

RESEARCH STATEMENT, OCTOBER 2011

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This document puts my research into a broader context, categorizing and linking my papers. It was originally written for internal purposes, so I have not gone into great detail about any particular paper, nor do I talk about the origins of the work.

I am an applied microeconomic theorist who studies dynamic incentives, applying the insights to industrial organization, labor economics and auction design. I have a diverse set of interests that allows me to exploit the common structure underlying seemingly disparate problems. This research can be broadly grouped into three categories. The first strand studies optimal sales contracts in models where buyers are strategic, assuming the seller can commit to a contract that is enforceable through a court. The second strand considers weaker legal environments, where contracts are enforced through long-term relationships. The final strand studies a setting without contracts, examining how the desire to maintain a good reputation generates investment incentives. The techniques used are drawn from game theory and dynamic programming; the inspiration comes from empirical studies, introspection and other theory.

I. RESEARCH

A. DYNAMIC SALES CONTRACTS

In the first strand, I examine the optimal sales policies for firms facing strategic customers. For four of the papers, this means that customers can optimally time their purchases. In the last paper, bidders in an auction can strategically declare bankruptcy.

In “Durable-Goods Monopoly with Varying Demand” I analyze the optimal pricing strategy for a firm facing customers who can strategically delay their purchases, when incoming demand changes over time. For example, in response to the influx of students with highly elastic demand, Office Depot holds a “back-to-school” sale each September. However, such a sale causes non-students who would have bought in July and August to delay their purchases until the sale starts. This paper derives a technique to solve a class of two dimensional mechanism design problems where customers have private information about both their valuation and their birth date. It also shows that the optimal price path exhibits fast increases and slow declines, with the price level always exceeding the fixed price chosen by a firm who cannot vary its price. This paper was published in the *Review of Economic Studies* in April 2008.

More recently I have collaborated with Andrzej Skrzypacz (Stanford) on a paper entitled “Revenue Management with Forward-Looking Consumers”. We consider a firm that has K goods to sell over T periods and incoming demand is constant over time. For example, an airline wishes to sell the seats on a plane, or a car dealership wishes to clear its lot. In contrast to typical models of revenue management, we allow customers to delay their purchases if they anticipate that prices will fall. While considering all possible sales mechanisms, we derive a striking result: the firm’s optimal allocation is deterministic in that it depends on the time and number of units remaining, but not the number of agents who have entered the market, their valuations or when previous units were sold. This property implies that, in the continuous time limit, the optimal allocation can be implemented by posted-prices with an

auction at time T . This pattern is qualitatively consistent with internet sites conducting “last minute” auctions for plane and hotel reservations. This paper is currently “revise and resubmit” at the *Review of Economic Studies*.

The above papers assume the firm can commit to a pricing strategy, perhaps by via a computer algorithm. When the firm cannot commit, the celebrated Coase conjecture says that as high-valuation consumers buy the good and exit the market, the firm will lower its price. Anticipating these declining prices, customers start to delay, lowering the profits of the firm, and even driving them to zero in the continuous time limit. In “Outside Options and the Failure of the Coase Conjecture” with Marek Pycia (UCLA), we point out that the Coase conjecture fails to hold if customers have a small opportunity cost of delaying because of an outside option (e.g. a competing product). The outside option means that low-value customers also leave the market if prices do not fall sufficiently quickly, countering the departure of high-value buyers. In the unique equilibrium, prices are constant over time and the firm can attain full commitment profits.

I have two older papers on related topics. In “Selling Options”, I consider a firm who sells an object whose value varies over time. The winner of the auction can then choose when to realize this value (i.e. exercise their option). For example, after the Alberta government sells off an oil sands lease, the winner can then choose when to initiate extraction as a function of the oil price. This paper shows that the optimal auction consists of (a) an up-front fee and (b) a contingent payment, paid when the oil is extracted. Appealingly, this contingent payment is independent of both the oil price and the time of exercise, making the auction relatively easy to implement. This paper was published in the *Journal of Economic Theory* in September 2007.

In “Bidding into the Red”, I analyze the situation where a winning bidder can declare bankruptcy after winning an auction. Such insolvency is commonly seen in procurement auctions (where firms operate toll roads, build schools or run railways) and in sales auctions (where firms bid for spectrum or pay-per-view rights). The paper compares first and second price auctions in different post-bankruptcy scenarios. When the principal can take over the bankrupt assets with little social loss (e.g. the government takes over the operation of a bankrupt toll road), the seller is actually bankruptcy loving and prefers second-price auctions. When the social loss is higher, the seller becomes bankruptcy averse and prefers the first-price auction. Finally, if the bankrupt assets are resold via a second auction, then the seller is bankruptcy averse but may prefer a second-price auction. The overall lesson is that the seller should carefully consider which post-bankruptcy scenario is likely to occur before designing the auction. This paper was published in the *Journal of Finance* in December 2007.

B. RELATIONAL CONTACTS

In a second line of research, I investigate markets where incentives are provided through long-term informal agreements and enforced by the threat of discontinuing trade. Such self-enforcing contracts are studied by analyzing the Pareto-optimal equilibria of a repeated game.

In “Relational Contracts and the Value of Loyalty” I consider a firm who wishes to trade with one supplier each period, where costs of each supplier vary over time and the chosen supplier can choose their effort. The firm thus trades off the desire to exploit the gains from trade against the need to incentivize suppliers via long-term relationships. In the optimal contract, the principal divides suppliers into “insiders”, with whom they have previously traded, and “outsiders”, with whom they have never traded. The principal then uses insiders efficiently, while being biased against outsiders, similar to Toyota’s *keiretsu* supply partnerships. The model thus provides a theory of endogenous switching costs and helps

explain why firms are more loyal in countries and industries where contract enforcement is poor. This paper is forthcoming at the *American Economic Review*.

I have a second paper entitled “Relational Contracts in Competitive Labor Markets” with Moritz Meyer-ter-Vehn (UCLA). We observe that the ability for a single firm to incentivize its workers depends on the longevity of their relationship which, in turn, depends on the contracts offered by other firms in the industry. This paper then seeks to study the interaction between a continuum of firms who each motivate their workers via relational contract. We show that, in equilibrium, identical firms offer a continuous distribution of contracts, with some firms offering high-wage, high-productivity contracts and others offering low-wage, low-productivity contracts. We also examine how the shape of this wage distribution and level of equilibrium unemployment depends on the relative abilities of employed and unemployed workers to find jobs. Indeed, if employed workers receive better offers than the unemployed then free entry leads to full employment, and wage dispersion rather than unemployment incentivizes workers. This paper is currently “second round” at the *Review of Economic Studies*.

C. REPUTATION AND INVESTMENT

In a third line of research, Moritz Meyer-ter-Vehn and I study how a firm’s desire to maintain a good reputation can incentivize investment in their product quality, even in the absence of any contracts.

Traditionally, reputation is modeled as the market’s belief that the firm has a particular innate type (e.g. an underlying quality or a behavioral characteristic). Instead, we propose a new model of firm reputation where product quality is persistent and determined by the firm’s past investments. Reputation is then modeled directly as the market belief about quality. The aim of the project is to advance our understanding of the value of reputation, the incentives to invest in (or run down) a reputation, and to derive implications for the firm’s lifecycle and the resulting reputational dynamics.

In “Reputation for Quality” we investigate how reputational incentives depend on the specification of market learning. When consumers learn about quality through perfect good news events (e.g. a restaurant receives a positive review), incentives decrease in reputation and there is a unique work-shirk equilibrium with ergodic dynamics. When learning is through perfect bad news events (e.g. a restaurant poisons a customer), incentives increase in reputation and there is a continuum of shirk-work equilibria with path-dependent dynamics. For a large set of Poisson signals, we show that the good news result is more robust: when costs are low, there exists a work-shirk equilibrium with ergodic dynamics. Moreover, we identify conditions under which this equilibrium is essentially unique. This paper is “second round” at *Econometrica*.

In a follow-up paper, “A Reputation Theory of Firm Dynamics”, we use the model of reputation to study the lifecycle of a firm which enters an industry, invests in its quality and exits the industry if its reputation falls too low. Our most striking results concern the firm’s investment incentives when it is close to exiting. If the firm shares the market’s uncertainty about its product quality then it stops investing when its reputation approaches the exit threshold and its life-expectancy vanishes. In contrast, if the firm knows its product quality perfectly, both high- and low-quality firms invest at the threshold where low-quality firms exit the market. While the life-expectancy of a low-quality firm vanishes, investment remains profitable because investment success boosts the firm’s quality and averts exit. This paper will be submitted soon.

D. OTHER WORK

I have three other papers outside my main agenda. In “Monopolistic Group Design with Peer Effects” I analyze how a firm divides agents of differing types into groups using price discrimination in an environment where agents care about with whom they are matched. For example, a private school system may sort pupils into different schools by charging different prices, or a fashion house may segment customers into different clothing lines. I first show that a profit-maximizing firm would introduce more segregation than is socially optimal. Intuitively, in creating a sink school the firm can force middle class parents to pay more for the good school, increasing profits. The paper also derives sufficient and almost necessary conditions for the (privately or socially) optimal group structure to involve some partitioning. I do this while placing very little structure on the form of peer effects. This paper was published in *Theoretical Economics* in March 2009.

In “Revealing Information in Auctions: The Allocation Effect”, I examine the effect of releasing independent information in simple auctions, clarifying and unifying a number of results in the literature. I first show that when there are two bidders, releasing independent information in an English auction with private values makes the seller worse off. However, this is no longer true with more bidders: when there is enough competition, revelation benefits the auctioneer. In three examples the dividing case is shown to be three bidders. This paper was published in *Economic Theory* in January 2009.

Finally, I have a bargaining paper with Jeff Zwiebel entitled “Endogenous Competitive Bargaining”. This paper is motivated by the idea that the right to make a bargaining offer is a valuable asset that parties will covet, and that should therefore be priced. Formally, we consider a version of Rubinstein's bargaining model where agents use limited capital to bid for the right to propose a split of the pie each period. We examine how the desire to acquire agenda control is tempered by the need to save capital for future uses. As a result, competition grows more intense as the game progresses. Moreover, when the agents have endowments similar to each other and the pie, bids double in successive rounds and the model generates alternating offers as an equilibrium result. This paper has been submitted.