

Contracting on Time

Sergei Guriev and Dmitriy Kvasov

I. A. What are the main issues addressed?

Consider two agents, say a buyer and a seller, and that an action by the seller contains positive cross benefits for both parties, say investment in the production process which eventually reduces costs or improves quality ultimately enjoyed by both parties. It is well known by contract theorists that efficient investment by the seller benefiting both parties can be realized by continually renegotiated fixed-term contracts. If the fixed-term is too long, then the seller will initially over invest in the process and under invest in the product harming the buyer relative to his immediate outside options; and if the fixed-term contract length is too short then both parties will suffer from the inability of the seller to adequately invest in process improving innovations. After the moment that an optimal length contract is signed, the contract length effectively decreases as time goes by and, just like the case of too short of term contracts, the seller is again unable to adequately invest. Thus, even though fixed-term contracts are capable of achieving first-best investment levels momentarily, in order to maintain these optimal investment dynamics it is necessary to continually renegotiate them to, in essence, stay on the margin. Realistically there exist costs to continual renegotiation which can make such contracts impractical. Guriev and Kvasov demonstrate that the first-best investment dynamics can be achieved through the use of Evergreen Contracts. Evergreen contracts

are automatically, continually renewing contracts that require the agents to finally provide an advance notice of termination. Moreover Guriev and Kvasov demonstrate that the optimal advance notice time generating the optimal investment dynamics is less than the term length of the perpetually renegotiated fixed-term contracts. This means that both parties experience less on-contract time while knowing that the relationship is effectively terminated; therefore reducing the possibility of adverse end-game behaviors. Both types of contracts still result in the same behavior: same actual contract duration, same optimal investment dynamics (while Evergreen contracts generically appear to be more practical and have less risk of unexpected end-game behavior deviations.)

I. B. Previous Treatments by the Literature.

McLeod & Malcomson (1993, 1995) studied a dynamic 2-period incomplete contract model. Under specific restrictions (certain bargaining power allocations or production switching costs sufficiently high so that renegotiation of fixed-term contracts are not needed) efficient investment behavior can be implemented through option [to terminate] contracts. A major difference between their papers and this one is that McLeod & Malcomson do not actually contract in time, meaning that their contracts terminate immediately upon the exercising of the option to terminate. Herein the advance notice of the Evergreen contracts allows the agents to achieve optimal investments in even a more general setting. Another difference between McLeod & Malcomson papers and Guriev and Kvasov is that the latter also considers stochastic durations which allow us to analyze the effects of different ratios of the sellers' investment desires and the buyer's desired flexibility.

Also, there exist in previous literature multiple solutions to the holding problem, the underinvestment by the seller due to the dilution of the investment incentive between buyer and seller. Pitchford & Snyder (2004) and Che & Sakovics (2004) both rely on infinite rounds of investment and bargaining between the parties, where Evergreen contracts achieve first best behavior in both finite and infinite time horizons.

Other mildly relevant literature includes Lobet (2000) on sequential innovations and patents whose results are consistent with basic consequences of the Guriev and Kvasov model. In addition, Crawford (1988) considers risk neutrality and non-risk-neutrality in the special case when it is assumed that the seller's investment is observable and therefore contractible (which is not always the case such as with investments to improve workers' human capital).

II. The Authors Innovations and Results

The authors construct a model with a seller and buyer desiring to enter into a contract for goods or services where there exist positive cross-benefits from investment actions taken by the seller. Further, the model specifies that the uncertainty of the time of arrival of an alluring outside alternative for the buyer is distributed according to a stationary Poisson distribution. The model is constructed in a continuous time environment which trivially includes the discrete case. The authors assume Inada conditions assuring interior solutions to the fixed-term length and advance notice period. The authors also assume a generic payoff value function, and generic cross-benefit function.

In the body of the paper, the authors calculate the term length of the fixed-term contract that generates optimal investment levels and subsequently optimal investment dynamics upon continually renegotiated. The term length, T , is a function of the agents' shared discount factor, the goods or service depreciation level, ex ante expected total contract duration length derived from the distribution of probabilities of the arrival time of the alluring outside option for the buyer, and a ratio of the marginal benefits of the agents from the seller's investment. The fixed-term length achieving first-best seller investment dynamics is

The authors then show that there exists an Evergreen contract inducing the same first-best investment dynamics. They then calculate the corresponding advance notice time, T_A , required to implement this Evergreen contract,

It can be seen that the required advance notice time is unambiguously less than the fixed-term.

III. The Value of the Contribution

Guriev and Kvasov have accurately characterized more general conditions under which Evergreen contracts can achieve the first best investment behaviors previously only known to belong to renegotiated fixed term contracts. Also Guriev and Kvasov quantified the exact time benefits of the shorter advance notice over the longer fixed-terms. With these contributions, Guriev and Kvasov have paved the way for future research in Evergreen contracts. Also, these results bring the enticing benefits of evergreen contracts closer to realization for private industries and governments.

The degree of cross-benefits dictates the optimal duration of the relationship between the parties and spotlights the welfare importance of achieving first best investments. Large firms in a global economy are constantly looking for practical lower-risk contracts that optimize investment behavior. One should caution however that while Evergreen contracts lower the risk of adverse end-game behavior they incur higher risks if one party is susceptible to filing bankruptcy. Recent bankruptcy regulations stipulate that agents who have filed for bankruptcy are immune to Evergreen contracted parties seeking to terminate contracts or even submit advance notice of option to terminate.

IV. Considered Extensions and Questions for Future Research

First, the authors considered some of a multitude of possible distributions governing the probabilities of the arrival of the buyer's outside option. The above results are robust for non-stationary distributions. Further, the above results are partially robust for differing distributions such as the uniform distribution. Under the uniform distribution of probabilities, renegotiated fixed-term contracts and Evergreen contracts

still attain first best investment results. Also, the difference between the term of the fixed-term contract and the advance notice time is the expected duration of the relationship at that time. A notable difference with the uniform distribution is that the term length, T , and advance notice time, τ , are now time dependent.

Another extension considered by the authors is the allowing of the buyer to return to the seller following a breakup with his outside option. Given the investments and cross benefits, both parties should be willing to reengage in contract and the results of the Evergreen contract are robust over this case.

As for extensions with differing initial bargaining power allocations, the results only change in that both the fixed-term length and required advance notice time increase with the seller's bargaining power. When the seller's bargaining power gets too large relative to the desired flexibility of the buyer dependent on the distribution of arrival of the outside option, the null contract outperforms the Evergreen contract. This result suggests that a weakness of contracts on time is their sensitivity to the modeling of outside options and seller's investments. In practice, this would mean that Evergreen contracts should not be used in situation where outside options or investment functions are not well understood – this also means that understanding outside option functions and investment functions of firms likely to participate in Evergreen contracts are important and would be a worthwhile area for future research.

Lastly, by introducing into the model the increased risks generated from contracting with bankruptcy-liable firms under recent bankruptcy regulations there exist interesting research questions such as the immediate question of under what relative risk thresholds can Evergreen contracts still generate first best investment dynamics.