

Employability and the Costs of Organizing Work

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Abstract

A new macroeconomic equilibrium theory is presented which gives a rigorous economic foundation of the notion of employability. The division of the labor force into those who are employable and those who are unemployable is not fixed by nature but is endogenously determined by the adopted methods of organizing work and the resources allocated to this organization. Both the volume of labor which is employable from an efficiency point of view and the volume of labor which is considered as employable by profit-maximizing firms in a market economy are derived.

Employability depends on the one side on the workers' abilities, but on the other side also on the skill requirements implied by the organizational environment provided by firms. It is shown that the range of abilities which is considered as unemployable by the firms varies with the competitive pressure in the goods market as well as with the used organization methods. Under fairly general conditions the resulting level of equilibrium employment is lower than the efficient level. Moreover, it is shown that in particular workers with low interactive abilities drop out of the employable labor force.

1 Introduction

Creating wealth and letting all people participate in the production and consumption of increasing wealth has been the major concern of political economy from the beginning. Whereas many countries have succeeded in creating richness, even very rich economies face two severe problems: One is the substantial rise of inequality during the last decades, in particular but not only in the United States (see e.g. Juhn, Murphy and Pierce [1993] or Heckman, Lochner and Taber [1998] for a detailed analysis of rising wage inequality in the U.S. For a broader discussion of the problem of inequality in different countries see e.g. Atkinson [1997, 2000]). The other problem is employment. The most striking puzzle is in my view that non-employment of low skilled workers has risen even in countries with flexible wages. It is the purpose of this paper to explain how this is possible in a market equilibrium without search frictions.

In spite of substantial differences in unemployment rates, a common feature of both European and American labor markets is that employment opportunities for the least skilled workers have declined. (See, for example, Nickell and Bell [1996], Murphy and Topel [1997] or Gregg and Manning [1997] and the references given there). According to Murphy and Topel [1997], nonemployment rates of low skilled males in the U.S. have even risen up to 35 % (see also Nickell and Bell [1997]). Also in other countries substantial non-employment is observed despite declining unemployment rates (see e.g. Green [1999]). Jobless people who are not counted as unemployed are said to be out of the labor force. One reason for why they have dropped out is that they are considered to be unemployable – due to their age, their qualification, their learning abilities, their social skills. Many economists seem to believe that the (un-)employability is a personal characteristic of the concerned worker and thus exogenous to the economic analysis. However, who is and who is not employable depends also on the requirements implied by the used methods of production, in particular the way of organizing work. In a market economy competition decides about which kind of labor is profitably employable under given production and organization technologies. Therefore, economic analysis cannot take unemployability as exogenously given but has to explain endogenously how technology and market conditions determine the range of abilities for whom jobs are provided whereas workers outside this range are considered as unemployable and remain jobless.

This paper presents a model of ex ante heterogeneous workers which

determines the equilibrium number of jobs in an economy and explains why the least skilled workers may find no employment even with flexible wages like in the United States. The central assumption is that employment requires a work place in an organization (firm). And work places are organized only for those workers who are profitably employable.

Weitzman (1982) pointed to the crucial role of the nature of firms for a genuine employment theory. Work is organized in firms. Labor force cannot be simply offered to an abstract labor market. The economic reason for the fact that employment requires a work place within an organization (called firm) are internal economies of scale. They arise from fixed costs of what Weitzman called the “large scale specialization” of modern production. Although we hear nowadays much about the disappearance of classical firm structures and new virtual organizations, it remains nonetheless true that for reasonable earning opportunities an individual usually must be connected to some organization, i.e. some kind of firm. Moreover, also new forms of internal organization are real in the sense that they require investment of economic resources. If companies end up as “networks of smaller firms or individuals bound together by corporate culture and communications” (Economist, June 26th 1999), they must still build up the networks and provide the infrastructure necessary for creating corporate culture and communication. Fixed costs in form of physical capital may become less important but fixed non-production requirements for coordinating the individual activities and supervising, training, or should we say socializing the workers for the company gain in importance.¹ It is this staff work and the infrastructure for coordination, supervision and training which constitute the essential fixed costs in the presented model.

Obviously, the aspect of organizing several jobs within a firm or a network cannot be captured by a model in which production takes place in one firm - one worker pairs as considered, for instance, in the job creation model by Aghion and Howitt (1998, Chapter 4). The analysis in this paper leaves the search and matching problem (Pissarides [1990]) aside and concentrates on the question how many work places are installed by profit-maximizing firms in the macroeconomic equilibrium, given the available work force and the competitive environment. In a first stage, firms set up the organizational

¹For evidence on rising non-production employment shares see Berman, Bound and Grilichis (1994), Machin, Ryan and van Reenen (1996), Berman, Bound and Machin (1998), and Machin and van Reenen (1998).

infrastructure by hiring staff workers. At this stage, there are no fixed costs. The size of the staff determines supply of work places, that is, the number and types of production workers that can be managed. In the second stage, the installed organizational capacity is fixed and firms employ production workers and sell their output in the market. Labor is the only input in the provision of the non-production services in the first stage as well as in producing output in the second stage. An important implication of the fact that fixed costs have to be incurred before production takes place is that prices cannot equal marginal production costs. That means, we have necessarily some form or imperfect competition in the goods markets. It is assumed that firms are symmetric and act under monopolistic competition of the Dixit and Stiglitz (1977) type.

Total employment is determined by the number of work places organized by firms. It is assumed that no internal diseconomies of scale limit the size of firms.² Thus, increasing the number of firms does not lead to more jobs in our model. Moreover, while there are increasing returns to scale in production since non-production inputs have to be fixed before, in the provision of non-production services the individual firm faces a constant return technology. Thus, the number of firms will have no effect on aggregate equilibrium employment. This paper shows that the number of jobs provided by firms may be limited by the fact that the coordination, supervision and training costs per installed work place depend on the quality of work required by the techniques of production but vary also with the quality of the available work force. Suppose that workers are heterogeneous with respect to their abilities. When the level of aggregate employment increases, also less able workers have to be hired by the firms. Suppose further that hiring less able workers implies higher costs of coordination, supervision and training per work place.³ Then the installation of work places becomes more costly when aggregate employment is high. This amounts to diseconomies of scale which are external to the single firm. They determine an upper limit for the number of jobs which can be profitably provided by firms in a macroeconomic equilibrium. This number may be lower than the number of work places required for full employment. Then the least skilled workers can find no job

²Calvo and Wellisz (1978) considered optimal firm size under rising transaction costs in a model of monopolistic competition.

³Put differently, with less able workers it is not possible to use cost saving forms of organization like decentralization to the same extent as they can be used with more able workers.

whatever their wage rate. For a given quality of the labor force, the danger of non-employment is the higher, the higher the skills required by the employed methods of production and work organization, since higher skill requirements mean higher non-production input for securing the necessary quality of work. Both skill supply and skills required by the used technology are exogenous in this paper.⁴ Only comparative static results are considered.

Abilities and differences in abilities have an effect on employment insofar as they influence the costs of organizing firms, that is, of teams or networks of individual workers. Therefore, it is useful to make a distinction between skill characteristics which can be related one to one to individual productivity and skill characteristics which are important for the productivity of the organization or team. Skill differentials of the first kind can be internalized by corresponding wage differentials. Since wage inequality is not the focus of the paper, it is assumed that as far as individual productivity is concerned labor can be measured in efficiency units. Wages are paid per efficiency unit. There is no dual labor market with different jobs for different skill groups.⁵ The heterogeneity of labor which is central in this analysis arises from the second type of skill characteristics which may be termed "communication or social skills" for short.⁶ Since social skills have external effects on others by their nature, they cannot be compensated by wage differentials. As a result, for given techniques of production and methods of organization, the costs of coordinating and supervising the activities of different workers within a firm depend on the distribution of these abilities in the employed work force.

The model explains why less able workers find no employment. This does not mean that non-employment or unemployability is given by nature. First, the distribution of abilities depends on social conditions and policy, in particular, on the education system. Secondly, the cut-off level of abilities below which workers are not employed depends on the firms' profitability consid-

⁴In particular no effects of technological change on the acquisition of skills (like Heckman, Lochner and Taber [1998]) or of skill supply on the choice of techniques (like Acemoglu [1998]) are considered. The approach in this paper is more modest. The aim is to clarify the fundamental role of organizational costs, skill requirements and job supply before turning to complex endogenous long-run reactions. For an equilibrium analysis of reorganization with endogeneous adoption of the method of work organization see Lindbeck and Snower (1996) and Falkinger (2000).

⁵See Falkinger and Grossmann (1999) for an extension of the analysis to dual labor markets.

⁶Recent trends in the reorganization of work like the switch from task-orientation to customer oriented teams (Snower [1999]) make such skills more important.

erations and is not determined by some exogenous disability criterion or by efficiency reasons. One point of the paper is to show how non-employment can arise in an equilibrium with flexible wages and perfect foresight of firms. Another question is if the resulting equilibrium level of employment is efficient. It will be shown that the number of jobs provided by firms in monopolistic competition is lower than the efficient level of employment if the firms' coordination, training and supervising costs don't react too elastically to the aggregate level of employment.

The next section describes the exogenously given fundamentals of the economy. In section 3 firm behavior and equilibrium are analyzed (Subsection 3.1 characterizes prices and production resulting in the equilibrium at stage 2. Subsection 3.2 determines the job supply equilibrium at stage 1). Section 4 compares the equilibrium employment level with the efficient and full-employment level. Section 5 summarizes the results.

2 Demand, labor supply and technology

The economy consists of n symmetric industries. Later it will be seen that for the result the number of industries n does not matter. Labor is the only factor of production. Aggregate money income (determined by money supply and velocity of circulation) is given by Y .

Preferences can be represented by a CES-utility index

$$U(x_1, \dots, x_n) = \left[\sum_{i=1}^n x_i^\rho \right]^{\frac{1}{\rho}} \quad (1)$$

where x_i denotes the consumed quantity of the good supplied by industry i and $0 < \rho < 1$.

For given goods prices p_1, \dots, p_n , maximizing (1) subject to the budget constraint

$$\sum_{i=1}^n p_i x_i = Y \quad (2)$$

yields for the aggregate demand of goods from industry i the function

$$x_i^D = \left(\frac{p_i}{P} \right)^{-\sigma} \frac{Y}{P} \quad (3)$$

where $\sigma = \frac{1}{1-\rho}$ is the elasticity of substitution between the different products and P denotes the price index defined by $P \equiv [\sum_{i=1}^n p_i^{1-\sigma}]^{\frac{1}{1-\sigma}}$ (See Dixit and Stiglitz [1997]).

Labor supply is inelastic. Each worker supplies a certain amount of labor measured in efficiency units. The total amount of supplied units of labor is normalized to one so that level and rate of employment coincide. (Throughout the paper labor inputs and employment levels are measured in efficiency units). In addition, each worker is characterized by her or his level of "social skills", denoted by z . In the further analysis, ability and heterogeneity of abilities will always refer to this skill characteristic. These skills determine the requirements of firms for arranging work places, that is, for coordinating and supervising work of different workers within their organization. Symmetry implies that no firm can pick a selection of abler individuals than the workers employed by competing firms. It is assumed that labor is supplied in the following way. Workers choose randomly one of the n firms for seeking employment. Abler individuals are first in lining in front of the firms' doors. Thus, each firm faces an identical row of job seekers ordered according to abilities. The average quality of the sample decreases with aggregate employment N , since also less able workers are employed. Formally, denote by $z_0(N)$ the lowest skill level which is employed if aggregate employment is N , and let $\bar{z}(N)$ be the average skill level of the employed labor (i.e. of all workers with $z \geq z_0(N)$). We have $dz_0/dN \leq 0, d\bar{z}/dN \leq 0$ with strict equality holding if labor has homogenous social skills.⁷

Technology has two components, production and organization, respectively. The production technology is given by the linear function

$$x_i^s = l_i/A, \tag{4}$$

where x_i^s is output of firm i and l_i the amount of production labor employed by firm i . $A > 0$ is the constant coefficient of labor. However, employment of labor in production requires that work places have been arranged before. That means, production is limited by the restriction

$$l_i \leq \bar{l}_i \tag{5}$$

⁷The assumption that $z_0(N), \bar{z}(N)$ are differentiable is made for technical convenience. With labor which is homogenous over some intervals, z_0, \bar{z} and the later defined g would be step functions. However, only employment levels at which abilities change can be unemployment equilibria (consider figure 2 and suppose that g has a flat). If one worker of a certain skill group finds a job, other workers of the same group do as well.

where \bar{l}_i denotes firm i 's work place capacity, i.e. the units of labor for which production work places have been provided by firm i . The organization technology describes the input requirements for the provision of work places. This input consists on non-production workers.⁸ The requirements of coordination and the necessary supervision and training facilities for a production work place vary with the average ability of the employed work force. Lower social skills require more organization and socialization input per unit of employed labor. Since with rising aggregate employment N average ability $\bar{z}(N)$ of employed workers declines, the non-production input per unit of labor in production rises.⁹ Formally, for organizing production work for \bar{l}_i units of labor firm i has to employ

$$s_i = g(N, \gamma) \bar{l}_i \quad (6)$$

units of labor in non-production (i.e. staff work), where $\partial g/\partial N > 0$.¹⁰ Parameter γ represents the skill requirements implied by the used methods of production and organization. $\partial g/\partial \gamma > 0$ is assumed: This means a higher γ represents a technology with higher skill requirements (relative to the abilities of the labor force).

3 Firm behavior and equilibrium

The aim of the firm owners is to earn profits by hiring labor and selling their product. However, for being able to compete with other firms they have to set up the infrastructure for production and selling before. Thus, there are two stages. In the first stage, firms install their work place capacity. Ex ante the capacities are variable, i.e. firms can choose their size. Ex post they are fixed and firms produce with internal economies of scale. Thus, in the second stage, firms have a natural monopoly in their market and monopolistic competition takes place between them.

⁸See Falkinger (2000) for a model in which the creation of jobs requires also capital.

⁹Ex post, after the capacity of work places has been installed, the non-production requirements are fixed and don't vary with actual production as long as $l \leq \bar{l}$. But ex ante the requirements for the creation of capacity vary with the size of capacity to be created.

¹⁰A labor force which is homogenous with respect to their social skills would imply $\partial g/\partial N = 0$.

We make the usual assumption that firms when making their decisions take all macroeconomic variables, i.e. aggregate money income Y , price level P , aggregate employment N and nominal wage rate (per efficiency unit of labor) w , as given. (Aggregate money income Y is exogenously given. Price level P , aggregate employment N and wage rate w are endogenous. They result as aggregate consequences of the individual behavior). Moreover, it is assumed that firms when deciding about the size of the work place capacity to be installed at stage 1 have rational expectations about stage 2, i.e. they anticipate the outcome of monopolistic competition correctly. An equilibrium is reached if profit-maximizing investments in the creation of work places at stage 1 and profit-maximizing price setting and hiring of production labor at stage 2 lead to those values of employment N , price level P and wage rate w on which the firms have based their decisions.

We determine first the monopolistic competition equilibrium which results at stage 2 for a given capacity of work places. Then the equilibrium supply of workplaces resulting at stage 1 under correct anticipation of stage 2 is analyzed.

3.1 Prices and production in the monopolistic competition equilibrium (stage 2)

Suppose that at stage 1 each firm has invested s units of non-production labor and has so installed a production work place capacity \bar{l} . The maximal possible aggregate employment level (including staff work) is thus

$$\bar{N} = S + \bar{L} \quad (7)$$

with $S = ns$ and $\bar{L} = nl$. ($N \leq 1$, since labor supply was normalized to one). Equations (6) and (7) imply the condition $S + \bar{L} = \left[g(S + \bar{L}, \gamma) + 1 \right] \bar{L}$ which defines a relationship $\bar{L}(S)$ between aggregate investment in non-production resources and the maximal possible level of aggregate employment in production. If each firm invests s units of non-production labor at stage 1, then $\bar{L}(S)$ production work places for workers with abilities higher than or equal to $z_0(\bar{N}) = z_0(S + \bar{L}(S))$ are created.

Given the investment of stage 1, a firm i can earn profits at stage 2 by hiring production workers l_i , producing output x_i and setting price p_i . Current profits (without accounting for the sunk costs of work place installation)

are given by

$$\pi_i = p_i x_i - w l_i. \quad (8)$$

At stage 2, each firm maximizes this profit function subject to the demand curve (3) and the technological constraints (4) and (5).

The corresponding Lagrangian is given by

$$\mathcal{L} = (p_i x_i - w l_i) + \lambda_i \left(p_i^{-\sigma} \frac{Y}{P^{1-\sigma}} - x_i \right) + \mu_i \left(\frac{l_i}{A} - x_i \right) + \nu_i (\bar{l} - l_i). \quad (9)$$

Differentiating with respect to p_i, x_i and f_i , we obtain the first-order conditions:

$$x_i = \lambda_i \sigma p_i^{-\sigma-1} Y / P^{1-\sigma}, \quad (10)$$

$$p_i = \lambda_i + \mu_i, \quad (11)$$

$$\mu_i = A(w + \nu_i). \quad (12)$$

Substituting (3) for x_i in condition (10), we get $\lambda_i = p_i/\sigma$. Using this in condition (11) and substituting μ_i from condition (12), we have $p_i = A(w + \nu_i)/(1 - 1/\sigma)$. This means, as long as capacity restriction (5) is not binding so that $\nu_i = 0$, we have the familiar mark-up price equilibrium

$$p_i = p \equiv mwA, \quad (13)$$

where $m \equiv \frac{\sigma}{\sigma-1}$ is a strictly increasing function of the degree of monopoly. According to (3), this implies

$$x_i^D = x^D \equiv \frac{1}{n} \frac{Y}{mwA} \quad (14)$$

and, according to (4), aggregate demand for labor in production is given by the function

$$L^D = \frac{Y}{mw}. \quad (15)$$

If, however, at prices determined by (13) demand is higher than capacity, i.e. if $\frac{Y}{mw} > \bar{L}$, then $\nu_i > 0$ and $p_i > mwA$. In this case, we have $L^D = \bar{l}$ and $x_i^D = \bar{x} \equiv \bar{l}/A$ which implies, according to (4), $p_i = \bar{p} \equiv \frac{Y}{n\bar{x}}$.

In sum, aggregate labor demand (including non-production staff S) $N^D = S + L^D$ is given by the function

$$N^D = \begin{cases} S + \frac{Y}{mw}, & \text{if } \frac{Y}{w} \leq m\bar{L} \\ S + \bar{L}, & \text{otherwise.} \end{cases} \quad (16)$$

This function is illustrated in figure 1.

Figure 1

Labor demand at stage 2 is a decreasing function of the wage rate w as long as $w \geq Y/(m\bar{L})$. But below this level demand for production labor is completely inelastic. Firms are endowed with a work place capacity \bar{L} for workers with abilities higher than or equal to $z_0(\bar{N})$. They are not prepared to employ additional labor and to produce with workers whose abilities are below $z_0(\bar{N})$.

With flexible nominal wages the wage rate will fall until the maximal level of employment in production $\bar{L}(S)$ is realized. A further decrease in the wage rate does not lead to more employment. Even if unemployed low-skilled workers would offer their work at zero wages, it would not be profitable to the firms to employ them, since they are not prepared to use them productively. Thus, under flexible wages, the following labor market equilibrium results in stage 2: $L^D = \bar{L}$ and $w = w^*$ with

$$w^* = \frac{Y}{m\bar{L}}. \quad (17)$$

(For $w > w^*$, we have unemployed labor which seeks and can get employment if w is lowered. If $w < w^*$ employed workers can request a higher w without risking underbidding, since even if there is unemployment at w^* underbidding of w^* brings nothing to the unemployed).¹¹

Finally, prices and production quantities are determined by (13) and (14).¹² Thus, we have

$$p^* = mw^*A \quad (18)$$

¹¹Note that this remains valid if labor supply is elastic provided that labor supply at w^* is higher than \bar{N} . This is in contrast to the imperfect competition models surveyed in Silvestre [1993]. (See also D'Aspremont et al.[1990] and Silvestre [1990]).

¹²Note that for $w = Y/(m\bar{L})$ demand x^D at price $p = mwA$ is equal to capacity $\bar{x} = \bar{l}/A$.

and

$$x^* = \frac{1}{n} \frac{Y}{mw^*A} = \bar{l}/A \quad (19)$$

as the equilibrium outcome of monopolistic competition in stage 2, given fixed investments $s_i = s$ at stage 1.

3.2 The equilibrium supply of jobs (stage 1)

In the preceding section the goods and labor market equilibrium (which may be an unemployment equilibrium) was derived from the assumption that firms had invested a certain amount $s_i = s$ of non-production input in stage 1. This investment implies that firms are endowed with a certain work place capacity \bar{l} when entering monopolistic competition. In equilibrium, production, goods prices, employment and the wage rate are determined as functions of the non-production investment at stage 1. This section closes the model by answering the question which level of non-production investments are chosen at stage 1 if firms expect the equilibrium derived in 3.1. In particular, it is shown that the expectation of symmetric firm capacity ($s_i = s$) is consistent.

Suppose that firm i plans to invest s_i units of non-production resources. The costs of investment are w^*s_i .¹³ According to (4) and (6), this will create a production capacity $\bar{x}_i = \bar{l}_i/A = s_i/[Ag(N, \gamma)]$. The firm expects that the capacity output can be sold at price $p^* = mw^*A$. Then the profit expected from investing s_i is given by

$$\begin{aligned} \pi_i &= (p_i^* - w^*A)\bar{x}_i - w^*s_i \\ &= w^*s_i \left[\frac{m-1}{g(N, \gamma)} - 1 \right] \end{aligned} \quad (20)$$

Thus, each profit-maximizing firm wishes to expand capacity as long as the term in square brackets is strictly positive and to install less capacity if the term is strictly negative. Formally, $d\pi^i/ds_i >, =, < 0$ if $N <, =, > N_0(\gamma, m)$, respectively, where $N_0(\gamma, m)$ is defined by the equation

$$g(N_0, \gamma) = m - 1. \quad (21)$$

¹³It was assumed that there is only one type of efficiency units of labor so that each unit has the same price. If non-production work would be better paid than production work the unemployment problem would be aggravated, since the fixed costs of creating jobs would be higher compared to the analysis which is presented here.

Firms want to increase s_i if they expect $N < N_0$ and they choose a lower s_i if $N > N_0$.¹⁴ An investment equilibrium is reached if $N = N_0$ so that firms want neither to create more jobs nor to invest less, or if $N_0 > 1$ so that full employment limits expansion (i.e. increasing investment in job creation would be profitable but there are no workers left for filling the additional work places). Thus, aggregate equilibrium employment is

$$N^* = \min \{N_0, 1\} \quad (22)$$

where $dN_0/d\gamma < 0$ and $dN_0/dm > 0$, according to (21) and (6).¹⁵

The situation is illustrated in figure 2. Part a) represents a situation in which unemployment results in equilibrium ($N^* < 1$). This is the case if the costs of arranging work places are high due to high skill requirements and/or increase strongly with N due to heterogeneity of social skills.

Figure 2

Part b) of figure 2 represents a full-employment equilibrium ($N^* = 1$). Such a situation arises if job creation costs are low or insensitive to N (i.e. in particular if labor is homogenous).¹⁶

In principle, any investment stream s_1, \dots, s_n leading to N^* could be an investment equilibrium. However, profit function (20) is based on the expectation that firms can sell their capacity output at price $p^* = mw^*A$. According to the analysis of section 3.1, this expectation is indeed fulfilled if $s_i = s$ for all i . Thus, with symmetric investments all expectations on which individual decisions were based are fulfilled in equilibrium. Equilibrium investments $S^* = ns^*$ leading to the aggregate employment N^* are determined by the fact that aggregate employment and aggregate investment in job creation are related by the equation $N = S + \bar{L} = S + S/g(N, \gamma)$ (Use $\bar{L} = S/g(N, \gamma)$, according to (6)). This defines S^* (and thus s^*) as a function of N^* .

In sum, we have a symmetric equilibrium in which firms invest an aggregate amount S^* in the installation of work places. This leads to aggregate

¹⁴Note that, at the same time, $\pi^i >, =, < 0$ if $N <, =, > N_0$, respectively. The reason is that there are no internal diseconomies of scale in organizing jobs. The limit comes through $g(N, \gamma)$ which is external to the firm.

¹⁵ $\partial g/\partial \gamma > 0$ was assumed, and $\partial g/\partial N > 0$ if labor is heterogeneous.

¹⁶If apart from labor an exogenous factor like capital is needed for job creation, unemployment is possible also with homogenous labor (see Falkinger [2000]).

employment N^* and creates $\bar{L}^* = N^* - S^*$ jobs in production. This production capacity together with aggregate money income determines nominal wage rate and price level, according to (17) and (18). The real wage is independent of the level of employment. It depends on the degree on monopoly and on productivity of labor in production. The number of firms n , over which aggregate employment and production is distributed (see (19)), plays no role for the macroeconomic equilibrium. The reason is that the costs of setting up work places, although fixed ex post when monopolistic competition takes place at stage 2, are for any individual firm proportional to the size of installed capacity. Note finally that equilibrium investments in jobs, S^* , equilibrium work place capacity \bar{L}^* and total employment N^* do not depend on the wage level provided that wages are flexibly adjusted to w^* . Suppose that w^* would be lowered by decreasing money supply and thus Y . This would change nothing in the maximization calculus of profit function (20). The reason is that a lower wage has two compensating effects. On the one hand, it means lower investment costs w^*s_i at stage 1. But on the other hand, it implies also lower production prices and a lower return on production at stage 2. However, if wages were not flexible but fixed at some level $\bar{w} > w^*$, we would have of course an effect on employment. As shown in section 3.1, labor demand for production would be lower than at w^* . If this is not anticipated by firms at stage 1, we have unused capacity ($L^D < \bar{L}^*$). If the rigidity is foreseen, firms create fewer jobs.

4 Equilibrium employment versus full employment and efficient employment

It was shown that the equilibrium number of jobs supplied under monopolistic competition may be limited so that part of the labor force finds no employment. The reason is that the costs of organizing a work place rise if aggregate employment increases and firms have to integrate less able workers into their work force. In a situation of unemployment, the equilibrium level of employment is given by $N_0(\gamma, m)$ which decreases with γ and increases with m . The following discussion concentrates on this unemployment equilibrium.

Parameter γ represents the skill requirements. If techniques of organization and production require higher skills, the costs of organizing jobs for a given quality of labor increase. This raises the fixed costs which firms have

to cover by the profits earned in monopolistic competition. To reduce these costs they cut jobs of low skill workers.

Parameter m is determined by the degree of monopoly. It affects both the real wage rate (see (18)) and the unemployment equilibrium N_0 . A higher degree of monopoly depresses real wages. This is a usual result under monopolistic competition. But, at the same time, a higher level of employment results, since a higher return on labor in production makes it possible and attractive to invest in the creation of more work places. (Note that after deduction of the set-up costs we have zero profits in an underemployment equilibrium. This means, all profits earned in production are spent on non-production labor for organizing work places. If firm owners had the power to take a rent, equilibrium employment would be lower than N_0 and a higher degree of monopoly could mean higher rents rather than more jobs.¹⁷ Note further, that the degree of monopoly in this model of monopolistic competition is determined by the elasticity of substitution between the different products not by the number of firms. Thus, it would be wrong to conclude from the analysis that increasing concentration is good for employment. In particular, the integration of firms into large international corporations increases not only the firms' market power but is accompanied by changes in techniques and methods of organization, γ , which affect the costs of providing a work place and the skills required from the workers. This means we may observe an increase in the market power of firms which depresses real wages without stimulating employment, since at the same time an increase in γ , i.e. in staff costs and skill requirements makes job creation more costly.)

Is this non-employment a market failure? Obviously, also the social planner must take coordination, training and supervising costs into account. Thus, the efficient level of employment may be also lower than 1 (i.e. lower than full employment). The relevant question from a normative point of view is if equilibrium employment is lower than efficient employment.

Since labor supply is fixed, for any given n , welfare is proportional to the aggregate output of the economy $X = \bar{L}/A$.¹⁸, In view of (6), creation of

¹⁷ m describes the market power in the monopolistic competition of stage 2. However, no market power exist at stage 1. Since market power at stage 2 is a *conditio sine qua non* in any model with sunk investments at stage 1, the presented model is as close as possible to perfect competition. Not the most realistic description of the world is the purpose of this analysis but the proof that non-employment is a possible equilibrium outcome in an almost ideal market economy.

¹⁸Maximizing (1) subject to $\sum_{i=1}^n x_i A \leq \bar{L}$ gives $x_i = \bar{L}/(nA)$ for all i . Thus, utility

work places for \bar{L} units of production labor requires $S = g(N, \gamma) \bar{L}$ units of non-production labor, where $N = S + \bar{L}$. In sum, $\bar{L} = N / (1 + g(N, \gamma))$ so that the aggregate output of the economy is given by

$$X(N) = \frac{N}{A[1 + g(N, \gamma)]}. \quad (23)$$

Differentiating (23) with respect to N we obtain the condition

$$\frac{dX}{dN} >, =, < 0 \text{ if } \frac{1}{g(N, \gamma)} + 1 >, =, < \kappa(N, \gamma) \quad (24)$$

where $\kappa \equiv \frac{\partial g}{\partial N} \frac{N}{g}$ is the elasticity of job creation cost g with respect to aggregate employment. Thus, as long as this elasticity is not too high, in particular if $\kappa \leq 1$, it is always efficient to expand employment to full employment, whatever is the magnitude of cost g . Only if the costs of organizing work places react highly sensitively to the expansion of employment, i.e. if additional employment would imply a big relative decline in the quality of the producing labor force, it may be efficient to allow non-employment. In other words, only if workers are so disabled relative to employed workers that their integration costs more than they can produce, efficiency considerations suggest to leave them without a job.

This result is in sharp contrast to the employment equilibrium resulting under monopolistic competition. Elasticity κ plays no role in (22) and (21). The reaction of g to aggregate employments is external to the firm. So it is not taken into account in their decisions. Insofar it is even possible that firms create more jobs than efficient if κ is high or rises strongly with N .¹⁹ The reason why firms leave people without a job is not that their integration would be counterproductive but that it is not profitable to create more jobs. This profitability depends only on the level (not the change) of the costs of a work place and on the profit earned from the output of a work place. Therefore, besides g the degree of monopoly m is the relevant determinant for N_0 in (21). Obviously, this m plays no role in condition (24) relevant for the planner. This comparison of equilibrium employment and

achieved by creating \bar{L} production work places is given by $n^{1/\rho-1} \bar{L}/A$. Choosing n is not meaningful in a model without innovation costs.

¹⁹For instance, suppose that m is high, whereas κ increases sharply as N approaches full employment. Then we can have full employment, according to (22), although it would be efficient to reduce employment, according to (24).

efficient employment has the following important implication for the question of how employment is related to overhead costs and the skill requirements influencing these costs. Rising skill requirements and high costs of installing work places can never justify non-employment by efficiency arguments unless the costs of organizing jobs react highly elastic to expansion of employment. In contrast to this, they may shift the monopolistic competition equilibrium from full employment to a non-employment equilibrium and they certainly increase unemployment if the economy has already been in an unemployment equilibrium before the rise in skill requirements and job creation costs.

5 Conclusion

This paper has shown that involuntary non-employment can be an equilibrium in a market economy with flexible wages, no search frictions and no asymmetric information problem. Non-employment is involuntary in the strict sense that jobless workers would get no job even if they would work for nothing. The reason is that under the given production methods and goods-market conditions firms do not find it profitable to integrate them in their work force.

The result is based on the assumptions that employment requires a work place in a firm and that the organization of work places in a firm requires non-production resources (staff work) which depend on the abilities of the employed work force. For a given composition of abilities, the staff costs for organizing jobs depend on the skills required by the used methods of production and organization.

The analysis is conducted in a model with the following basic features: Before entering competition and selling the output of their production workers to the market (stage 2) firms have to arrange work places (stage 1). Whereas the costs of installing work places are variable at stage 1, they are fixed ex post. At stage 2 monopolistic competition takes place with the work place capacity determined at stage 1. Firms are profit maximizers which take macroeconomic variables as given. In the equilibrium at stage 2 prices, production and wage rate are determined. At stage 1 the number of work places is determined. In equilibrium the expectations on which firms base their decisions at stage 1 must be fulfilled at stage 2.

Labor is the only input both in production and in the organization of work places. Workers can be heterogeneous in two respects. They may be different

with respect to individual productivity which can be compensated by wage differentials. Apart from this, there are differences in abilities which have an impact on the non-production requirements for organizing jobs in a firm (e.g. "social skills"). This impact cannot be individualized and compensated, and the staff costs for organizing work places rise if jobs for less able workers are to be provided. As a result, it may not be profitable to the firms to arrange work places for the least able.

To conclude from this that only disabled persons are unemployed, who can not be productively integrated in the work process, would be a dangerous misunderstanding. It has also be shown in this paper that under fairly reasonable assumptions equilibrium non-employment is possible although full employment would be efficient. The criterion for firms is if creating a job is *profitable*, not if it is *productive* under aggregate efficiency considerations.

As to the explanation of why workers are considered as unemployable by the firms, the presented analysis points to a different form of skill-biased technological change which is in line with the recent empirical evidence on rising shares of non-production labor. New techniques of production and methods of work organization require a higher quality of work. To the extent to which this requirement is not met by the rising abilities of the labor force it must be compensated by increased coordination and supervision. This makes job creation more costly and non-employment of low skilled workers more likely.

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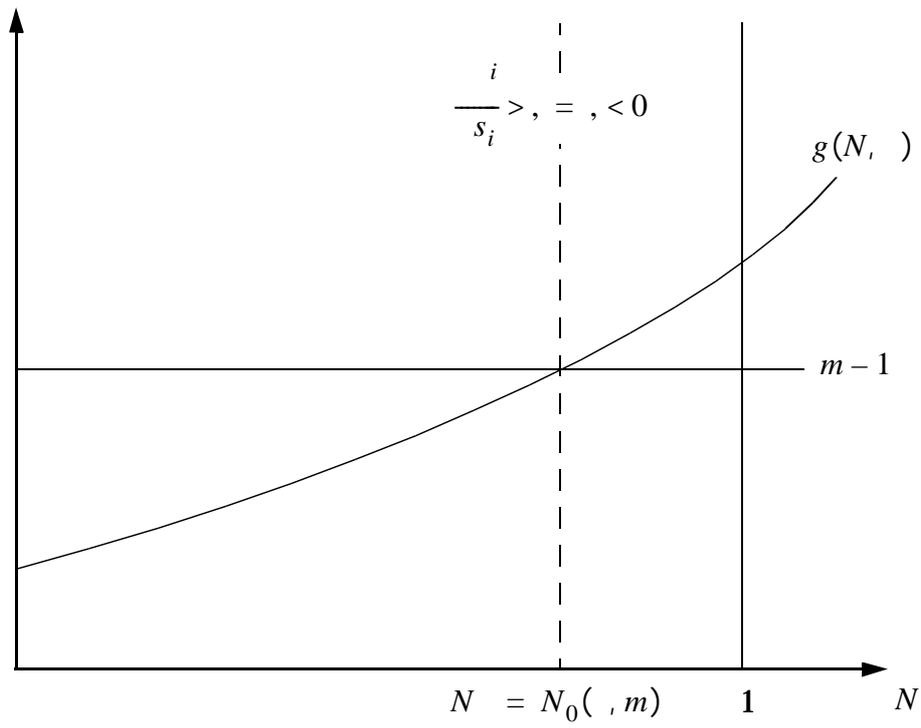
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Part a: Unemployment



Part b: Full employment

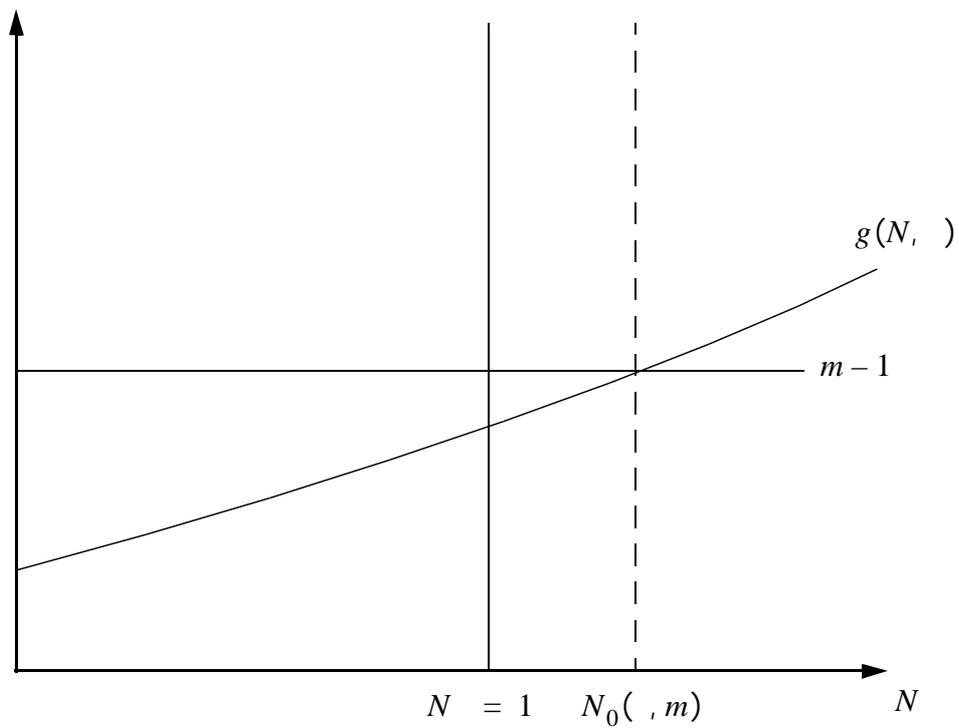


Figure 2: Equilibrium job supply

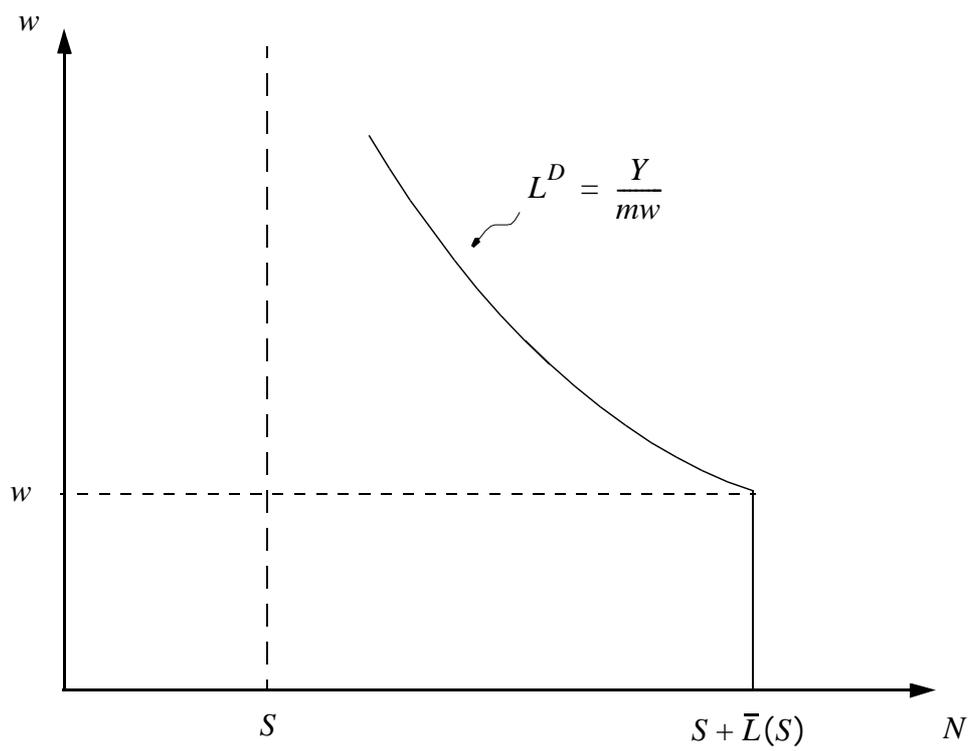


Figure 1: Labour demand and equilibrium wage