Health Economics

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Week – 03

Lecture 15- Profit and Non-profit Maximization Models in Health care

Welcome friends. Once again, regarding our NPTEL MOOC module on Health Economics, I hope you have been following this module, specifically this week, on supply-side aspects. We have so far taken four lectures. This lecture is going to end this week. Here, we emphasize how profit and non-profit maximization work in healthcare.

Hence, the title is Profit and Non-profit Maximization Models in Healthcare. In the previous lecture, we explained the production and cost theories, which are indeed relevant to economic healthcare as an economic good. In this lecture, we will discuss the supply side perspectives of firm industries in the market, especially emphasizing their different market structure, following the traditional and non-traditional theories as well. We will also discuss what contestability is and why we should adopt a contestability-based approach in our studies.

Let us classify what is called market and, as you might have read, microeconomics, where buyers and sellers and their meeting place are decided, and they follow certain negotiations and those used to be considered as order of exchange. A market is a place where those who wish to supply goods are the sellers and those who demand as buyers are brought together to effect an exchange. So they follow a strong eventual contract to settle their dealings. So, who are the sellers in the market? Usually they are the hospitals that provide healthcare to patients, medical equipment manufacturers or pharmaceutical companies, provide inputs to healthcare production process etc. And who are the buyers in this case? Of course, they are the households or the individuals who buy healthcare services, hospitals employ healthcare professionals from the labor market and buy their inputs, such as pharmaceuticals etc.

So, it will define firms in the healthcare market. In this case, a firm is an economic unit that produces and sells goods and services and whose are the goods in this context, we are saying goods are the medical equipment, whereas services are like dental care services, health insurance services, etc. And all these form together an industry. Hence, an industry is a collection of economic units that sell similar products. For example, we may say instead of individual drugs to be sold, we say the pharmaceutical company, the industry, the insurance industry, or the hospital industry as a whole. So, we are linking this discussion to theory of

firms, which mentions that supply-side economics is majorly concerned with the theory of firms, where firms are highly motivated to maximize their profit.

Most of the firms and many insurance companies target maximizing profit. However, most hospitals, nursing homes, and insurance companies do not aim for this. Hence, the discussion the problem statement we just focus on here. That is not just the profit that is to be maximized, it is rather beyond that. The study of the profit maximization model is useful as it provides information on performance, benchmarks, and efficiency.

So we are discussing efficiency elsewhere, but the concept etc. are sticking. You may raise your points for your research. However, the benchmark and standards are also required to be defining a company as part of the performance indicator. So, Statista provides the macro information, especially at the aggregate firm level, even in the company level information you will get.

So, we are referring to the figures from Statista of different companies. Here the figure is on the net profits of leading pharmaceutical companies in India as of 2022, which are in billion Indian rupees. So the companies are Cipla and Glenmark, Dr. Reddy, Alchem, etc. I think many of these names you might have heard and they are the dominating player.

We have just kept whose market share net profit are among the best of all pharmaceutical companies. You can see the top two companies capturing nearly 30 percent of the market share. It is not exactly called market share, it is called net profit. So somewhere it is reflecting how dominating these companies are and then we will also discuss some of the directions to understand profit calculation, how to calculate profit. As we know profit is nothing but revenue minus cost or that is precisely called total revenue minus total cost.

So, TR as we all know, TR is nothing but the per head price times the quantity is being sold minus per head average cost times the quantity produced. Then there are some concept we derived from it called, once we divide it by Q then we can make it their average one and also Q in that case called average profit. Then, this concept will be a total revenue TR, TR divided by Q, which is nothing but AR. So far as average profit is concerned. So, this is through average profit.

These concepts are very valid when you analyze healthcare as a whole. This is what is mentioned. The usual concept which is discussed in microeconomic theory or in healthcare perspective, is on whether the company is actually attaining the minimum profit or in general term we say the normal profit that is precisely called no profit, no loss condition. The meaning in simple term we have mentioned here, the owners of the specialty clinic must earn a minimum amount of profit to prevent them from closing down their business and doing something else instead. So, along with this we also suggested following some of the analysis which managerial people, and management guys used to do it called breakeven analysis.

So, I am not explaining much on this, but usually it is connecting to the pie when it is equating to 0, whether the company is deciding further to continue or not. Usually the company takes bold decisions in this case. Traditional economic theories of the firm based on profit maximization and that is as per the traditional economic theories and hence there are four important broader markets defined when you are sticking to product market not the factor market. This precisely refers to the product market when the market is related to the product or the firm. What the product prices are being evaluated through different features of the market.

As you know perfect competitive market, monopoly, monopolistic competition and oligopoly these are in scale. The monopoly and perfect competitive market are the extreme end of the scale. Perfect competition and monopoly lie in between the monopolistic competitive market and the oligopoly market. I think everyone knows the simple meaning of monopoly even if you have not read might be from medical science background. For you it is no need to go by the standard definitions.

It is a simple meaning of it is that a single player or the group of player when they have taken a common decisions and made a strong tacit or formal agreement to decide a price where they have actually camouflaged the market and taking a single decisions based on their own quotations etc. are largely called monopoly power. When I say monopoly power, it is quite obvious that the individual player, who is responsible for the quality of the product, makes the decisions. This quality of product might be compromised because hardly there is any checkpoint. Whereas in the other extreme point where it is the bargaining power is largely understood with the buyers, wherein monopoly is with the seller.

We will discuss everything in a scheme in our next slide. I am just giving you the rough directions. Whenever market power is concerned, we usually say how the price is charged over and above the marginal price or marginal cost through markup pricing, etc. So, it is considered to be P minus MC by P.

So, called markup price you will read that if markup price is usually exercised very well by the monopolist and little much less and near about zero markup pricing in perfectly owned market. And how to calculate all sorts of things? I think there are different research questions. We are not discussing much on this. It has a connection with the concentration index. You can calculate through the Herfindahl-Hirschman Index or market power calculations by their dominant sharing etc.

Like in the recent example, instead of looking at oligopolistic structure, pricing decisions in the recent time, it is not just a product, the function of a product. The company might be deciding based on a feature of the competitor like Flipkart is actually deciding Flipkart and the Amazon, you must have checked that the pricing structure are more or less same. But the offers are taken by someone first and another quickly follow. In that case, it is not the

product that matters. It matters how far you are capturing your customers, how far you are bringing your customers.

It is led to two-sided market. One market is a function of another market, not the product or the pricing. So it is very interesting. It is not just a target as profit. Yes, eventually, because of the elastic structure with few differences in offer, you will capture the profit through selling.

Hence, the target is selling maxization rather than just profit maximization. There are some companies like Rolex etc. You see Rolex or a premium segment like your Apple products, computers, laptops, etc. There is a premium pricing structure. So, price skimming is usually the direction for it.

Given all the directions, not relevant much in a healthcare context, but hence, premium hospitals facilities like there are a couple of hospital units in Delhi, even as against the complete public-based model called Mohalla Clinic in Delhi. So, there are different structures. Customers still prefer premium structures because of certain premium qualities they follow. Hence, by discussing this general context, I am coming to relate these markets to our non-profit target maximization approaches called growth maximization theory, behavioral theory, utility maximization theory, or hospitals as physicians' cooperative theory. We are going to explain all those things one by one how relevant in the present context.

But before that we will clarify what are those four types of market structures, market like perfect competitive market, monopoly, monopolistic and oligopoly. So here are the features for you. What you find is the following. We usually refer through the important four indicators. For the perfect competitive market, just see it is related to number of firms in the market, entry deterrence etc.

, type of product, price controls etc. Out of these first on the perfectly competitive market you see there are a very large number of firms exist in this market. Hence, nobody controls the market and hence they are not the price decision maker. They are bound to accept this based on the eventuality of directionals within the market. Whatever a combination settles, it has to be considered the best win-win solution. And suppose you go by the typical microeconomic theory for the perfect competitive market. In that case, there are number of derivations proofs given how it is actually they are the price takers and that is indeed maximizing their strategy. So, we are not discussing much on it, just try to clarify what is there.

Related to entry into a market there is no restriction indeed and therefore it is said as unrestricted, type of product is considered to be homogeneous and the exact word is undifferentiated, all are considered to be equal. But equality is very difficult, the right term is homogeneous and price control no one has price control. One of the famous example in

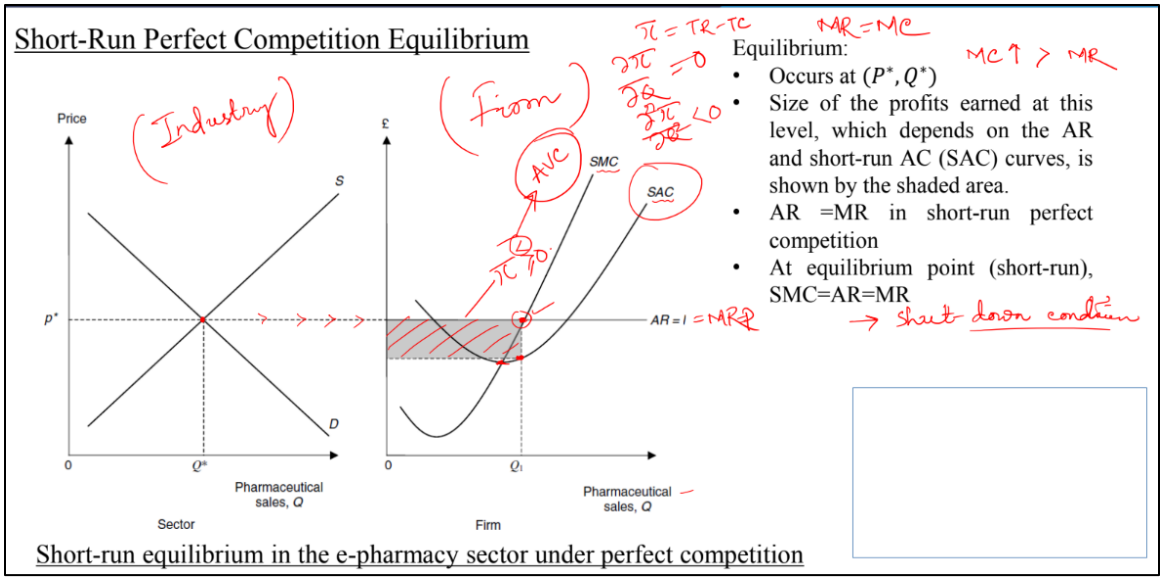
this case we have tried to give it called internet pharmacies. So where these features largely followed. In the second case monopolistic competitive market, but we wanted to add some clarification for perfectly competitive market which I just mentioned.

In addition to that, perfect knowledge and firm are price takers, free-entry and exit, and product homogeneity, which we have already discussed. And you have to now if you do not want to follow the diagrams is still perfectly fine, but we suggest you to go through. But first part is for the industry, second diagram is for the firm, how firm are the price takers. So, I am not discussing much, I will just give you one clarification in other market and their demand structure you can also do it on your own. As an industry or in a market equilibrium, if you simply remember, our demand curve is downward sloping, and supply is upward sloping, and based on that, the price is decided at the market level.

Once the price is decided for any reason with all possible contracts, the eventual outcome is determined, and that has to be accepted by all the firms. They are the individual firms and this is the industry and this is the firm. So, we say that since they are infinite or large number of firms are there, they cannot have any major share, so they have to accept this as their price. So, every time, they are going to sell the pharmaceutical product at the same price.

Hence, the average revenue is constant. When the average revenue is constant, it is also equal to the marginal revenue. So, and this is nothing but the price. Whereas to decide how much to be sold it is the responsibility of the firm to what extent they manage their skills with their management skill to control their through maybe a lucrative efficiency or their managerial efficiency whichever the way they can restrict their production cost. The cost of production might be higher, might be lower. Let us for an example, at this moment we have discussed about short run average cost and this is short run marginal cost, S stands for short run.

And in the short run, I am just explaining that the average cost curve follows a U-shaped curve and the marginal there in principle if you take the derivative of the slope of the one and equate it to zero at the minimum most point, marginal cost curve will pass through the minimum most point. As per the profit maximization, we are supposed to maximize TR minus TC. We have to take first order derivative d pi by dq equal to zero ($\frac{d\pi}{dq} = 0$) then d square pi by dq square that should be since we are reaching at a maximum point then the second order partial derivative has to be less than zero ($\frac{\partial^2 \pi}{\partial q^2} < 0$). So, in that case, if you solve it, in principle, our first-order condition must be satisfied, the first-order condition states that MR should be equal to MC. Hence, this point is satisfied, and the second sufficient condition is that MC the slope of the MC curve must be higher than that of the slope of the MR curve at the time of equilibrium or at the place of equilibrium.



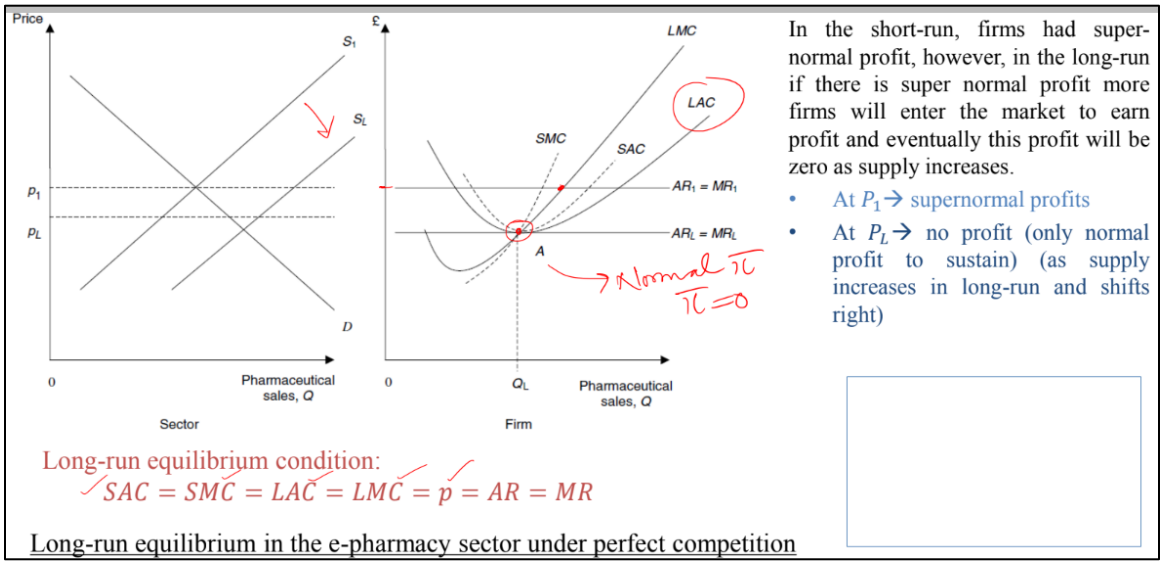
So, the slope MC is rising where the MR curve is zero slope hence this is also fulfilling the second-order condition. Hence the equilibrium defines the maximum quantity an individual firm can able to sell and corresponding to this level, we can plot our average cost and average cost times the price is nothing but the profit an individual firm can earn given the fact that their average cost curve is still below the prevailing price rate or the marginal revenue. This is what we said for a short-run, perfect competitive structure. In the long run situation is little different and in the long run especially in perfectly competitive market probably we are not explaining, yes we are explaining here as well. In the long run, yes in the short run we get pi is positive, possibility pi could be positive, could be also zero, could also be negative.

There are all possibilities in the short run because the company might not have adjusted very quickly. However, once it is negative, we have some concerns about whether the company can cover up its minimum cost, which is considered average variable cost. If the average variable cost is covered, then the company will operate in the long run. In that case, we defined our condition as a shutdown condition. That has to be equated with the average variable cost.

So, not explaining much in this case I am sure if you raise doubts we will be taking extra lecture without any hesitation and we will clarify. However, in the long run what really happens in there are large number of firms and there is no entry and exit barriers. Hence, the incremental profit whoever the marginal firms derive in the industry will be further adjusted. This might be the first price and when it seems companies are earning profit in this case. And because this distance you can easily see, you can see there are profit earned since average cost curve lies below. There will be eventual adjustment because other outsider firms will try to penetrate the market. They will erase or consume all possible profit and hence total supply will rise and supply curve might shift rightward and that will

pull down their profit and price will fall.

Finally, the final settlement might occur at a point where all the possible supernormal profit are vanished and firm at this particular point is in a position not to go out, not to enter further, hence this is considered to be the best equilibrium point in the long run. Hence the final eventual outcome in the long run is normal profit, where pi is equal to 0. So, this is what happens in long run equilibrium in e-pharmacy sector as well and at P1 we already said firm might earn supernormal profit, but at PL no profit is earned and normal profit is earned to be sustained in the long run. Long run equilibrium condition hence is given. all this P short run average cost, short run marginal cost, long run average cost, long run marginal cost would equal to P and AR MC or AR MR all are should be equalized.



It is also good to discuss **the monopoly market** and its features. We explained perfect commodity markets in a short while. We are discussing monopoly, single seller, then restricted entry, complete entry and exit are controlled by the person hence, restricted and completely blocked and type of product is unique whatever the single seller is selling and the price control is considerable because it is with the single seller. Some examples like government monopoly you can refer to, like medicines in the short run and public health insurance etcetera, can also be referred. So similarly, in monopoly, the picture is little different since that was in individual firms context were discussed, but here monopoly firm is nothing but the monopoly industry and the demand curve is downward sloping and rest of the demand curve is downward sloping and rest of the directions are discussed MR equal to MC, MR has to pass half the distance, this distance should be equal to this distance wherever is intersect.

Anyway, I am not emphasizing this, we are just clarifying this is the price how it is determined and once based on that we can plot the possible profit from the AC curve and the profit is expected to be positive. And so it depends upon and that too one of the

important features of this market is the elasticity of the demand which monopoly space is inelastic, is less elastic and downward sloping because of the fact that substitutions are very less and the changes in the demand pattern responsiveness with the demanders is very less. So monopoly regarding price discrimination, monopolies can also explore their market power by selling their product at different prices and hence I am not discussing you please go through. One example we have cited for the tuberculosis drug, especially its name is bedaquiline as part of the important medicine of TB tuberculosis patients produced by Johnson and Johnson. This is a major pharmaceutical company in the US, and it got approval from the FDA in 2012.

This was a big deal because it was the first new TB medicine in over 40 years. So Johnson and Johnson had the right to make this particular medicine that is bedaquiline until July 23 they had the right to produce. So since this period is over now and earlier this year these medicine tried to extend the patent years for another roughly around 5 years, but the Indian patent office said clear No and after that this company lowered the price of the drugs by 55 percent going from 289 dollar to 194 dollar for a 6 months treatment course. You can see once the patent that means once somebody is carrying a patent is carrying a monopoly power and once it is over then they are becoming more competitive hence the price is less.

Another market is called monopolistic competitive market. The features are here, but one of the interesting features of this is that there are differentiated products and products are highly closely substituted. So that is one of the interesting market and example is that hence they have some control over their product and medicines in the medium and long run are referred to be monopolistically competitive products. You can also differentiate this with the perfectly competitive market and here the demand structure is fairly elastic and hence because of the fact that they have high degree of substitutions though they are not homogenous, but that is the case. In the long run new firms will enter in the market because of the feature and they start to provide services. In the long run the extended profit might be erased, might be eroded completely or they derive normal profit.

The demand curve will continue to shift leftward and become flatter as long as supernormal profit are being earned in the long run. The long run equilibrium is reached and the firm earns no supernormal profit. That is one other interpretation I am not mentioning much. The Healthcare market typically exhibits monopolistic competition with providers offering services that are valuable, but not perfect substitutes. This intermediate scenario allows for some pricing discretion and differentiation among a substantial number of providers.

One case study is presented for the maternity care in India. In this study conducted by Meenakshi Gautam and other authors in 2019, the focus was on understanding the competitive landscape faced by the private delivery providers in UP, Uttar Pradesh, India. The research involved a survey of 3800 private health facilities across five state districts, revealing that most of the payments were made out of pocket indicating minimal insurance

coverage. Private health facilities encountered robust competition from both public sector entities and other private providers. To navigate this competition, these facilities adopted a variety of pricing structure and non-pricing strategies. Non-price competition was characterized by factors such as their location, medical infrastructure, amenities, staff qualification, reputation and marketing efforts as well.

The study shed light on a dynamically expanding and diverse market marked by variations in the complexity of care provided and the socio-economic status of the clientele. The market exhibited traits reminiscent of monopolistic competition, highlighting a presence of differentiated offerings as part of monopolistic structure and among the private hospitals in particular in Uttar Pradesh. We have also cited the paper here for your reading. First one to explain in this case is Oligopoly market.

There are few sellers. One of the specialized form of Oligopoly market is called Duopoly, where we used to discuss two players case to define their strategies through game theory. We used to discuss game theory here, especially when the decisions are not in sync or in comparison to the equilibrium decisions are taken and game theoretic format derives the best decisions. So hence game theory, game structures are suggested. This is because of the case that either there are two types of pure monopoly and differentiated oligopoly and pure oligopoly and differentiated oligopoly based on the type of product they are selling and entry into market is highly restricted, not 100% restricted. Market is highly restricted and since because of very few are operating, examples are like hospital services, private health insurance etc.

There are multiple models of oligopoly and we therefore give you a very brief overview. We have already discussed that two characteristics will make them either to collude with each other or not to cooperate or collude. So hence we say as collusive oligopoly or non-collusive oligopoly. Dafny 2010 explored the competitiveness of the US private health insurance industry from the period 1998 to 2005 examining if insurers impose higher premium on more profitable firms, it was posited that such price discrimination is viable only in imperfectly competitive markets. Realizing premiums for diverse group health insurance plans based on employer, location insurance firm, plant type, your Dafny found evidence supporting this kind of practice.

The findings suggest that healthcare insurance possesses and exerts market power in an expanding number of geographic markets where a 10% point profit increase of firms correlate within 1.2% rise in health insurance premium. Once it increases this extend to their profit. So the exact citation from American economic review is presented and the case study is from USA market. The theory of firm other than profit, what we discuss about profit, other than profit are broadly like defined as if firms do not seek profit then there are two possibilities they want to make profit but not to maximize them.

They do not want to make any profit but just want to sustain their business. And this is due

to different approaches of decision makers. Hence there are some conflicting version like principal agent problem also comes in between. However, the decisions lies with whether it is through further ownership, whether further manager or further physicians. Physician wants to maximize profit, managers want to make profit but just to satisfy owners, physician want utility maximization of patients, etc.

Hence the non-profit maximization strategies are adopted. One of the famous approaches is called the growth maximization approach or the theories are built on this proposed by Marris 1963. And the purpose is to go for the target of growth and growth is highly correlated with profit and growth is also correlated with prestige and job security of the managers. Growth may be achieved either by internal expansion by the mergers and acquisitions as well. So another aspect is called behavioral theory of firm starting with some cases like hospital comprises two separate firms or decisions such as medical staff or administration. Medical staff responsible for patient care decisions and order services from administrative staff whereas administrative staff provides ancillary services to medical staff.

Since there are perfect behavioral overlapping, medical staff is concerned about patient outcomes and their own earnings while the administration is more concerned with maximizing profit, utilization of services and avoiding space capacity. Hence what is mentioned by Cyert and March 1963 developed generalized behavioral theory of firm. Mentioned the firm is complex organization comprises managers, owners, workers and customers. Each have their own demands which we have explained.

Somewhere aspirations and wishes rather than strict maximization is the target. Coming to utility maximization theory, especially hospital based utility maximization theory, Newhouse indeed developed a model of utility maximization applied to hospital sector. Hospitals aim to maximize both quantity and quality of services provided subject to a financial constant. Quality and quantity together comprise the output of the hospital. So hence quantity of services is taken further explanation as Q, measured sometimes as a number of patients treated or number of patient days of care provided. Quality is measured maybe through the dimension called expertise of clinical staff, status and prestige, quality of care, quality of care, especially routinely collected statistics such as readmission rates, non-health care characteristics such as other provisions, food and ambulance etc.

If we just use these in the utility maximization function, the average cost is assumed to be a function of quality of services hence AC equal to g of function of k. Demand for hospital services is hence a function of quality of care provided, hence it is D equal to the average revenue is equal to h function of k that is demanded and the average quality, the cost we have just discussed. Utility of the hospitals, hence it will be a function of k, the quality and quantity aspects given the financial constraint, the hospital. So, hence finally the equality AR of k times AC of k will define the directions for the best use. Maximizing net income per

physician another one, so in that case the per physician the return is also important rather than the profit maximization.

Model of utility maximization of hospital sector

Average cost is assumed to be function of quality of services

$$AC = g(k)$$

Demand for hospital services is function of quality of care provided

$$D = AR = h(k)$$

Utility of hospital:

$$U = f(k, q)$$

Financial constraint faced by the hospital is that it breaks even or a point at which average revenue is equal to average cost.

$$AR(k) = AC(k)$$

Pauly and Redisch, 1973 developed a model of hospital as a physician's cooperative. Patient control how the hospital operates and act as a net income maximizing agent who seek to maximize the sum of money becomes of all staff physicians. If TP is total profit earned by hospital and physician staff size is M, then of course it will TP divided by M, average profit is nothing but the TR minus TC divided by M. Hence two concepts to be discussed very clearly another aspect rather than competition is called contestability. It is not just competition at a particular point in time matters; rather what happens to your potential competitors.

You used to be discussing the context of sustainability. Contestability mentioned by Baumol et al. in 1982 work, they mentioned that what is important in determining the degree of competitive pressure is how contestable the market is. Not just how many contestants at that point or there are, hence we are emphasizing the potential competitors. So, determinants of this contestability is basically the cost of entry and exit into market.

Perfect contestability will be the zero cost of entry and exit. If there are no barriers of some cost, perfect contestability allow hit and run competition. The theory of contestable market says that what is crucial to the conduct of firms is not the actual degree of competition they face in the market, but the threat of competition is rather more important. Contestability explains why the number of competitors may not determine market structure, but does not in itself explain what does determinate. This brings the concept of efficient market structure. In perfectly competitive market for the efficient market structure under contestability monopoly provider is forced to adopt the same pricing and output strategy as it would if faced with a very large number of competitors.

Policy analysis should be devoted to assessing efficient market structure rather than the level of concentration only. So, these are all I think we have given all backup for microeconomic theory along with the healthcare sector to derive important directions. Hence what we discussed in the entire five lectures this week are the role of physicians, hospitals in healthcare provisions to the patients and how a healthcare provider can induce demand. And we also discuss about the traditional economic theory of production and cost and their profit and non-profit maximization theories in healthcare market in particular.

I hope you are geared enough to go for the next unit and next unit is on equity and health. I think that will be useful for you to follow it up and these are the standard readings. We have given the best understanding. You can also suggest this course if you find to anyone useful. With this, it is time to close next. So, thank you.