Book Review of "Contract Theory" (Bolton and Dewatripont, 2005)

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Two of the most successful contract theorists have written this much-anticipated book (early versions of some chapters have been circulating for many years). Pioneers of contract theory are praising the book. On the back cover, Jean Tirole, Oliver Hart, and Bengt Holmström unanimously say that it will become the standard text in contract theory. Eric Maskin points out that the authors make contract theory seem "beautifully simple" (which I consider to be very desirable indeed). Philippe Aghion argues that this is the most important textbook on microeconomics since TIROLE's [1988] celebrated *Theory of Industrial Organization*. Thus, expectations could not be higher.

The first part of the book analyzes static contracting between two parties, a principal and an agent. Chapter 2 discusses adverse selection. In the basic model, a monopolistic seller faces a buyer who has private information about his willingness-to-pay. In a tractable two-type model, the optimal contract is derived. The authors then discuss applications (e.g. credit rationing, labor contracts), where new problems (such as risk aversion) are introduced. Finally, returning to the seller-buyer model, more than two types are considered. Here the authors presume familiarity with dynamic optimization (not all readers will consider this to be beautifully simple). In chapter 3, signaling games are analyzed, where an informed principal conveys information to her agent (e.g., by choosing an education level), and finance

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applications are discussed. Chapter 4 is focused on moral hazard models with hidden actions. The authors first present accessible models with two output levels. The trade-offs between incentives and insurance (when the agent is risk-averse) and between incentives and rents (when the agent is risk-neutral but wealth-constrained) are discussed. A prominent model with linear contracts is presented, but it is stressed that at least in a static setting linear contracts are suboptimal. Finally, models with more than two output levels and applications are discussed. Chapter 5 considers "certifiable information" (what will be called "hard information" in a later chapter) in financial contracting applications, which are quite different from the seller-buyer adverse selection problem. Emphasis is put on voluntary disclosure and mandatory disclosure laws. Chapter 6 discusses multidimensional adverse selection, hidden action models with multiple tasks, and combinations of adverse selection and hidden actions.

The second part of the book considers static contracting where more than one party has private information or chooses an effort level (the authors' description of this part as contracting with three or more parties on p. 238 is slightly misleading, since some models consider two parties). Chapter 7 continues the discussion of adverse selection with MYERSON AND SATTERTHWAITE's [1983] celebrated result (that voluntary bilateral trading under asymmetric information cannot always be ex post efficient) and a concise introduction into auction theory. The authors start with simple two-type models, before they discuss a continuum of types. Chapter 8 is focused on HOLMSTRÖM's [1982] moral hazard in teams problem, relative performance evaluation (e.g., tournaments), principal-supervisor-agent models (with hard information and collusion), and hierarchies in large organizations.

The third part of the book analyzes repeated bilateral contracting. Continuing the discussion of adverse selection, chapter 9 distinguishes between agents' types that are fixed over time or drawn in each period. Another distinction is made between full commitment, renegotiation of long term contracts, and short term (spot) contracts. The latter distinction can also be made in the context of repeated moral hazard, which is discussed in chapter 10, where the consumption smoothing motive of risk-averse agents plays an important role. Moreover, renegotiation in one-shot hidden action models (with risk-averse agents), relational (i.e., implicit) contracting, and career concerns (i.e., signal jamming) are analyzed.

The book's fourth and final part deals with incomplete contracting, which plays a key role for the enormous success of contract theory in the past two decades. A two-parties version of GROSSMAN AND HART's [1986] path-breaking work is presented, framed as a discussion of the costs and benefits of employment relationships (compared to sales contracts). The authors then discuss the property rights approach with *n* parties following HART AND MOORE [1990], before they turn their attention to financial contracting. Chapter 12 is focused on the controversial debate surrounding the (so-called) foundations of incomplete contracting. Contractual solutions to the hold-up problem (where relationship-specific investments are observable but non-verifiable and renegotiation cannot be prevented) are discussed and alternative approaches are considered. Finally, in chapter 13 it is argued that often there is no grand contract signed by all concerned parties. Contracting in market contexts is discussed, with particular emphasis on bilateral contracting of a principal with multiple agents.

In an appendix (chapter 14), there are more than fifty exercises, classified by chapter. No solutions are provided.

As I have remarked, Aghion has compared this book with TIROLE's [1988] *Theory of Industrial Organization*. Tirole's book has only one major drawback: There has never been an up-dated edition. I hope there will be a second edition of Bolton and Dewatripont's book! Even though it is brilliant in many ways, significant value could be added without much effort. Additional footnotes would often be useful. For example, many authors use ARROW's [1985] and HART AND HOLMSTRÖM's [1987] definition of adverse selection (precontractual private information) and moral hazard (postcontractual information asymmetries due to hidden actions or hidden information). In contrast, Bolton and Dewatripont do not treat hidden information as a special case of moral hazard. A short footnote explaining that some authors use a different wording would help students who might otherwise be confused.

I have used the book in a seminar. Each student had to read a chapter and present the central insights. The students liked the fact that many ideas can be understood with the help of simple binary models that do not rely on mathematical pyrotechnics. They were also interested in the applications, but criticized the finance bias and the fact that (e.g., in chapter 2) each application often has its own notation and the relationship to the basic model is not always clear. The students were annoyed by the fact that there are quite some mistakes in the formulae (e.g., there are at least five printing errors in chapter 2). Most typos are harmless, but there are cases where as a consequence the economic conclusions are misleading (specifically, see the comparison between employment and sales contracts in section 11.1.2.5).

I agree that a minimalist approach (only introduce elements of a model that are necessary to generate the economic effects) is very desirable. Bolton and Dewatripont have impressively demonstrated in many chapters that contract theoretic insights can be presented in such a way. This is "economics at its best," to use Aghion's words from the book's back cover. Clearly, it would have been a good idea if the authors had asked each of their PhD students to proofread a few chapters, so that students who read the book would not be frustrated when they are uncertain if they misunderstood a model or if there is just another typo. I also agree that contract theory has "applications in virtually all fields of economics" (p. 2), so many readers indeed might have preferred more applications unrelated to finance.

The book will be an important research reference (probably even a "bible") on contract theory. Hence, I think that the guides to the literature at the end of each chapter could have been slightly more extensive. Usually, the references mentioned in the text are repeated, and some related papers are listed. While sometimes papers that seem to be less relevant are mentioned, important work is omitted. For example, ROGERSON's [1992] benchmark model of how to solve hold-up problems contractually and CRAMTON, GIBBONS, AND KLEMPERER's [1987] important variant of MYERSON AND SATTERTHWAITE's [1983] model have been ignored. The authors could have added more footnotes throughout the text mentioning closely related work. For example, I wonder why they do not mention MATSUO [1989] when they discuss the two-type version of MYERSON AND SATTERTHWAITE's [1983] model.

The book is a collection of many interesting models, often motivated by applications. It is not really a systematic treatment of contract theory as such. For example, regarding adverse selection, one could have made a distinction between private values (a seller has private information about his costs) and common values (a seller knows the quality of a good, which influences the buyer's valuation), between an exogenous and an endogenous status quo, or between type-dependent and type-independent reservation utilities. Even with one-sided private information, ex post efficiency may not be attainable if the status quo can be chosen by a party (see SCHWEIZER [1988] or KLIBANOFF AND MORDUCH [1995]) or if there are common values (see SAMUELSON's [1984] contract-theoretic version of AKERLOF's [1970] lemon problem). The authors could have distinguished between ex post inefficiencies due to voluntary participation and due to incentive compatibility (i.e., violations of monotonicity) alone. The role of the single-crossing property is not really made clear. The information structure could have been endogenized by a systematic analysis of information gathering (see

CRÉMER, KHALIL, AND ROCHET [1998]), and so on. Thus, the reader should not expect a conceptually crystal clear and systematically structured presentation of pure contract theory.

To give another example, concepts such as the renegotiation proofness principle are mentioned but not rigorously stated as theorems (what does it say precisely, when exactly does it hold?). Such omissions are not surprising, given the state of the art. Maybe the most obvious point in this context is the fact that there is no clear definition of incomplete contracts (see also TIROLE [1999]). The authors say that “rather than optimizing over a general contract set” (p. 487), the form of the contract is “prespecified exogenously in at least some dimensions” (p. 37; in other words, what actually is incomplete is the search for an optimal contract). Hence, why are linear contracts in static moral hazard models discussed in the (complete contracting) chapters 4 and 8, if the restriction to linearity is exogenously imposed and not a result of optimization over all conceivable contracts? Moreover, it is unclear what is meant by foundations of contractual incompleteness in chapter 12. Are we looking for models where the optimal contract looks “simple” (e.g., since a simple contract plus a particular renegotiation protocol [which might be difficult to impose] can mimic a complicated contract; see also HUBERMAN AND KAHN [1988])? In many models in chapter 12 incompleteness (i.e., an ad hoc restricted class of contracts) is simply assumed (sometimes it is argued that the assumption is not necessary). Note that quite some of the papers which argue that writing no contract at all is optimal in hold-up situations rely on questionable assumptions regarding renegotiation (see LYON AND RASMUSEN [2004] and WATSON [2005]).

The book is a perfect starting point for researchers who are looking for interesting contract-theoretic problems. Here are a few topics that I personally consider to be promising. It is natural to extend the adverse selection models of chapter 2 by considering verifiable ex post signals (see KESSLER, LÜLFESMANN, AND SCHMITZ [2005]). Moreover, it is important to explore the interplay between hidden action and hidden information, maybe in even simpler models than the ones studied in chapter 6 (see SCHMITZ [2002], where neither precontractual private information nor limited liability are needed). The property rights approach of chapter 11 could be enriched by ex post transaction costs due to private information (see SCHMITZ [2006]). The possibility to explain the allocation of control rights in models with ex post unverifiable actions in the sense of chapter 12 should be further explored (see e.g. SCHMITZ [2005]). Finally, behavioral contract theory is a fashionable topic that will be a focus of future research, but it is not discussed in the book. It would be interesting to know if the authors made this decision because of space limitations or because of other concerns.

Will this formidable book be the standard text in contract theory? I think so, although it might have had a strong competitor. LAFFONT AND MARTIMORT [2002] planned three volumes on contract theory, the first of which (dealing with principal – single agent models) has been published. Unfortunately, we will never know what the complete opus would have looked like, because Jean-Jacques Laffont died in 2004. The first volume of LAFFONT AND MARIMORT's [2002] work is one of the best books in economics that I have ever read. It is a conceptually clear and systematically structured text on agency theory. I do not know if David Martimort, perhaps with another co-author, will still work on the planned two volumes. In any case, at the moment Bolton and Dewatripont's book is unique in its broad coverage of the contract-theoretic literature. There are a few other recommendable books on contract theory, including SALANIÉ's [1997] primer and SCHWEIZER's [1999] *Vertragstheorie* (which is available in German only; it systematically synthesizes contract-theoretic insights in uniform frameworks using uniform notations). Moreover, FUDENBERG AND TIROLE's [1991] game theory book includes masterful discussions of mechanism design, and HART's [1995] book is essential reading with regard to incomplete contracts.

In my view, contract theory (i.e., "the theory of incentives, information, and economic institutions", p. 2) is the most fascinating topic in economics in the last three decades. It addresses fundamental questions that are relevant for virtually all fields of economics. Bolton and Dewatripont's impressive book is valuable for everyone seriously interested in modern economic theory. However, even a brilliant book that is bound to become the definitive text on its topic can be further improved, so I hope there will be a second edition.

References

AKERLOF, G. [1970], "The Market for Lemons," *Quarterly Journal of Economics*, 84, 488–500.

ARROW, K. [1985], "The Economics of Agency," pp. 37–51 in: J. Pratt and R. Zeckhauser (eds.), *Principals and Agents: The Structure of Business*, Harvard Business School Press: Boston.

BOLTON, P., AND M. DEWATRIPONT [2005], *Contract Theory*, MIT Press: Cambridge and London.

CRAMTON, P., R. GIBBONS, AND P. KLEMPERER [1987], "Dissolving a Partnership Efficiently," *Econometrica*, 55, 615–632.

CRÉMER, J., F. KHALIL, AND J.-C. ROCHET [1998], "Contracts and Productive Information Gathering," *Games and Economic Behavior*, 25, 174–193.

FUDENBERG, D., AND J. TIROLE [1991], *Game Theory*, MIT Press: Cambridge, MA.

GROSSMAN, S. J., AND O. D. HART [1986], "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration," *Journal of Political Economy*, 94, 691–719.

HART, O. D. [1995], *Firms, Contracts and Financial Structure*, Clarendon Press: Oxford.

– – AND B. HOLMSTRÖM [1987], "The Theory of Contracts," pp. 71–155 in: T. Bewley (ed.), *Advances in Economic Theory*, Cambridge University Press: Cambridge.

– – AND J. MOORE [1990], "Property Rights and the Nature of the Firm," *Journal of Political Economy*, 98, 1119–1158.

HOLMSTRÖM, B. [1982], "Moral Hazard in Teams," *Bell Journal of Economics*, 13, 324–340.

HUBERMAN, G. AND C. KAHN [1988], "Limited Contract Enforcement and Strategic Renegotiation," *American Economic Review*, 78, 471–484.

KESSLER, A. S., C. LÜLFESMANN, AND P. W. SCHMITZ [2005], "Endogenous Punishments in Agency with Verifiable Ex Post Information," *International Economic Review,* 46, 1207–1231.

KLIBANOFF, P., AND J. MORDUCH [1995], "Decentralization, Externalities, and Efficiency," *Review of Economic Studies*, 62, 223–247.

LAFFONT, J.-J., AND D. MARTIMORT [2002], *The Theory of Incentives: The Principal–Agent Model*, Princeton University Press: Princeton, NJ.

LYON, T. P., AND E. RASMUSEN [2004], "Buyer-Option Contracts Restored: Renegotiation, Inefficient Threats, and the Hold-Up Problem," *Journal of Law, Economics, & Organization*, 20, 148–169.

MATSUO, T. [1989], "Efficient Mechanisms for Bilateral Trading," *Journal of Economic Theory*, 49, 189–194.

MYERSON, R. B., AND M. A. SATTERTHWAITE [1983], "Efficient Mechanisms for Bilateral Trading," *Journal of Economic Theory*, 29, 265–281.

ROGERSON, W. P. [1992], "Contractual Solutions to the Hold-Up Problem," *Review of Economic Studies*, 59, 774–794.

SALANIÉ, B. [1997], *The Economics of Contracts: A Primer*, MIT Press: Cambridge, MA.

SAMUELSON, W. [1984], "Bargaining under Asymmetric Information," *Econometrica,* 52, 995–1005.

SCHMITZ, P. W. [2002], "On the Interplay of Hidden Action and Hidden Information in Simple Bilateral Trading Problems," *Journal of Economic Theory*, 103, 444–460.

– – [2005], "Allocating Control in Agency Problems with Limited Liability and Sequential Hidden Actions," *RAND Journal of Economics* 36, 318–336.

– – [2006], "Information Gathering, Transaction Costs, and the Property Rights Approach," *American Economic Review* 96, 422–434.

SCHWEIZER, U. [1988], "Externalities and the Coase Theorem: Hypothesis or Result?" *Journal of Institutional and Theoretical Economics*, 144, 245–266.

– – [1999], *Vertragstheorie*, Mohr Siebeck: Tübingen.

TIROLE, J. [1988], *The Theory of Industrial Organization*, MIT Press, Cambridge: MA.

– – [1999], "Incomplete Contracts: Where Do we Stand?" *Econometrica*, 67, 741–781.

WATSON, J. [2005], "Contract, Mechanism Design, and Technological Detail," Discussion Paper, Department of Economics, University of California, San Diego.