

## 1 DEFINITION AND MEASUREMENT

### 1.1 HOW TO DEFINE LABOUR SHORTAGE

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In a country, at a time when half of the population came of age under state socialism, it is easy to overuse the words “labour shortage”. In the paternalist communist economy, the softened budget constraints of companies led to an unlimited hunger for resources and a chronic excessive demand in the markets of all resources, which was not possible to mitigate even with higher prices and wages (Kornai, 1980, 1993). Obviously, over the past nearly thirty years, there has not been such a shortage and neither is it expected to happen in the near future. The system became characterised by demand-side constraints more than 25 years ago, which happened within a second on the historic time-scale.

In the model of the frictionless complete market it is just as pointless to discuss labour shortage as the shortage of Ferraris or caviar: these would not pose a shortage for consumers if they were willing to pay a sufficiently high price for them (or sufficiently high wages in the case of labour). Nevertheless, situations when labour demand is temporarily difficult to meet may often occur even in a competitive textbook market economy which is not operated by magic but competitive textbook market economy: time is needed for wages to adjust and even more time is required for the wage adjustments to produce the necessary responses on the demand side, especially when it is only possible to enter the given market through a specific education, e.g. in the case of physicians, lawyers or pilots. Replacing labour by capital takes even more time.

Even in economies without significant geographical or occupational imbalances, jobs (i.e. matching firms and workers) are goods requiring search for both job seekers and employers: some time is needed for the parties to find each other. There is no objectively defined point in time, during the period needed for the recruitment-job search process, beyond which it is possible to speak of “labour shortage”.

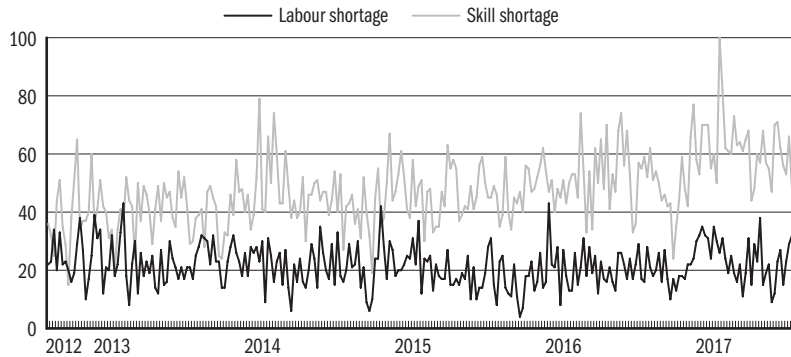
This is why scientific research does not use or only reluctantly uses, bracketing it within quotation marks, the term *labour shortage* and uses the term *skill shortages* only slightly more frequently (Figure 1.1.1).

In the period of the fast growth of western market economies in the 50s and 60s, there were attempts to systematically investigate the question (Blank-Stigler, 1957; Arrow-Capron, 1959).<sup>1</sup> However, the topic has been largely neglected since that time: only less than ten of the several tens of thousands studies published in the Bonn IZA Discussion Paper series discuss labour shortage and even those mainly examine *complaints* and *consequences* of labour shortage (see Rutkowski, 2007; Junankar (Raja), 2009, Gimpelson et al 2009; Holt-Sawicki, 2010; Bellmann-Hübler, 2014; McGuinness et al, 2017).<sup>2</sup>

1 The so-called sputnik panic resulting from the Soviet rocket development and space research success impelling western states to expand engineering and science education to address shortages in engineers also played a role in it.

2 IZA (Institute for the Study of Labour: <https://www.iza.org>) is the leading international forum of labour market research.

Figure 1.1.1: Incidence of the phrases “labour shortage” and “skill shortage” on the Internet



Note: Google trends, November 2011 – October 2017, measured weekly.

### Definitions of shortage

*Blank–Stigler* (1957) examine three definitions of shortage. There may be labour shortage in the sense that politics regards a kind of labour (e.g. engineers in the example of the authors) as insufficient in order to achieve a socially important goal – in their case the counterbalancing of the presumed soviet technical advantage and war threat. They reject this approach due to lack of clear criteria.<sup>3</sup>

The term ‘shortage’ can also be used in the sense that demand exceeds supply *at the particular wage level*, while quantity adjustment and/or mobility are restricted by various factors. (Data considered in the Blank–Stigler study did not indicate the presence of such restrictions in the market of engineers between 1929 and 1954.)

Finally, shortage may also develop when the available supply of labour increases more slowly than demand for labour *at recent wage levels*. Although the authors do not refer to it, this state corresponds to the first phase of a *cobweb cycle*, when, after the shift in the demand curve (to the right and upward), wages still stay around the initial level and supply does not yet respond to the increase in demand (*Kaldor*, 1934; *Freeman*, 1976).

Blank and Stigler opt for the latter, noting that wages can only gauge shortage effectively if supply is sufficiently flexible. After examining limitations to mobility and the possibility of wage setting (and ruling them out), the authors relied on trends in relative wages to conclude that after 1929 the supply of American engineers, relative to the demand for them, grew faster than the growth seen in the total labour supply. Furthermore, because the income surplus of engineers exceeds the costs of obtaining the engineering degree (as opposed to those without a higher education degree) this trend was expected to continue. All in all, they did not find evidence for a significant labour shortage as defined above.

<sup>3</sup> For more details on the “social demand model” see *Barnow et al* (2013).

*Arrow–Capron* (1959) also based their investigations on complaints of shortage of engineers and scientists and their main focus was dynamic labour shortage: the continuous upward movement of the demand curve generates shortage, the extent of which depends on the extent of increase in demand, the speed of the response of the market as well as the price elasticity of demand and supply (i.e. to what extent quantities react to changes in price). The authors presume that the decisions market players make at any time points are not necessarily optimal and it takes time to correct them. Arrow and Capron use the term reaction rate for the rate of price increase within a time unit and the surplus demand (in excess of supply). The shortage disappears sooner if the reaction is faster and the supply and/or demand elasticities are greater. Reaction rate depends on institutional arrangements and the proportion of long-term contracts. According to the authors, it was basically the extremely rapid increase in demand that led to shortages in the market of American engineers and scientists in the 1950s but the slow adaptation also contributed to the long subsistence of the shortage.

*Deaton–Thomas* (1977) emphasise that, although according to most of the relevant literature the adjustment of labour demand and supply takes place through price mechanism, it may also happen that factors other than price adjustment processes dominate. Norms, i.e. what a given business regards as a standard wage and an acceptable quality of work are also important.

As mentioned before, research papers with micro-level analysis of the problem of labour shortage have become rather scarce over the past few decades. One of the few exceptions is the study of *Bellmann–Hübler* (2014), which examined the impact of the characteristics of businesses and institutions on skills shortage in Germany between 2007 and 2012 using enterprise-level data. For the empirical analysis, the authors relied on representative enterprise-level surveys from the period examined. At the start of the econometric analysis, they chose the statistically most relevant characteristics of enterprises.<sup>4</sup> Then, in the second step, they used the probit model to explain the probability of the skills shortage perceived by enterprises with enterprise variables.

The findings of the authors showed that skills shortage is a long-term phenomenon with a break during the global crisis. Nevertheless, this does not mean that the number of vacancies for skilled labour continuously increases at businesses.<sup>5</sup> Skills shortage typically occurs for a short time at a firm. It is more likely to occur at younger firms, the service sector, firms in a strongly competitive market and also enterprises that have not accumulated labour. Firms employing more women are less likely to face skills shortage and, compared to industry, it occurs more frequently in the service sector and less frequently in trade.

For some businesses traineeship proved to be efficient for preventing the shortage of skilled labour. Surprisingly, there is positive correlation between

<sup>4</sup> For this, the LARS (*least angle regression*) method was applied, which uses the correlation of the available variables and the residues obtained in the previous step for selecting relevant variables.

<sup>5</sup> German businesses stockpiled labour during the crisis partly because of high redundancy costs and high expected recruitment costs. Consequently, estimates indicate weaker links between the structural characteristics of businesses and skills shortage during the crisis than in other years.

shortage indicators and extra pay in excess of the wage level included in collective agreements as well as profit sharing, working time accounts and retraining. The authors suggested that these correlations may have developed as a result of responses to shortage (pay rise or introducing an arrangement that improves flexibility), although it seems to be contradicted by the case of working time accounts, whose deferred value also positively correlated with the shortage.

Complaints of shortage became more frequent only long after the transformational recession in Eastern Europe – after the turn of the millennium (Rutkowski, 2007). Mass emigration, a region specific element unknown to developed OECD countries, played an important role here. In Romania, which was one of the most affected countries, several studies discuss the issue (Frunzã et al, 2009; Pociovalisteanu–Badea, 2013). They report difficulties of companies in finding skilled labour while facing increasing wage costs. The authors expect a 2.3-fold increase in labour shortage in Romania from 2002 to 2025, especially in the construction and textile industries, hotels and tourism as well as the woodworking and furniture industries, thus Romania will need to import labour in these industries. According to Pociovalisteanu–Badea (2013), the country incurs considerable costs because of a brain drain, such as the shortage of well performing workers and the low rate of return on investment in education.

In Hungary, labour shortage has hardly been discussed to date, except for various economic reports and newspaper articles, and there has been no research into it (see the literature review of the Institute for Economic and Enterprise Research, 2017), therefore scientific analysis of the issue is still awaited. Some chapters of *In Focus* present initial empirical research but it is even more important to define a conceptual framework, in which the phenomenon of recruitment difficulties may be logically incorporated.

### Labour shortage in the setting of “search and matching”

Complaints of labour shortage are becoming more frequent, while unemployment hardly decreases (as will be discussed in more detail later on) in Hungary, thus it is important to see that it is possible for a market to get stuck in a state, even for a longer period, where unemployment is high, yet it is difficult to fill vacancies at the same time.

In this respect it should be noted, that the market is always in motion: plenty of jobs are created and lost continuously. A “steady state” is reached if within a given time frame as many worker-firm matches are created as are dissolved.<sup>6</sup> The question is, at what level of unemployment this steady state is reached.

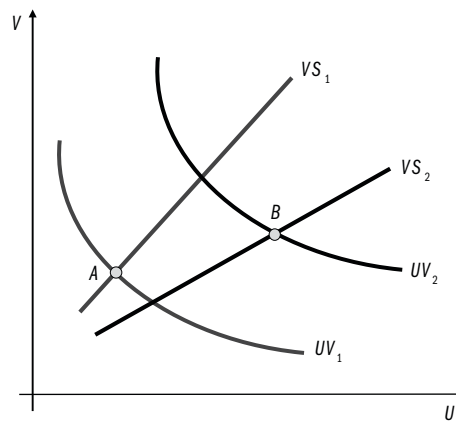
The problem is illustrated in *Figure 1.1.2*, which presents two types of curves – and two curves for each type. The curves convex to the origin are called the *UV* or Beveridge curves in textbooks and studies.<sup>7</sup> The *UV* curve consists of the geometrical positions of points that satisfy the equation  $s(P - U) = x[U, V]$ ,

<sup>6</sup> We primarily follow the logic of search and matching models developed by Olivier Blanchard, Paul Diamond, Dale Mortensen and Christofer Pissarides – for more detail see the summary study by Pissarides (2000).

<sup>7</sup> The name *UV* originates from an article by Dow–Dicks–Mireaux (1958), while the name Beveridge curve refers to the economist and social reformist William Beveridge (1879–1963) and started to be used later.

where  $U$  is the number of the unemployed,  $V$  is the number of vacancies on the market in a given period,  $P$  is the pool of labour,  $s$  is the rate of jobs lost and  $x[U, V]$  is the function describing the number of successful recruitments (*matching function*). The matching function is a kind of production function relevant to the labour market: by using the “resources”  $U$  and  $V$ , the market “produces” worker-firm matches efficiently or less efficiently. As customary with production functions,  $U$  and  $V$  are *stocks*, expressed in person and piece, while  $x[U, V]$  is a *flow*, expressed in piece/time unit.<sup>8</sup> Thus the number of persons finding a job along the  $UV$  curve equals the number necessary for an unchanging unemployment level at a given pace of job destruction.

Figure 1.1.2: Two economies in the space of unemployment ( $U$ ) and vacancies ( $V$ )



At high unemployment levels it is easy to fill a vacancy and therefore a few vacancies are sufficient for satisfying the equation of flows. It explains why the curve slopes to the right. In the case of extremely low (high) unemployment it is especially difficult (easy) to find appropriate applicants: this is why the curve becomes very steep (flat) near the axes.

The distance of the  $UV$  curve from the origin is basically defined by the specificities of institutions and economic structures. If the “matching” is inefficient because information flow is poor, mobility is low or the skills supplied and required are highly different, then more  $V$  is needed at a given level of  $U$  for the flows to be equal. (Or the other way round, more unemployed persons are needed per unit of time to successfully fill a given number of vacancies.) In an economy where for the above mentioned reasons firms and workers find it difficult to meet, the Beveridge curve ( $UV_2$ ) is shifted higher and outwards from the origin than in a market less affected by structural difficulties and frictions ( $UV_1$ ).

<sup>8</sup> The function is often used in the Cobb–Douglas form ( $x = aU^bV^{1-b}$ ), where parameter  $a$  represents efficiency.

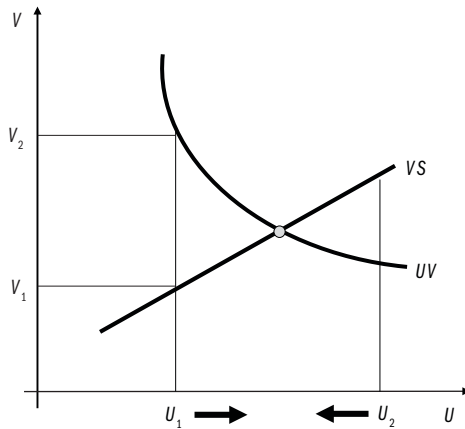
The other pair of rising curves of the graph is marked as  $VS$  (*vacancy supply curve*). How many jobs businesses should create? How is it related to the

level of unemployment? The  $VS$  curve aims at providing – at this level only theoretical – answer to these questions. If unemployment is high, the resulting lower wages and recruitment costs encourage companies to offer more vacancies on the market, if other factors are unchanged. If the costs of job creation for some reasons do not decrease at a time of rising unemployment, the  $VS$  curve will be lower: at a given  $U$ , less  $V$  is created and the situation is described by  $VS_2$  instead of  $VS_1$ .

A *steady state* is reached when firms – at a given pace of job destruction – create just the number of jobs, which are hoped to be filled at the given unemployment level and matching efficiency.

This possibly difficult-to-understand statement is clarified by *Figure 1.1.3*. The initial level of unemployment is set at  $U_1$ . In order for  $U_1$  unemployed to be able to find employment at the given level of matching efficiency,  $V_2$  vacancy would be needed. However, companies only create  $V_1$  vacancy at this unemployment level, therefore  $U$  starts to increase, as shown by the arrow below the horizontal axis. By contrast, the number of new jobs created at  $U_2$  initial unemployment level and at  $s(P - U)$  job destruction is sufficient for the unemployed to find appropriate jobs and unemployment starts to decrease. The market stays in equilibrium at the intersection of the two curves ( $UV$  and  $VS$ ).

Figure 1.1.3: Equilibrium in the  $UV$  space



As for *Figure 1.1.2*, there are not one but two equilibriums (*A* and *B*). The more favourable *A* steady state, at lower unemployment level, may be achieved in an economy where wages are flexible, mobility is inexpensive, information flow is adequate and structural differences are small. The market can also reach an equilibrium if the cost of job creation does not decrease in spite of an increasing unemployment – because e.g. transport is insufficient, moving to another city is complicated, serious structural differences hinder the meeting of



market participants and benefits are too high – but only in point *B*, at a high unemployment level and persistent recruitment difficulties.

The conceptual framework adopted here calls attention to several facts important for the topic of *In Focus*.

- It is natural to have unemployment and vacancies at the same time in the labour market.
- The market does not even reach an ideal state in a (dynamic) equilibrium: the steady state may be reached at high unemployment levels with a large number of vacancies.
- This “bad” balance may be attributable to a number of factors: agreements preventing the adaptation of wages, government interventions, legal restrictions, high transaction costs, insufficient transport infrastructure, underdeveloped rental market, mistaken education and welfare policy and insufficient support in taking up employment.
- Individual businesses perceive this in two different ways: it is not worth creating jobs because it is costly despite high unemployment, while vacancies offered are still difficult to fill.

Some of the businesses complain of labour shortage in such a situation and mainly look for an explanation and solution where they hope to find direct state support.

“More engineers or skilled workers should be trained in this or that occupation! Do not let young people pursue “economically useless” general upper-secondary or higher education studies! Shorten the length of vocational training so that pupils are able to start work sooner! The State should also undertake special training costs and should focus on teaching and drilling skills needed for technologies used here and now! The unemployed should be ordered more strictly to accept “appropriate jobs”! Procedural rules on dismissal should be relaxed, while the categories of those eligible for severance pay should be restricted and the amount to be paid should be reduced, that is, future burdens whose discounted value increases labour costs already at recruitment should be lightened!”

Concerning these complaints, it should be noted that they are motivated by interests and in addition to having a *reason*, they usually also have a *purpose*. Corporate complaints do not always come from the flagships of progress: they often come from companies unable to increase wages on their own, step up their recruitment efforts or provide special training and therefore they long for government funding. Consider the in-depth analysis by *Gimpelson et al* (2009), stating that Russian firms complaining of labour shortage are less efficient than the average, pay lower wages, do not raise wages or provide more training when facing labour shortage but they are very vocal within the corridors of local governments.

Regarding recruitment difficulties accompanied by high unemployment, institutional arrangements worsening the matching efficiency should be taken into account. In the other chapters of *In Focus*, we will first examine the changes in the number of vacancies and in corporate complaints of shortage, then map the companies complaining. But the majority of chapters will focus on factors influencing the matching efficiency (wage flexibility, employment mobility, the education system and adult learning).

It is not only because of the conceptual framework described above. As will be shown later, there is an order of magnitude of difference between the number of companies complaining of shortage (more than eighty per cent in the industry) and the proportion of vacancies reported by them (barely two per cent). An analysis investigating only the number, distribution and causes of vacancies, overlooks the fact that a lot of firms give up creating jobs *a priori*, since they think the skills they need are not available on the market and it is not possible to create a sufficient quality supply by pay rise within a reasonable time.

Companies often articulate their lack of development opportunities as “shortage”, which may be conceptually inaccurate but reflects a real problem. As will be shown, complaints of shortage often come from companies paying wages below the market rate, but probably also a lot of investment and market openings fail because only low quality supply is available even at higher wage levels. Examining education, vocational education and training as well as adult learning is relevant also because whether Hungary is able to create the labour supply necessary for following developed market economies basically depends on them.

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