LOW SUPPLY OF CORE LABOUR LIKE LIMIT FACTOR OF THE GROWTH THE FACTORY

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Abstract

All companies act under the impact of allocation of manufacturing factors. Despite noticeable modernisation and automation of manufacturing processes, human labour still remains an indispensable manufacturing factor. At present, some industries face a low labour supply. Theoretical economics sees several possibilities of eliminating such facts. They can be modelled on the choice of a suitable company that is affected by such facts. In order to eliminate these unfavourable facts, the company has a chance to focus on a change in its strategy. This consists in changes of wage rates.

Keywords

Labor, Capital, Supply of Labor, Production of the Firm, Core Labor, Core Capital

Introduction

Since about mid-2007, various media have repeatedly discussed and analysed a phenomenon whose true picture is reflected (with an overstatement typical of journalists) in the "*Hospodářské noviny*" headline reading "Labour market in the Czech Republic is depleted". The daily wanted to draw attention to an issue already discussed before, which is that despite the ongoing and considerable unemployment, companies are not able find enough suitable candidates for work that they cannot do without. There is lack of skilled and trained specialists in technical and other professions.

Most probably, everything starts at schools. According to a Selective investigation into labour force (Czech Statistical Office, 2007) there is a downward trend in the proportion of science students at universities and in the proportion of secondary school students focusing on crafts. An EU survey carried out in relation with the so called Lisbon trial suggests that in Western Europe, there are between 10 and 12% of people who are educated in sciences or engineering, while there are only 4.5% of such people in the Czech Republic.

Media sources, however, are not satisfied in any EU country. A selectively low labour supply and adverse effects induced by the low supply, particularly in industry, appear not only in this country but also in other central European countries and in traditional EU countries with advanced economies. This unfavourable phenomenon seems to be affecting a growing number of professions.

This, alongside the fact that it is long-term, makes this phenomenon universal to some extent. This universality implies that the phenomenon should be observed and noted, but also researched so that it could be dealt with. All this may only be based on regularities in market operation, particularly labour market, and on regularities in the functioning of labour as a factor in the production process. Conveniently arranged simulations of typical existing and possible situations can bring some knowledge that is universal to such an extent that it can enrich the scientific platform, in the given case microeconomics as the theoretical economics of the market.

Discusion

1. Core Labour

The topic of the present paper was prompted by specific difficulties that companies having to face the low labour supply have run into in recent years. This kind of labour is referred to as core labour here. Generally, it is a component of total labour which, being a part of the production process, creates a stream sensitive to changes: the impact of exogenous (market) or possibly endogenous (company) modifiers induces immediate and adequate changes, which then equally directly and adequately influence production. Activities of sheet metal press operators in the manufacture of metal parts for office equipment, possibly with a system service, may serve as an introductory example.

Core labour is further determined by the surveyed industry and also by what phenomena are being studied and what the modifier is. This paper will deal with the labour under exogenous impacts, namely influenced by the decline in the labour supply in the market.

Core labour differs from the remaining labour whose changes do not affect production so directly or adequately. The remaining labour includes for instance production preparation and control (if it is not control exerted by an operator on the lowest level of management), material production, energy production and some other production which assists logistics, commercial departments, company management and administration, etc. The remaining labour $L_{remaining}$ plus core labour L_{core} make the total labour L:

$$L = L_{core} + L_{remaining} \tag{1}$$

Lack of workforce performing core labour causes a decline in production (Q) in accordance with the function derived from the common perception

$$Q = f[(K_{core} + K_{remaining}), (L_{core} + L_{remaining})] \tag{2}$$

where K_{core} is core capital, i.e. the capital tied to core labour in production and $K_{remaining}$ is then the remaining capital. If we imagine, for the sake of making things simple, that in the short term there will be neither changes in total K, which is the result of adding up core capital and the remaining capital, nor changes in the remaining labour, then the consequence of the decrease in core labour corresponds to expressions 3 and 4.

$$\Delta Q = f[(K_{core} + K_{remaining}), (\Delta L_{core} + L_{remaining})] \tag{3}$$

$$\Delta Q \neq \Delta L_{core} \tag{4}$$

Even in these simple conditions (and the more so in real and more complex situations) it is a system of interlinked component phenomena that are caused by exogenous as well as endogenous impacts. The company can respond to the situation with various strategies. The aim of this paper is to investigate such a system and to analyze possible strategies on a general level, thus theoretically.

The paper is drafted as an analysis of simulation experiments with company models. The company is supposed to be typical of the industry that has been selected in such a way that the low interest in key professions will bring about changes in the companies that will be significant enough to result in damage reflected in the loss of trading income (loss of profit).

The equation (2) in the shape of the well-known Cobb-Douglas production function constitutes one of the bases of such a model

$$Q = A * K^a * L^b \tag{5}$$

where the total capital K as well as the total labour L are the sums of the respective core and remaining components.

Even with stable technologies when constants A, a and b do not change, the intent of the paper results in all constants, as well as each of the component parts of the capital and

labour, being able to change. The experiments are based on changes that are described discreetly little by little when these steps correspond to the situations of the company at times t_0 to t_n where n is in the order of units.

Besides Equation (5), the nucleus of the model of company operation is the generally valid definition of profit π according to the equation below:

$$\pi = P*Q - TC \tag{6}$$

Where P is the price of the product Q determined by the production function (5), and TC stands for the total costs of input used in the production process. These total costs comprise variable costs VC and fixed costs FC given in the following equations

$$VC = w * L \tag{7}$$
$$FC = r * K \tag{8}$$

Where w is the price of labour L and r is the price of the capital K invested in the production process, whether this is their total value or the value of any component or any part of a factor used in production. In a particular model (state of the company operations), the prices may have different values.

2. Selection of industries

It was possible to base the company operation model (affected by the lack of core workforce) on the above relationships. Without further prerequisites, however, such effort would lead to such perception of a company's operation which would correspond to a whole spectrum of Czech industries. Such degree of generalization is justified in some cases. However, it can hardly reflect the phenomena occurring in individual businesses. It is more useful to look for narrower representation, or, in the last resort, base the investigation on one industry only, which, however, would be selected for this particular purpose. This was what the paper focused on.

The selection was carried out assuming that the representative model should respond to the lack of core labour supply as sensitively as possible. This could be reflected by the coefficients A, a, and b in Equation 5 as well as by the prices P, w, and r from Equations 6, 7, 8. However, studies to identify these coefficients and prices for at least the most significant industries as well as subsequent modifications to obtain a sensitive model would fall outside the scope of the present paper.

Preliminary analyses have shown, however, that sensitivity of this or that industry depends strongly on the relationship between the amount of capital and labour, or, more precisely, the relationship between the amount of core capital and core labour.

Let us consider that both labour and capital, similarly both core labour and core capital, participate in the manufacturing process in amounts that are expressed (in compliance with microeconomic principles) in time units, for instance in years[1]. It is also possible for the majority of technologies to find a certain ratio of amounts of one production factor and the other, or more precisely, of their core components. If the technology (in the broad sense of the word) does not change, this ratio can be considered as constant and the following equation holds.

$$K_{core}/L_{core} = Z = constant \tag{9}$$

From this point of view, the state of affairs in passenger or goods transport is striking as the amount of labour performed in one year by one driver is tightly linked with the volume of capital that corresponds to one-year use of one vehicle. It holds true for the ratio defined in

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[1] This corresponds to the idea that a company hires means that act as capital for a certain period of time, and similarly, the company enters into contracts with employees who put labor into the production process.

Equation (*9*) that Z=1. When a single driver is absent or similarly when one truck is taken out of service, the production of the whole dual *driver-truck* central unit is absent.

The original production corresponds to the equation

$$Q_0 = A * 1^a * 1^b = A \tag{10}$$

and the production Q_1 following the absence of one driver is zero, so $Q_1/Q_0 = 0$ and the decline caused by the absence $Q_0 - Q_1 = A$.

The decrease in the amount of core labour may not be so noticeable in technologies where the ratio Z is substantially lower than one. If, for instance, one person is absent in a group of six operators (L_{core} = 6 years) of an assembly bay (K_{core} = 1 year), the amount of core work in the case a worker is absent for one year shifts by one year (or by its equivalent part when the worker is absent for a shorter period of time; this, however, is not in the centre of attention of the present paper).

If the technology and corresponding efficiency parameters do not change, the original production Q_0

$$Q_0 = A * l^a * 6^b \tag{11}$$

Decreases to an apparently lower Q_1

$$Q_1 = A * l^a * 5^b \tag{12}$$

If the exponential members *a* and *b* equalled 1/2, which is the most common case (Dornbusch and Fischer, 1994$^)$, Q_0 would be 2.45 A, while Q_1 would be 2.24 A and there would be a decline in the ratio $Q_1/Q_0 = 0,91$ and there would be a loss $Q_0-Q_1 = O,21A$.

Let us note that in real life, it is not always assumed that in operations with a ratio Z < 1, a short-term absence of one worker would cause a big production slowdown. It can't even be ruled out that after the organization of labour of the operators´ team has been modified, the damage in the form of production stoppage would be insignificant in a short term. If there were no fundamental changes in technology (which would be an issue outside the discussed research area), some urgent tasks, for instance, could be suspended. The bigger, however, the drop in production would be later on.

It might be useful to have a look at cases when Z is bigger than one. In real life, one can come across this in automated operations where one operator services several machines running simultaneously. With 6 machines and one operator (Z=6) and in the situation when a = b = 0.5, the original production reaches

$$Q_0 = A * 6^{1/2} \, 1^{1/2} = 2,45A \tag{13}$$

When there is a one-unit decrease in core labour, however, the original production is eliminated altogether ($Q_1 = 0$), so $Q_1/Q_0 = 0$ and the stoppage $Q_0 - Q_1 = 2,45A$. The ratio index is the same as when Z = l, the differential index, however, has increased. From a certain point of view, the technology of this kind may be considered to be the most sensitive.

If we, however, consider selecting an industry for a model company burdened with declining core labour supply, cases with high Z are not appropriate as a rule because the job of an operator of a high number of machines (usually automated) does not suffer from an extremely low interest in it. The low supply of this labour in some areas is a matter of a sufficient number of vocational school graduates, which is the reason why it is beyond the companies´ direct control and is thus not typical of the aim of the present paper. The lack of interest in the job of a truck driver is explained by its many drawbacks, some of which can usually be minimized by the companies themselves, others, however, can be offset only with difficulties. They include for instance long stays of drivers out of homes without families and their social contacts. In such cases it is necessary to look for candidates with suitable psychological and social backgrounds.

The long-distance trucking industry has been identified as a suitable industrial sector where companies are able to affect the low labour supply, at least partially, and which is sensitive enough to such low supply. Furthermore, it is a rather big sector, which is significant for the performance of other sectors, and in which the lack of truck drivers has been examined. This has long been reflected in media reports and studies carried out in the Czech Republic[2] as well as other countries, Germany[3] among others. According to the Czech studies, the lack of drivers can be seen in 65% out of 103 interviewed businesses and is the result of the roughly 10% labour turnover and also the result of a considerable demand for transport services, which exceeds the realized value by about 14%. The more detailed German experience identifies the drawbacks of the job as the major cause of young men's low interest in it. The drawbacks are on average week-long stays out of home, big responsibility for the property that the employer has entrusted them with, the responsibility for health and property of other road users and, last but not least, activities governed by a number of constantly changing regulations, carried out under police supervision and reviewed by the general public. The results of the German studies suggest that these drawbacks can partly be offset by higher bonuses.

Conclusion

A company strategy should facilitate minimizing or even eliminating adverse effect of low labour supply among core professions. The company proceeds from the assumption that the unfavourable situation in the labour market was caused by external circumstances and in order to eliminate their effects, the company must change while respecting the circumstances. The company has to adapt to them and has to adapt to the changed environment. The following part will deal with various principles on which the company strategy may be based, starting with procedures preserving given technology and ending with crucial changes in production methods. Various strategies are specified based on changes in the form of production functions and production factors.

If a company seeks the easiest way to eliminate the impact of a low supply of core labour, which definitely means a way without changing production technology, first of all they will look for possibilities of restoring the original number of key employees with whom the company achieved good results due to suitable relation between capital and labour. Restoration of the pre-crisis number of employees may by based

➢ on increase in demand for labour while focusing on foreign countries, in other words, hiring foreign nationals;

➢ on non-monetary motivation of interest in jobs that are in short supply (benefits);

➢ On a wage increase, or rather on an increase in wage rates.

The first of the methods, hiring people from abroad, depends heavily on legal regulations in force and on international treaties, but still, it is a viable method. With respect to wages and salaries in the Czech Republic and in other countries, Czech companies will pin their hopes on chances to get labour force from countries east of the Czech Republic. The technicalities surrounding such hire will definitely be more complicated than when local people are hired. Competitive labour offers from other countries (Germany, France, and the

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[2] Průzkum zaměřený na dostupnost profesionálních řidičů v oblasti nákladní dopravy (A research into the availability of professional drivers in the trucking industry), ČESMAD BOHEMIA, Praha, April 2006

[3] Aktivně pro nákladní dopravu (Actively for truck transport). Market research into truck transport, Bundesamt fuer Gueterverkehr, Koeln 2007, released at:
http://www.bag.bund.de/cln_010/nn_46266/SharedDocs/Publikationen/DE/Marktbeobachtung/Sonderberichte/Sonderber__Fahrpersonal,templateId=raw,property=publicationFile.pdf/Sonderber_Fahrpersonal.pdf

Netherlands) may constitute an obstacle to hiring people from abroad. The above countries are farther away from the employees´ home countries, it is true, but they offer higher wage standards and perks. The issue of insufficient attractiveness of the job will basically only transfer to another environment when foreigners are hired but it does not disappear.

Difficulties with information exchange caused by significant information asymmetry (Sojka, 2001) both at the time of decision taking and when exercising the profession may be a disadvantage. This together with possible differences in life and labour culture may bring specific problems that are not easy to overcome. The personnel department will most probably have to be staffed with specialists.

Non-salary motivation behind the interest in selected core jobs is a way which a number of small as well as big companies pursued in the past and are pursuing at present (in the past for instance Baťa (Němeček, 2004) - very thoroughly)). This includes care for employees and their families, chances of bargains for the families, provision of good quality accommodation, offer of free time activities, provision of education useful for the company, cultivation of loyalty for the company, systematic building of a positive image of company employees in the eye of the general public, etc. These activities are labour intensive, time consuming and expensive. They can't do without psychological, sociological and economic analyses and can be carried out only in conditions of constantly balanced economic growth of the company. It is easier to carry this out in suitable conditions such as when the company site is secluded, far from centres of cultural and social life. It seems to be more acceptable for big companies, although introducing improved positive corporate culture may be suitable even for small companies. A reasonable way is also increasing one's qualifications if the otherwise promising applicant lacks it. As for financial aid, this does not necessarily have to be non-repayable, so this type of non-salary help may be granted even by small entrepreneurs.

The last of the three methods that might lead to restoring the supply of core labour is **increasing the wage rate.** This term will include all types of remuneration in the form of regular monthly salaries (advance wage payment and final remuneration), rewards for extraordinary achievements (bonuses), what they call the thirteenth and the fourteenth salaries, etc. In the models, the amount of the remuneration is given by the volume of labour (which is given in time units as has been stated and yet will be stated) and the wage rate, or the price of labour (in CZK per selected time unit) Due to the fact that time will be measured in years in the models, the total wage may include the whole income of employees disbursed in the course of the year**.**

Business point of view
Aiming of this paper is the microeconomics analyses. The micro - economics terms are possibility also to transform on the specific usage for the corporate environment. Like the simplest variant shows usage non-salary motivation. It's part, which the most firms is able to derive benefit from with relatively low user - oriented expenses. Like the first step is necessary try to find special motivational factors. Motivation factor depends on the group employees. Like the common motivation factor is possible often use other education. The language acquirements are for future very important. Other motivation factors is necessary optimizes with reference to variable legislative environment. Like the opportunity to the futures is brightly defines pension additional insurance employees. For big firm primarily in abroad is slowly happen standard also build - up company mother's nurseries. The specific solving culpability always depends on the conditions specific company. All variants, how else to motivate employee exceeds possibilities this type of article.

Another point of solution is Replacement of Labor Deficit with Capital. It is similar to the well-known substitution of labor with capital, which is typical of technical progress. The discussed form of adaptation also has a lot in common with changes in organization of production factors, known as innovation. Innovation differs in, among others, the depth of changes in structure and performance of the company.

The questions whether replacement of labor deficit with capital means introduction of technologies that are modified or completely different from the original one is rather crucial for determination of the increased amount of capital. It is therefore necessary to asses the situation responsibly. New technologies may differ from the original ones in the structure of inputs in particular. This does not mean, however, that every change in the ratio between capital and labor means a fundamental change in the method of production. The production function (which is understood as a basic reflection of the way of transforming a structured set of capital and labor into production), by contrast, assumes that output may be obtained by different combinations of essential production factors. As mentioned before, adaptation in the form of replacement of labor deficit with capital has more or less the character of innovation.

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Summary

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LOW SUPPLY OF CORE LABOUR LIKE LIMIT FACTOR OF THE GROWTH THE FACTORY

The topic of the present paper was inspired by slow recognition that in the labour market in the Czech Republic (and as a matter of fact elsewhere, too) there is an occasional low labour supply, particularly in some jobs. In some industries, companies got into a crisis which made them even consider radical changes in their business as well as analyse such situations and search for possible solutions. This relates particularly to more detailed understanding of processes by means of which changes in company behaviour are put in practice. The lack of labour manifests itself to a high degree in various industries seen on a microeconomic scale, i.e. in groups with a limited number of companies producing similar or even identical products. The truck transport is one of

the very sensitive industries where the drivers constitute an indispensable part of inputs and where overcoming difficulties caused by the declining interest in this profession makes the companies consider a change in their entrepreneurial orientation. That is the reason why despite the overall effort to present the investigated issues broadly, some parts of the paper, in particular the experimental one, are based on transport companies. The core labour is justified especially when specifying consequences that the declining labour supply has on key professions. It can further be utilised in simulations of processes taking place in companies´ economies due to the low core labour supply. It points to declining production and decreasing profit (even in negative values) as the major indicators of a crisis development.

If the companies are exposed to a long-term low labour supply in key professions, it will be possible to offer studies focused on various policies of adaptation of companies to these conditions. The major type of adaptation is increase in wage rates.