tirole (1988) study short-term contracting in a multi-period framework. Other applications are dynamic pricing (e.g. Tirole, 2016; Beccuti and Möller, 2018; Xu and Xu, 2019; Breig, 2022), organization design (e.g. Shin and Strausz, 2014) or auction design (e.g. Vartiainen, 2013; Skreta, 2015; Akbarpour and Li, 2020). A fundamental problem is the breakdown of the revelation principle. Bester and Strausz (2001, 2007), Skreta (2006) and Doval and Skreta (2022) develop methodologies for analyzing such mechanisms with *exogenous* incomplete commitment. Instead, we treat incomplete commitment as *endogenous*.

Caruana and Einav (2008) construct a game in which the power to commit arises endogenously from the fundamentals of the model. They examine *who* eventually commits to an action. In our model, the principal has the power to commit by assumption. We establish circumstances under which the principal chooses to *limit* its commitment. In Diasakos and Koufopoulos (2018), a principal either fully commits to an initial offer or adds a clause that gives the principal the right to withdraw it. The buyer receives the outside option after withdrawal. In our model, it is the agent that has the right to reject the initial offer, in line with how escape clauses work. Moreover, activation triggers a subsequent offer by the principal instead of the outside option. The revised offer is the source of the ratchet effect which key to our results.⁸

A string of papers (e.g. Ben-Porath et al., 2019; Hancart, 2025) establish conditions for when ex-post yields the same expected surplus as ex-ante contracting so that commitment does not benefit the principal. Under constrained ex-ante contracting, the principal may strictly prefer incomplete commitment through a menu of ex-ante contracts augmented by an escape clause.

⁷A classical model of ex-post contracting is the analysis of strategic information transmission by Crawford and Sobel (1982) where an informed agent sends a signal to the principal who then takes an action. The equilibrium features uniform randomization by the agent with partitions that are more or less informative. Transfer payments and an ex-post participation constraint by the agent reduce the informativeness of the agent's cost reports that trigger the escape clause in our model.

⁸Fudenberg and Tirole (1983) analyze sequential bargaining under incomplete information. Contracting is constrained by an assumption that the seller provides a single price offer in the first stage. They observe that the seller may strictly benefit from proposing a revised price if the buyer declines the seller's initial offer. Adding this second stage amounts to introducing ex-post contracting.

Escape clauses have been studied in models of optimal delegation where contracting is constrained in the sense that transfers between the principal and the agent cannot be state-contingent (e.g. Bagwell and Staiger, 2005; Beshkar and Bond, 2017; Coate and Milton, 2019).⁹ Activation of an escape clause in this context usually implements a different predefined rule than the default, so the mechanism features complete commitment. In our model, triggering the escape clause nullifies the initial menu of contracts and generates an ex-post contract offer. Halac and Yared (2020) analyze delegation under incomplete commitment. Activation of the escape clause by the agent implies that the principal pays a fixed cost to verify the agent's type and thereafter implements the efficient allocation. In our framework, the principal draws inferences based on the agent's observed behavior, but is unable to verify the agent's type directly.

As for constrained contracting, Rogerson (2003) establishes circumstances under which the loss in expected surplus of a cost-reimbursement contract combined with a fixed-price contract is no more than 25 percent relative to implementation of the second-best menu of contracts. Chu and Sappington (2007) show that a two-item menu where the fixed-price contract is replaced by a linear cost-sharing rule does better in a broader range of circumstances. Our results suggest that an escape clause could reduce the expected loss of such simplified menus even further.

2 The contracting problem

The agent (here a monopoly firm) can be one of a finite number $I \geq 2$ of types. An agent of type $i \in \{1, 2, \dots, I\} = \mathcal{I}$ has constant marginal production cost $0 < \theta_i < \infty$. Types are ranked in order of increasing marginal production cost: $\theta_{i+1} > \theta_i$ for all $i \in \{1, \dots, I-1\}$. Let $\boldsymbol{\nu} = (\nu_1, \dots, \nu_i, \dots, \nu_I)$ be the probability distribution over the set of possible types $\boldsymbol{\theta} = (\theta_1, \dots, \theta_i, \dots, \theta_I)$, with $\nu_i > 0$ for all $i \in \mathcal{I}$, and $\sum_{i=1}^I \nu_i = 1$. To simplify indexation, we define a null type $\theta_0 \in [0, \theta_1)$ that occurs with probability $\nu_0 = 0$. Also, we let $G_i = \sum_{j=0}^i \nu_j$ be the probability that the agent has marginal production cost less than or equal to θ_i .

A contract $x = (q, t)$ is a pair specifying a quantity $q \geq 0$ the agent has to produce and an associated transfer of $t \geq 0$ from the principal to the agent (transfers are non-negative because the agent cannot be forced to produce at a loss). An agent with marginal cost θ_i

⁹As the principal cannot use transfers to accomplish incentive compatibility, the remaining design issue is how much discretion to leave to the agent regarding which actions to choose. Hence, the term optimal delegation. First analyzed by Holmström (1984), Amador and Bagwell (2013) represents the most general treatment.

operating under contract x obtains the rent

$$U_i(x) = t - \theta_i q.$$

The principal (here a regulatory authority) achieves the corresponding surplus of

$$W_i(x) = S(q) - t + \alpha U_i(x) = S(q) - \theta_i q - (1 - \alpha)U_i(x)$$

under contract x , where $S(q)$ is the principal's utility function of output q . This function is twice continuously differentiable and strictly concave, with $S(0) = 0$. The parameter $\alpha \in (0, 1)$ in the principal's objective function reflects the weight the principal attaches to the rent of the agent. We assume that the outside no-contract option has a value of zero both to the principal and the agent and that agent participation is voluntary.

We employ the standard regularity assumption

$$\theta_i + \frac{G_{i-1}}{\nu_i}(1 - \alpha)(\theta_i - \theta_{i-1}) < \theta_{i+1} + \frac{G_i}{\nu_{i+1}}(1 - \alpha)(\theta_{i+1} - \theta_i) \quad \forall i \in \{1, \dots, I - 1\} \quad (1)$$

of increasing virtual marginal cost.

First-best contracting For any given output q , the principal wants to minimize the agent's rent by setting the transfer t as small as possible. Under complete information about the agent's marginal production cost, the principal sets $U_i(x) = 0$ and maximizes

$$W_i^{fb}(q) = S(q) - \theta_i q$$

over $q \geq 0$. We assume that $\lim_{q \rightarrow 0} S'(q) > \theta_1$ and $S'(q) < \theta_I$ for some $q > 0$, so that the first-best contract $x_i^{fb} = (q_i^{fb}, t_i^{fb})$ entails strictly positive output and transfer payment:

$$q_i^{fb} = S'^{-1}(\theta_i) > 0, \quad t_i^{fb} = \theta_i q_i^{fb} > 0 \quad \forall i \in \mathcal{I}.$$

Let the first-best contract be strictly better from the principal's point of view than the outside option, $w_i^{fb} = W_i^{fb}(q_i^{fb}) > 0 \quad \forall i \in \mathcal{I}$. The menu $\mathbf{x}^{fb} = (x_1^{fb}, \dots, x_i^{fb}, \dots, x_I^{fb})$ of first-best contracts thus involves *full participation* in the sense that the agent produces a strictly positive output under complete information, regardless of its marginal cost.

Asymmetric information We study a contracting problem with incomplete information. Everything is common knowledge except the agent has private information about its marginal cost θ_i prior to contracting. The principal only knows the distribution characteristics $\boldsymbol{\theta}$ and $\boldsymbol{\nu}$. We deviate from the canonical setup by limiting the total number K

of different contracts the principal can offer the agent up front. K measures the degree to which the environment constrains contracting between the principal and the agent, with a smaller K meaning a more constrained environment. Contracting is unconstrained for $K \geq I$ because the principal then can offer one contract for each possible realization of the agent's marginal cost. Contracting is ex-ante constrained if $K < I$. We refer to the polar extreme case $K = 1$ as one of *maximally constrained* contracting. We deviate from the standard paradigm also by assuming that the principal can enter into the mechanism offered to the agent a possibility to contract ex post under predefined circumstances.

Formally, we analyze the following game between the principal and the agent:

Stage 0: The principal constructs two disjoint subsets $\mathcal{A} \subset \mathcal{I} \cup \emptyset$ and $\mathcal{B} \subset \mathcal{I} \cup \emptyset$ and a subset $\mathcal{C}$ which contains the types not in $\mathcal{A}$ or $\mathcal{B}$. The set $\mathcal{C}$ is empty if $\mathcal{A} \cup \mathcal{B}$ contains all types $\mathcal{I}$.

Stage 1: The principal commits to a menu $\mathbf{x}_{\mathcal{A}} = \{x_j\}_{j \in \mathcal{A}}$ of ex-ante contracts, $x_j = (q_j, t_j) > (0, 0)$ for all $j \in \mathcal{A}$ if $\mathcal{A} \neq \emptyset$, and to $x_j = x_0 = (0, 0)$ for all $j \in \mathcal{C}$ if $\mathcal{C} \neq \emptyset$. The menu $\mathbf{x}_{\mathcal{A}}$ consists of at most K different contracts: $|\mathbf{x}_{\mathcal{A}}| \leq K$.

Stage 2: The agent accepts or rejects the Stage 1 offer.

- Rejection: The principal and the agent receive their reservation utilities. Game over.
- Acceptance: The game continues to the next stage.

Stage 3: The agent reports marginal cost θ_j , $j \in \mathcal{I}$.

- If $\mathcal{A} \neq \emptyset$ and $j \in \mathcal{A}$, then the agent produces q_j in exchange for t_j . Game over.
- If $\mathcal{C} \neq \emptyset$ and $j \in \mathcal{C}$, then the agent receives the *null contract* x_0 . Game over.
- If $\mathcal{B} \neq \emptyset$ and $j \in \mathcal{B}$, then the game continues to the next stage.

Stage 4: The principal offers an *ex-post* contract $x_j = (q_j, t_j)$.

Stage 5: The agent accepts or rejects x_j .

- Rejection: The principal and the agent receive their reservation utilities. Game over.
- Acceptance: The agent produces q_j in exchange for t_j . Game over.¹⁰

The mechanism features *pure ex-ante contracting* if $\mathcal{B} = \emptyset$. This is the standard *complete commitment* setting of mechanism design, adapted here to the context of constrained

¹⁰The game does not formally incorporate such changes in operating conditions as described in the introduction that would cause the agent to invoke the escape clause; the agent already knows its production cost in stage 2. We could easily accommodate a possible cost shock by assuming that Nature draws the agent's type between stage 2 and 3, after which the agent decides whether to take one of the ex-ante contract proposals or invoke the escape clause. This extension of the game would not change anything in a mechanism that contains an escape clause ($\mathcal{B} \neq \emptyset$) or features incomplete participation ($\mathcal{C} \neq \emptyset$) because such a the mechanism would nevertheless require ex post individual rationality.

contracting. The mechanism has *incomplete commitment* if $\mathcal{B} \neq \emptyset$. If also $\mathcal{A} \neq \emptyset$, we interpret this property as the inclusion of the following *escape clause* in the mechanism:

All initial contract offers by the principal are void if the agent reports marginal cost θ_j , $j \in \mathcal{B}$. The agent will receive a new contract offer from the principal subsequent to invoking this clause.

The mechanism features *pure ex-post contracting* if $\mathcal{A} = \emptyset$ so that the principal does not offer any contract upfront before communicating with the agent.

The menu of contracts $\mathbf{x} = (\mathbf{x}_{\mathcal{A}}, \mathbf{x}_{\mathcal{B}})$, $\mathbf{x}_{\mathcal{B}} = \{x_j\}_{j \in \mathcal{B}}$, is direct by assumption. Bester and Strausz (2001) show for the class of games we consider here that the principal cannot gain anything by extending communication to more general message spaces. The result applies if the principal contracts with one single agent with private information about his type in a discrete and finite type space, the menu of contracts $\mathbf{x}$ and the agent's reporting strategy Σ (see below) maximize the expected surplus of the principal, and the agent communicates its type with the principal only once. Bester and Strausz (2001) do not specifically consider incomplete commitment in the form of an escape clause, nor do they discuss constrained contracting. However, we show in Tangerås and Gick (2026) that their *stochastic revelation principle* applies to our model. We restrict attention to deterministic mechanisms in the sense that every cost report θ_j is associated with one contract x_j .¹¹

The information that forms the basis of the principal's contract offer in Stage 4 differs from the information underlying contract offers in Stage 1 because the later-stage contract offer builds on information the principal has obtained from communicating with the agent, namely the cost report θ_j , $j \in \mathcal{B}$. The menu $\mathbf{x}_{\mathcal{B}}$ contains all elements of $\mathcal{B}$, but at most one of them will ever be proposed in equilibrium. Hence, the maximal number of contracts with positive output offered along the equilibrium path is $K + 1$. Observe also that the principal always can offer the null contract x_0 regardless of K . This is not unreasonable given the simplicity of this particular contract. The null contract is a simple way to handle *partial participation*, where some types do not produce a positive quantity in equilibrium.

A mechanism with incomplete commitment may involve the agent misrepresenting its type with positive probability in equilibrium. The reporting strategy of an agent of type $i \in \mathcal{I}$ is a probability distribution $\sigma_i = (\sigma_{1i}, \dots, \sigma_{ji}, \dots, \sigma_{Ii})^T \in \Delta^{I-1}$, where Δ^{I-1} is the $I - 1$ standard simplex. Specifically, $\sigma_{ji} \in [0, 1]$ is the probability that an agent with marginal cost θ_i claims to have marginal cost θ_j . We let $\sigma_i = \sigma_{ii}$ denote the

¹¹Our motivation for studying constrained contracting is that it constitutes a real property of contracts. Stochastic contracts are seldom seen. For stochastic contracting to occur, the principal must be able to commit to a transparent randomization technology. An explanation why such contract designs are unusual could be an inability of the principal to devise or commit to a randomization technology. Strausz (2003) establishes circumstances under which the principal cannot gain by randomizing across contracts.

probability that an agent with marginal cost θ_i truthfully reports its marginal cost. Let $\Sigma = (\sigma_1, \dots, \sigma_i, \dots, \sigma_I) \in \Delta^{2(I-1)}$ be the $I \times I$ matrix of reporting probabilities. We call μ_{ji} the posterior probability attached by the principal to the event that the agent has marginal cost θ_i when the agent has reported marginal cost θ_j , and let $\mu_j = \mu_{jj}$ be the posterior belief that the cost report θ_j has been truthful.

By an extension of the terminology in Bester and Strausz (2001) to our environment, a mechanism $(\mathbf{x}, \Sigma | \mathcal{A}, \mathcal{B})$ is *incentive feasible* given $(\mathcal{A}, \mathcal{B})$ if it meets the following conditions:

$$U_i(x_i) \geq 0 \quad \forall i \in \mathcal{I} \quad (2)$$

$$U_i(x_i) \geq U_i(x_j) = U_j(x_j) + (\theta_j - \theta_i)q_j \quad \forall (i, j) \in \mathcal{I} \times \mathcal{I} \quad (3)$$

$$\sigma_i > 0, \sigma_{ji}(U_i(x_i) - U_i(x_j)) = 0 \quad \forall (i, j) \in \mathcal{I} \times \mathcal{I} \quad (4)$$

$$x_j \in \arg \max_{x' \in R_+^2} \sum_{i=1}^I \mu_{ji} W_i(x') \quad \forall j \in \mathcal{B} \text{ if } \mathcal{B} \neq \emptyset \quad (5)$$

$$\mu_{ji} = \frac{\nu_i \sigma_{ji}}{\sum_{h=1}^I \nu_h \sigma_{jh}} \quad \forall (i, j) \in \mathcal{I} \times \mathcal{I} \quad (6)$$

$$|\mathbf{x}_{\mathcal{A}}| \leq K \quad (7)$$

Constraints (2) and (3) are the standard individual rationality and incentive compatibility constraints. The ex-post menu $\mathbf{x}_{\mathcal{B}}$ and agent reporting strategy Σ must jointly form a PBE to be part of an incentive feasible contract if $\mathcal{B} \neq \emptyset$. Constraints (4)-(6) are the associated equilibrium conditions. First, (4) is a rationality constraint on Σ that keeps an agent of type i at least indifferent between truth-telling and lying given that the agent correctly expects to receive x_j if it invokes the escape clause by reporting $j \in \mathcal{B}$. Second, (5) is a sequential rationality constraint on $\mathbf{x}_{\mathcal{B}}$ requiring that x_j maximize the expected surplus of the principal subsequent to every cost report θ_j , $j \in \mathcal{B}$, and given the principal's Stage 4 distribution of beliefs about the agent's true marginal cost θ_i . Third, (6) is a consistency requirement that the principal's posterior beliefs satisfy Bayes' rule. The final constraint (7) appears because of constrained ex-ante contracting, and does not feature in Bester and Strausz (2001). We use $\Gamma(\mathcal{A}, \mathcal{B})$ to label the set of incentive feasible mechanisms given $(\mathcal{A}, \mathcal{B})$.

Following again Bester and Strausz (2001), a mechanism $(\hat{\mathbf{x}}, \hat{\Sigma} | \mathcal{A}, \mathcal{B})$ is *incentive efficient* given $(\mathcal{A}, \mathcal{B})$ if it maximizes the principal's expected surplus

$$W(\mathbf{x}, \Sigma | \mathcal{A}, \mathcal{B}) = \sum_{i=1}^I \sum_{j=1}^I \nu_i \sigma_{ji} W_i(x_j) \quad (8)$$

in the set $\Gamma(\mathcal{A}, \mathcal{B})$ of incentive feasible mechanisms. Observe that the principal optimizes both over the menu of contracts $\mathbf{x}$ and the reporting strategy Σ .

Complete commitment represents the default mode in mechanism design analysis where $\mathcal{B} = \emptyset$ so that no additional contracting occurs after the agent has reported its marginal cost. Bester and Strausz (2001) consider exogenously incomplete commitment, which amounts to exogenously given $(\mathcal{A}, \mathcal{B})$ in the present context. Our paper attempts to bridge the gap between the two paradigms by endogenizing commitment. Specifically, at Stage 0 of the game, the principal chooses $(\mathcal{A}, \mathcal{B})$ to maximize the expected surplus $W(\hat{\mathbf{x}}, \hat{\Sigma}|\mathcal{A}, \mathcal{B})$. An *incentive optimal* mechanism $(\mathbf{x}^*, \Sigma^*|\mathcal{A}^*, \mathcal{B}^*)$ solves this problem.

Instances can occur when an incomplete commitment mechanism can do as well as one with complete commitment, but no better. We stack the deck against escape clauses by letting the principal choose pure ex-ante contracting in this case. The principal reduces contract commitment at stage 0 if and only if doing so strictly increases expected surplus.

Definition 1 (Escape clauses are minimal) *A mechanism $(\mathbf{x}^*, \Sigma^*|\mathcal{A}^*, \mathcal{B}^*)$ containing an escape clause ($\mathcal{B}^* \neq \emptyset$) is incentive optimal if and only if it maximizes the principal's expected surplus in the set of incentive efficient mechanisms,*

$$W(\mathbf{x}^*, \Sigma^*|\mathcal{A}^*, \mathcal{B}^*) \geq W(\hat{\mathbf{x}}, \hat{\Sigma}|\mathcal{A}, \mathcal{B}) \quad \forall (\mathcal{A}, \mathcal{B}) \subset [\mathcal{I} \cup \emptyset] \times [\mathcal{I} \cup \emptyset], \quad \mathcal{A} \cap \mathcal{B} = \emptyset, \quad (9)$$

and the escape clause is minimal in the following sense:

$$W(\mathbf{x}^*, \Sigma^*|\mathcal{A}^*, \mathcal{B}^*) > W(\hat{\mathbf{x}}, \hat{\Sigma}|\mathcal{A}, \mathcal{B}) \quad \forall (\mathcal{A}, \mathcal{B}) \subset [\mathcal{I} \cup \emptyset] \times [\mathcal{B}^* \cup \emptyset], \quad \mathcal{A} \cap \mathcal{B} = \emptyset, \quad \mathcal{B} \neq \mathcal{B}^*. \quad (10)$$

The incentive optimal mechanism entails *endogenously incomplete commitment* if $\mathcal{B}^* \neq \emptyset$. Condition (9) simply states that the proposed mechanism with the escape clause maximizes the principal's expected surplus across all possible incentive efficient mechanisms. Condition (10) requires in addition that the principal must strictly prefer the proposed mechanism with the escape clause to any incentive efficient mechanism without any escape clause, but also that the principal cannot find another mechanism with a narrower escape clause $\mathcal{B} \subset \mathcal{B}^*$, $\mathcal{B} \neq \mathcal{B}^*$, that yields the same expected surplus as the proposed mechanism. The incentive optimal escape clause is minimal in this sense.

3 Maximally constrained contracting

Consider the polar extreme case of maximally constrained contracting where the principal can offer at most one contract upfront to the agent, that is, $K = 1$. Many real-life contracts have a one-size-fits-all property. We first compare pure ex-ante with pure ex-post contracting. This analysis provides insight into the relative merits of offering contracts ex ante relative to ex post. In the first case, the principal commits to one single contract $x = (q, t)$. The agent accepts this contract if it has marginal cost $\theta_i \leq \frac{t}{q}$, but rejects it

otherwise. Under pure ex-post contracting, the principal does not propose any contract upfront. Instead, the principal states an upper bound θ_B to the marginal cost report above which there will be no contract with the agent. If the agent reports marginal cost $\theta_j \leq \theta_B$, then the principal offers a contract $x_j = (q_j, t_j)$ based on this cost report and the beliefs inferred about the agent's true cost. The ex-post contracting situation is particularly simple under full participation. The agent then reports its cost, after which the principal offers a contract. We will demonstrate that the principal strictly prefers pure ex-post over pure ex-ante contracting if $K = 1$.

Pure ex-ante contracting Suppose the principal implements an ex-ante contract that only an agent with marginal cost equal to or below θ_A , $A \in \mathcal{I}$, accepts. The rent-minimizing transfer by the principal equals $t = \theta_A q$ for quantity q . Maximization of the principal's expected surplus

$$\tilde{W}_A(q) = \sum_{i=1}^A \nu_i [S(q) - (\theta_i + (1 - \alpha)(\theta_A - \theta_i))q] \quad (11)$$

over q yields the associated output requirement $\hat{q}_A$ as the solution to

$$S'(\hat{q}_A) = \sum_{i=1}^A \frac{\nu_i}{G_A} (\theta_i + (1 - \alpha)(\theta_A - \theta_i)) \leq \theta_A = S'(q_A^{fb}). \quad (12)$$

The inequality is strict if $A \geq 2$, in which case $\hat{q}_A > q_A^{fb}$. We denote the incentive efficient ex-ante contract that yields a cut-off at θ_A by $\hat{x}_A = (\hat{q}_A, \theta_A \hat{q}_A)$. Let $\theta_{\hat{A}}$ be the cut-off that maximizes the principal's expected surplus among all potential cut-offs θ_A , $A \in \mathcal{I} \cup \emptyset$. Assume that $\hat{A} \geq 2$.¹² Let the maximum be strict:

$$\tilde{W}_{\hat{A}}(\hat{q}_{\hat{A}}) > \tilde{W}_A(\hat{q}_A) \quad \forall A \in \mathcal{I} \cup \emptyset, \quad A \neq \hat{A}. \quad (13)$$

Pure ex-post contracting The principal does not offer any contract upfront, $\mathcal{A} = \emptyset$, but proposes an ex-post contract x_j if and only if the agent reports marginal cost θ_j , $j \in \mathcal{B} = \{1, \dots, B\} \neq \emptyset$. Let the agent randomize uniformly across all cost reports θ_j , $j \in \underline{\mathcal{B}} = \{1, \dots, B - 1\}$ if $B \geq 2$ and it has marginal cost θ_i , $i \in \underline{\mathcal{B}}$. Let $\sigma_B \in (0, 1]$ be the probability that an agent with marginal cost θ_B truthfully reports its cost. Assume that $\sigma_B = 1$ if $B = 1$ and that this agent reports marginal cost θ_j with probability $\frac{1 - \sigma_B}{B - 1}$ for all $j \in \underline{\mathcal{B}}$ otherwise. Assume that the agent rejects the contract if $B \leq I - 1$ and it has marginal cost θ_i , $i \in \mathcal{C} = \{B + 1, \dots, I\}$.

¹²A sufficient condition for $\hat{A} \geq 2$ is $W_2^{sb}(q_1^{fb}) > 0$. This condition is satisfied for instance if $\theta_2 - \theta_1$ is small, since then $W_2^{sb}(q_1^{fb}) \approx w_1^{fb} > 0$.

The sequentially rational contract offer by the principal subsequent to the cost report θ_B is x_B^{fb} because the principal attaches posterior probability $\mu_B = 1$ to the event that the agent was truthful upon receiving the report θ_B , and $w_B^{fb} > 0$. If $B \geq 2$, then all marginal cost reports θ_j , $j \in \underline{\mathcal{B}}$, generate the same posterior probability distribution

$$\mu_i = \frac{\nu_i}{G_{B-1} + \nu_B(1 - \sigma_B)} \quad \forall i \in \underline{\mathcal{B}}, \quad \mu_B = \frac{\nu_B(1 - \sigma_B)}{G_{B-1} + \nu_B(1 - \sigma_B)} \quad (14)$$

of the agent's true marginal cost θ_i . The principal offers the transfer $t = \theta_B q$ under the assumption that the principal wants the agent to produce q for all marginal cost realizations equal to or below θ_B . The corresponding expected ex-post surplus of the principal equals

$$\tilde{\Omega}_B(q, \sigma_B) = \sum_{i=1}^{B-1} \nu_i [S(q) - (\theta_i + (1 - \alpha)(\theta_B - \theta_i))q] + \nu_B(1 - \sigma_B)[S(q) - \theta_B q] \quad (15)$$

divided by $G_{B-1} + \nu_B(1 - \sigma_B)$. Hence, the ex-post optimal quantity q_1 solves

$$S'(q_1) = \frac{\sum_{i=1}^{B-1} \nu_i(\theta_i + (1 - \alpha)(\theta_B - \theta_i)) + \nu_B(1 - \sigma_B)\theta_B}{G_{B-1} + \nu_B(1 - \sigma_B)} < \theta_B = S'(q_B^{fb}). \quad (16)$$

The uniform distribution of reporting strategies implies that the ex-post contract offered by the principal for any cost report θ_j , $j \in \underline{\mathcal{B}}$, is the same as the contract offered to an agent that reports marginal cost θ_1 . This contract equals $x_1 = (q_1, \theta_B q_1)$ if the principal wants the agent to produce for all cost realizations equal to or below θ_B .

Comparison of ex-post and ex-ante contracting Let $B = \hat{A}$ to facilitate comparison between pure ex-post and pure ex-ante contracting. Under pure ex-post contracting, the ex ante expected surplus of the principal equals

$$\Omega_{\hat{A}}(q_1, \sigma_{\hat{A}}) = \tilde{\Omega}_{\hat{A}}(q_1, \sigma_{\hat{A}}) + \nu_{\hat{A}} \sigma_{\hat{A}} w_{\hat{A}}^{fb}. \quad (17)$$

The first term on the right-hand side is the expected surplus of the x_1 contract, and the second term is the expected surplus of the $x_{\hat{A}}^{fb}$ contract given the randomization strategy of the agent. Under pure ex-ante contracting, we can write the ex ante expected surplus of the principal as

$$\tilde{W}_{\hat{A}}(\hat{q}_{\hat{A}}) = \tilde{\Omega}_{\hat{A}}(\hat{q}_{\hat{A}}, \sigma_{\hat{A}}) + \nu_{\hat{A}} \sigma_{\hat{A}} W_{\hat{A}}^{fb}(\hat{q}_{\hat{A}}). \quad (18)$$

Subtracting the two expressions from one another delivers

$$\Omega_{\hat{A}}(q_1, \sigma_{\hat{A}}) - \tilde{W}_{\hat{A}}(\hat{q}_{\hat{A}}) = \tilde{\Omega}_{\hat{A}}(q_1, \sigma_{\hat{A}}) - \tilde{\Omega}_{\hat{A}}(\hat{q}_{\hat{A}}, \sigma_{\hat{A}}) + \nu_{\hat{A}} \sigma_{\hat{A}} (w_{\hat{A}}^{fb} - W_{\hat{A}}^{fb}(\hat{q}_{\hat{A}})) > 0 \quad \forall \sigma_{\hat{A}} > 0.$$

In this expression, $\tilde{\Omega}_{\hat{A}}(q_1, \sigma_{\hat{A}}) > \tilde{\Omega}_{\hat{A}}(\hat{q}_{\hat{A}}, \sigma_{\hat{A}})$ because q_1 represents a better trade-off between efficiency and rent extraction than $\hat{q}_{\hat{A}}$, given $\sigma_{\hat{A}}$. In addition, ex-post contracting enables the principal to supply a tailor-made ex-post contract to an agent with reported marginal cost $\theta_{\hat{A}}$.

The benefits of increased truthfulness Pure ex-post contracting with $B = \hat{A}$ delivers strictly higher expected welfare than pure ex-ante contracting for any reporting strategy $\sigma_{\hat{A}} > 0$ if $K = 1$ and it is sequentially rational for the principal to allow production for all marginal cost reports $\theta_i \leq \theta_{\hat{A}}$. Still, ex-post contracting leads to distorted outcomes if a type $\hat{A}$ agent understates its marginal cost, $\sigma_{\hat{A}} < 1$. The principal benefits from a more truthful agent,

$$\frac{\partial \Omega_{\hat{A}}}{\partial \sigma_{\hat{A}}} = \nu_{\hat{A}}[w_{\hat{A}}^{fb} - W_{\hat{A}}^{fb}(q_1)] > 0,$$

because an agent with marginal cost $\theta_{\hat{A}}$ is more likely to receive a contract better suited (from the principal's perspective) to the agent's particular circumstances if $\sigma_{\hat{A}}$ is larger. The marginal effect on output q_1 of an increase in $\sigma_{\hat{A}}$ only has a second-order effect on expected surplus.

Even the agent benefits in expectation from a more truthful reporting strategy,

$$\frac{\partial}{\partial \sigma_{\hat{A}}} \sum_{i=1}^{\hat{A}} \nu_i U_i(x_i) = \sum_{i=1}^{\hat{A}-1} \nu_i (\theta_{\hat{A}} - \theta_i) \frac{\partial q_1}{\partial \sigma_{\hat{A}}} > 0.$$

The agent is indifferent between truthfully reporting its marginal cost $\theta_{\hat{A}}$ and understating it to $\theta_j < \theta_{\hat{A}}$, all else equal. But the ex-post quantity increases as the agent becomes more truthful,

$$\frac{\partial q_1}{\partial \sigma_{\hat{A}}} = \frac{-\alpha \nu_{\hat{A}} \sum_{i=1}^{\hat{A}-1} \nu_i (\theta_{\hat{A}} - \theta_i)}{S''(q_1) (G_{\hat{A}-1} + \nu_{\hat{A}}(1 - \sigma_{\hat{A}}))^2} > 0,$$

since the expected virtual marginal cost of an agent reporting $\theta_j < \theta_{\hat{A}}$ is smaller when $\sigma_{\hat{A}}$ is larger. More output increases informational rent whenever the agent has marginal cost $\theta_i < \theta_{\hat{A}}$.

The ratchet effect Both the principal and the agent agree ex ante that more truthful behavior would be better under pure ex-post contracting. However, there is an upper bound $\bar{\sigma}_{\hat{A}} < 1$ to the agent's truthfulness about its marginal cost $\theta_{\hat{A}}$ that is consistent with sequential rationality of x_1 . If $\sigma_{\hat{A}}$ is too large, then it becomes sequentially rational for the principal to exclude this cost type after receiving a cost report $\theta_j < \theta_{\hat{A}}$. Doing so would allow the principal to save on informational rent without sacrificing much efficiency.

This is the ratchet effect.

Suppose the principal, instead of x_1 , implements an ex-post contract that only an agent with marginal cost equal to or below θ_A , $A \in \{1, \dots, \hat{A} - 1\}$, would accept. The associated rent-minimizing transfer by the principal equals $t_A = \theta_A q$ for arbitrary quantity q . Based on the posterior beliefs (14), this alternative strategy yields expected surplus $\tilde{W}_A(q)$ divided by $G_{\hat{A}-1} + \nu_{\hat{A}}(1 - \sigma_{\hat{A}})$. The conditionally optimal deviation contract therefore equals $\hat{x}_A$. This result delivers a necessary and sufficient condition

$$\tilde{\Omega}_{\hat{A}}(q_1, \sigma_{\hat{A}}) \geq \tilde{W}_A(\hat{q}_A) \quad \forall A \in \{1, \dots, \hat{A} - 1\}$$

for sequential rationality of x_1 .

A comparison of (16) and (12) shows that q_1 converges to $\hat{q}_{\hat{A}}$ for $A = B = \hat{A}$ when $\sigma_{\hat{A}}$ goes to zero. As a result, $\tilde{\Omega}_{\hat{A}}(q_1, \sigma_{\hat{A}})$ converges to $\tilde{W}_{\hat{A}}(\hat{q}_{\hat{A}})$; see (18). By way of (13), it follows that

$$\lim_{\sigma_{\hat{A}} \rightarrow 0} \tilde{\Omega}_{\hat{A}}(q_1, \sigma_{\hat{A}}) = \tilde{W}_{\hat{A}}(\hat{q}_{\hat{A}}) > \tilde{W}_A(\hat{q}_A) \quad \forall A \in \{1, \dots, \hat{A} - 1\}.$$

Hence, x_1 is sequentially rational for $\sigma_{\hat{A}} > 0$ sufficiently close to zero.¹³

The pair $(x_1, x_{\hat{A}}^{fb})$ of ex-post contracts is incentive feasible if the probability is sufficiently large that an agent with marginal cost $\theta_{\hat{A}}$ understates its cost to achieve the ex-post contract x_1 instead of the ex-post contract $x_{\hat{A}}^{fb}$.¹⁴ As $\hat{x}_{\hat{A}}$ maximizes the principal's expected surplus across all incentive feasible pure ex-ante contracts, we conclude:

Proposition 1 *The principal strictly prefers pure ex-post over pure ex-ante contracting if contracting is maximally constrained ($K = 1$), and the principal's surplus-maximizing pure ex-ante mechanism involves some pooling of cost types ($\hat{A} \geq 2$).*

The benefit of an escape clause Under maximally constrained contracting, ex-post contracts generally offer superior fit to the economic environment compared to a pure ex-ante contract, despite strategic manipulation of cost reports by the agent due to the ratchet effect. Because under ex-post contracting the principal can always add an ex-ante contract without reducing expected surplus, we obtain (the proof is in Tangerås and Gick, 2026):

¹³Observe that $\tilde{\Omega}_{\hat{A}}(q_1, 1) = \tilde{W}_{\hat{A}-1}(q_1) - \sum_{i=1}^{\hat{A}-1} \nu_i(1 - \alpha)(\theta_{\hat{A}} - \theta_{\hat{A}-1})q_1 < \tilde{W}_{\hat{A}-1}(\hat{q}_{\hat{A}-1})$. Hence, $\bar{\sigma}_{\hat{A}} < 1$.

¹⁴The individual rationality (2) and incentive compatibility constraints (3) are met by $U_i(x_i) = U_i(x_j) > U_i(x_{\hat{A}}) > 0 = U_i(x_h)$ for all $(i, j) \in \{1, \dots, \hat{A} - 1\}^2$ and for all $h \in \{\hat{A} + 1, \dots, I\}$ if $\hat{A} \leq I - 1$, $U_{\hat{A}}(x_i) = 0$ for all $i \in \mathcal{I}$, and $U_i(x_i) = U_i(x_j) = 0 > U_i(x_h)$ for all $(i, j) \in \{\hat{A} + 1, \dots, I\}^2$ and $h \in \{1, \dots, \hat{A}\}$ if $\hat{A} \leq I - 1$. These properties also imply (4). Sequential rationality (5) was demonstrated in the main text. The posterior beliefs stated in (14) and by $\mu_{\hat{A}} = 1$ satisfy Bayes' rule (6). The constrained contracting condition (7) is trivially met under pure ex-post contracting by $\mathcal{A} = \emptyset$.

Proposition 2 *The incentive optimal mechanism contains an escape clause if contracting is maximally ex-ante constrained ($K = 1$), and the principal's surplus-maximizing pure ex-ante mechanism involves some pooling of cost types ($\hat{A} \geq 2$).*

Using the ex ante contracting possibilities to their full extent increases the principal's surplus by reducing the ratchet effect. A complementary escape clause increases the adaptability of the mechanism to the production conditions of the agent.

4 Constrained contracting

We now turn to the general case $K \geq 1$ of constrained contracting. Section 4.1 analyzes constrained mechanisms under complete commitment, which represent the appropriate benchmark against which to evaluate incomplete commitment mechanisms. In Section 4.2, we derive general properties of mechanisms under incomplete commitment. Section 4.3 then establishes circumstances under which an escape clause increases the principal's expected surplus. Finally, Section 4.4 characterizes a fundamental trade-off underlying an incentive optimal escape clause.

4.1 Constrained contracting with complete commitment

Assume that the principal commits to an ex-ante menu of contracts ($\mathcal{A} \neq \emptyset$), but does not engage in ex-post contracting ($\mathcal{B} = \emptyset$), so that the mechanism features complete commitment. Contracting is (weakly) constrained, $1 \leq K \leq I$. By the revelation principle, we can restrict attention to truthful mechanisms, i.e. incentive feasible mechanisms for which $\Sigma = \mathbf{I}$, where $\mathbf{I}$ is the identity matrix.¹⁵ The principal maximizes (8) over $\mathbf{x}$ subject to (2), (3) and (7).

The principal minimizes transfer payments by ensuring that an agent with marginal cost θ_i , $i \in \{1, \dots, I - 1\}$, is indifferent between its designated contract x_i and the local downward contract x_{i+1} , and that an agent with maximal marginal cost θ_I is indifferent between producing and not. Formally,

$$U_i(x_i) = t_{i+1} - \theta_i q_{i+1} = U_{i+1}(x_{i+1}) + (\theta_{i+1} - \theta_i) q_{i+1} \quad \forall i \in \{1, \dots, I - 1\}, \quad U_I(x_I) = 0.$$

The rent of an agent with marginal cost θ_i is found by adding up rents for more efficient

¹⁵The proof of the revelation principle can be performed in two steps. The first step is to show that the principal can restrict attention to direct mechanisms compared to mechanisms with more general message spaces. The second step is to show that the principal can restrict attention to mechanisms in which the agent report its true type with probability one compared to mechanisms in which the agent randomizes across type reports. Both steps are undertaken given an arbitrary menu of contracts. Hence, the revelation principle applies also under constrained contracting as defined in our framework.

types,

$$U_i(x_i) = \sum_{j=i}^{I-1} (\theta_{j+1} - \theta_j) q_{j+1} \quad \forall i \in \{1, \dots, I-1\}, \quad U_I(x_I) = 0, \quad (19)$$

loosely the discrete type version of the well-known integral in the continuous type case.

After a summation by parts, the expected surplus of the principal becomes

$$\sum_{i=1}^I \nu_i W_i^{sb}(q_i), \quad W_i^{sb}(q_i) = S(q_i) - (\theta_i + \frac{G_{i-1}}{\nu_i} (1 - \alpha) (\theta_i - \theta_{i-1})) q_i, \quad (20)$$

which is entirely a function of output $\mathbf{q} = \{q_1, \dots, q_i, \dots, q_I\}$.

Under constrained ex-ante contracting, set $\mathcal{A}$ is partitioned into K non-empty *cost groups*, indexed by $k \in \{1, \dots, K\}$. Each group k defines a set $\mathcal{A}_k \subset \mathcal{A}$ consisting of all cost types that are pooled into the same contract. Each cost group is a convex set because incentive compatibility implies that output is non-increasing in the agent's marginal cost. Monotonicity of output implies that the set of cost types for which there is ex-ante contracting is convex and contains the most efficient cost types: $\mathcal{A} = \{1, \dots, A\}$, where θ_A is the marginal cost of the least efficient agent that produces positive output in the mechanism. The mechanism features full participation if $A = I$. Otherwise, $\mathcal{C} = \{A+1, \dots, I\}$. Let $\theta_{\underline{A}_k}$ be the marginal cost of the most efficient agent contained in $\mathcal{A}_k$, and let θ_{A_k} be the marginal cost of the least efficient agent contained the same cost group. We identify the contract designed for cost group k by $x_{A_k} = (q_{A_k}, t_{A_k})$. We rank cost groups such that the agent is more efficient if it has marginal cost in cost group k than $k+1$. Observe also that $x_{A_K} = x_A$ because A is the least efficient cost type contained in $\mathcal{A}_K$.

Maximization of the expected welfare function

$$W_{\mathcal{A}_k}(q) = \sum_{i \in \mathcal{A}_k} \nu_i W_i^{sb}(q) \quad (21)$$

over q yields the incentive efficient output $\hat{q}_{A_k}$ in cost group k as the solution to

$$S'(\hat{q}_{A_k}) = \sum_{i \in \mathcal{A}_k} \frac{\nu_i}{\nu_{\mathcal{A}_k}} (\theta_i + \frac{G_{-i}}{\nu_i} (1 - \alpha) (\theta_i - \theta_{-i})). \quad (22)$$

In this expression, $\nu_{\mathcal{A}_k} = \sum_{i \in \mathcal{A}_k} \nu_i$ measures the ex-ante probability that the agent's marginal cost is contained in $\mathcal{A}_k$. Importantly, the output of an agent with marginal cost θ_{A_k} is larger in a pooled cost group than the corresponding second-best output, $\hat{q}_{A_k} > q_{A_k}^{sb}$, where the second-best quantity q_i^{sb} of an agent with marginal cost θ_i solves

$$S'(q_i^{sb}) = \theta_i + \frac{G_{i-1}}{\nu_i} (1 - \alpha) (\theta_i - \theta_{i-1}) = \theta_i^{sb}. \quad (23)$$

The marginal value of production equals the virtual marginal cost θ_i^{sb} under second-best contracting. The upward inefficiency of constrained contracting occurs as a result of the contract x_{A_k} pooling types with a virtual marginal production costs equal to or below that of the upper boundary type A_k . Conversely, the output of an agent with marginal cost $\theta_{\underline{A}_k}$ is smaller in a pooled cost group than the second-best quantity, $\hat{q}_{\underline{A}_k} = \hat{q}_{A_k} < q_{\underline{A}_k}^{sb}$, because the contract pools types with a virtual marginal production costs equal to or above that of the lower boundary type $\underline{A}_k$ under constrained contracting.¹⁶

Assume that the principal strictly prefers the second-best contract to the outside option for all possible cost realizations, $w_i^{sb} = W_i^{sb}(q_i^{sb}) > 0$ for all $i \in \mathcal{I}$. The menu $\mathbf{x}^{sb} = (x_1^{sb}, \dots, x_i^{sb}, \dots, x_I^{sb})$ of second-best contracts then features full participation. By assumption (1), the second-best contract for each type is unique, so that $|\mathbf{x}^{sb}| = I$. Therefore $\mathbf{x}^{sb}$ is incentive infeasible under constrained contracting, $K < I$. The principal might then consider reducing contract commitment by allowing ex-post contracting.

4.2 Contracting with incomplete commitment

This section establishes fundamental properties of the contract menus and the agent's reporting strategies in incentive feasible and incentive optimal mechanisms with incomplete commitment. For any incentive feasible mechanism $(\mathbf{x}, \Sigma | \mathcal{A}, \mathcal{B})$ that features incomplete commitment ($\mathcal{B} \neq \emptyset$), we let $\underline{B}$ and B be the minimal and maximal types, respectively, contained in $\mathcal{B}$. $\underline{C}$ represents the minimal type contained in $\mathcal{C}$ if the mechanism features partial participation, $\mathcal{C} \neq \emptyset$. We add an asterisk “*” to this notation if the mechanism $(\mathbf{x}^*, \Sigma^* | \mathcal{A}^*, \mathcal{B}^*)$ is incentive optimal.

Fundamental properties of contracts under incomplete commitment We first establish general results concerning contracts that satisfy conditions (2)-(7) in mechanisms with incomplete commitment (the proof is in Tangerås and Gick, 2026):

Lemma 1 *Any incentive feasible mechanism $(\mathbf{x}, \Sigma | \mathcal{A}, \mathcal{B})$ that features incomplete commitment ($\mathcal{B} \neq \emptyset$) has the following properties:*

1. $\mathcal{B}$ has at most two unique contracts: $|\mathbf{x}_{\mathcal{B}}| \in \{1, 2\}$.
2. If $|\mathbf{x}_{\mathcal{B}}| = 2$, then:
 - (a) All cost reports θ_j , $j \in \{\underline{B}, \dots, B - 1\}$, yield the same contract $x_{\underline{B}} = (q_{\underline{B}}, \theta_B q_{\underline{B}})$.
 - (b) Cost report θ_B yields contract x_B^{fb} .

¹⁶Tangerås and Gick (2026) contains a fuller treatment, where we also analyze other important aspects of constrained contracting, namely the optimal scope A of the ex-ante mechanism and the efficient partitioning of $\mathcal{A}$ into the K specific cost groups.

Item 1 shows that incomplete commitment increases the degrees of freedom in the mechanism by at most 2 compared to a mechanism with complete commitment. The number of different contracts contained in the menu $\mathbf{x}$ of incentive feasible contracts equals $|\mathbf{x}| = |\mathbf{x}_A| + |\mathbf{x}_B| \leq K + 2$ under incomplete commitment. This result applies to all incentive feasible mechanisms, and is not specific to the mechanisms with pure ex-post contracting analyzed in Section 3. Flexibility is limited under ex-post contracting by the ratchet effect that renders incentive compatibility constraints simultaneously downward- and upward-binding. We return to this issue shortly.

By Item 2 of Lemma 1, a "no-distortion-at-the-bottom" result applies to the upper boundary cost type B that invokes the escape clause, $x_B = x_B^{fb}$ if $|\mathbf{x}_B| = 2$. This follows from the discretion of mechanisms with incomplete commitment. The contract x_B leaves an informational rent to any agent with a smaller marginal cost $\theta_i < \theta_B$. Unlike in the complete commitment setting, the transfers necessary to reach incentive compatibility are sunk after the agent has announced marginal cost θ_B at stage 4 of the game. Consequently, there is no ex-post trade-off between efficiency and rent extraction. If $|\mathbf{x}_B| = 2$, the agent reports θ_B only if it indeed represents the agent's true marginal cost; see below. Upon observing cost report θ_B , the principal's sequentially rational choice therefore is to offer the first-best efficient contract for that specific type.

We now establish some fundamental results of contracts in the incentive optimal mechanism, i.e. the one chosen by the principal (the proof is in Tangerås and Gick, 2026):

Lemma 2 *Any incentive optimal mechanism $(\mathbf{x}^*, \Sigma^* | \mathcal{A}^*, \mathcal{B}^*)$ that features incomplete commitment ($\mathcal{B}^* \neq \emptyset$) has the following properties:*

1. *The mechanism exploits all available ex-ante contractual flexibility, $|\mathbf{x}_{A^*}^*| = K$.*
2. *All cost types contained in $\mathcal{A}^*$ are more efficient than those contained in $\mathcal{B}^*$, and all ex-ante contracts have strictly higher output than all ex-post contracts, $\theta_{A^*+1} = \theta_{\underline{B}^*}$ and $q_{A^*}^* > q_{\underline{B}^*}^*$.*
3. *All cost types contained in $\mathcal{B}^*$ are more efficient than those contained in $\mathcal{C}^*$ if the mechanism features partial participation, $\theta_{B^*+1} = \theta_{\underline{C}^*}$ if $\mathcal{C}^* \neq \emptyset$.*

Item 1 is evident because the principal always can increase expected surplus by adding a new contract to the mechanism as long as not all ex-ante contractual flexibility has been fully exploited. Items 2 and 3 imply that ex-ante contracts are designed for more efficient types, whereas the escape clause is intended for less favorable agent circumstances. Sufficiently inefficient cost types may not produce at all in equilibrium.

Figure 1 illustrates a partitioning of cost types that is consistent with the above results for an agent with 16 possible cost types and under the assumption that the principal only

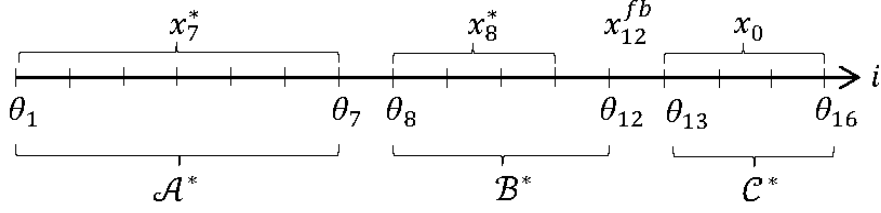


Figure 1: Partitioning of cost types in an incentive optimal mechanism.

can offer one single contract ex ante, $K = 1$. The mechanism is designed such that an agent who reports marginal cost in the span between θ_1 and θ_7 receives the ex-ante contract x_7^* , where $A^* = 7$ marks the upper boundary cost type for the ex-ante contract. The agent invokes the escape clause for any marginal cost report between θ_8 and θ_{12} , where $\underline{B}^* = 8$ is the lower boundary and $B^* = 12$ the upper boundary cost type for the escape clause. The agent receives the same ex-post contract offer x_8^* for nearly all cost reports that activate the escape clause. The exception is for the upper boundary cost report θ_{12} , subsequent to which the principal offers the agent the associated first-best contract x_{12}^{fb} . The agent is not allowed to produce anything for reported marginal cost equal to or above θ_{13} , so that $\underline{C}^* = 13$ marks the lower boundary cost type for non-production.

Fundamental properties of reporting strategies Consider next the incentive optimal reporting strategy Σ^* by the agent. Denote by $\underline{\mathcal{B}}^*$ the set of types such that any marginal cost report θ_j , $j \in \underline{\mathcal{B}}^*$, induces the principal to offer the ex-post contract $x_{\underline{B}^*}^*$.¹⁷ For instance, $\underline{\mathcal{B}}^* = \{8, 9, 10, 11\}$ in Figure 1. We prove the following result in Tangerås and Gick (2026):

Lemma 3 *For any incentive optimal mechanism $(\mathbf{x}^*, \Sigma^{**} | \mathcal{A}^*, \mathcal{B}^*)$ featuring incomplete commitment ($\mathcal{B}^* \neq \emptyset$), there exists an incentive optimal mechanism $(\mathbf{x}^*, \Sigma^* | \mathcal{A}^*, \mathcal{B}^*)$ and reporting strategy Σ^* with the following properties:*

1. *With respect to cost types in $\mathcal{A}^*$:*

- (a) *All but the upper boundary type A^* truthfully report their cost, $\sigma_i^* = 1 \forall i \in \{1, \dots, A^* - 1\}$ if $|\mathcal{A}^*| \geq 2$.*
- (b) *The upper boundary type A^* may invoke the escape clause, and then randomizes uniformly across all cost types contained in $\underline{\mathcal{B}}^*$, $\sigma_{A^*}^* > 0$ and $\sigma_{jA^*}^* = \frac{1 - \sigma_{A^*}^*}{|\underline{\mathcal{B}}^*|} \forall j \in \underline{\mathcal{B}}^*$.*

2. *With respect to cost types in $\mathcal{B}^*$, assuming $|\mathcal{B}^*| \geq 3$:*

¹⁷Formally, $\underline{\mathcal{B}}^* = \{\underline{B}^*, \dots, B^* - 1\}$ if $|\mathbf{x}_{\mathcal{B}^*}^*| = 2$, and $\underline{\mathcal{B}}^* = \{\underline{B}^*, \dots, B^*\} = \mathcal{B}^*$ if $|\mathbf{x}_{\mathcal{B}^*}^*| = 1$; see Lemma 2.

- (a) All but the upper boundary type B^* randomize uniformly across all types in $\underline{\mathcal{B}}^*$, $\sigma_{ji}^* = \frac{1}{|\underline{\mathcal{B}}^*|} \forall (i, j) \in \{\underline{B}^*, \dots, B^* - 1\} \times \underline{\mathcal{B}}^*$.
- (b) The upper boundary type B^* randomizes between all types of cost reports that yield ex-post contracting:
 - i. $0 < \sigma_{B^*}^* < 1$ and $\sigma_{jB^*}^* = \frac{1 - \sigma_{B^*}^*}{|\underline{\mathcal{B}}^*|} \forall j \in \underline{\mathcal{B}}^*$ if $|\mathbf{x}_{B^*}^*| = 2$;
 - ii. $\sigma_{jB^*}^* = \frac{1}{|\underline{\mathcal{B}}^*|} \forall j \in \underline{\mathcal{B}}^*$ if $|\mathbf{x}_{B^*}^*| = 1$.
- 3. Cost types in $\mathcal{C}^*$ truthfully report their cost if the mechanism features partial participation, $\sigma_i^* = 1 \forall i \in \mathcal{C}^*$ if $\mathcal{C}^* \neq \emptyset$.

Lemma 3 provides a near-complete characterization of the incentive optimal reporting strategy under endogenously incomplete commitment, despite the potentially large set of cost types and feasible randomization strategies. The reporting strategies of the individual cost types are mostly simple, which we illustrate based on Figure 1. By Item 1(a) of Lemma 3, any agent with marginal cost between θ_1 and θ_6 truthfully reports its marginal cost. This result follows from an application of the revelation principle to the menu of ex-ante contracts. By Item 2(a) of the lemma, any agent with marginal cost between θ_8 and θ_{11} uniformly randomizes between cost reports θ_8 and θ_{11} and thereby receives the ex-post contract x_8^* with probability 1. By Item 3 of the lemma, any agent with marginal cost equal to or above θ_{13} truthfully reports its marginal cost and receives the null contract. In Figure 1, remaining uncertainty relates to the probability $1 - \sigma_7^* \in [0, 1)$ with which an agent with marginal cost θ_7 exaggerates its marginal cost to activate the escape clause and thereby receive the ex-post contract offer x_8^* . Additional uncertainty is associated with the probability $1 - \sigma_{12}^* \in (0, 1)$ with which an agent with marginal cost θ_{12} understates its marginal cost to receive the ex-post contract x_8^* .¹⁸

Summary of results Understatement of marginal costs by some relatively inefficient types is fundamental to ensure incentive compatibility of ex-post contracts for cost types $i < B^*$ in equilibrium. Suppose, for instance, that no agent with marginal cost equal to or above θ_9 ever pretends to have marginal cost θ_8 in Figure 1. The principal would then infer from a cost report equal to θ_8 that the agent had marginal cost of no more than θ_8 . The sequentially rational ex-post contract offer x_8 would then involve a transfer $t_8 \leq \theta_8 q_8$ by the principal in an effort to minimize agent rent. Anticipating this ratchet effect, an agent with marginal cost θ_8 would expect to earn non-positive rent by a truthful cost report. It would be better for the agent to exaggerate its marginal cost, for instance

¹⁸Tangerås and Gick (2026) consider also the residual cases of $|\mathcal{B}^*| = 1$ and $|\mathcal{B}^*| = 2$. We show that $\sigma_{B^*}^* = 1$ if the escape clause contains a single cost type B^* . If $|\mathcal{B}^*| = 2$, then an agent with marginal cost $\theta_{\underline{B}^*}$ may understate marginal cost to θ_{A^*} in equilibrium.

to θ_{12} , and earn strictly positive rent. Consequently, the mechanism would be incentive incompatible. The requirement that incentive compatibility constraints must be locally upward-binding underlies the finding in Lemma 1 that ex-post contract offers for all cost reports θ_j , $j \in \{\underline{B}, \dots, B - 1\}$ are the same in any incentive feasible mechanism. We summarize the most important qualitative features of incentive optimal mechanisms with incomplete commitment as:

Observation 1 *An incentive optimal mechanism contains an escape clause to accommodate situations where the agent has high marginal costs. Ex-post contracts are distorted from an ex-ante perspective mainly because (i) the principal treats informational rent as a sunk cost when making ex-post contract offers; (ii) the agent may trigger the escape clause by exaggerating its marginal cost.*

This section has characterized properties of incentive optimal mechanisms assuming incomplete commitment. The next section establishes sufficient conditions for when the principal prefers to include an escape clause for $K \geq 1$.

4.3 Incentive optimality of an escape clause

So far we have established the incentive optimality of introducing an escape clause when the principal only can offer a one-size-fits-all contract under ex-ante contracting. The value of ex-post contracting is smaller if the principal can offer more complex contracts ex ante, that is, when K is larger, because then the principal can account for more contingencies already beforehand. Still, the principal may have insufficient degrees of freedom to account for all potential contingencies ex ante. This occurs for any K if the type space is large. This plausible scenario leads to the question whether escape clauses are incentive optimal for more generally constrained mechanisms such that $1 \leq K < I$? The next result establishes a simple sufficient condition for this to be the case (the proof is in Tangerås and Gick, 2026):

Lemma 4 *Let $\hat{A}$ be the least efficient cost type that produces positive output $\hat{q}_{\hat{A}} > 0$ in the mechanism that maximizes the principal's expected surplus across all incentive feasible mechanisms with complete commitment (pure ex-ante contracting). The incentive optimal mechanism features incomplete commitment if $\hat{q}_{\hat{A}} > \hat{q}_{\hat{A}}^{fb}$.*

By pooling a subset of cost types into a cost group K that contains multiple cost types, the least efficient cost type $\hat{A}$ in that group produces excessive output from the viewpoint of the second-best contract, $\hat{q}_{\hat{A}} > q_{\hat{A}}^{sb}$; see Section 4.1. If it is also the case that $\hat{q}_{\hat{A}} > q_{\hat{A}}^{fb}$, then the principal can add to the initial mechanism a small escape clause that only contains

the $\hat{A}$ type. The principal then manages to reduce excessive output for the $\hat{A}$ cost type from $\hat{q}_{\hat{A}}$ to $q_{\hat{A}}^{fb}$. The reason is that the sequentially optimal contract implements $x_{\hat{A}}^{fb}$.

The sufficient condition of Lemma 4 is satisfied if $K = 1$ and $\hat{A} \geq 2$; see optimality condition (12). This property establishes Proposition 2. To evaluate $K \geq 2$, subtract (22) from $S'(q_{\hat{A}}^{fb}) = \theta_{\hat{A}}$ to get the difference

$$\nu_{\hat{A}_K}[S'(q_{\hat{A}}^{fb}) - S'(\hat{q}_{\hat{A}})] = \sum_{i \in \hat{A}_K} \nu_i(\theta_{\hat{A}} - \theta_i) - \sum_{i \in \hat{A}_K} G_{-i}(1 - \alpha)(\theta_i - \theta_{-i})$$

in marginal expected surplus. The first term on the right-hand side measures the effect on the virtual marginal cost of pooling cost type $\hat{A}$ with more efficient cost types $i < \hat{A}$. The pooling effect tends to increase $\hat{q}_{\hat{A}}$ compared to the first-best output $q_{\hat{A}}^{fb}$. The second term on the right-hand side above measures the adjustment of the informational rent, which occurs under constrained contracting, but not under first-best contracting. This adjustment tends to reduce $\hat{q}_{\hat{A}}$ relative to $q_{\hat{A}}^{fb}$.

The adjustment for informational rent vanishes in the limit as $\alpha \rightarrow 1$ since rent extraction has a negligible effect on output $\hat{q}_{\hat{A}}$ when α is close to one. We directly conclude:

Proposition 3 *The incentive optimal mechanism contains an escape clause if the principal attaches sufficient weight to efficiency relative to rent extraction (α is sufficiently close to 1).*

Sometimes the principal can offer more complex contracts than one-size-fits-all and may place a lot of weight on rent extraction in the design of the mechanism. The above results do not apply when $K \geq 2$ and α is small. Still, there are plausible circumstances under which the incentive optimal mechanism features incomplete commitment (the proof is in Tangerås and Gick, 2026):

Proposition 4 *Assume that the mechanism that maximizes the principal's expected surplus across all incentive feasible mechanisms with complete commitment features partial participation. The incentive optimal mechanism then contains an escape clause if $\theta_{\hat{A}+1} - \theta_{\hat{A}-1}$ is small and $W_{\hat{A}}^{sb}(q_{\hat{A}}^{fb}) > 0$.*

In the best mechanism with full commitment, the principal is nearly indifferent between including an agent with boundary marginal cost $\theta_{\hat{A}}$ or excluding it from the mechanism if the type space is large and the mechanism features partial participation. A better alternative could be to include the boundary type through an escape clause instead. This occurs if the expected surplus of doing so is sufficiently high in the sense that

$W_A^{sb}(q_A^{fb}) > 0$.¹⁹ The second-best welfare function is the correct welfare metric because it conveys the optimal trade-off between efficiency and rent extraction from an ex-ante perspective.

The two previous subsections have established circumstances under which the incentive optimal mechanism features incomplete commitment. However, we have not discussed the trade-offs faced by the principal in the design of the escape clause. This is the topic of our next subsection.

4.4 Trade-offs in the design of an escape clause

To examine the boundaries of the escape clause, consider a mechanism $(\mathbf{x}^*, \Sigma^* | \mathcal{A}^*, \mathcal{B}^*)$ featuring an escape clause $\mathcal{B}^*$ that contains at least two cost types. Assume that the agent truthfully reports its marginal cost θ_i if $i \in \mathcal{A}^* \cup \mathcal{C}^*$ and randomizes uniformly across all marginal cost reports θ_j , $j \in \mathcal{B}^*$, if $i \in \mathcal{B}^*$. This mechanism delivers the expected surplus

$$w^* = \sum_{i \in \mathcal{A}^*} \nu_i W_i(x_i^*) + \Omega_{\mathcal{B}^*}(q_{\mathcal{B}^*}^*).$$

In this expression,

$$\Omega_{\mathcal{B}^*}(q_{\mathcal{B}^*}^*) = \sum_{i \in \mathcal{B}^*} \nu_i [S(q_{\mathcal{B}^*}^*) - (\theta_i + (1 - \alpha)(\theta_{\mathcal{B}^*} - \theta_i))q_{\mathcal{B}^*}^*]$$

defines the expected surplus of the ex-post contract $x_{\mathcal{B}^*}^* = (q_{\mathcal{B}^*}^*, \theta_{\mathcal{B}^*} q_{\mathcal{B}^*}^*)$.

Compare now the initial mechanism to a modified mechanism $(\mathbf{x}, \Sigma | \mathcal{A}, \mathcal{B})$ with an incrementally smaller escape clause. Specifically, the lower boundary type $\underline{B}^*$ is included in the least efficient cost group, so that $\mathcal{A}_K = \mathcal{A}_K^* \cup \underline{B}^*$, and the escape clause is correspondingly reduced to $\mathcal{B} = \mathcal{B}^* \setminus \underline{B}^*$. All other cost groups remain the same as before. The modification of the escape clause reduces ex-post output to $q_{\underline{B}} < q_{\mathcal{B}^*}^*$ in the sequentially rational ex-post contract $x_{\underline{B}} = (q_{\underline{B}}, \theta_{\mathcal{B}^*} q_{\underline{B}})$ because the escape clause now consists of less efficient cost types than before. This output reduction changes the downward incentive compatibility constraints, which affects the transfer to the more efficient types. The initial ex-ante contracts are modified as follows:

$$q_j = q_j^*, \quad t_j = t_j^* + t, \quad t = (\theta_{\underline{B}^*} - \theta_{A^*})(q_{A^*}^* - q_{\underline{B}^*}^*) - (\theta_{\mathcal{B}^*} - \theta_{A^*})(q_{\underline{B}}^* - q_{\underline{B}}) \quad \forall j \in \mathcal{A}^*,$$

whereas $x_{\underline{B}^*}^* = (q_{A^*}^*, t_{A^*}^* + t)$. Every ex-ante contract has the same output requirement

¹⁹It is easy to create a model in which $W_i^{sb}(q_i^{fb}) > 0$ for all $i \geq 2$. Consider the quadratic surplus function $S(q) = (s - \frac{1}{2}q)q$. Under this assumption, $q_i^{fb} = s - \theta_i$ and $q_i^{sb} = s - \theta_i^{sb}$. Hence, $W_i^{sb}(q_i^{fb}) = (s - \frac{1}{2}q_i^{fb} - \theta_i^{sb})q_i^{fb} > 0$ if and only if $s > \theta_i + 2\frac{G_{i-1}}{\nu_i}(1 - \alpha)(\theta_i - \theta_{i-1})$.

as before but all transfer payments are adjusted by the same amount.²⁰ This particular mechanism generates the expected surplus

$$w = \sum_{i \in \mathcal{A}} \nu_i W_i(x_i) + \Omega_{\mathcal{B}}(q_{\underline{B}}) = \sum_{i \in \mathcal{A}^*} \nu_i W_i(x_i^*) - G_{A^*}(1 - \alpha)t + \nu_{\underline{B}^*} W_{\underline{B}^*}(x_{\underline{B}^*}) + \Omega_{\mathcal{B}}(q_{\underline{B}}).$$

The second term measures the expected economic effect of the change in transfer payments to any agent with marginal cost equal to or below θ_{A^*} . The third effect is the expected surplus of an agent with marginal cost $\theta_{\underline{B}^*}$ who is now on an ex-ante contract. The last term is the expected surplus of the escape clause.

We can decompose the net benefit to the principal of the incentive optimal mechanism over the modified one into three separate effects:

$$\begin{aligned} w^* - w &= \nu_{\underline{B}^*}^* [W_{\underline{B}^*}^{sb}(q_{\underline{B}^*}^*) - W_{\underline{B}^*}^{sb}(q_{A^*}^*)] \\ &\quad - G_{\underline{B}^*}(1 - \alpha)(\theta_{B^*} - \theta_{\underline{B}^*})(q_{\underline{B}^*}^* - q_{\underline{B}}) - [\Omega_{\mathcal{B}}(q_{\underline{B}}) - \Omega_{\mathcal{B}}(q_{\underline{B}^*}^*)]. \end{aligned}$$

The first term on the right-hand side is the effect on the expected surplus of an agent with marginal cost $\theta_{\underline{B}^*}$ producing ex-post output $q_{\underline{B}^*}^*$ instead of the ex-ante output $q_{A^*}^*$, evaluated on the basis of the second-best welfare function. The ex-post contract provides a better ex-ante trade-off between efficiency and rent extraction than the ex-ante contract if the ex-post output is closer to the second-best output than the ex ante output so that $q_{\underline{B}}^{sb} < q_{\underline{B}^*}^* < q_{A^*}^*$. Output $q_{\underline{B}^*}^*$ is larger under escape clause $\mathcal{B}^*$ compared to $q_{\underline{B}}$ under the smaller escape clause $\mathcal{B}$ because an agent that has invoked the escape clause on average is more efficient under $\mathcal{B}^*$ than $\mathcal{B}$. The increase in output has a first-order effect on ex ante expected informational rent because the principal chooses $q_{\underline{B}^*}^*$ and $q_{\underline{B}}$ ex post after the information rent is sunk. The dynamic inefficiency of a broader escape clause is measured by the first negative term on the second line above. The final effect is the one on the inefficiency of output $q_{\underline{B}^*}^*$, relative to $q_{\underline{B}}$ under the ex-post welfare function $\Omega_{\mathcal{B}}(q)$.²¹

Based on these trade-offs, the initial mechanism is incentive optimal only if:

$$\nu_{\underline{B}^*}^* [W_{\underline{B}^*}^{sb}(q_{\underline{B}^*}^*) - W_{\underline{B}^*}^{sb}(q_{A^*}^*)] \geq G_{\underline{B}^*}(1 - \alpha)(\theta_{B^*} - \theta_{\underline{B}^*})(q_{\underline{B}^*}^* - q_{\underline{B}}).$$

We interpret the left-hand side of this inequality as the *expected improvement in contract fit* associated with an agent of marginal cost $\theta_{\underline{B}^*}$ receiving an ex-post contract $x_{\underline{B}^*}^*$ that is better suited to that agent (from the principal's perspective) than the ex-ante contract $x_{A^*}^*$. This benefit must be sufficiently large to outweigh the *expected increase in dynamic*

²⁰The proof that this mechanism is incentive feasible is available on request.

²¹This final effect is of second-order importance in a large type space in the sense that $\frac{\Omega_{\mathcal{B}}(q_{\underline{B}^*}^*) - \Omega_{\mathcal{B}}(q_{\underline{B}})}{\theta_{\underline{B}^*+1} - \theta_{\underline{B}^*}} \rightarrow 0$ for $\theta_{\underline{B}^*+1} - \theta_{\underline{B}^*} \rightarrow 0$.

inefficiency associated with ex-post contracting under the escape clause on the right-hand side of the inequality. We summarize this fundamental trade-off as:

Observation 2 *The design of an incentive optimal escape clause balances an expected improvement in contract fit against an expected increase in dynamic inefficiency.*

5 Discussion

The maximal number K of contracts the principal can offer the agent upfront is exogenous in the main analysis. In Section 5.1, we provide a foundation for endogenously constrained contracting by introducing direct contracting costs. We have interpreted K as the maximal number of contracts contained in the menu offered to the agent upfront. In Section 5.2, we show that K instead can be modeled as a restriction on contract complexity measured as the maximal number of non-trivially binding incentive compatibility and individual rationality constraints. The incentive optimal mechanism in the main text stipulates a detailed escape clause. In Section 5.3, we establish a sufficient condition for when a mechanism in which the agent self-selects from a menu of ex-ante contract complemented by a general escape clause is close to incentive optimal. In Section 5.4, we briefly discuss a renegotiation clause as an alternative to an escape clause.

5.1 Contracting costs as a source of incomplete commitment

There are several reasons why a principal would limit the number of contracts. For instance, the Swedish Regulatory Authority for the Electricity Market offers one single regulatory contract to avoid discriminating across different electricity distribution networks ex post. We here explore a different avenue to explain $K < I$. Let K be endogenous, but assume that there is a fixed cost $c > 0$ of adding each additional contract to any given menu of contracts. This menu cost arises both for ex-ante and ex-post contracts. An important difference is that the cost of specifying an ex-ante contract for a marginal cost revelation θ_j , $j \in \mathcal{A}$, arises *regardless* of whether this contract stipulation is actually used, whereas the cost of specifying an ex-post contract only arises *after* the agent has activated the escape clause by reporting marginal cost θ_j , $j \in \mathcal{B}$.

The contracting cost approach introduced by Dye (1985) has suffered criticism for being ad hoc. For instance, Segal (1999) argues that the economic value of a contract stipulation is likely to be large relative to the cost of inserting it into an agreement. From that perspective, contracts should be complete even in the presence of contracting costs. Adding an arbitrary contract stipulation to an initial menu of contracts is unlikely to be very costly. But not all contract additions generate economic value to the principal. For

this to be the case, the additional contracts must be incentive compatible and increase the principal's expected surplus relative to the initial menu of contracts. Characterizing an incentive compatible and surplus-increasing incremental contract is much more challenging in terms of time and resources than simply adding an arbitrary contract. The complexity of this task is probably larger and its value smaller as the number of initial contracts is larger. For these reasons we let the cost of adding a contract be non-negligible. We will then characterize circumstances under which the principal would rather constrain the number of ex-ante contracts and rely on some ex-post contracting than increase the number of ex-ante contracts.

The two-type example Consider an example with two cost types. The principal has three possibilities under complete commitment. Option one is to offer the first-best efficient contract to the low-cost type and achieve expected surplus $\nu w_1^{fb} - c$. The second option is a single contract offer $\hat{x}_2 = (\hat{q}_2, \theta_2 \hat{q}_2)$ that is just acceptable to the agent regardless of its marginal cost; see (12) for the definition of the output $\hat{q}_2$. This contract yields the expected surplus $\tilde{W}_2(\hat{q}_2) - c$, where the expected surplus function was defined in (11). Option three is to implement the second-best mechanism and obtain the second-best expected surplus $w^{sb} = \nu w_1^{fb} + (1 - \nu)w_2^{sb}$ at the expense of a higher contracting cost $2c$.

Assume that constrained contracting is strictly better than null contracting from the principal's viewpoint. This condition is met, for instance, if the total expected value of the contract is larger than the total ex-ante contracting cost:

$$\tilde{W}_2(\hat{q}_2) = \nu W_1^{fb}(\hat{q}_2) + (1 - \nu)W_2^{sb}(\hat{q}_2) > c.$$

The principal prefers constrained to unconstrained contracting if the incremental value of increasing the number of contracts is so small relative to the incremental contracting cost that

$$w^{sb} - \tilde{W}_2(\hat{q}_2) = \nu[w_1^{fb} - W_1^{fb}(\hat{q}_2)] + (1 - \nu)[w_2^{sb} - W_2^{sb}(\hat{q}_2)] < c.$$

However, the principal might prefer constrained to unconstrained contracting even if $w^{sb} - \tilde{W}_2(\hat{q}_2) \geq c$. This occurs if the probability $1 - \nu$ that the agent has a large marginal cost θ_2 is so small that

$$w^{sb} - \nu w_1^{fb} = (1 - \nu)w_2^{sb} - c < 0. \quad (24)$$

The principal can do even better by reducing contract commitment, as shown in Section 3.²² Hence, direct contracting costs can explain both constrained contracting and

²²By Proposition 1, there exists an incentive feasible mechanism with pure ex-post contracting that

incomplete contract commitment in the simple two-type case. This equilibrium can be sustained even if the marginal contracting cost c is small, provided ν is large. We next consider the general type space $I \geq 2$.

The general model Analyzing the general case requires some additional notation. Let $(\hat{\mathbf{x}}^K, \mathbf{I}|\hat{\mathcal{A}}^K, \emptyset)$ maximize the principal's expected surplus for arbitrary $1 \leq K \leq I$ subject to the requirement of complete commitment. In this mechanism, $\hat{\mathcal{A}}^K = \{1, \dots, \hat{A}_K\}$ is the subset of cost types for which the agent receives an ex-ante contract. Denote cost group k by $\hat{\mathcal{A}}_k^K = \{\hat{A}_k^K, \dots, \hat{A}_k^K\}$. Define the contract $\hat{x}_j^K = (\hat{q}_j^K, \hat{t}_j^K)$ awarded to the agent if it reports marginal cost θ_j , $j \in \hat{\mathcal{A}}^K$. This mechanism delivers the expected surplus

$$W(\hat{\mathbf{x}}^K, \mathbf{I}|\hat{\mathcal{A}}^K, \emptyset) - cK = \sum_{i=1}^{\hat{A}_K} \nu_i W_i^{sb}(\hat{q}_i^K) - cK.$$

We first establish a sufficient condition for constrained contracting to be incentive optimal, which is a straightforward generalization of (24) in the two-type case. The full commitment mechanism with $K = I - 1$ generates expected surplus

$$W(\hat{\mathbf{x}}^{I-1}, \mathbf{I}|\hat{\mathcal{A}}^{I-1}, \emptyset) - c(I-1) \geq \sum_{i=1}^{I-1} \nu_i w_i^{sb} - c(I-1) = w^{sb} - cI + c - \nu_I w_I^{sb}.$$

The expected net surplus of the unconstrained mechanism equals $w^{sb} - cI$. A comparison leads to the immediate conclusion:

Proposition 5 *The incentive optimal mechanism features constrained contracting, $K \leq I - 1$, if $\nu_I w_I^{sb} < c$.*

All else equal, the principal optimally saves on contracting costs by reducing the number of ex-ante contracts below I if the likelihood ν_I of a very adverse marginal cost realization θ_I is sufficiently small.

The principal can possibly do better by introducing an escape clause. Assume that the constrained full commitment mechanism $(\hat{\mathbf{x}}^K, \mathbf{I}|\hat{\mathcal{A}}^K, \emptyset)$ features incomplete participation, $\hat{A}_K \leq I - 1$. Modify it by an escape clause targeted to an agent with marginal production cost $\theta_{\hat{A}_K+1}$. Let the agent truthfully report its marginal cost in this modified mechanism. The first-best efficient contract $x_{\hat{A}_K+1}^{fb}$ then is sequentially rational following the marginal

delivers strictly higher expected surplus $\tilde{\Omega}_2(\bar{q}_1, \sigma_2)$ than $\tilde{W}_2(\hat{q}_2)$ if $\tilde{W}_2(\hat{q}_2) > \nu w_1^{fb} = \tilde{W}_1(\hat{q}_1)$. The expected contracting cost is the same and equal to c in both mechanisms. If $\tilde{W}_2(\hat{q}_2) \leq \nu w_1^{fb}$, the principal achieves at most expected surplus $\nu w_1^{fb} - c$ under pure ex ante contracting. The principal would achieve strictly higher expected welfare $\nu[w_1^{fb} - c]$ by setting $\mathcal{B} = \{1\}$, $\mathcal{C} = \{2\}$ and offering the first-best contract x_1^{fb} after observing the marginal cost report θ_1 . This mechanism is incentive feasible with equilibrium reporting strategies $\sigma_1 = \sigma_2 = 1$ by the agent.

cost report $\theta_{\hat{A}_{K+1}}$. To maintain incentive compatibility, the principal must increase the transfer by $(\theta_{\hat{A}_{K+1}} - \theta_{\hat{A}_K})q_{\hat{A}_{K+1}}^{fb}$ for all marginal cost reports θ_j , $j \in \hat{\mathcal{A}}^K$. This mechanism is incentive feasible if and only if $\hat{q}_{\hat{A}_K} \geq q_{\hat{A}_{K+1}}^{fb}$, and delivers expected surplus

$$W(\hat{\mathbf{x}}^K, \mathbf{I}|\hat{\mathcal{A}}^K, \emptyset) - cK + \nu_{\hat{A}_{K+1}}[W_{\hat{A}_{K+1}}^{sb}(q_{\hat{A}_{K+1}}^{fb}) - c].$$

We then obtain a more general result concerning the optimality of escape clauses (the proof is in Tangerås and Gick, 2026):

Proposition 6 *Assume that the mechanism $(\hat{\mathbf{x}}^K, \mathbf{I}|\hat{\mathcal{A}}^K, \emptyset)$ that maximizes the principal's expected surplus across all incentive feasible mechanisms with complete commitment features constrained contracting and partial participation, $\hat{A}_K \leq I - 1$. The incentive optimal mechanism contains an escape clause if $\theta_{\hat{A}_{K+1}} - \theta_{\hat{A}_{K-1}}$ is small and $W_{\hat{A}_{K+1}}^{sb}(q_{\hat{A}_{K+1}}^{fb}) > c$.*

Adding an escape clause increases the expected surplus of the principal if the ex-post contract is sufficiently valuable compared to the contracting cost.²³ Expanding the menu of contracts beyond K in a full commitment contract is unprofitable if and only if

$$\frac{W(\hat{\mathbf{x}}^L, \mathbf{I}|\hat{\mathcal{A}}^L, \emptyset) - W(\hat{\mathbf{x}}^K, \mathbf{I}|\hat{\mathcal{A}}^K, \emptyset)}{L - K} = \sum_{i=1}^I \nu_i \frac{W_i^{sb}(\hat{q}_i^L) - W_i^{sb}(\hat{q}_i^K)}{L - K} \leq c, \quad \forall L \in \{K + 1, \dots, I\}.$$

This lower bound on the contracting cost and the upper bound in Proposition 6 are mutually satisfied, for instance, if

$$\frac{W_i^{sb}(\hat{q}_i^L) - W_i^{sb}(\hat{q}_i^K)}{L - K} \leq c < W_i^{sb}(q_i^{fb}), \quad \forall i \in \mathcal{I}, \quad L \in \{K + 1, \dots, I\}.$$

This sufficient condition illustrates how direct contracting costs may simultaneously sustain constrained contracting and an escape clause. This occurs when the marginal contracting cost exceeds the *incremental* increase in surplus of expanding the number of contracts under complete commitment, but is smaller than the *total* value of introducing a new contract.

5.2 Contract complexity

We have interpreted K as the maximal number of contracts contained in the ex-ante menu $\mathbf{x}_{\mathcal{A}}$ offered to the agent. However, it is not necessarily the case that one can meaningfully define constrained contracting in terms of the number of contract offers to the agent. Consider a principal that commits to a non-linear compensation function $T(q)$. Arguably,

²³ $W_i^{sb}(q_i^{fb}) > c$ for an agent with marginal cost θ_i in the quadratic model introduced in footnote 19 if $s > \theta_i^{sb} + \sqrt{(\theta_i^{sb} - \theta_i)^2 + 2c}$.

this is one single contract offer. Assume that this function has the property $T(q_i) = t_i$ for all $i \in \mathcal{A}$. The rest of the compensation function can be constructed to implement $\mathbf{x}_{\mathcal{A}}$, an application of the taxation principle; see for instance Martimort and Stole (2002) for a discussion. While constituting a single contract offer, $T(q)$ implements no more than K different outcomes.

One possibility would be to define constrained contracting in terms of a restriction on the number of contract *outcomes* instead of contract *proposals*. A different avenue is to view K as a restriction on contract complexity measured as the maximal number of non-trivially binding incentive compatibility and individual rationality constraints. An incentive compatibility constraint is non-trivially binding if $U_i(x_i) = U_i(x_j)$ and $x_j \neq x_i$ (trivially binding if $x_j = x_i$). An individual rationality constraint $U_i(x_i) = 0$ is non-trivially binding if $x_i \neq x_0$ (trivially binding if $x_i = x_0$).

To formalize this idea, assume that the principal commits to some ex-ante contract $T(q)$. Let $x_i = (q_i, t_i) = (q(\theta_i), T(q(\theta_i)))$ be the contract outcome intended by the principal for an agent with marginal cost θ_i , $i \in \mathcal{A} = \{1, \dots, A\}$. There are at most A such outcomes under a deterministic contract. Let $\mathbf{x}_{\mathcal{A}} = \{x_1, \dots, x_i, \dots, x_A\}$ be the set of potential contract outcomes. For each potential cost type $i \in \mathcal{A}$, define the set $\Gamma_i = \{x_j \in \mathbf{x}_{\mathcal{A}} | U_i(x_i) = U_i(x_j), x_j \neq x_i\}$ of non-trivially binding incentive compatibility constraints. This set can be empty. Let $\gamma_i = |\Gamma_i|$ be the cardinality of Γ_i . Define $\gamma = \sum_{i \in \mathcal{A}} \gamma_i$, and denote by $\gamma + 1$ the complexity of contract $T(q)$. We leave one degree of freedom for a binding outside option, which can be the null contract or in our setting, an anticipated ex-post contract offer by the principal. This contract is said to be constrained complex of degree K if it is subject to a requirement that $\gamma + 1 \leq K$.

The monotone hazard rate condition (1) in our model implies that all incentive compatibility constraints are locally downward-binding, whereas all non-local constraints are non-binding in the second-best mechanism $\mathbf{x}^{sb}$. Hence, $\Gamma_i = \{x_{i+1}^{sb}\}$ and $\gamma_i = 1$ for all $i \in \{1, \dots, I - 1\}$. Moreover, $\Gamma_I = \emptyset$ and therefore $\gamma_I = 0$. By implication, $\gamma = \sum_{i \in \mathcal{I}} \gamma_i = I - 1$. Hence, the complexity of the second-best mechanism is I .

For a different example, consider the auction of an indivisible good to a single buyer with valuation θ_i . The incentive efficient mechanism is to post a reservation price $t = \theta_A$ and to sell the good with probability $q = 1$ if the agent is willing to pay the posted price, and refuse to sell the good otherwise. Hence, $x_i = (1, \theta_A)$ for all $i \in \mathcal{A} = \{1, \dots, A\}$, and $x_i = x_0$ for all $i \in \mathcal{C} = \{A + 1, \dots, I\}$. Pooling implies $\Gamma_i = \emptyset$ and therefore $\gamma_i = 0$ for all $i \in \{1, \dots, A\}$. Any incentive efficient mechanism has complexity 1, which implies that imposing constrained contracting has no implications for the optimal mechanism in the auction with a single buyer.

5.3 Implementation through a general escape clause

An incentive optimal mechanism $(\mathbf{x}^*, \Sigma^* | \mathcal{A}^*, \mathcal{B}^*)$ with incomplete commitment describes for each possible cost report θ_j , $j \in \mathcal{A}^*$, which contract x_j^* of K options the agent shall receive, and it defines a subset $\mathcal{B}^*$ of cost types such that the agent triggers the escape clause for all marginal cost reports θ_j , $j \in \mathcal{B}^*$. Finally, the mechanism may also specify a non-empty subset $\mathcal{C}^*$ such that the agent does not produce anything for any cost report θ_j , $j \in \mathcal{C}^*$. Such high level of contractual detail can be costly to implement in practice, and delineating the exact boundaries of the escape clause seems particularly challenging. A relevant question then concerns the extent to which detailed communication adds economic value to the principal.

To gauge the value of communication between the principal and the agent in our context, consider an alternative mechanism and sequence of events:

Stage 1: The principal commits to a GC mechanism consisting of a menu $\mathbf{x}^{GC}$ of K contracts $x_{A_k^*}^{GC} = (q_{A_k^*}^{GC}, t_{A_k^*}^{GC})$, where

$$q_{A_k^*}^{GC} = q_{A_k^*}^*, \quad t_{A_k^*}^{GC} = t_{A_k^*}^* - (\theta_{B^*} - \theta_{A^*})(q_{B^*}^* - q_{B^*}^{GC}) \quad \forall k \in \{1, \dots, K\},$$

augmented by the general escape clause (GC):

The agent has the right to terminate the initial agreement and request a new contract offer from the principal regardless of the circumstances.

Stage 2: The agent

- selects $x_{A_k^*}^{GC}$ if $\theta_i \in \mathcal{A}_k^*$ and $\theta_i < \theta_{A^*}$.
- selects $x_{A^*}^{GC}$ with probability $\sigma_{A^*}^*$ and activates the escape clause GC with probability $1 - \sigma_{A^*}^*$ if the agent has marginal cost θ_{A^*} .
- activates the escape clause GC if the marginal cost is θ_i , $i \in \mathcal{B}^*$.
- rejects the offer if $\mathcal{C}^* \neq \emptyset$ and the marginal cost is θ_i , $i \in \mathcal{C}^*$.

Stage 3: If the agent has invoked the escape clause in stage 2, then the principal offers the ex-post contract $x_{B^*}^{GC}$ featuring transfer payment $t_{B^*}^{GC} = \theta_{B^*} q_{B^*}^{GC}$ and output requirement $q_{B^*}^{GC}$ solved by

$$S'(q_{B^*}^{GC}) = \frac{\nu_{A^*}(1 - \sigma_{A^*}^*)(\theta_{A^*} + (1 - \alpha)(\theta_{B^*} - \theta_{A^*})) + \sum_{i \in \mathcal{B}^*} \nu_i(\theta_i + (1 - \alpha)(\theta_{B^*} - \theta_i))}{\nu_{A^*}(1 - \sigma_{A^*}^*) + \sum_{i \in \mathcal{B}^*} \nu_i}. \quad (25)$$

Communication is restricted in the GC mechanism in the sense that the agent never directly reports its cost to the principal, only implicitly through its choices. The agent either self-selects one of the ex-ante contracts, activates the escape clause, or completely rejects the offer after which the game ends. Contrary to the escape clause that forms the foundation of the incentive optimal direct mechanism, the above clause applies generally.

We now show the consequences when the principal introduces a mechanism with restricted communication. The principal forms the posterior beliefs

$$\mu_{A^*}^{GC} = \frac{\nu_{A^*}(1 - \sigma_{A^*}^*)}{\nu_{A^*}(1 - \sigma_{A^*}^*) + \sum_{i \in \mathcal{B}^*} \nu_i}, \quad \mu_i^{GC} = \frac{\nu_i}{\nu_{A^*}(1 - \sigma_{A^*}^*) + \sum_{i \in \mathcal{B}^*} \nu_i} \quad \forall i \in \mathcal{B}^* \quad (26)$$

about the agent's distribution of marginal costs subsequent to the activation of the escape clause by the agent. The right-hand side of (25) measures the expected virtual marginal cost of an agent that invoked the escape clause GC, where the expectation is taken over the principal's posterior belief distribution (26).

In the incentive optimal mechanism, the posterior belief distribution equals

$$\begin{aligned} \mu_{A^*}^* &= \frac{\nu_{A^*}(1 - \sigma_{A^*}^*)}{\nu_{A^*}(1 - \sigma_{A^*}^*) + \sum_{i \in \underline{\mathcal{B}}^*} \nu_i + \nu_{B^*}(1 - \sigma_{B^*}^*)} \\ \mu_i^* &= \frac{\nu_i}{\nu_{A^*}(1 - \sigma_{A^*}^*) + \sum_{i \in \underline{\mathcal{B}}^*} \nu_i + \nu_{B^*}(1 - \sigma_{B^*}^*)} \quad \forall i \in \underline{\mathcal{B}}^* \\ \mu_{B^*}^* &= \frac{\nu_{B^*}(1 - \sigma_{B^*}^*)}{\nu_{A^*}(1 - \sigma_{A^*}^*) + \sum_{i \in \underline{\mathcal{B}}^*} \nu_i + \nu_{B^*}(1 - \sigma_{B^*}^*)}, \end{aligned} \quad (27)$$

for any marginal cost report $\theta_j, j \in \underline{\mathcal{B}}^*$. This distribution differs only by the factor $\nu_{B^*}\sigma_{B^*}^*$ compared to the GC belief distribution. In particular, the belief distribution (26) places higher posterior probability than (27) on the agent having the maximal marginal cost realization θ_{B^*} . This property increases the virtual marginal cost of the GC mechanism relative to the incentive optimal mechanism, which implies that the equilibrium output requirement satisfies $q_{\underline{B}^*}^{GC} < q_{\underline{B}^*}^*$ solved by

$$\begin{aligned} S'(q_{\underline{B}^*}^*) &= \frac{\nu_{A^*}(1 - \sigma_{A^*}^*)(\theta_{A^*} + (1 - \alpha)(\theta_{B^*} - \theta_{A^*}))}{\nu_{A^*}(1 - \sigma_{A^*}^*) + \sum_{i \in \underline{\mathcal{B}}^*} \nu_i + \nu_{B^*}(1 - \sigma_{B^*}^*)} \\ &+ \frac{\sum_{i \in \underline{\mathcal{B}}^*} \nu_i(\theta_i + (1 - \alpha)(\theta_{B^*} - \theta_i)) + \nu_{B^*}(1 - \sigma_{B^*}^*)\theta_{B^*}}{\nu_{A^*}(1 - \sigma_{A^*}^*) + \sum_{i \in \underline{\mathcal{B}}^*} \nu_i + \nu_{B^*}(1 - \sigma_{B^*}^*)}. \end{aligned} \quad (28)$$

The smaller output of the GC mechanism reduces the transfer payments necessary to maintain incentive compatibility, which tends to increase the expected surplus of the principal under the GC compared to the initial mechanism. However, the incentive optimal mechanism provides more flexibility than the GC mechanism if the former implements

$x_{B^*}^{fb}$ subsequent to the marginal cost report θ_{B^*} . These pros and cons are both negligible for small $\nu_{B^*}\sigma_{B^*}^*$ because then the contracts are almost identical in both mechanisms (the proof is in Tangerås and Gick, 2026):

Proposition 7 *Assume that the incentive optimal mechanism features incomplete commitment. Then there exists a restricted communication mechanism augmented by a general escape clause that can be sustained as a PBE. This mechanism generates in the limit $\nu_{B^*}\sigma_{B^*}^* \rightarrow 0$ the same expected surplus as the incentive optimal mechanism.*

Proposition 7 holds because all cost reports θ_j , $j \in \underline{\mathcal{B}}^*$, provide exactly the same information to the principal about the cost distribution of the agent. Only the report θ_{B^*} potentially produces different information than the others. This additional information is negligible in expectation in a large type space (so that ν_i is small for all $i \in \mathcal{I}$). Hence, the proposition shows that the value of direct communication is small under plausible circumstances. A policy implication is that the principal has little to gain from specifying a detailed escape clause. A general escape clause does nearly as well in equilibrium.

5.4 Other clauses

The benchmark against which we evaluate mechanisms with incomplete commitment is the mechanism that maximizes the principal’s expected surplus in the set of incentive feasible mechanisms with complete commitment. The general message is that incentive feasible mechanisms sometimes exist that strictly improve upon the complete commitment benchmark under constrained contracting. All such improvements must necessarily involve incomplete commitment.

We have modeled incomplete commitment as an escape clause triggered by the agent through a marginal cost report θ_j , $j \in \mathcal{B}$, where $\mathcal{B}$ is specified in the mechanism upfront. All initial contract offers are then invalidated. This formulation of incomplete commitment is inspired by qualitative properties of real-life escape clauses. However, our results do not rule out the possibility that other mechanisms featuring incomplete commitment could outperform mechanisms with escape clauses, from the viewpoint of the principal.

A *renegotiation clause* is similar in spirit to an escape clause. Invoking a renegotiation clause also triggers ex-post contracting. A main difference is that the agent under a renegotiation clause will reject any ex-post contract offer that delivers lower rent than the best possible ex-ante contract.²⁴ To see the implications, assume that the agent receives one of K ex-ante contracts for cost reports θ_j , $j \in \mathcal{A} = \{1, \dots, A\}$. The agent triggers the

²⁴A renegotiation clause means that the mechanism may feature partial renegotiation (i.e. only for a subset of cost reports) as opposed to full renegotiation as has previously been studied by e.g. Hart and Tirole (1988), Laffont and Tirole (1990), and Maestri (2017).

renegotiation clause by reporting θ_j , $j \in \mathcal{B} = \{A + 1, \dots, B\}$, $B \geq A + 1$. An agent with marginal cost θ_i , $i \in \mathcal{B}$, that has invoked the renegotiation clause, accepts the ex-post contract x_j if and only if

$$U_i(x_j) \geq U_i(x_A).^{25}$$

The right-hand side of this ex-post individual rationality constraint depends on the agent's marginal cost θ_i , unlike in the case of the escape clause where the right-hand side is zero. This modification has an impact on the principal's sequentially rational choice of the ex-post contract. For instance, the principal is unable to extract all rent ex post even if the agent truthfully reports its marginal cost. This property should dampen the ratchet effect associated with ex-post contracting and will most likely also affect the extent to which the agent manipulates cost reports in equilibrium. As our paper has shown, such effects have implications for the incentive optimal mechanism that are far from obvious.

6 Conclusion

This paper has shown why a principal would deliberately reduce its commitment to a contract even if ex-post contracting would cause dynamic inefficiency. In a setting where the principal cannot costlessly cover every possible pay-off relevant contingency in an ex-ante contract, ex-post contracting can improve contract fit in a way that is valuable enough to dominate the ratchet effect of discretionary contracting. In this way we have offered a novel sight on why regulators endogenously limit their commitment power when designing real-world contracts in regulation and service procurement. A common solution by regulators is to use an escape clause. Our analysis shows that such clauses can be formulated in a general way without incurring a substantial efficiency loss.

Complementary analysis of endogenously limited commitment could involve studying the optimal contract length of the contracts offered to agents. This topic is an important design issue in regulation and procurement agreements as well.²⁶ Defining appropriate market size thresholds for when to regulate firms directly (ex-ante contracting) or indirectly through competition policy (ex-post contracting) is another design problem featuring endogenous commitment choices. Such study would require independent analysis, which we leave for future research.

²⁵Formally, the agent evaluates x_j against all x_h , $h \in \mathcal{A}$. However, incentive compatibility and monotonicity of output of the menu of ex-ante contracts implies $U_i(x_A) - U_i(x_h) = U_A(x_A) - U_A(x_h) + (\theta_i - \theta_A)(q_h - q_A) \geq 0$ for all $(i, h) \in \mathcal{B} \times \mathcal{A}$.

²⁶Mechanism design has mainly focused on long-term contracts; see Bergemann and Välimäki (2019) for a survey.

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