# RSM 1201: Strategic Management

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## Class Notes: Value Capture Theory

Why do some firms persistently earn high profits and others do not? We know from basic economics that in perfect competition, where firms can freely enter and operate with the same cost structure as incumbents, price will be competed down to marginal cost. Most competitive settings, however, involve a finite number of buyers, suppliers, and rival firms, with limited potential for entry because of learning curves, formal barriers, or information asymmetries. We believe that the difference in firm profitability comes down to active choices - *strategies* - employed by these firms. But how do we know whether a particular strategy will work?

There are many models attempting to answer that question - SWOT, Porter's Five Forces, Core Competencies, Blue Ocean Strategies, and so on. However, it is our principle in this class to only use analysis tools that

- Have a rigorous basis in economic theory
- Are able to be investigated quantitatively
- Are congruent with observed data in the world, and
- Impose as few assumptions as possible

One such tool is called Value Capture Theory (VCT).[1] VCT has at its core a branch of game theory called "coalitional game theory". The basic idea is the following. Firms will take actions to "set the competitive table": acquire resources, choose pricing and compensation policies, choose what products to sell, and so on. Given these actions, a *market* made up of suppliers, buyers, rivals, and governments will perform economic activity which maximizes total economic surplus. The distribution of that surplus - how much value is *captured* by each player - will then be determined by a small set of relatively uncontroversial axioms.

The fundamental concept that will come out of these axioms is that, **when a market made up of many actors *creates value*, competition *between* players lowers how much value you capture, while competition *for* your skills, abilities, unique demand, and so on increases it**. That is, "competition" can be either good or bad: you certainly want firms competing to have you as a supplier! In general, these fundamental competitive factors affecting the amount of surplus captured as profit or consumer surplus will only give us a range of possible outcomes.

[1] For more details, see Brandenberger and Stuart JEMS 1996, Chatain and Zemsky SMJ 2011, MacDonald and Ryall Man.Sci. 2004, Brandenberger and Stuart Man.Sci. 2007, Gans and Ryall SMJ 2017, among others.

This model is conceptually, though not mathematically, challenging at first. The alternative to the mathematics is a purely verbal chain of logic, which quickly becomes very hard to follow even for a very smart manager. Learning how the model works makes it much easier to understand the logic by which some firms accrue high profits from particular strategies, and others do not.

## The model and its assumptions

First, a few definitions.

Assume that there are a set of $N$ players in a market. A *market* is some collection of buyers, suppliers, rivals, producers of substitutes, potential competitors, and so on who have first-order importance for profit in a given industry. If these actors take every economic action that generates economic surplus, we denote the total value they create as $V$.

What is "economic surplus" or "value"? Economic surplus is created when *every* transaction occurs where the cost of the resources - labor, materials, the disutility of labor - going into goods is less than willingness to pay of some consumer for that good, and where every good is produced as efficiently as possible.[2] Note that the word "price" does not appear. A simple barter exchange between two people who value the other's good more highly generates economic surplus. Assume my supplier can produce aluminum for \$3, but charges me \$5, and I can use resources to turn aluminum into cans for \$1. Value is created as long as a final consumer is willing to pay at least \$4 for the cans. Note that we said \$4, not \$6! The total economic cost of resources including labor used to make the can is \$1+\$3. That I am being charged *a price of* \$5 for the aluminum has nothing to do with the fact that the three players *could* create economic surplus as long as the consumer's willingness to pay was at least \$4.

For every subset of players $G$ from the full set $N$, we denote the total value $G$ can create working on their own as $V(G)$.

We call player $j$'s *added value* the difference between the value created by everyone working together and the maximum value that can be created by everyone other than $j$ working together ($A_j = V - V(N - j)$). That is, if you are player $j$, how much surplus could everybody else create if you didn't exist? The difference between what they could create with you and without you is your added value. Going back to the previous example, imagine that we still have one supplier (who can produce aluminum using \$3 of real resources, and that you ("player $j$") can turn that alumnium into cans for \$1, and that there is a buyer who wants to buy one can and is willing to pay \$8. Imagine also that there is a second aluminum can producer who can turn aluminum

[2] I'm afraid there are subtleties when it comes to "willingness to pay" and "as efficiently as possible" that played major roles in 20th century economic theory and go beyond what we can discuss in this class.

into cans for \$2.75. Then the most efficient way to create surplus is for you to make the can, creating \$8-\$3-\$1=\$4 of surplus, or $V = 4$. If you didn't exist, the most efficient way to create surplus is for the other producer to make the can, creating \$8-\$3-\$2.75=\$2.25 of surplus, or $V(N - j) = 2.25$. Your added value is therefore $V - V(N - j) = \$4 - \$2.25 = \$1.75$.

We call the *outside option* $O_j$ of player $j$ the maximum added value of $j$ in some alternative market. You can think of this as the value that can be created by j working with nobody but itself in its current market: $O_j = V(j)$. That is, maybe you can use your alumnium can machine to make car parts instead, earning some profit.

We call the vector $x$ a *proposed allocation*, where $x_j$ is the allocation that we propose player $j$ will receive. **Our goal here is simple. Under a very simple set of uncontroversial axioms about this proposed allocation - or proposal about how much profit and consumer surplus everyone will receive - we will be able to see why certain strategies allow firms to earn excess profit over time.** That is, we will see whether a proposed set of profit and consumer surplus, given a particular set of firm strategies, "makes sense". Further, we will do this without having to solve any complicated economic models which, though more precise, are more complex than we need to achieve this goal. In particular, we will make the following assumptions:[3]

**Assumption 1.** *No player earns more than their added value:* $x_j \leq A_j$.

**Assumption 2.** *Every player earns at least their outside option:* $x_j \geq O_j$.

**Assumption 3.** *The proposed allocations given to all players sum to the total value created:* $\sum_j x_j = V$.

**Assumption 4.** *If there are a range of payoffs* $x_j$ *that satisfy all of the above for player* $j$*, then the exact payoff* $j$ *gets depends on their relative bargaining power, to be defined below.*[4]

These assumptions ought to be relatively uncontroversial.

[3] In the full value capture model, or the "core" of a coalitional game, we have the further assumption that any allocation must be *stable*. This means that the combined members of every subgroup $G$ must earn at least as much surplus from the market as they could jointly earn just doing economic transactions with themselves. That is, for every subgroup $G$, $\sum_{j \in G} x_j \geq V(G)$. This assumption basically checks whether a group of players could work by themselves to earn more overall than they are proposed to be earning in the allocation in question. Checking this condition requires a number of additional algebraic complexities, so we omit it. The "best case" and "worst case" profit we solve for using our simpler assumptions is just a weakly larger set of possible profit than what you would get with the additional assumption.

[4] There are also technical assumptions we need to ensure that there exists at least one vector of allocations $x$ that satisfy Assumptions 1 through 4 and the fifth assumption in the previous footnote. This is called the "core existence problem", and we omit the mathematical details from these notes. We should be clear that these assumptions rule out analyzing, e.g., negative externalities within a model of this type. See Gillies (1959), "Solutions to general non-zero-sum games".

Assumption 1 says that a player can't get more than its added value. Since added value is defined as the increased value created when $j$ is a member of a market, it does seem economically sensible that $j$ can't get *more* than this amount. For example, if a market $N$ generates 80 dollars of value, and the market can generate 60 dollars of value without $j$, then $j$'s added value is 20 dollars. Imagine we propose $j$ earns 30 dollars of surplus. This means everyone else is earning a combined 50. But everyone else could ignore $j$, interact only with each other, and earn a combined 60 dollars.

Assumption 2 says that a player gets at least its outside option. Imagine player $j$ has added value of 20 dollars in its current market, and 10 dollars of added value to its next best market. Imagine the current market offers $j$ only 5 dollars of surplus. The next best market would offer $j$ 6 dollars to switch. That is, competition *for* firm $j$ ensures that it earns at least its best outside option.

Assumption 3 just says that, if a group creates economic value, it must go to somebody; economic value doesn't disappear into thin air.

Assumption 4 notes that assumptions 1 through 3 may not pin down an exact payoff for every player. That is, the $x_j$ that satisfies those assumptions may be a *range*. So how much will player $j$ earn? We assume only that economic fundamentals in those assumptions pin down the range, and whether you wind up in the high or low end of that range depends on your skill in bargaining. There are many reasons a firm will be good at bargaining - it may be very patient compared to counterparties, or may have good salespeople, and so on.

So how much profit will a given player $j$ earn? The four assumptions above imply that every player earns profit in a range

$$[W_j, B_j]$$

The best case scenario $B$ for player $j$ is simply their added value: $A_j = V - V(N - j)$. That is, competition *among* players providing similar types of value to the market will lower the maximal surplus you earn.

The worst case scenario $W$ for player $j$ is the largest of two values. A firm must earn at least its outside option $O_j$ by Assumption 2. Since the total surplus must go to somebody by Assumption 3, if all other players are earning their added value and there is still something left over ($V - \sum_{i \neq j} x_i > 0$), then $j$ must earn that value. That is, competition *for* your skills, resources, and so on by outside markets (Assumption 2), or subsets of players within your market (Assumptions 3), increases how much you are guaranteed to earn.

This means that there are *four* ways that a firm can increase its profit! It can increase its added value, increase its best outside option, decrease the added value of other players, or increase its bargaining power. A frequent mistake in strategy is to think the only way firms can earn profit is by increasing their added value: by offering some value that other firms can not replicate. It

should be clear from the value capture model that this is not true. And remember: these bounds are generated from assumptions which are very general, and quite uncontroversial!

What should a firm's goal be? Figure out clever strategies that do at least one of the four things above. Even better, figure out strategies that continue to have that beneficial effect even when other firms in your market respond to them with their own clever strategies. The reason firms earn persistently high profit is not by listing strengths and weaknesses (SWOT), avoiding competitive industries (Blue Ocean), avoiding harmful competition in general (Five Forces), or developing a unique method of generating value (core competencies). If we want to seriously understand differences in firm performance, we may need to understand complicated chains of logic. A formal theory, backed by basic economics, helps us do that.

## A few simple applications

Note that the assumptions in the previous section are very general: we don't assume, for instance, that firms are playing Cournot and choosing prices, or that firms have to set fixed prices rather than price discriminate, etc. The goal of value capture theory is to use the most minimal set of economically reasonable assumptions about who will earn what. It turns out that, in the case of perfect competition and monopoly, value capture theory gives precisely the same payoffs $x_j$ to every player as what standard economic analysis would suggest.[5] However, in cases where there are a finite number of firms, suppliers, or buyers, value capture theory often implies rather counterintuitive results for who earns what - well, counterintuitive until you think through the logic your new VCT-driven intuition implies!

Let's see two very simple stylized models, fully worked out, then two simple real-world examples. We will formally calculate best and worst case payoffs for a firm of interest, and consider how seemingly-smart strategies may actually lower profits.

**Pure Bargaining.** Let there be one buyer and one firm that can make at most one widget. The firm can make at most one widget at a cost of 1. The buyer values widgets at a willingness to pay of 10. How much surplus is created and who earns it?

The amount of surplus created, $V$, is the value of all efficient transactions in this market. The efficient transaction converts resources with a cost of 1 into a widget with a consumer valuation of 10. So $V = 9$.

Who captures this? Note that both players have an added value of 9: without the firm, there can be no widget, and without the buyer, the firm just has a

[5] Technically, it gives the payoffs a perfectly price discriminating monopolist would induce.

valueless block of metal. So both the firm and the buyer have an best case surplus of 9 (that is, the best case profit for the firm is 9, and the best case consumer surplus for the buyer - the difference between their willingness to pay and the price they pay - is also 9).

To check their worst case profit, we will check two things. First, what are the outside options of the buyer and firm if they don't participate in this particular piece of value creation? We have assumed nothing here, so in this case it is zero for both. However, imagine there was a consumer in a different industry who could turn the raw resources owned by the firm into a good they value at 4. In that case, competition *for* for the firm's resources between that consumer and the firm's current buyer would ensure the firm receives at least 4, hence earn a surplus of at least 3 (4 minus the cost of resources, 1). We also need to see if there is necessarily any surplus left over for either player if everyone else gets their full added value. In this case, total value $V = 9$, and the added value of the buyer is 9, so since $9 - 9 = 0$, nothing is necessarily left for the firm. Likewise, since the added value of the firm is 9, nothing is necessarily left over for the buyer. So again, the worst case surplus caused by this factor is zero.

Summing up, then, both the firm and the buyer will earn something in the range $[0, 9]$. Why? Well, though the firm is a monopolist, the buyer is also a monopsonist. No other firm is competing with our firm for the buyer's custom, but also no other buyers are competing with our buyer to get the widget. That is, this is a situation of pure bargaining. Where will we wind up within these intervals? This will depend on bargaining power, broadly defined. For instance, if the firm is about to run out of money, they may find it tough to bargain the price up. If the industrial custom is that firms make take-it-or-leave-it offers to buyers, they will of course make a take-it-or-leave-it offer of \$10 for the widget.

What you should understand here is that even though the firm is a monopolist, the balance of competition for and against the firm means that pure competitive factors do not pin down the firm's profit. You should also think through what strategic factors might affect the bargaining power of the firm and the buyer.

**Perfect Market Competition.** Let us consider a nearly identical situation to the previous example. Here there is one firm that can make at most one widget, at a cost of 1. However, there are now many buyers with a willingness to pay of 10. How much surplus is created and who earns it?

As before, the efficient transaction converts resources with a cost of 1 into a widget with a consumer valuation of 10. So $V = 9$.

Who captures this? Note that the firm still has an added value of 9. However, if any single buyer disappears, there remain many other buyers with willingness to pay of 10, hence there still remains the possibility of creating 9 dollars of

surplus. That is, the added value of any individual buyer is 0, and hence the best case surplus earned by any buyer is zero.

To check worst case profit, we again check two factors. As before, we have assumed no pure outside option for any player. Checking whether there is necessarily any surplus left over when everyone other than the firm gets its full added value, however, you see that there is: all buyers combined have added value of 0, and there is a surplus of 9 that must go to someone, hence the firm's added value is 9! Though we could directly check each factor for the buyers, their worst case surplus turns out to be straightforward: since each buyer's added value is 0, the most they can earn is 0, and since they can always just do nothing, the least they can earn is also 0.

Summing up, the firm's profit range is [9,9], and the buyer's profit range is [0,0]. There is no range at all! Why? Again, the firm is a monopolist, so no one is competing against the firm to provide the buyers value. However, every buyer who doesn't get a widget is competing for the firm's services. This competition for the firm ensures that the firm captures a lot of surplus - in this case, all of it.

**Should Jiffy Lube offer brake service?** Jiffy Lube offers very low cost oil changes performed by low-skilled workers. A mechanic's shop can also fix your brakes, but because their labor is higher-skilled, their costs to change your oil are higher. In particular, assume the following. There is one consumer who needs oil service and brake service. They value the oil change at 15 dollars, and the brake service at 25 dollars. Jiffy Lube can change oil at a cost of 5 dollars, but can't fix brakes. An auto mechanic can offer oil changes at a cost of 10 dollars, and brake repair at a cost of 20 dollars.

What is the most economic surplus that can be generated? The consumer should get oil changed at Jiffy Lube, and brakes fixed at the mechanic. This generates $(15-5)+(25-20)=15$ dollars of surplus. How much will Jiffy Lube earn? Their added value is 5: if they don't exist, the consumer can get both services from the mechanic, generating surplus of 10. So Jiffy Lube's best case profit is 5. Why? Let's think economically. Jiffy Lube earns 5 if they price at 10 dollars per oil change. If they try to price higher, the mechanic can undercut them and take their business.

What is Jiffy Lube's worst case profit? We assumed no outside option, and the combined added value of the other players combined is more than 15 (leaving no surplus that *has* to go to Jiffy Lube), hence Jiffy's Lube's worst case profit is 0. Therefore, Jiffy Lube's profit will be somewhere in [0,5].

Jiffy Lube's CEO makes the following (wrong) argument. The most Jiffy Lube can earn if they only make oil changes is to charge each consumer their full willingness to pay of 15, earning 10 dollars of profit. But it is possible to build a "full service" Jiffy Lube by hiring slightly better labor. If they did so, they could change oil at a cost of 7, and fix brakes at a cost of 19, both cheaper

than the mechanic. They could therefore earn up to 14 dollars: 15-7=8 dollars for the oil change, and 25-19=6 for the brake service. Fourteen is more than ten, hence Jiffy Lube should go full service.

What is wrong with that argument? Let's check what Value Capture Theory says. What is Full Service Jiffy Lube's best case profit? The total value $V$ generated by Full Service Jiffy Lube and the Mechanic is 14: consumers will get both services from Jiffy Lube as in the CEO's (wrong) intuition since Jiffy Lube using higher quality labor is still able to produce both services more cheaply than the mechanic. The total value $V$ generated if Full Service Jiffy Lube doesn't exist is 10, when the consumer gets both services from the mechanic. Since 14-10=4, Jiffy Lube's added value, and hence best case profit, is only 4! You can check as before that their worst case profit is still 0.

So going from limited service Jiffy Lube to Full Service Jiffy Lube *lowers* profit from [0,5] to [0,4]! What happened? It is true, as the CEO noted, that the consumer will now get both services from Jiffy Lube. However, it is not true that Jiffy Lube can charge 25 for brake service or 15 for oil changes even though that it the consumer's willingness to pay: if they charge more than 20 for brakes, the mechanic has an incentive to undercut them, and likewise if they charge more than 10 for oil changes. This means that the brake service Jiffy Lube now offers only earns them one dollar at most. And in order to be able to offer that service, the most profit they can earn from oil changes falls from 5 to 3, as costs rise with the now-more-skilled labor.

This formalizes the idea that "tradeoffs can be useful". Is it not necessarily good for Jiffy Lube to be "good at all things". By becoming better at offering brake service, they reduce their competitive advantage on offering oil changes, and the net of these two things turns out to lower Jiffy Lube's profits. Choosing a labor strategy that makes it *hard* to offer brake service can be a good thing!