

Supply-Side Strategic Unemployment in Small Business

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ABSTRACT. In this paper, the model which will be analysed is characterized by a labour market with (a) profitable vacancies, (b) unemployment, (c) excess labour supply, (d) limited mobility and divisibility of labour, and (e) competition on-the-job. The analysed setting is typical for a small-business economy. The analysis suggests that unemployment will be greater than equilibrium unemployment if present employees and potential entrants consider job assignments for this market under strategic perspectives.

1. Introduction

Barriers to entry and exit are substantial determinants of market structures. Market structures determine whether the economic outcome is efficient or whether a misallocation of resources prevails. This, in general, also holds for the labour market. In many cases, a cure for unemployment suggests restructuring the market by reducing barriers of entry and exit.¹ The problem of a successful policy, however, is that the barriers are often not obvious and our theoretical apparatus has to be further developed.

In his summary paper, Demsetz (1982) discusses three, already classic, concepts of barriers to entry: the one by George Stigler, which defines barriers "as a cost of producing (at some or every rate of output) which must be borne by a firm which seeks to enter an industry but is not borne by firms already in the industry"; the one by Joe Bain, which defines the conditions of entry as determined by "the extent to which, in the long run, established firms can elevate their selling prices above the minimal average costs of produc-

tion and distribution . . . without inducing potential entrants to enter the industry"; and the one by Ferguson, which defines barriers as "factors that make entry unprofitable while permitting established firms to set prices above marginal cost, and to persistently earn monopoly return". (See Demsetz, 1982, p. 47, for these quotations.)

Of course, these definitions overlap. In this paper, we discuss a fourth type, strategic barriers, which constitutes a rather independent category of its own. The peculiarity of strategic barriers is that the costs of entry or exit depend on the behaviour of other decision makers.² Thus, of course, by its very nature game theory is an adequate instrument for the analysis.

The concept of strategic barriers to entry is applied to the allocation of labour in order to explain the phenomenon of the simultaneous prevalence of unemployment and profitable vacancies in an economy. In Section 2, a simple model is introduced. In Section 3, the model is analysed. Section 4 discusses the results with reference to standard labour economics. In Section 5, a "story" is given which illustrates and, if possible, gives relevance to the preceding analysis.

2. The model

The economy consists of two firms, X and Y , and a set of (homogeneous) workers $W = \{1, 2, 3, 4\}$ of identical labour capacity and identical labour qualification. The payoff function for an individual worker i in this economy is given by 1., 2., and 3.:

1. If i works with firm X and S is the subset of workers, $S \subset W$, employed with X , and s is the cardinality of S , then the payoff to i is:

$$x_i(S) = \begin{cases} 0 & \text{if } s = 0, \\ a & \text{if } s = 1 \text{ and } i \text{ in } S, \\ e & \text{if } s > 1 \text{ and } i \text{ in } S. \end{cases}$$

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2. Correspondingly, i 's payoff with firm Y is given by

$$y_i(R) = \begin{cases} 0 & \text{if } r = 0, \\ b & \text{if } r = 1 \text{ and } i \text{ in } R, \\ c & \text{if } r = 2 \text{ and } i \text{ in } R, \\ e & \text{if } r > 2 \text{ and } i \text{ in } R. \end{cases}$$

R is the set of workers employed with firm Y and r is its cardinality; again R is a subset of W .

3. If i is neither an element of S nor of R , then i is an element of the set of unemployed workers U and his payoff is d , independent of the cardinality of U . Moreover, the intersection of R , S , and U is assumed to be empty and $R \cup S \cup U = W$.

The payoffs consist of money rewards, i.e., wage income, and non-monetary rewards such as prestige, reputation, acknowledgement of efforts, the pain of work and the pleasure of leisure, freedom of decision making, various levels of work intensity and expectations of promotion or wage increase, etc. All forms of sidepayments among the workers, explicit or implicit, are excluded.

We assume that monetary rewards are determined before entry into employment with one of the two firms, while the non-monetary rewards, e.g. work intensity, will be determined after entry in accordance with the above payoff function, i.e., depending on the number of workers employed in a firm. The payoff function is known to the workers, mainly because of previous experience, before they enter into employment.

Work contracts are valid for a discrete, substantial period, T . In order to keep the model as simple as possible, workers are assumed not to consider payoffs from periods after T when they decide on their employment in period T . Since the model is understood as a proxy of an atomistic economy with larger sets of workers and firms, where the interaction in the pre-contract state is anonymous, no essential feature is lost by choosing a one-period approach.

By the same token, it seems to be appropriate to assume that workers decide simultaneously on their occupation for the period T and that a worker signs his contract with a firm without knowing the decision of the other workers — more specifically, without knowing how many workers will be employed with the firm he (or she) enters. This excludes pre-entry communication and set-

tings with a very small (highly specialized) labour force.

Set W and its subsets constitute only a proxy of the expectations of the workers in W which is considered relevant for the decision problem. That is, agents in W do not expect more than two workers to enter the labour market characterized by X and Y . Thus, the maximum amount for X or Y is four workers.

The assumed payoff function can be derived by applying Böhm-Bawerk's theory of "marginal pairs" to a bilateral factor market with indivisibilities (see von Neumann and Morgenstern, 1949, pp. 560 ff., Morgenstern and Schwödiauer, 1976). It reflects the "competition-on-the-job" phenomenon. Thus e can be interpreted as the reservation payoff of worker i , i.e., if the work situation is so bad that the payoff at work is less than e , then the worker will stay at home in spite of the existing work contract which binds him (or her) for one period, perhaps risking a fine or a period of no money income. (Most unemployment benefit schemes have a period of quarantine for which a worker does not get benefit payments if he (or she) quits "without justified reason".)

Note that the payoff function is compatible with a large variety of production technologies since the payoffs do not reflect competitive wages. For the contract period T the employers and employees are in a bilateral relation (as, e.g., modelled in Bull (1983) with respect to work effort and wage payment). The payoffs to the employees express the share they receive from the surplus which results from combining labour, capital and managerial talent under the given market conditions.

Depending on the initial allocation of labour, L_0 , and on the specification of the payoffs a , b , c , d , and e , a large variety of decision situations can be modelled for the described economy. However, there are obviously combinations of initial situations and payoffs of minor interest, e.g., if the status quo implies a Nash equilibrium so that rational behaviour does not motivate a change in the allocation, or if $e > d$ so that workers strictly prefer working to being unemployed independent of the allocation of labour to the firms. Similarly, cases in which e or d are maximal payoffs are not of interest: all workers look for employment or unemployment, respectively. To give the initial

allocation of labour some strategic meaning, we assume throughout the following analysis that employed workers will not choose unemployment as an alternative for the contemporary position if the payoffs resulting from this position are higher than d . More specifically, the payoffs are assumed to satisfy the ordering $a > b = c > d > e$ and the initial allocation L_0 should be characterized by the fact that workers 1 and 2 are employed with firm Y while workers 3 and 4 are unemployed.

In this scenario, the idle payoff potential of firm X can be interpreted as the result of an increase of the demand of the commodity produced by X and Y .

3. The analysis

In the following we will not consider mixed strategies and whether we can derive a Nash equilibrium therefrom.³ As a consequence, it suffices to consider the ordinal ranking of the payoffs.

Obviously, the entry game contained in the above model has six pure-strategy Nash equilibria:⁴

$(X_1, Y_2, Y_3, U_4), (X_1, Y_2, U_3, Y_4), (Y_1, Y_2, X_3, U_4),$
 $(Y_1, Y_2, U_3, X_4), (Y_1, X_2, Y_3, U_4), (Y_1, X_2, U_3, Y_4)$

Here, X_1 and Y_2 express that worker 1 is with firm X (is in S) and worker 2 is with firm Y (is in R); U_3 expresses that worker 3 is unemployed (is in U), and so on.

All feasible choices of the agents in W are related to some equilibrium and therefore rationalizable (as defined in Bernheim (1984) and

Pearce (1984)). The application of the Nash equilibrium concepts does not discriminate among the strategies and the outcomes, and thus is of little help in solving the inherent coordination problem. Alternatively, we may apply the concept of (pure-strategy) maximin solution. To do so we first ask the question, how would workers 1 and 2 decide given status quo L_0 . Then Matrix I applies. The maximin solution of this game is characterized by the strategy pair (stay Y , stay Y) and the corresponding payoff pair (b, b) .

Next, we derive the maximin solution for workers 3 and 4 given that they assume that 1 and 2 follow the identical principle. Then Matrix II applies. We see that the strategy "unemployed" strictly dominates "enter Y " for both players and thus "enter Y " is irrelevant for the maximin solution. Comparing the maximin values of "enter X " and "unemployment" sorts out the latter as maximin strategies for both players. Thus, the maximin solution is characterized by the strategy pair (unemployed, unemployed) and the corresponding payoff pair (d, d) .

Matrix I: The choice of 1 and 2 in isolation
 (c is substituted by the equivalent b).

		2	
1		stay Y	enter X
	stay Y	(b, b)	(b, a)
	enter X	(a, b)	(e, e)

Matrix II: The choice of 3 and 4 given that 1 and 2 stay with Y .

		4		
3		enter Y	unemployed	enter X
	enter Y	(e, e)	(e, d)	(e, a)
	unemployed	(d, e)	(d, d)	(d, a)
	enter X	(a, e)	(a, d)	(e, e)

The result of Matrix II excludes the possibility that 3 and 4 follow maximin while they assume that a different solution concept applies to 1 and 2 (which produces an outcome different from the maximin of Matrix I). Strong rationality supports this implication if extended to the choice of solution concepts. It postulates that "if you are a rational player, you must expect, and act on the expectation, that other rational players will likewise follow these rationality postulates" (Harsanyi, 1977, p. 154).

Further, we check whether the result from Matrix II is consistent with the conditions under which we derived the maximin solution from Matrix I. We find that the conditions coincide with the result from Matrix II. We conclude that the maximin solution supports the status quo L_0 . That is, irrespective of the payoff potential of firm X , no worker will join this firm, and the potential remains idle, and, as a consequence, unemployment will be twice as high as in equilibrium. — We assumed that employed workers will not choose unemployment as an alternative for the contemporary positions if the payoffs resulting from this position are higher than the unemployment benefit d . Without this assumption on the structure of the game, the maximin solution would prescribe that all workers in the economy opt for unemployment.

Of course, L_0 is not an equilibrium. Thus, at least one worker could improve his payoff outcome by an alternative choice *given the choices of the other workers*. However, a worker cannot assume that the other workers will not choose alternative occupational positions when he reasons about changing his position himself. He needs a theory about the behaviour of the others to decide upon his best response. Equilibrium theory does not give him an answer to this problem. Maximin, however, makes the agent independent of the behaviour of the other agents and, thus, the agent does not need a solution to the question of how others behave. The price of applying maximin is that an agent may not gain a maximum payoff given the choices of the other players.

The maximin result also derives from an immediate application of symmetry postulates which prescribe that homogeneous players in identical decision situations apply identical strategies and identical theories to do so and assume that other agents do so as well if they are in

identical situations. Again, this follows from an extension of Harsanyi's (1977, p. 154) strong rationality. But strong rationality needs further discussion.

4. Interpretation

It is standard to classify unemployment by two components, one representing demand deficiency, and the other functional, seasonal, and structural unemployment (see, e.g., Hamermesh and Rees, 1984, chapter 8). If the volume of unemployment, U , is equal to the number of vacancies, V , demand deficiency unemployment is defined to be zero. If we consider the economy of the preceding section as a proxy of a closed economy of identical structures, then we get outcomes which indicate that the volume of unemployment is twice as high as the number of vacancies. This indicates that half of the unemployment is due to demand deficiency. The other half, however, is neither functional nor structural according to the standard definitions (see, e.g., Holt, 1970; Driehuis, 1978, for structural unemployment) and seasonal unemployment is irrelevant: it is due to strategic barriers to entry on the supply side of the labour market. Thus, we can speak of supply-side strategic unemployment to characterize the second component of the prevailing unemployment in the outlined small business economy.

The next question to answer is whether this classification is justified, i.e., whether supply-side strategic unemployment is a self-sustaining concept. Although this cannot be discussed here in detail, at least one issue might be pointed out at this stage. The above analysis shows that strategic unemployment depends on the level of unemployment benefits. But, in contrast to search unemployment, which is said to depend on the amount of non-labour income including the joy of leisure and unemployment benefits as its main components, strategic unemployment only depends on the ordinal value of the payoffs of unemployment compared to the payoffs of various occupations. There is no continuous function expressing the reservation wage rate for the workers and the firms depending on search time as contained in standard search models (see, e.g., Holt, 1970). Whether the rate of unemployment benefit is too high, such that workers choose to stay (or become)

unemployed, depends not only on the payoffs of occupations in relation to the benefit level but also on the payoff level structure as given by the payoffs of alternative occupations and by the payoffs of the other participants. This makes strategic unemployment, in some ranges of the domain, independent of variations of unemployment benefits.

We may conclude that strategic unemployment is a form of structural unemployment. I do not deny that there are structural elements involved: the set of strategies and the payoff matrix of any game define a structure. However, it would be misleading to identify strategic unemployment with structural unemployment as defined in Holt (1970) and tested in Driehuis (1978)⁵ and it would be hazardous for economic policy. There is a different medication for each of the two components.

Much of what is said of unemployment depends on whether we can generalize the model to be an adequate proxy for an economy. Obviously, the model hinges on indivisibilities which we experience in small business units (see illustration in the following section) or firms with a high degree of compartmentalization.⁶ There must be small units on the demand side of the labour market since otherwise the strategic relationship among employed and/or potential employees becomes too weak. On the supply-side the model can operate with larger numbers of agents and still produce strategic unemployment if agents apply maximin. In fact, the larger the number of potential competitors on-the-job, the more likely it seems that no entry occurs and strategic unemployment prevails, and that pre-entry communication among the workers can be excluded.

Of course, within the model, the number and payoffs of workers in the market, the number and payoff potential of firms, and the status quo can be submitted to substantial modifications. There will be situations where no strategic unemployment arises for maximin solutions and where the Nash equilibrium is unique and the coordination problem solves. But, behind a "veil of ignorance" we cannot exclude market situations which have a similar structure as the above model and for which supply-side strategic unemployment seems relevant.

An important ingredient of the above model is

the assumption of on-the-job competition which is reflected in the payoff functions. Whether it exists is an empirical question which is certainly difficult to answer in general. The following story, which summarizes personal observations of the author, may help to illustrate the problem and motivate empirical studies.

5. Observations

In Munich (FRG) and the surrounding area (of about 2.5 million inhabitants), the business of small edition offset printing, which is, e.g., relevant for the publication of doctoral dissertations, is characterized by a small-business market structure. The one or two owners work with one or two printers, an unskilled graphic specialist, a secretary who also takes care of the bookkeeping and the reception of clients, a good helper who does the binding and cutting in the basement, and a low-paid apprentice who has to do the work which is not of obvious profitability, i.e., fetching the morning bread from the near-by bakery or substituting a misprinted sheet 87/88 in an edition of 350 copies with a corrected version of it. Very often the second printer is missing and printing jobs pile up, clients get frustrated and revenues do not flower as they should. Of course, the owner works as hard as he can, helping with the printing, binding, and cutting. However, this time is largely consumed by having meetings with impatient clients and bank officials who ask curious questions about liquidity, solvency, etc.

The solution to this problem is to look for a second printer. You (the owner) do not call the public labour office because they will send you unqualified candidates who have been out of business for a year or more. (This is a common statement and, indeed, there are good reasons why it often holds.) What should one expect of a printer who has not got a job for a longer period and frequents the public labour office while you spend a lot of money advertising the position in the local newspaper? In addition, you advertise in newspapers of the more rural areas where you expect to find qualified unemployed printers or ambitious candidates looking for a good job. You even offer a little flat in town which is considered a precious offering since there is an extreme shortage of housing facilities in this area. If there are

two equally qualified candidates, this would be fine for you. There are jobs which so far could not be accepted because of the limited capacity and because the price would not cover the augmented payments for extra-hours and, anyway, one takes the most profitable ones if capacity is limited. However, with two additional printers capacity increases considerably. Of course, you would tell each of them, perhaps also the printer who was already working with you before, that they have to work hard and increase their productivity. Otherwise the business does not earn the wages for three printers and one of them has to leave.

If there are two candidates, of course, you can save the little down-town flat for your niece who wants to come to Munich next autumn in order to study business administration. In any case, one flat would not be enough for two printers and you do not want to discriminate because that ruins the willingness to work.

If there are two candidates, but you advertised for one, and you accept both of them, they should be willing to work hard and accept working extra-hours without extra-hour payments. The ratio two candidates/one vacancy indicates a surplus and "aren't there 3.23 million registered unemployed in Germany right now?" Well, it is not easy to find a printer who can handle your fast-running little Japanese offset machine. But if there are two equally qualified candidates for the advertised job, then you should not hesitate to hire both of them and also let them work with the pre-war press which you bought cheaply for cases of emergency. Since its output per hour is lower, the printers have to accept that the morning break has to be reduced to five minutes in order to increase productivity and make the productivity of the old machine comparable to the productivity of your modern machine.

You will not lower the wage rate to match the lower productivity of the workers when working with the old machine. First of all, this would break the work contract and could become rather costly if brought to the court. Secondly, this would disturb the internal wage structure. Traditionally, the secretary earns 10 percent less than a printer to give credit to the different sex roles secretaries and printers play in the firm and outside. Even when you have only one secretary, but three printers, you are well advised to stick to the

traditional wage-rate pattern: there is always a means to balance the internal labour relation by increasing efficiency standards, like time at work. Thirdly, the reduction of the contracted wage rate could give a negative signal to other employees. They might get afraid of similar cuts if a close substitute in their jobs is employed in the future and therefore look for a new job in good times. Wage cuts could also give a negative signal to potential employees at future occasions. It is much easier to observe and register wage cuts than an increase of efficiency standards. In addition, it is seen as social merit to increase efficiency.

Since there are no depreciations on the old machine, the use of the old machine, in spite of some shortcomings, should be profitable for the firm. Its financial foundation will stabilise and job security will thus increase "on the average". Of course, if the productivity of the three workers, by their internal competition increases to an extent that allows them to satisfy the demand through only two printers, and a more goal-oriented input of the apprentice, you might consider giving one of your three qualified printers back to the labour market. Obviously, there is a shortage of good workers so that laying-off the third printer would be an action which can be easily justified by arguments of Pareto efficiency.

Indeed, there seems to be shortage of good workers. Week after week your advertising is published. Now and then an interview with a candidate can be arranged. Most of the candidates do not satisfy your qualification standards, or you suspect them to be potential troublemakers. In some cases you seemed to be lucky: a highly qualified candidate knocked on your door and agreed to work for you. However, he did not show up the day he was supposed to start his job. Even rather tedious investigations fail to show that he ended up in a contract with a competitor. Your guess is that he preferred to remain unemployed or that he entered a job in a different section of the printing business, where he may not be able to fully use his qualifications but can enjoy the advantage of a big enterprise: more security, less intensive work, more social contacts. If this is so, then it seems that you did not lose too much in this case.

However, cases add up. You get puzzled by the fact that statistics say that there are many unem-

played printers qualified for your business. In spite of your rather active advertising, you do not succeed in recruiting a single one of them. There might be a solution to this paradox if we consider interviews with unemployed offset printers. Many of them emphasize that they felt exploited during their last employment. In view of the economic recession and the threat of unemployment, they worked harder, increased their daily output, sacrificed weekends and holidays in order to help the firm to continue business. Nevertheless, one day they were laid-off. While enjoying the idle life of unemployment, reasonably financed by unemployment benefits but frustrated by social sanctions, they saw their former firm attracting more business than ever and, after some months, even advertise for a printer. Of course, they did not apply for work with their old employer but they went to interviews with other firms only to find out that the employment situation is quite similar to what they experienced in their old firms. There is the intensive mistrust that "in times like this" one employee is traded off at the expense of the other.

It is not my interest to test whether the negative expectations are justified, though there is some evidence from the reasoning of the enterprises in which I explicitly participated. I believe that the negative expectations, which I illustrated above, are widely spread. Moreover, I believe that the sketched problems are not only typical of the printing business, but also of other branches which show a small-business market structure, and that the phenomena are not specific to the region of Munich.

6. Conclusion

The pattern of labour market relations which characterizes the above model is relevant if a small number of workers (out of a large potential of workers) meets a small number of firms, or is expected to meet (though there is a large potential of firms) at any instant when offering a job, entering employment, laying off workers, and quitting a job. This will be the case if, for example, transaction costs of job search and hiring are substantial. Then, even an atomistic labour market reduces to bilateral relations. However, there is still anonymity because there are many firms and

many workers which may combine in pairwise relations.

If these conditions hold for a labour market (or a section of it), then it could be described by a replication of the above model. Unemployment will be larger than equilibrium unemployment because of strategic barriers to entry. The derived results may serve as a first approximation. They indicate that strategic unemployment could be an essential feature of the considered market.

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Notes

¹ Among others, Baumol (1982) pointed out that costly exit has similar effects to entry as costly entry.

² A pioneering article is Sherman and Willett (1967). The well-known limit pricing models (see Milgrom and Roberts, 1982) are a variation of this theme.

³ It has been shown for two-person variable sum games (see Wittman, 1985; Tsebelis, 1989; Holler, 1990; Holler and Høst, 1990) that the application of mixed strategies and the maximization of expected utilities produces rather peculiar ("counter-intuitive") results. This is due to the fact that the expected utility of player i is linear in the probability p by which he chooses a specific strategy. Calculating the first derivative of the expected utilities in order to get the first-order condition for a maximum thus shows that it does not depend on player i 's choice of mixed strategy whether his expected utility function is maximized but it depends rather on player j 's mixed strategy whether player i 's first-order condition is satisfied, or not. Leaving aside the aesthetics of consistency, there is no incentive for j to maximize or minimize i 's expected utility. In the following, we ignore mixed strategy equilibria and other randomizations on pure strategies.

⁴ A Nash equilibrium is a vector of choices — one choice for each agent — such that agent i cannot increase his/her payoff by revising his/her choice *given the choices of all other agents*.

⁵ In Holt (1970) and Driehuis (1978) the structure of labour markets is captured by compartmentalization effects (i.e., the effects of the compartmentalization of the labour market into segments) and allocation effects (i.e., the effects of the allocation of vacancies and unemployment among the segments). Strategic considerations do not enter the discussion of these effects.

⁶ Thus, our model supports the effect of compartmentalization on unemployment brought forward by Holt (1970) — but it stresses its strategic implications.

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