

Chapter 2

General Analysis of Typical Market Structures

§ 1. Methods

The general question to be answered in this chapter is how individual economic agents behave in a given market structure and what is the overall picture that emerges? This question is quite difficult to answer. We cannot directly deduce either the individual's behaviour or the overall picture from a particular premise. Our critical analysis must pursue an indirect route. This indirect method, as it will be applied here, is new in the field of economic theory research. Therefore, to begin with we ought to describe its basic principles without reference to the individual subject under investigation.

The structure of the classical general equilibrium relies on a restriction of the principle of free price formation. The independence (translator's note: (Unabhängigkeitsposition) Scherer: 64) of price from the behaviour of each individual has been assumed from the first – while in reality the relationship between individual and price only results from the market structure. Where this assumption would indeed have existed from the first, individual market structures would thus not have differed from one another in respect of their price formation and they would all have exhibited the same economic law of motion.

For the market structure we are about to examine, the validity of this restrictive hypothesis is initially assumed for all economic agents, with the exception of a few individuals. The unrestricted validity of the principle of free price formation is re-established however for the economic agent in our example. We then ask how this individual will behave on the strength of the established basic principles of the free market capitalist economy and where there is complete market transparency¹⁾. This examination is carried out for each individual in the relevant market.

Depending on the market structures, special considerations are then necessary in circumstances that cannot be expressed here in a general statement.

¹⁾I would like to thank my teacher, Professor Erwin von Beckerath, for this useful term.

The purpose of this is either to find a stable price formation in the relevant market or to demonstrate that such a stable price formation cannot exist. The price formation for a particular market structure is stable when it exhibits the following properties:

(a) Where the price formation structure is set as the assumption and the unrestricted freedom of price formation is established for any economic agent, its behaviour is then unchanged.

(b) The behaviour of any individual is not aimed at changing the actual price formation structure.

Where a stable equilibrium is not present, either the price formation structure or the market structure must change in some way and determining this more precisely is the subject of the sixth chapter.

§ 2. Classical Equilibrium by Free Competition

We are initially applying our methods to market structures that fall within an already well-researched area of economics. The key evidence to be provided is that the classical general equilibrium is in fact achieved in the market with free competition, and an independence of prices from the behaviour of each individual is therefore a consequence of the market structure stated above. The hard evidence can of course only be gathered using mathematical techniques and also however allows this critical analysis and its conclusions to be expressed in a very logical fashion.

1. The classical equilibrium has already been described in the first chapter where the independence of prices was accepted as an assumption. We will now abandon this assumption for an individual, i.e. a demander. This demander is therefore faced with a market in which a large number of demanders still compete with him and an equally large number of suppliers make up the other side. We will refer to the other demanders collectively as "the rivals" (translator's note: ("die Konkurrenz"), see Leontief: 555). The independence of price is initially still a requirement for "the rivals" and the supply side. Owing to the known market mechanism, immediately our demander demands a particular quantity of goods, then a specific demand by a rival arises with a specific supply and a specific price on the other side. So price is linked through the market mechanism to the quantity of goods demanded by our demander. That is its function. Once we have determined that function definitively, we also know the link between the quantity of goods demanded by our individual and the sum of money given in exchange since this is simply the product of price and quantity.

2. It can now be shown that the price is effectively almost independent of our individual's demand. We can explain this clearly as follows. Let us assume that our demander demands the same quantity he would demand if he regarded the price as being entirely independent and then let us ask ourselves how the price would change if our demander suddenly demanded nothing at all. At this level of

demand a smaller percentage of total demand would disappear and so the price would have a tendency to decrease by a small percentage too¹⁾. An increase in competitive demand linked to the price decrease however counteracts this tendency. These responses to changed market conditions would result in a new equilibrium whereby a price that is only slightly less than the original price would reduce the quantity by a negligible amount. It appears that even the largest change in demand that our demander could make has hardly any effect on the price. Therefore, where the assumption of independent prices is rejected for a demander they will however consider the demander to be independent since this independence is a result of the free competition market structure. Where this assumption is rejected for a second demander, the same conclusion will be reached and so on. The same also applies to supply, such that at the end of this process of logical deduction the independence of prices as an assumption entirely disappears and instead emerges as a consequence of the market structure and the basic principles.

§ 3. Monopsony and Monopoly²⁾

The deliberations in the previous paragraphs have not led to any new findings, but have merely presented the usage of our analytical methods and explained the critical analysis of the exact evidence for notions that incidentally are standard for price formation in a market with an atomised demand side and supply side. Also we will not establish any new territory in these paragraphs but instead test our line of argument on two similarly very established and well-defined market structures, monopsony and monopoly.

1. Classical price formation does not apply to the case of monopsony or monopoly. Once the assumption of independent prices is relaxed, the monopolist changes his behaviour. It is a fact that the monopolist notes the responses of the other side to the price changes, and so for him price is a variable that is dependent on his demand or supply. If he were to take no notice of this dependence, then a classical price formation would simply be achieved. In fact, he takes this dependence into account according to the principle of maximum utility and thus achieves the "monopolistic price formation" (translator's note: (monopolistische

¹⁾Chamberlain presents the same evidence (ibid.: 16 et seq.). (Translator's note: v. Stackelberg is referring here to the American economist, Chamberlin)

²⁾See Auspitz and Lieben, *Untersuchungen über die Theorie des Preises*, Leipzig, 1889: 361 et seq. Cournot, *Untersuchungen über die mathematischen Grundlagen der Theorie des Reichtums*. German ed., Jena, 1924, Capt. V. A. Marshall, *Principles of Economics*, 8th ed. London, 1925 [*Research into the Mathematical Principles of the Theory of Wealth*], Book V, chap. 14. E. Schneider, *Reine Theorie*, ibid.: 5 et seq. L. Amoroso, "La teoria matematica del monopolio, trattata geometricamente". *Giornale degli Economisti e Annali di Economia*, Ser. 2, Vol. 43 (1911: 207 et seq.).

Preisbildung), see Maks and Hahn: 40) that has been accurately described in detail by Cournot, Edgeworth, Marshall and others.

2. The fact that the monopolist changes his behaviour as soon as the restrictive assumptions for him are reversed, while every other economic agent in that market persists with his behaviour, as shown in the previous paragraphs and according to our method, this leads to the replacement of one classical price formation set as an assumption by another. This other price formation structure can be briefly formulated as follows: the monopolist dominates the market and modifies the price. The economic agents on the other side regard price as a variable independent of their behaviour, meaning that they behave just as they do under free competition. Evidence for this assertion using our method is to be stated and so we initially set the price formation structure described just now as the assumption for the whole market and then re-establish the independence of price formation for every individual economic agent (in order to maintain the assumption for the other economic agents) and investigate whether that kind of market behaves as the assumption states or whether it is possible that maximum utility is achieved in another way. Where its behaviour does not change, the validity of the price formation structure that was initially only proposed as a hypothesis is thus conclusively established. Where the assumption ceases to be valid for the "freed" economic agent, the hypothesis is thus invalid and must be replaced by another.

In our case, validity of the hypothesis for the monopolist is already emerging from the deliberations as outlined at the beginning. By contrast, no single individual is able to influence the price of an atomised side of the market, regardless of whether this is established in the competition mechanism on the demand or the supply side or whether it is set or manipulated by the monopolist. The evidence is quite similar to that cited in the previous paragraphs, only here "elasticity of the other side" ceases to exist – since even this is monopolised.

We must take into consideration that the monopolist can take various steps to dominate the market. He can set the quantity of goods sold and leave the other side to outcompete on price. On the other hand he can however also spontaneously set the price and leave it to the other side to set a particular quantity to sell on the strength of this price. In such cases, the monopolist therefore determines the quantity sold and achieves precisely the price he wants through the response of the other side. In other cases, he sets the price and by the response of the other side he obtains exactly the quantity sold that he wants to obtain¹⁾. In both cases, he acts with the intention of achieving the highest ordinal utility index or largest profit possible. Where all other markets exhibit the classical price formation structure, no difference thus exists between the two opportunities of the monopolistic market policy. In both cases, precisely the same quantity is sold and the same price occurs. Things are different however when several markets are organised in

¹⁾A. Marshall, *Principles* (ibid.) deals with the monopoly form of equilibrium quantity; Cournot (ibid.) shows the structure of price equilibrium; Maffeo Pantaleoni (*Manuale di economia pura*, English edition: "Pure Economics", London, 1898) contrasts these two structures (pp. 153) of monopolistic market policy.

a monopolistic way. As we will see in the third and fourth chapters, in this case and in certain circumstances, the equilibrium quantity leads to a different outcome to that of the price equilibrium. To simplify the way this is expressed, from now on we will refer to the monopolist's reaction when he sets the quantity as his "quantity adjustment policy" (translator's note: (Mengenpolitik), see Leontief: 555) and when he sets the price, as the "price adjustment policy" (translator's note: (Preispolitik, *ibid.*)).

As our ultimate conclusion we can state that according to the basic principles of the free market capitalist economy the monopolistic price formation structure newly described results from the market structure of the monopsony or monopoly. Compatibility of these basic principles with the market structures just examined is thus proven.

3. Monopoly theory can be immediately applied when it is a question of a so-called "imperfect" (translator's note: see Leontief: 559) monopoly. This is present when a demander (or supplier) achieves a part of the demand (or supply), a part not to be underestimated, while each of his rivals are also involved to a small extent, such that each of them views the price as an independent variable. The difference between the "perfect" and the "imperfect" monopoly is only slight¹⁾.

§ 4. Oligopolistic Supply and Demand

1. The three market structures discussed so far have been easily dealt with since no differences in opinion exist regarding their price formation, and their description only had to be given for the sake of completeness and to illustrate the method used here. In the paragraphs that follow, we are entering a sphere that has indeed been much discussed and about which there are still many differences of opinion, as we will see in the fifth chapter. The equivalence that exists between the similarly well-described demand and supply structures may only be discussed here in extenso with regard to a structure, e.g. a supply oligopoly, and to make deductions about the other form by analogy. The complexity of the subject makes it necessary to initially discuss a special kind of oligopoly, namely dyopoly (translator's note: Leontief: 555 says that Stackelberg himself uses "duopoly" spelled with a "y").

2. In the supply dyopoly two suppliers are faced with an atomised demand. The assumption that governs the theoretical starting point is as before that price is seen from the behaviour of all the market participants as an independent variable and thus the classical price formation occurs.

¹⁾See Karl Forchheimer: "Theoretisches zum unvollständigen Monopol". *Schmollers Jahrbuch*, Jg. 32 (1908, 1: 1–12).

The next step in the analysis frees the first of the two suppliers of these shackles. It can now be seen that this will change his behaviour since the more the price effectively depends on a supplier's supply, the larger this supplier's share of total supply. The first supplier will thus have a similar, but gradually weaker position¹⁾ than a monopolist. If we also now reject assumptions of a constant price for the second supplier, the following situation will thus be seen: his rival offers a specific quantity of goods on the strength of a specific market policy observation. Just as when we were considering the monopoly, let us initially retain this observation, even if the real assumptions change. The second supplier will then view his rival's supply as being independent of his own supply. Despite this, he will now change his previous behaviour as the demand side responds noticeably to changes in the supply of the second supplier, provided they deliver a noticeable part of the total supply. The second supplier will to the best of his ability therefore look to exploit the reaction of the demander to his changes in supply as far as the given supply of the first supplier is concerned and consequently achieve a similar position to the monopolist.

Let us return to the first supplier. He will establish that assumptions about his behaviour have changed because his rival for his part pursues a specific market policy, meaning – to use Pareto's terminology – he trades according to "type II". And indeed the first supplier will furthermore determine that his rival always views the supply of the first supplier as a given variable which he has to take into account. Expressed more precisely, the second supplier matches any supply set by his rival with a specific supply level of his own that generates him the biggest profit under the given circumstances. The supply of the second supplier therefore appears as a function of the supply of the first supplier. This first supplier will make use of this fact. In accordance with his rival's dependence, as outlined above a moment ago, he will examine all profit maximisation options and implement the best one. We can say that the first supplier dominates the market, while the second is his follower (translator's note: (Mitläufer) Leontief: 555). It should be very clear from the explanations in the previous paragraphs that the atomised demand side will always consider price to be a variable, independent of its individual behaviour.

The strange thing about the provisional result we have noted is the fact that both suppliers have two completely different positions in the market. Also, it is not difficult to appreciate that you cannot effectively adopt a system of equal rights between two suppliers based on real assumptions by yourself because the behaviour of your rival is also governed by the real assumptions on which an individual bases his behaviour. It can now be shown with the help of logical deduction that the assumption about the behaviour of the rival cannot be the same for every supplier. To simplify our presentation we will refer to the first supplier as A and the second as B. This then leads to the following logical conclusions:

¹⁾He has an "imperfect" monopoly here.

A views the behaviour of B either as dependent on or independent of his own behaviour:

1) Assuming that A views the behaviour of B as being independent of his (A's) behaviour, in this case A regards B's supply as a given variable and he orientates himself to it. Thus the behaviour of A is dependent on the behaviour of B. If B therefore trades based on assumptions that match reality he thus sees the behaviour of his rival A as being dependent on his (B's) behaviour.

2) Assuming that A views the behaviour of B as being dependent on his (A's) behaviour, if that matches reality, then it means that B is orientating himself to A's behaviour. That is only possible however if B always views A's behaviour as being a given situation, that is, he views it as being independent of his (B's) behaviour.

The real problem of dyopoly and moreover, of oligopoly, lies in this strange difference between the actual positions of both suppliers. Since each supplier can have each of the two types of position, the price formation structure outlined above is thus imperfect. Each of the two rivals will strive to achieve (Scherer: 64) the most favourable situation. It is possible that the more favourable position is independence. The opposite can however also happen. Namely, the supplier would favour being dependent, that is, being the "follower" because, due to the special price and cost conditions, his profit is even larger if he orientates himself according to his rival and "dominates" this market as if it were the other way around.

In a purely theoretical sense it is not possible to distinguish which of these two scenarios is the more probable. Only empirical research, in particular, statistical analysis of the demand curve, can reveal something conclusive about the greater or lesser probability of these two possibilities. We can however, as is to be explained again in more detail in the fourth chapter, put forward the assumption based on general experience that the favourable position is generally independence. And we can further assume that the question about which position is the more favourable as a rule has the same answer for both dyopolists. These two assumptions are valid whenever the demand function is close to being a straight line.

Thus for the price formation under dyopoly we have three cases:

1) First case: Each of the two dyopolists is striving for "market dominance", (translator's note: (Marktherrschaft) Scherer: 64), that is, a position of independence, because this promises the greatest profit. Then e.g. the first dyopolist will try to convince the second dyopolist that the former's actual supply has to be seen as an independent variable. The first dyopolist can achieve this by no other means than simply "blindly" supplying a particular quantity and indeed precisely the quantity he wants his rival to orientate towards, that is, the quantity of goods the first dyopolist would supply if he already dominated the market and the second dyopolist was his follower. We refer to this quantity as the first dyopolist's "independent supply".

The second dyopolist will also behave in exactly the same way because for him at the outset, there is no reason whatsoever to give way to the first dyopolist. Therefore he will also achieve his "independent supply".

We refer to this situation as the "Bowley dyopoly" because Bowley was the first to describe this scenario¹⁾. Total supply in the "Bowley dyopoly" is the sum of both "independent supplies". The price formation is, as we can immediately see, not a stable one since the behaviour of the two dyopolists is not oriented around achieving the greatest profit under the "given circumstances" when you consider that for the dyopolist's rival this is the actual supply under a "given circumstance". A reaction to the "given circumstances" is not even possible here. If each dyopolist considered the other's supply as a "given circumstance", then at the same time, he would ignore another "given circumstance", namely the rival's "dependence" associated with such a reaction. The reaction of each dyopolist is much more oriented here around the intention of changing the existing price formation and so this contradicts the second condition that we described earlier for the stable price formation of a true general equilibrium²⁾. Just to achieve this change, the dyopolist has accepted the disadvantages of the battle – that is what he is clearly dealing with here – for himself. If he accepted the market dominance of his rival, oriented himself to the reaction of his rival and gave up his own market dominance, he would do better than he would in a "Bowley dyopoly" even if the greater advantage of such a surrender would fall to his rival. It is possible that the "Bowley dyopoly"

¹⁾A. L. Bowley, *Mathematical Groundwork of Economics*. Oxford, 1924: 38, Explanations regarding dyopoly, in particular the two reaction functions for X_1 and X_2 . We cannot however agree with the final conclusion. The price in the "Bowley dyopoly" needs by no means to be approximately equal to the marginal costs, and therefore lies in the proximity of the competitive price.

Although Bowley, after whom we have named the dyopoly structure, is to our knowledge the first person to have constructed the two definitive equations, no particular originality can be attributed to him because his deduction should essentially be defined by Edgeworth's fundamental publication: "La teoria pura del monopolio", *Giornale degli Economisti e Annali di Economia*, July, 1897, in particular through the publications on pp. 26 et seq. (Published in English: "The Pure Theory of Monopoly", *Papers Relating to Political Economy*, London, 1925, Vol. 1: III et seq.: compare pp. 122 et seq.). The facts described by Edgeworth are indeed materially different from those of the "Bowley dyopoly", but formulaically they contain all the necessary information. It would have been possible to transfer the Edgeworth deduction to our case by a simple argument by analogy. This circumstance will be further described at a later stage (see Chaps. 3 and 4).

Henry L. Moore further achieved an important prior publication on the concept of "Bowley dyopoly" in his publication "Paradoxes of Competition", *Quarterly Journal of Economics*, Vol. 20 (1905/6: 211 et seq.).

Kurt Sting presents a clearer account ("Die polypolitische Preisbildung", *Jahrbücher für Nationalökonomie und Statistik*, Vol. 134 (1931,1): 761 et seq.). The situation referred to by us as the "Bowley dyopoly" then arises if the two dyopolists react in a hyper-political way in the sense of a sting.

For further reading, see my *Grundlagen einer reinen Kostentheorie*, Vienna, see 1932: 87 et seq. and my publication "Sulla teoria del dyopolio e polipolio", in: *Rivista Italiana di Statistica, Economia e Finanza*, June, 1933. In these two publications, I have referred to the dyopoly situation in question as the "Pareto dyopoly". I consider this description today to be inappropriate since the facts assumed by Pareto (*Manuel*, ibid. Appendix No. 69 and 70) are appreciably different to those for the "Bowley dyopoly".

For further reading, see chap. 5.

²⁾Chap. 2, § 1.

ultimately becomes market dominance for one of the two dyopolists. It is however not possible to determine in theory which of the two dyopolists will win and it is always possible that eventually the dyopolist who initially gave in will make a new attempt to regain market dominance – so that in the end, the "Bowley dyopoly" re-occurs¹⁾.

2) Second case: each of two dyopolists wants to be the "follower" because that is best for them respectively. Then, for example, the first dyopolist will try to convince the second dyopolist that the former's actual supply has to be seen as a dependent variable. The first dyopolist is unable to do this in any way other than treating it as though his rival's supply was always a given variable, meaning that he matches his own quantity supplied to each individual quantity set by his rival that would provide him (the first dyopolist) with the greatest profit when his rival's supply remained unchanged. Expressed another way, he thus reacts to each of his rival's supply levels as described above for the "follower".

The second dyopolist will also behave in exactly the same way because for him, from the outset, there is no reason not to give way to the first dyopolist. He will therefore also deliberately play the role of the "follower".

We refer to this kind of dyopoly as a "Cournot dyopoly" because Cournot was the first to clearly and correctly describe this situation²⁾, without however explaining the conditions under which it occurs. Here too, total supply occurring as a result of the behaviour of the two dyopolists outlined above is a well-defined variable. Generally there is just one particular supply combination for the two dyopolists where the first dyopolist's supply is exactly the same supply response to the supply of the second and this in turn at the same time is the supply reaction of the second to the first dyopolist's supply. Here again the price formation is not a stable one since neither of the dyopolists are looking to achieve the largest profit "under the given circumstances", but rather a specific modification of these "circumstances". If he were to abandon trying to obtain the most favourable position, he would accept the circumstances of his rival's dependence and achieve his "independent supply". In this way he would be already doing what his rival would like him to do, but would however also be better off than in the "Cournot dyopoly". It is therefore possible that the "Cournot dyopoly" ultimately becomes the "market dominance" of a dyopolist. However it can then suffer a degeneration at any time. We see that neither the "Cournot dyopoly" nor the "Bowley dyopoly" constitutes an equilibrium state because here the second condition of a stable price formation is not fulfilled.

The difference between these two types of dyopoly can be emphasised as follows: two circumstances are fulfilled by the behaviour of a dyopolist. Firstly, the fact that he supplies a particular quantity of goods and secondly, the fact that he reacts in a particular way to a rival supply that he considers to be unalterable. In the "Bowley dyopoly" each dyopolist is oriented around the change possibilities of the rival supply and does not note the actual rival supply itself, whereas in the "Cournot

¹⁾A numerical example for a case where the position of independence for every dyopolist is the most favourable one, see Chap. 4., § 6. It is recommended that the reader reads this example.

²⁾Cournot, *ibid.* chap. VII.

dyopoly" each dyopolist is oriented around the actual rival supply and ignores its change possibilities. A dyopolist can only succeed in obtaining the most favourable position when he disregards one or other of the circumstances and when this is quite deliberate in both cases. We ought finally to mention here again as a particularly noteworthy fact that one trade from all the "given circumstances" is absolutely impossible because both the circumstances that were described a moment ago are "given circumstances" that a dyopolist cannot simultaneously determine his reaction to. In any case, the dyopolist – whether he wants to fight or surrender – must therefore single out one circumstance from all of the given ones that he wishes to orientate himself to¹⁾.

3) Third case: one dyopolist strives towards a position of independence when the second favours a position of dependence. Here it is in the interest of each dyopolist to simply do what the other would like. A real equilibrium thus occurs since everyone immediately orientates his behaviour to what offers him the greatest profit maximisation and no one has an interest in modifying the actual price formation structure. We refer to this dyopoly scenario as "asymmetric dyopoly" (translator's note: (asymmetrische Dyopol) see Senn: 15). This is also achieved, as shown, when one of the two dyopolists in the "Bowley" or "Cournot" dyopoly gives up the most favourable position. This does not then produce a stable equilibrium, but rather an unstable one, since the "Bowley" or "Cournot dyopoly" can re-establish itself from this again at any time.

From these three scenarios, on the strength of the assumption outlined earlier and which is still to be explained in more detail later on, we can describe the "Bowley dyopoly" as the rule and the "Cournot dyopoly" as the exception and the "asymmetric dyopoly", where it constitutes a stable equilibrium, as an exceptional case. This "exceptional case" can then clearly only occur if the individual relationships, in particular the cost and production functions of the two dyopolists, differ from each other considerably.

3. Analysis that was carried out for the supply dyopoly is now also extended to the general supply dyopoly. Let us assume that the first supplying individual sees his rival's supply as a given variable that he orientates himself towards. He then behaves "monopolistically" (translator's note: (monopolistisch), see Scherer: 68) towards demand so that he manipulates the price "under the given circumstances". The second supplier can now influence the supply of the first supplier since this also depends on the supply of the second supplier.

Similarly however, the second supplier regards the supply of his other rival as given. The third oligopolist also even manipulates the supply of the first and second oligopolist as well as their demand, whereas he himself depends on the remaining supply and orientates himself towards it, and so on. Therefore a continuous chain occurs that ends with the last supplier. This last supplier dominates the whole

¹⁾Compare the numerical example in Appendix, IX, 3.

market in the way that was outlined above. We thus obtain a supplier ranking that follows logically from the asymmetry of the rivals' interdependence outlined above and shows all the possible positions.

Each oligopolist can now recognise any of the positions described as being the most favourable for him.

1) As a rule each pursues the position of "last" oligopolist and so supplies exactly the quantity he would supply if he already had this position of market dominance. We refer to this market situation as a "Bowley oligopoly" in the same way as a "Bowley dyopoly".

2) In special circumstances each supplier seeks to obtain the position of first oligopolist. This results in the "Cournot oligopoly" described by e.g. Amoroso¹⁾ and Schneider²⁾. It is merely an aside, as mentioned above, that the special circumstances should occur less often under oligopoly than under dyopoly.

In general oligopoly theory, many "mixed cases" are mixed dyopoly cases. This occurs when at least two oligopolists aspire to different positions. Here, an asymmetric dyopoly would be a situation where just one oligopolist aspires to each of the possible positions. Such a situation might only become reality by an extraordinary and improbable coincidence. Furthermore we should mention a situation in which all the oligopolists apart from one aspire to the "first" position and thus complete dependence, whereas the most favourable situation is where the oligopolist is dominating his rival's behaviour. Generally however, the "mixed cases" lead to completely chaotic, confused market conditions. The same also applies to the "Bowley oligopoly", where individual oligopolists give up trying to achieve absolute market dominance and aspire to dominate sectors of the market and so to fight for the position of "first" and "last" oligopolist. A systematic review of all possibilities would take us too far from our subject and is also not of interest.

4. The observations that were made about oligopolistic supply can be repeated almost word for word for oligopolistic demand and lead to the same conclusion. This can be stated for oligopoly as follows.

The market structures of demand and supply oligopolies are rarely consistent with the basic principles of the free market capitalist economy, and then only for exceptional cases, that is, in cases where a stable "asymmetrical price formation" occurs. As a general rule, the "Bowley oligopoly" and exceptionally, the "Cournot oligopoly" occur. In fact, both exhibit a well-defined total demand or well-defined total supply, not in a steady state but where the solution inclines towards warfare. However, this war cannot be resolved by the market mechanism. The different mixed oligopoly structures and the "Bowley" or "Cournot" oligopolies are very confused and chaotic. A small number of oligopolists decide not to try to achieve the best market position and aspire instead to the intermediary position.

¹⁾L. Amoroso, "La curva statica di offerta", *Giornale degli Economisti e Annali di Economia*, Vol. 70, 1930: 10 et seq.

²⁾E. Schneider, *Reine Theorie* (ibid.): 149 et seq.

5. The more economic entities an oligopolistically organised side of the market has, the closer the picture of the market becomes to the market structure of "free competition" (translator's note: (freie Konkurrenz), see Leontief: 555). This is effectively proven by the "convergence" of the oligopoly with the number of individuals. The market position for each individual is ultimately such that it makes almost no more difference to their profit or utility whether they dominate the market or are a follower or even whether they view price as being independent of their behaviour. The rivalry applies increasingly only to fractional amounts. The discrepancies between price and costs caused by this rivalry become increasingly irrelevant, so that the unstable (translator's note: (gleichgewichtslose) Senn: 16) oligopoly – with the increasing number of rival oligopolists and the decreased size of their individual turnover – becomes the classical general equilibrium of free competition.

§ 5. Bilateral Monopoly¹⁾

1. In a bilateral monopoly a demander and supplier are opposites. Where the assumption of independent prices is set for both this culminates in the classical price formation structure. Each of the two market participants always view price as a given variable and match it with a particular demand or a particular supply. The higher the price, the less is demanded or the more is supplied and vice versa. For every quantity of goods sold there is a specific price at which this quantity of goods is demanded (the smaller the price, the greater the quantity of goods) and another specific price at which this quantity of goods is supplied (the higher the price, the greater the quantity of goods). Therefore each quantity of goods is matched by a specific "demand price" and a specific "supply price". Where the assumption of an independent price applies to both market participants, the quantity sold is exactly that which is consistent with their "demand price" and "supply price". We refer to this quantity as the "standard quantity" and the price as the "standard price" (translator's note: (Normalpreis), see Scherer: 68).

2. Where we now reject the assumption of an independent price for the demander, so the suppliers' reactions to price changes will take this into account in exactly the same way as a monopsonist faced with a supply that is economically and competitively determined. He will no longer trade based on his "demand price" but choose the most favourable of the "supply prices" and simply set that, or else demand exactly the quantity that is offered at this supply price. Here, the price and the quantity would be less than the "standard price" and "standard quantity". It also follows that the "demand price" for this quantity sold, that is of course no longer in evidence, is higher than the "standard price", and is only just higher than the "supply

¹⁾See F. Y. Edgeworth, *Mathematical Psychics*, London, 1881 (ed. 1932): 16 et seq. A. Marshall, *Principles*, ibid. Appendix F.: "Barter": 791; Mathematical App., Note XII bis: 844 et seq.

price" that occurs in the market. The difference between the notional demand price and the "supply price" achieved is kept by the monopsonist as his monopoly profit. We refer to the market situation described a moment ago as "demand dominance".

3. Where we reject the assumptions of an independent price for the supplier, they do however exist for the demander and this therefore results in a very similar picture. Now the supplier dominates the market; he calculates the demander's responses and determines how they are expressed in the relationship between the quantity sold and the demand price. The quantity of goods sold is likewise smaller than the "standard quantity". The market price that occurs, in this case, the demand price of the quantity sold, is higher than the standard price however and definitely higher than the supply price – that is not the case here – of the quantity of goods sold. The monopolist "pockets" the difference between the demand price achieved and the notional supply price as a monopoly profit. We refer to this market situation as "supply dominance".

4. The market situation described under 2 and 3 is no different to the monopsony or monopoly that were described in § 3. However, an exaggeration of the market dominance of one side or the other is still conceivable here and probably cannot occur if the other side is atomised.

For each demander such a large sum of money is assigned to each quantity of goods demanded that if it were to be spent on this quantity of goods, it would devalue the purchase of this quantity of goods. The quantity of money forfeited decreases their ordinal utility index by the same amount as the purchase of the quantity of goods increases it. Through this correlation, we achieve a specific sum of money as a function of the quantity of goods. We refer to this function as the "demander's equivalence function", that is, the sum of money thus assigned to any quantity of goods as being the "equivalent amount" of the quantity demanded.

Furthermore, such a small sum of money is assigned to each quantity of goods supplied that if the demander merely achieved it, it would exactly represent compensation for the quantity of goods given, that is, the sum of money that the supplier's ordinal utility index exactly increases the amount by and that the giving of the quantity of goods decreases it by. We refer to this sum of money as the "equivalent amount of the quantity supplied" and its resulting function as the "supplier's equivalence function"¹⁾.

Where the supplier is a company, his "equivalence function" is hence the same as the "total cost function" (translator's note: (Gesamtkostenfunktion), see Leontief: 556).

So where the demander only has the choice either not to purchase anything at all or to purchase a specific given fixed quantity of goods for which he has to pay an amount that is less than the corresponding equivalent amount, he will make a

¹⁾These equivalence functions are none other than the cost and utility curves constructed by Auspitz and Lieben, *Untersuchungen über die Theorie des Preises* (pp. 5 et seq. and pp. 8 et seq.).

decision to purchase. Similarly, the supplier will sell if he receives an amount for his quantity supplied that is higher than the corresponding equivalent amount. Where e.g. the demander dominates the market he can present the supplier with the alternative, either not to sell anything or to sell a quantity of goods that the demander determines, multiplied by the price also stipulated by the demander and resulting in an amount that lies just above the supplier's equivalent amount. The demanders will now compare all combinations of quantities of goods and corresponding supplier equivalent amounts with each other and choose the one that is the most favourable, meaning the one that uses the ordinal utility index to the maximum. He will then consistently demand this quantity and therefore pay an amount that lies just above the supplier's corresponding equivalent amount. We refer to this situation as the "supplier's utility".

Accordingly, the supplier can include the demander's "equivalence function" in his calculations and then exploit the demander.

In both cases he will pocket the largest possible profit by dominating part of the market and in both cases the price differs substantially from the standard price, either above or below. By contrast, the quantity sold is always equal to the standard quantity when both are monopolist firms.

Where the other side is atomised, "exploitation" is generally therefore not possible because the monopolist would be compelled to impose a fixed quantity sold on countless of each of his partners.

5. Where we ultimately resolve the assumption of independent prices for both market participants, we immediately see that an automatic equilibrium is impossible¹⁾ because the favourable position here is in any case one of market dominance²⁾ i.e. the definite opportunity to exploit the other side. For standard quantities sold each market participant would perhaps attempt to secure the margin between the demand price and the supply price in the case of less than the standard quantity sold or even the difference between the equivalent amount of the demand and the equivalent amount of the supply. A power struggle would emerge, the outcome of which would have a different result according to the actual state of the market in question but that would have nothing in common with the automatic self-regulation of the market. We thus see that the market structure of a bilateral monopoly is irreconcilable with the basic principles of the free market capitalist economy.

¹⁾F. Edgeworth, *Mathematical Psychics* (ibid.), Marshall, *Principles* (ibid.), A. C. Pigou, "Equilibrium under bilateral monopoly", *The Economic Journal*, Vol. 18 (1908): 205 et seq. A. L. Bowley, "Bilateral monopoly". *The Economic Journal*, Vol. 38 (1928): 651 et seq.

²⁾The opposite would only be able to occur where there is a partially increased demand price function or a partially decreased supply price function. Both could be described as impossible.

§ 6. Bilateral Oligopoly, Reduced Monopsony, Reduced Monopoly

Detailed analysis of the market structures dealt with so far allows us to directly refer to the last three types still to be described without our methods having to break new ground.

1. A bilateral oligopoly¹⁾ occurs when both sides of the market consist of only a few economic agents. Its structure is a hybrid form, something between a single-sided oligopoly on the one hand and a bilateral monopoly on the other. We can already infer from this fact that a specific automatic equilibrium is not possible in a bilateral oligopoly under the basic principles of the free market capitalist economy.

There is an antagonism underlying each of the two sides of the market as described for single-sided oligopolies. Add to that the contradiction, even if only a small one, that is characteristic of a bilateral monopoly. This also destroys the opportunity for the bilateral oligopoly to bring about an equilibrium that would correspond to that of the "asymmetrical oligopoly", since even if oligopolists from each side of the market were to complement each other there would remain a power struggle between the two sides of the market. Indeed it would not be possible for the individual to achieve the market position of "utility" as his aim, but achieving market dominance would however remain the pursuit of any individual market participant. As a rule, an equilibrium would only be conceivable if all the market participants, except one at the most, would consider price to be a variable independent of their individual behaviour. This requirement would however contradict reality, as the description of the single-sided oligopoly shows.

As a consequence we can state that the free market capitalist economy is irreconcilable with the market structure of a bilateral oligopoly.

2. Restricted monopsony and restricted monopoly are hybrid forms, somewhere between bilateral oligopoly and simple monopsony or monopoly, or even between both the latter market structures and bilateral monopoly. Here a monopolist on one side is confronted with an oligopoly on the other side. A true automatic equilibrium – in the strict sense of the word – does not occur here either. However we will not easily be able to say that they are unstable, in the same way as a single-sided oligopoly, a bilateral monopoly or a bilateral oligopoly for instance. The power struggle between the two sides of the market within these market systems will essentially occur due to the superior position of the monopolist. Here however the monopolist is the one with the advantage, so we can calculate that he will dominate the market – something that cannot be said about either a bilateral oligopoly or a bilateral monopoly on either side of the market. To appreciate this we will summarize the different methods of market policy in other market structures. In free competition each market participant had to restrict themselves to a price that was independent of their behaviour to achieve a particular quantity sold. In the case of

¹⁾See F. T. Edgeworth, *Mathematical Psychics*, *ibid.*: 34 et seq.

single-sided oligopolies each oligopolist tried to influence the price, not directly however, but instead similarly by realising a specific quantity sold that was generally imposed on the rival and was dependent in special circumstances on the behaviour of the rival. In the case of a single-sided monopoly either the quantity sold or the price can be autonomously set by the monopolist.

In a bilateral monopoly the battle was eventually fought either by setting a price (translator's note: (Setzung eines Preises) Senn: 16) or even by fixing a price and a quantity sold. The situation was similar in a bilateral oligopoly, even if price setting by one of the market participants only offered a reduced chance of success. In a restricted monopoly, precisely this path pursued by the monopolist could however lead to the desired result since the oligopolist that is faced with price setting by the monopolist would run the risk of being eliminated by a rival in each counter-attack. It is thus to be expected that the oligopolists acknowledge the price set by the monopolist and so will not otherwise behave as the economically competitively organised side in a simple monopoly. The result would be an equilibrium that can be described as the market dominance of the monopolist. Of course this equilibrium is continually threatened with possible counteraction by the oligopolists and the stronger these are the fewer oligopolists oppose the monopoly. Where e.g. the oligopolistic side of the market is a dyopoly, so here too the market dominance of the monopolist is indeed to be expected. However, the instability of the general equilibrium is considerable here.

In conclusion, we can thus state that the free market capitalist economy is consistent with a restricted monopoly to a certain degree. An imperfect equilibrium occurs. The functioning of these market structures is however vulnerable to shocks which are impossible in market structures with a true equilibrium.



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Market Structure and Equilibrium

von Stackelberg, H.

2011, XIV, 134 p., Hardcover

ISBN: 978-3-642-12585-0