IN FOCUS:
LABOUR SHORTAGE

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FOREWORD BY THE EDITOR

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Reportings of shortage. Complaints from enterprises of labour shortage have become more frequent and the number of vacancies reported to the employment service as well as the shortage recorded in the enterprise surveys have been increasing in Hungary since 2013. Hungary is one of leading countries in Europe at present in terms of complaints about shortage.

Nevertheless, reportings of labour shortage should be treated with caution, since complaints are driven by interests. It is of no consequence for enterprises if they report recruitment intentions that do not materialise later. The type of questions such as "How many persons are lacking at your company?" do not specify the wage levels firms are willing to pay for the lacking people. Reportings of shortage are oversensitive: their values change to an extremely large extent as a result of minor changes in labour demand. Growing recruitment difficulties are accompanied by a faster labour turnover; complaints multiply and appear at several points of the vacancy chain. In spite of these distortions, complaints about recruitment difficulties remain an important social fact.

Shortage and unemployment. In the labour market it is natural to have unemployment and vacancies at the same time. The market does not even reach an ideal state in a (dynamic) balance: it may level off 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 intervention, legal restrictions, high transaction costs, insufficient transport infrastructure, an underdeveloped rental market, mistaken education and welfare policy and insufficient support in taking up employment. Thus the study of shortage necessarily involves investigating market adaptation and the factors influencing it.

While reportings of shortage have increased, the proportion of unskilled workers without a real job has remained high. The number of the registered unemployed decreased from nearly 600 thousand to slightly more than 300 thousand between 2010 and 2016; however, their total number together with public works participants exceeds 500 thousand, which is higher than any time between the so-called Bokros package in 1995 and the 2008 global economic crisis. This indicates structural tensions and conflicts. Hungary is not the only one having this problem – Ireland, Sweden and Slovenia had similar tendencies of vacancies and unemployment.

The impact of demographic replacement. As a result of demographic replacement, the total active age population will decrease by about 6 per cent between 2011 and 2020 but the level of educational attainment of the active age population will significantly improve. The biggest decrease, estimated at more than 500 thousand, is expected in the number of those with a lower secondary education in the period of 2010–2020, accompanied by a similar increase in the number of graduates. Demographic replacement will reduce the number of vocational school graduates by about 200 thousand, while changes in the number of upper-secondary qualification (Matura) holders will not exceed some tens of thousands.

Demographic impacts on the employment structure are somewhat different. Movements between education and employment as well as employment and retirement between 2006 and 2010 resulted in a loss in all sectors except service occupations and other intellectual professions. The most dramatic loss was seen in the number of unskilled and semi-skilled workers, in spite of an increased number of entrants from lower-secondary education due to the massive growth of public works after 2011. However, a stronger impact resulted from the large groups of unskilled labourers reaching retirement age or losing their capacity to work. It is not confirmed by data that demographic replacement or the difference in the educational attainment level of entrants and those exiting would endanger the skilled labour supply. Entries and exits were in balance in this sector between 2010 and 2015, while demographic replacement caused losses even in graduate and other intellectual work.

Employment abroad. According to data from the Labour Force Survey (LFS) corrected using mirror data, nearly 350 thousand Hungarians worked abroad in 2016. We estimate that somewhat more than 2 per cent of employees over 18 and not in retirement went abroad to work on average annually between 2011 and 2016 but nearly half of them returned to Hungarian jobs; therefore, the net proportion of the workers missing due to working abroad is estimated at more than 1 per cent on average annually. This rate was only below 0.6 per cent on average between 2006 and 2010. Employees also working a year before the survey went abroad to work to an extent below average but those studying a year before the survey went to a very high extent and those unemployed a year before also opted for employment abroad in high proportions. Among those returning to Hungarian jobs, the proportion of those being unemployed a year before the survey is also high, which implies that for them both employment abroad and in Hungary involves short-term, uncertain jobs.

The greatest proportion of those leaving to go abroad was from catering related jobs (cooks, waiters): the proportion of those exiting between 2011 and 2016 was nearly 5 per cent on average annually, while net workforce migration was 4 per cent annually. An estimated annual average of nearly 4.5 per

cent from the construction industry and 3.5 per cent from building services, engineering and installation took up employment abroad but in these jobs the proportion of returnees is also high. A great proportion of drivers also got a job abroad and – with a relatively small proportion of returnees – the net workforce migration results in a nearly 1.5 per cent annual potential workforce decrease on average. In spite of reportings of labour shortage in trade, our estimate indicated that the proportion of workers quitting from trade jobs is below average; however, the proportion taking up employment abroad showed the largest increase in these occupations between 2006 and 2010.

Who complains? There is a difference in scale between the number of companies complaining of a labour shortage (it is more than eighty per cent in the industry) and the proportion of vacancies reported by them (barely two per cent). 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 of low quality labour supply in spite of higher wages.

It is mainly more successful companies that report difficulties in recruiting and retaining staff, which is partly due to an increased demand in order to fulfil an increased volume of orders.

Manifest shortage, when a company is unable to fill an already existing vacancy or completely utilise existing capacities because of labour shortage, is a different case. While complaining of labour shortage as an obstacle to development is more characteristic of successful companies, manifest shortages mainly occur at companies operating under adverse market conditions and primarily in relation to skilled staff. Companies in good financial health tend to ward off serious shortages.

A sign of shortage of unskilled labour was only seen in the manufacturing industry: manifest shortages are more frequent in industrial mass production, where a higher than average proportion of unskilled workers is employed and capacity is more difficult to match to changing labour market conditions than in services or the construction industry.

Shortages occur more often among companies paying wages below the market rate but remarkable shortages are only seen among companies paying their *skilled* staff wages below the market rate. If the average wage at a company is one standard deviation below the market rate, it increases the likelihood of under-utilization of capacity due to labour shortage by about 3.5 percentage points (16 per cent on average in the study sample).

Shortage and wage growth. The presence and proportion of persisting vacancies and the under-utilization of capacity due to shortage of skilled labour had a significant impact on the 2016 wage increase *plans*. However, the impacts are weak: companies reporting vacancies in 2015 planned only 0.7

percentage point faster wage increases for 2016 than companies not complaining of shortages. However, complaints of shortage did not result in faster *actual* wage increase in any of the cases, compared to companies not reporting shortages. It is partly due to the fact that scheduled and actual wage increase had a positive but loose relationship: a planned wage increase of one per cent was likely to result in an actual wage increase of only one-third of a per cent.

Some of the companies facing recruitment difficulties try to overcome their labour shortage through means other than wage increase. Less productive companies, unable to raise wages, are easily prompted by lack of prospects to find grey, unlawful solutions outside the market. With the increase in labour shortage, this unlawful behaviour is likely to increase in the less productive segments of the economy.

Shortage and relative wages. Data from a large sample and long period on relative wages do not indicate that labour shortage would play a decisive role in the fast wage growth of recent years. Point estimates reveal rising wages among young professionals, skilled workers, graduates and in industry and they also show faster wage increase at companies more affected by demographic replacement, labour turnover and outward migration. However, hardly any of the changes are statistically significant and the point estimates themselves tend to indicate longer-term trends instead of a sharp break in the years of worsening labour shortages. Although there have been several cases (e.g. in large shopping centres) of significant pay rises resulting from increasingly severe recruitment difficulties, these did not alter the Hungarian wage hierarchy until 2016.

Consequences on education policy. Complaints about labour shortage have a strong impact on education policy, especially on upper-secondary vocational education and training. In order to interpret the complaints, changes in the structure of vocational education and training and in the labour market of vocational school graduates in the past two decades must also be considered. Upper-secondary vocational education and training did not diminish after the political changeover of the 90s: vocational training receded to the same extent as vocational education combined with a Matura expanded, and as a result of the two trends the proportion of young persons in an age-group entering the labour market with upper-secondary qualification has been roughly stable over the past twenty years. At the same time, the occupational composition of graduates from vocational training, which does not provide a Matura, has changed dramatically. Twenty years ago, 27 per cent of these worked in assembly jobs, as operators or in elementary occupations. At present, this is 46 per cent (including public works participants) in the entire economy and 52 per cent (excluding public works participants) at companies

with more than one hundred employees. Thus vocational schools train nearly half of their pupils for unskilled and semi-skilled work and a significant part of the unmet demand is also likely to consist of such jobs.

Even though complaints from manufacturing companies signal that they primarily need vocational school graduates with plenty of practical training experience and not weighed down with the tasks of preparing for a Matura, they value these employees in all physical occupations less than employees from upper-secondary vocational education. Wages and basic skills deteriorate with age in both groups but the rate of deterioration is faster among vocational school graduates than among vocational education graduates with a Matura, which implies that the competences they acquired at school rapidly become obsolete.

The data do not support the concept that the typical Hungarian enterprise would have considerable excess demand for vocational school graduates when filling skilled worker positions. This applies to the workforce trained in the *current* system and to the *current* standards of vocational training, and apparently the corporate sector does not believe in securing better employees from this supply by raising wages. Vocational training reforms will probably increase the supply of vocational school graduates in the short run, trained to the current standards, without forcing enterprises to raise wages but in-depth curricular reforms, updating the skills of teachers and renewing the teaching staff will require a longer time. Even if this takes place, the length of upper-secondary vocational training and education will decrease and the average standards of quality is likely to decline, especially regarding the development of skills needed for resilience, in a lengthy transitional period.

In higher education the government is trying to increase the volume of science and engineering students by administrative measures and financial incentives. However, according to the relevant literature and research, measures should be targeted at a much younger age-group, especially as regards gender differences. A marked difference in career plans between genders develops by the age of 15, and by that time the majority of girls attend schools that decrease the likelihood of further studies in science. When family background and school characteristics are constant, pupils may best be encouraged to choose science or engineering careers by expanding their scientific knowledge, using their computing skills and realising the labour market value of natural sciences. However, while the motivation of boys can clearly be increased by these measures, the motivation of girls only moderately improves (science knowledge and instrumental motivation) or does not improve (computing skills). Gender expectations have an influence on children at a very early age, which then have an impact on their interests and career ideas. Because science and engineering occupations still mainly have a masculine rather than a feminine image, gender segregation in this field is deeply rooted in culturally defined

gender expectations, which leads girls interested in science to choose medical-healthcare instead of science and engineering professions. A significant change in the present situation is not easy to achieve; it is perhaps most feasibly accomplished by early childhood interventions.

Adaptability. Adaptability and the underlying competences play a key role in preventing and overcoming shortage problems. Recent research clearly points to the primary role of non-cognitive skills. The Hungarian specificities (an enduring 'Prussian' style education, limited school and teacher autonomy, the narrow profile of vocational training and the extremely low level of involvement of NGOs) do not support the development of communication and social skills, friendliness, conscience, or emotional stability as well as openness to new and different ideas and therefore hinder labour market resilience.

Job mobility is less likely among workers with more job specific skills, acquired either in the formal school system – for example vocational school and higher education graduates –, or in on-the-job training (those who spend more apprenticeship or traineeship time in a job). Low job mobility among higher education graduates is due to receiving mostly profession-specific education from the beginning of their Bachelor studies, which has only been altered to a small extent by the introduction of the Bologna structure. However, the direction of job mobility is different in the case of higher education and vocational school graduates. Vocational school graduates have low mobility but when they switch occupations, they are more likely to move downwards in the occupational hierarchy. This indicates that on the one hand, changing their occupation is not voluntary, and on the other hand that they can only use their transferable skills in lower-level jobs. In other words, the level of their general competences does not enable them to move upwards in the occupational hierarchy.

Adult education, primarily non-formal, is of utmost importance in acquiring skills demanded by the economy, especially for young people with a lower secondary qualification or those dropping out of upper secondary education. According to an international comparative survey, Hungarian adults with low qualification levels came last in 23 activities and last but one in 8 activities out of the 34 spontaneous learning activities included in the survey and they only came first in passive television watching not for learning purposes. It is impossible to decide and is not necessarily a matter to be decided whether it is a cause or effect: whether joblessness restricts social contacts, knowledge accumulation and income, while knowledge deprived of development and poverty restrict employment and building social relationships, which in turn prevents the uptake of the reserve supply of the unemployed by businesses.

Formal adult education also plays a major role in resilience, especially in less employable groups. In the period reviewed, a smaller proportion of the

registered unemployed entered supported retraining programmes than in the first half of the 2000s; however, the proportion of the unqualified increased among the entrants. This is a positive development, since our findings show that training programmes are especially efficient in this group. However, the fact that a total of slightly less than 17 thousand job seekers without an upper-secondary certificate (Matura) entered a retraining programme in 2015–2016, while the figure was nearly 16 thousand *on average annually* between 2012 and 2014 is not good news. Longer training courses do not necessarily yield better results in the medium term (three or four years after entering the training) than shorter courses. The expansion of relatively short programmes, targeted at low-qualified job seekers, may significantly increase employment and alleviate labour shortage in the foreseeable near future (one or two years).

1 DEFINITION AND MEASUREMENT

1.1 HOW TO DEFINE LABOUR SHORTAGE

JÁNOS KÖLLŐ, DANIELLA NAGY & ISTVÁN JÁNOS TÓTH

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".

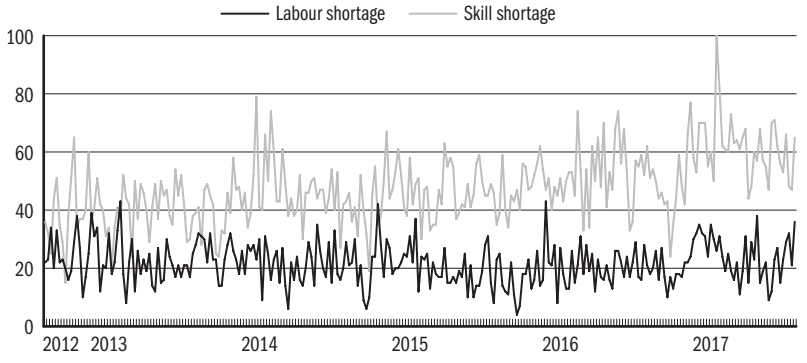
This is why scientific research does not use or only reluctantly uses, bracketing it within quotation marks, the term *labour shortage* and uses the term *skill shortages* only slightly more frequently (*Figure 1.1.1*).

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).[1] 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).[2]

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.[3]

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.

3 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.[4] 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.[5] 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

4 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.

5 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 (*Frunză 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.[6] The question is, at what level of unemployment this steady state is reached.

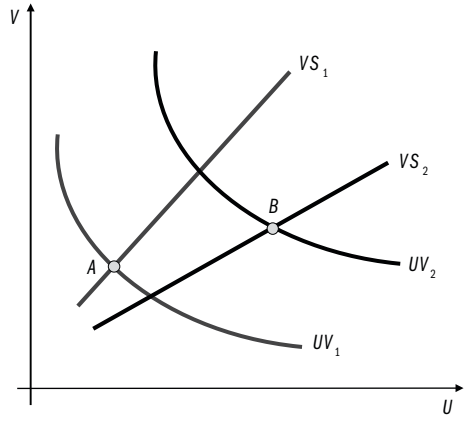
The problem is illustrated in *Figure 1.1.2*, which presents two types of curves – and two curves for each type. The curves convex to the origin are called the *UV* or Beveridge curves in textbooks and studies.[7] The *UV* curve consists of the geometrical positions of points that satisfy the equation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

6 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).

7 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.[8] 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).

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

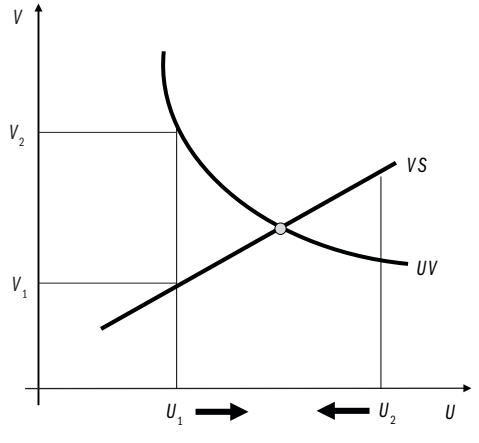
8 The function is often used in the Cobb–Douglas form ($x = aU^bV^{1-b}$), where parameter a represents efficiency.

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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1.2 "LABOUR SHORTAGE" IN THE HUNGARIAN PUBLIC DISCOURSE

ISTVÁN JÁNOS TÓTH & ZSANNA NYÍRŐ

To start with, let us divide the Hungarian discourse on labour shortage into two parts. When someone speaks about "labour shortage", they 1) implicitly define the problem with their own words describing what they mean by it; 2) in addition, often within the same sentence, they offer solutions for the problem they define.

The discourse on the "problem of labour shortage" will also be termed so herein, conforming to the lay Hungarian usage. It must be noted however, that wording is especially important because in itself it has an impact on, and often clearly defines how, we think about a problem and what solutions we arrive at.

As discussed in the previous sub-chapter, the problem of "labour shortage" can only be interpreted as an interaction of economic actors (in this case workers, businesses and the government). Accordingly, "labour shortage" always means for a business which is offering a vacancy, that they are unable to hire an employee for the vacancy they advertise at the wage level they offer. Obviously, the notion of "missing labour force" is only meaningful together with the "wage offered", since they are strongly interrelated.

When looking at comments on labour shortage, Hungarian public discourse almost exclusively focuses on the first aspect, "missing labour force" as "missing human resource" and – with a few exceptions – it neglects the second aspect, the "wage offered". The growing prevalence of "labour shortage" is well reflected in the number of articles containing the phrase "labour shortage". Out of the 860,212 articles published on the news portals index.hu, origo.hu, mno.hu and magyaridok.hu between 1 January 2010 and 30 August 2017 a total of 1,958 contained the phrase "labour shortage". The number of these articles started to increase significantly at the beginning of 2015 and reached a peak in October 2016 (see *Figure 1.2.1*). The trend in the number of articles indicates to what extent businesses perceived "labour shortage" during this period.

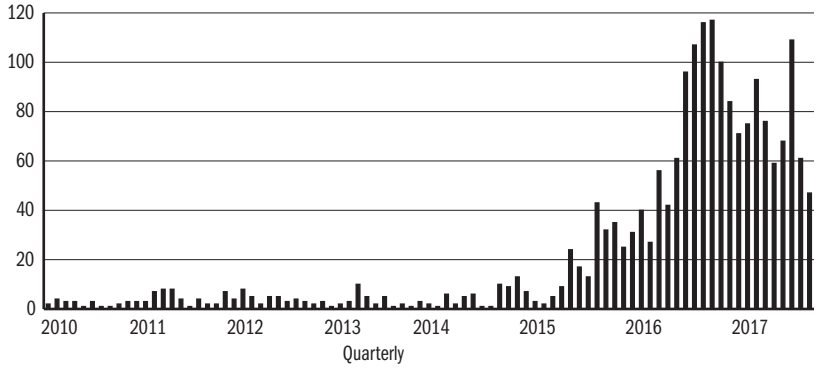
Having reviewed the articles, interviews and reports on labour shortage published after 2015, the following basic argument types may be deduced from the typical opinions:

1) "labour shortage" = people shortage,
2) "labour shortage" = people shortage (+ low wages),
3) "labour shortage" = people shortage (+ low wages + low productivity of firms),
4) "labour shortage" = people shortage + wages.

The characteristics of the above argument types as well as an example for them are given in *Table 1.2.1*. All four argument types interpret and discuss

the issue of "labour shortage" primarily as (skilled) people shortage. Types 2 and 3 also refer to labour shortage as "people shortage" but they also include other factors implicitly. These non-expressed factors, which are only referred to and their acknowledgement by the speaker only inferred, are indicated in brackets in the first column of the table.

Figure 1.2.1: The number of articles containing "labour shortage" on the news portals index.hu, origo.hu, mno.hu and magyaridok.hu between January 2010 and August 2017



Note: $N = 1958$.
Source: Authors' data collection.

Table 1.2.1: Typical types of arguments concerning the issue of "labour shortage" in Hungarian public discourse, 2015–2017

The logic of the argument	Reasons	Proposed solutions	Examples
1a) Labour shortage = HR shortage	Demographic reasons	Government intervention, reducing taxes	"The exponentially increasing number of people taking up employment abroad, the retirement of the Ratkó generation and the public works schemes suddenly removed several tens of thousands of workers from the labour market, while solutions emerge rather slowly – one such measure will be VAT reduction, which may make the wages in the catering industry more competitive. The Hungarian Tourism and Hospitality Employers' Association has been calling for measures improving the profitability of the industry for a long time, since these would address the issue satisfactorily according to them". (*Turizmus.com,* 2016).
1b) Labour shortage = HR shortage	Quality of vocational training	Improving the quality of vocational training	"I think the quality of vocational education and training needs to be improved. The Hungarian Chamber of Commerce and Industry has an inescapable responsibility, since they have been the ones in charge of vocational education and training since 2011. This is indeed very much needed, because we can already see chronic labour shortage in certain industries and occupations – partly because of an inadequate vocational education and training." (*ATV,* 2017a)
2) Labour shortage = HR shortage (+ wages)	Demographic reasons, emigration	Economic recovery	"Labour shortage is partly due to demographic reasons, since the working-age population continuously declines and the proportion of those temporarily moving abroad for work has increased recently, while the economy is growing and thus demand is increasing – said Ferenc Rolek, Vice-president of the Confederation of Hungarian Employers and Industrialists on Monday on the TV channel M1." (*Vg.hu,* 2017)

The logic of the argument	Reasons	Proposed solutions	Examples
3) Labour shortage = HR shortage (+ wages + productivity)	Demographic reasons, emigration	Pay rise, retraining, business development, automation, government intervention	"He said, the government does not seek to tackle the labour shortage by relying more on foreign labour. – He added that it is already possible to keep the workforce in the country by higher wages and incomes and the shortage can also be solved by retraining public works participants and the unemployed. The minister explained that the workforce can also be replaced by modernization, development and automation, which is supported by the government through various schemes and improving the business environment. This also encourages more and more businesses to become Tier-1 or Tier-2 suppliers and in this way enter foreign markets, he added. In addition, the corporate investment scheme also promotes the development of Hungarian businesses, emphasised Mihály Varga, adding that the government is willing to hold discussions with the key players of the construction industry in order to address the labour shortage of the industry." (*Varga,* 2017)
4) Labour shortage = HR shortage + wages	Structure of the education	Improving the quality of education, reducing the rate of dropping-out, pay rise	"According to Tamás Körözsi, the director in charge of IT training, the problem is rather complex, because they find it extremely difficult to keep pace with technological advancements and provide the kind of education for their students which is required by businesses. They often try to update older curricula but there is a backlog of several years because of the cumbersome approval procedure. No wonder, that – similarly to other large corporations – EPAM also provides in-house training for new recruits." (*Hir24.hu,* 2016). "The shortage has considerably increased wages in the IT industry: according to this year's survey of Hays, salaries rose by 8–10 per cent on average last year in the sector, which had already provided the second highest wages following the banking sector. Companies hunt not only experienced professionals from one another but also line up for fresh graduates. Junior software developers typically earn a gross salary of HUF 410 thousand, while more senior jobs are paid 600–900 thousand and in management positions it is generally possible to earn 1.1 million a month. According to head hunters, developers specialising in popular programming languages, such as Java, are able to get even more." (*Vg.hu,* 2016)

The majority of comments belong to the *first type*. It is a widespread view that labour shortage is due to simply not having enough workers in Hungary: "there is no more workforce on the market" (*ATV,* 2016a, 2017; *Turizmus.com,* 2016), "there are few skilled workers" etc. Proponents of this view identify three reasons for "labour shortage": a) demography, b) bad education structure (too few pupils attend vocational schools and too many attend general upper-secondary schools), c) the insufficient quality of vocational education and training. (Two more reasons – d) and e) –, will be added later on.)

According to Ferenc Dávid, Chair of Confederation of the Hungarian Employers and Industrialists, the main cause of labour shortage is that "supply on the labour market decreases by fifty thousand annually (in the 15–64 age group)" (*Hír TV,* 2017). Ferenc Rolek, Vice-president of the Hungarian Employers and Industrialists also thinks that labour shortage is "rooted in demography": "The generation born twenty years ago, who is entering the labour market at present, is considerably smaller in size than the cohort retiring (...) The difference between the two equals the reduction in labour supply." (*ATV,* 2017b.) According to these views, the quality of school education, especially vocational education and training has to be improved (*ATV,* 2017a). They

think "labour shortage" is caused by the lack of skilled labour: "In Borsod and Szabolcs counties for example thirty thousand people participate in public works schemes, thus in theory there is reserve labour force but these people (...) are so low-qualified that they are practically unemployable." (*Hír TV,* 2017.) This argument calls attention to the shortcomings of school education.

Emigration is often mentioned as a fourth cause leading to labour shortage: "in the old times it was the shopping centres that were cool and everybody went to work there, then the car factories – there is always a trend, and now everybody goes abroad" – as György Vámos summed it up (*ATV*, 2016a). These kind of comments can be classified in *Type 2*, since the reason for "emigration" is that workers seeking employment abroad are driven by the much higher real wages available abroad. These statements do not explicitly mention the difference between the wages offered abroad and in Hungary as a cause of labour shortage, they only refer to its consequence, "emigration".

Another reason mentioned as contributing to labour shortage is the high taxes and social security contributions payable on wages. Through this argument (also belonging to *Type 2*), the role of wages in the emergence of labour shortage is indirectly acknowledged but the low wages offered by companies are not mentioned at all. This is only revealed by the fact that "social security contribution cuts" is considered a key element of solving the problem of labour shortage.

The above types of arguments provide solutions for solving the problem ("labour shortage") as perceived by them which directly stem from the notions and reasoning defining the problem they see: since "labour shortage" has nothing to do with the behaviour of businesses, the wages they offer and their productivity and the phenomenon is caused by factors outside the economy (demography) on the one hand and factors outside the business sector (high tax wedge, low quality of school education) on the other hand, the problem of "labour shortage" can only be solved by government measures.

Types 1–2 arguments provide the following suggestions for solving labour shortage: government measures targeting adverse demographic trends; development of basic education and vocational training; government support for introducing modern technologies and reducing social security contributions and tax cuts, which would result in pay rises.

Arguments calling for tax and social security contribution cuts implicitly accept the fact that the wages offered also have an impact on "labour shortage". They are based on the implicit logic that if the wages offered were higher, labour shortage would diminish or disappear. However, they only point at tax and social contribution cuts as the source of pay rises: "It is impossible to redress the situation without a rebate on contributions (...) those who give an above-average pay rise, because they are forced to do so, should get a rebate on the excess contribution. Another inevitable measure is that a much

greater rebate on contributions should be granted for small enterprises (since they are in the gravest situation) in the various employment programmes than before." (*ATV*, 2016a.)

Argument *Type 3* already takes low productivity implicitly into account in the emergence of "labour shortage".[1] Although not mentioning productivity, it points at the necessity of "modernization", "automation" and the increase in investment activity (*Varga,* 2017). Also in this type, suggestions place a stronger emphasis on direct government measures ("the missing workforce may be supplemented by public works participants and the unemployed through retraining", "the corporate investment scheme provides incentives for the development of Hungarian enterprises") and indirect measures improving the competitiveness of the business sector ("improving the business environment") than on enterprise-level actions.

Type *4* is the only one that explicitly considers the wage levels on offer in addition to "people shortage". On the one hand, it refers to recruitment difficulties at a given wage level ("It is difficult to find IT staff even for a starting salary of HUF 400 thousand"), on the other hand, it also discusses that firms react to "labour shortage" by increasing wages: "The shortage has considerably increased wages in the IT industry: according to this year's survey of Hays, salaries rose by 8–10 per cent on average last year in the sector". These types of argument are less frequent than the ones belonging to the first three categories and are typically found in articles on the IT sector.

In conclusion, according to the Hungarian discourse on "labour shortage", the problem is general, "it already affects the whole economy" and it is mainly caused by "people shortage" or "skilled worker shortage". In several cases it may be inferred that the holders of these opinions also consider the impact of wages and corporate productivity but – except for articles on the IT sector, where the significance of wages is explicitly mentioned – these factors are never specified.

1 The significance of corporate productivity is very rarely mentioned explicitly in interviews and articles on labour shortage. See for example *Portfolio.hu* (2016).

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1.3 TRENDS IN BASIC SHORTAGE INDICATORS

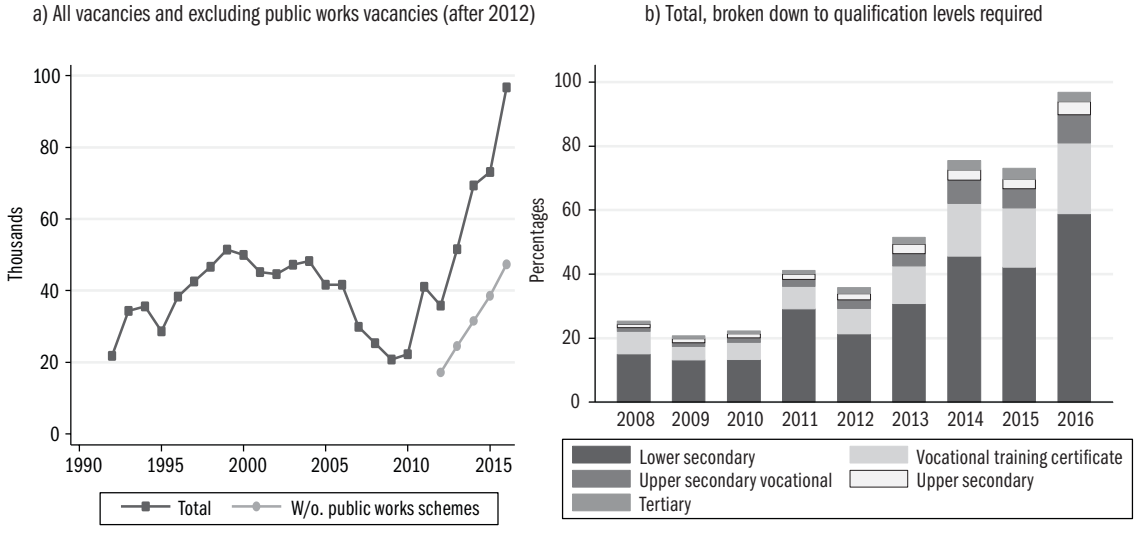
JÁNOS KÖLLŐ, ZSANNA NYÍRŐ & ISTVÁN JÁNOS TÓTH

There are two main approaches for measuring labour shortage: 1) using indicators of labour market imbalance, 2) analysing employers' perceptions of labour shortage, which is mapped by enterprise surveys (*Reymen et al,* 2015). This subchapter first investigates the trends in labour shortage in Hungary (and also abroad) using the first then the second approach. We are revealing up front that all sources reviewed suggest growing recruitment difficulties and increasingly more serious complaints in Hungary after 2013.

The vacancy registry of the National Labour Office

The average monthly number of vacancies reported to local job centres increased in 2015–2016 to a level unprecedented since the political changeover of the 90s. However, it is important to note that public works vacancies account for half of the total vacancies and 60 per cent of total vacancies require only a lower secondary qualification at most (*Figure 1.3.1*), thus the statistics of the National Labour Office cannot be regarded as an overall shortage indicator.

Figure 1.3.1: Number of vacancies reported by the National Labour Office, 1990–2016 (in thousands)



Note: Annual average figures.

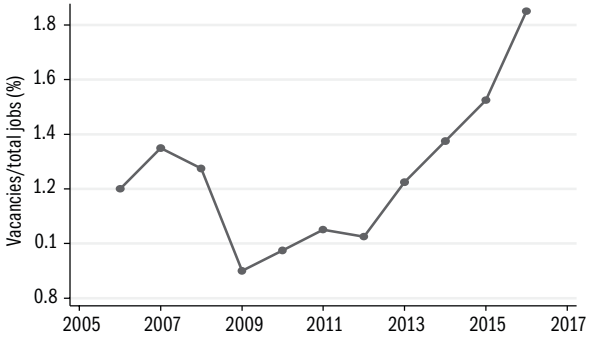
It should be noted that the average number of annual vacancies reported in the primary labour market in 2016 (47,302 vacancies) was lower than the total number in the period between 1998 and 2004 including public works vacancies. However, the number of public works participants in that period

did not reach twenty thousand, i.e. one-tenth of the figure in 2016, thus demand for labour in that sector cannot have been significant.

Data collected by the Hungarian Central Statistical Office (HCSO) and Eurostat

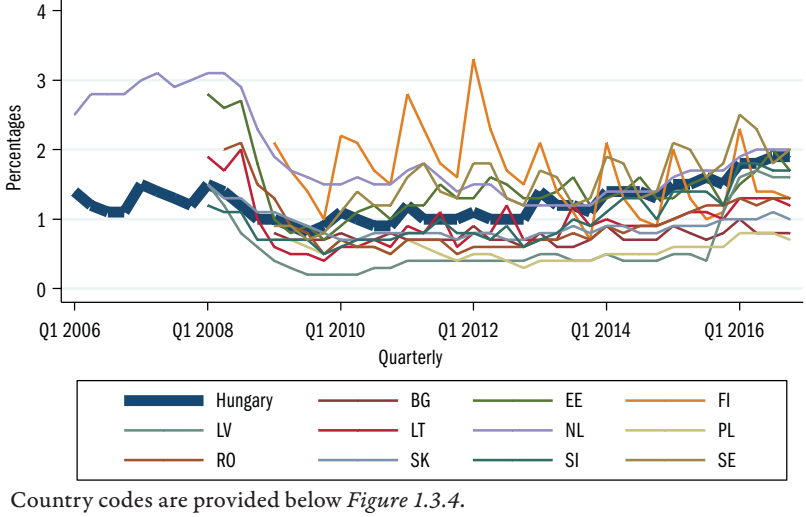
Based on enterprise surveys, there has been a dynamic growth in the proportion of vacancies relative to the total (filled and unfilled) jobs in the HCSO survey, which follows the methodology of Eurostat, since 2009 (*Figure 1.3.2.*). (The exact definition HCSO data is provided in the note of *Figure A1.3* of the *Annex*.)

Figure 1.3.2: Vacancies as a percentage of total jobs according to the HCSO survey 2006–2016



Note: Annual averages from quarterly surveys.
Source: *Eurostat*.

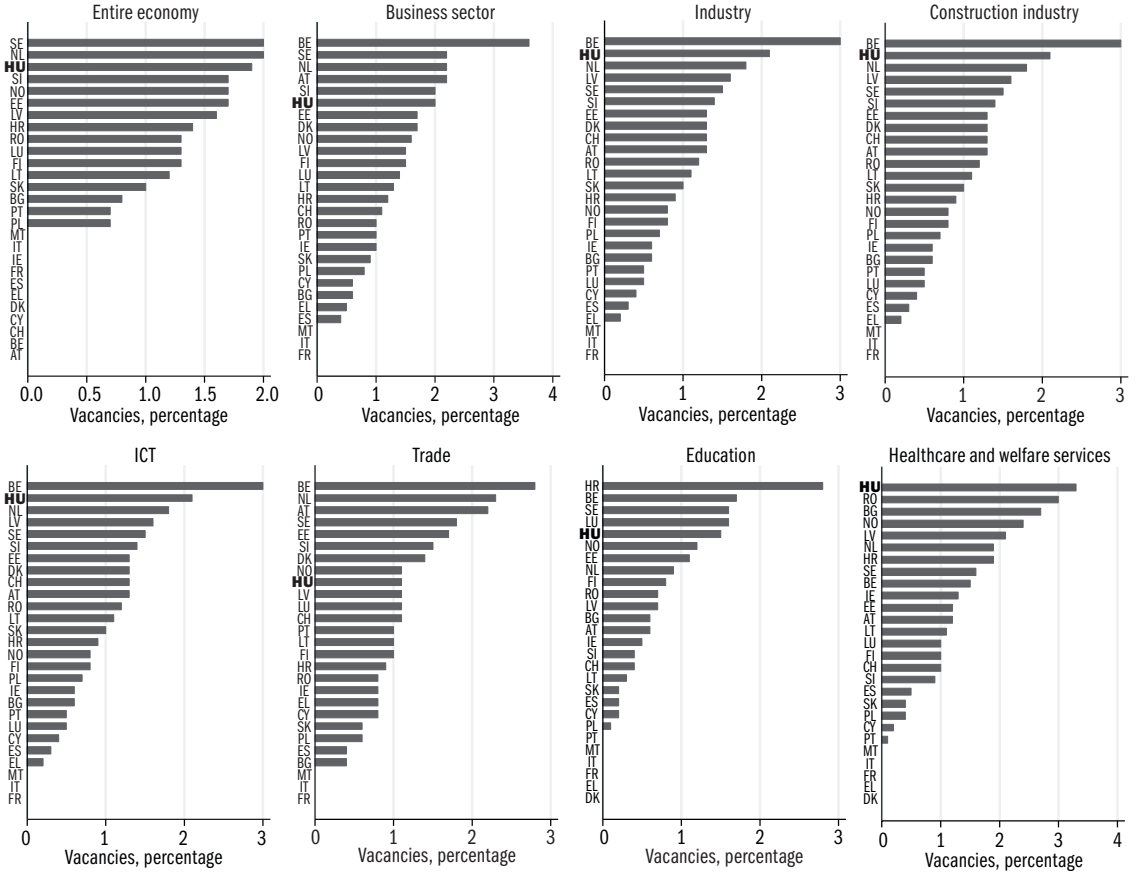
Figure 1.3.3: The proportion of vacancies according to Eurostat data in 12 countries, 2006–2016



Country codes are provided below *Figure 1.3.4*.
Source: *Eurostat* data, authors' calculation.

Eurostat surveys enable international comparison. As seen in *Figure 1.3.3*, Hungary was in the mid-range in terms of vacancies in 2006 but as a result of the dynamic increase, which started three or four years ago, an extremely high level has emerged: at the end of 2016, Hungary had the third highest number of vacancies following Sweden and Holland. The figure includes countries that publish time series about the entire economy since 2008 or earlier. The Hungarian surveys started in 2006.

Figure 1.3.4: The proportion of vacancies in the fourth quarter of 2016 according to Eurostat

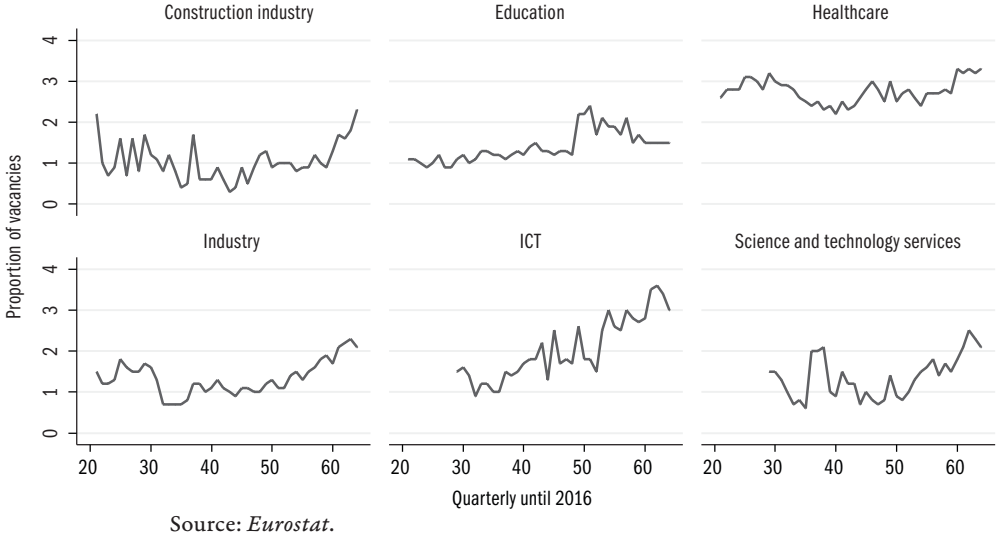


Country codes: AT: Austria, BE: Belgium, BG: Bulgaria, CY: Cyprus, CZ: Czech Republic, DE: Germany, DK: Denmark, EE: Estonia, EL: Greece, ES: Spain, FI: Finland, FR: France, HR: Croatia, HU: Hungary, IE: Ireland, IT: Italy, LT: Lithuania, LU: Luxemburg, LV: Latvia, MT: Malta, NL: Holland, PL: Poland, PT: Portugal, RO: Romania, SE: Sweden, SI: Slovenia, SK: Slovakia.

Figure 1.3.4. shows that at the end of last year Hungary ranked *second* in the proportion of vacancies in industry, the construction industry and the IT sector. However, concerning the whole business sector, and among a wider range

of countries, it only ranks *sixth*. The high level in education and especially in healthcare and social welfare plays a key role in ranking third in terms of the entire economy, as seen in *Figure 1.3.3*. Healthcare is the only sector that Hungary ranks *first* in. The number of vacancies broken down to sectors is provided in *Figure 1.3.5*.

Figure 1.3.5: The proportion of vacancies in some sectors



Source: *Eurostat*.

The graphs of the Figure reveal how different the reasons leading to complaints of shortages are. The highest final levels are seen in the IT sector as well as healthcare and social welfare. The former shows a continuous increase also taking place during the global crisis, which is probably due to the rapid increase in global demand resulting from digitalization and the (partly inevitable) slow adaptation of the education system. The latter is primarily due to regulatory restrictions on headcount, low wages and the resulting continuous outmigration of doctors and nurses. By contrast, the time series of industry, construction industry and science-engineering services were heavily affected by the crisis and the following recovery.[1]

The questionnaires of several international (e.g. the Business and Consumer Survey coordinated by the European Commission)[2] and Hungarian (e.g. GKI Economic Research. Institute for Economic and Enterprise Research [IEER], Kopint–Tárki Institute for Economic research) business surveys contain questions on the most important factors hindering firms' business activities. They also include labour shortage (and sometimes also skilled worker shortage) among the possible answers. The question has been included in business surveys covering EU member states and accession states since the 1980s. The main findings of surveys on Hungarian labour shortage are presented below.

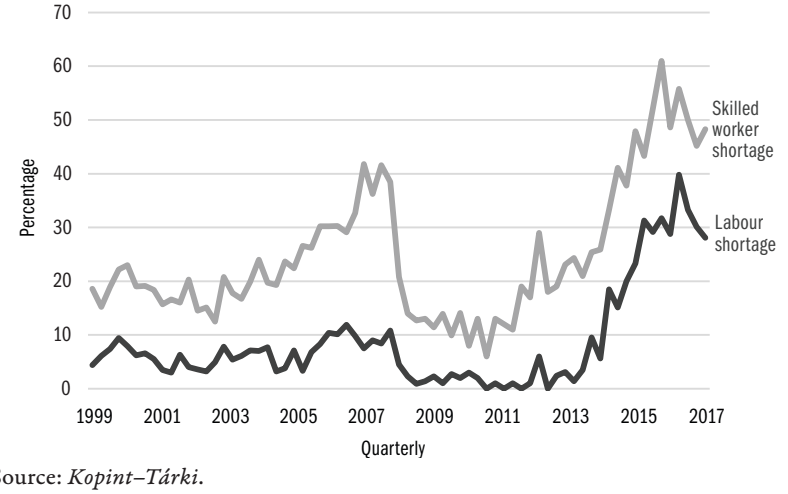
1 Time series about industry and the IT sector are provided in *Figure A1.3* of the *Annex*.

2 The Business and Consumer Survey of the European Commission.

Labour shortage as barrier – Surveys conducted by Kopint–Tárki

The proportion of those regarding labour shortage or the shortage of skilled workers as an obstacle is first presented relying on data from Kopint–Tárki (*Figure 1.3.6*). According to these, the proportion of businesses mentioning labour shortage was about 10 per cent and those mentioning skilled worker shortage was 30–40 per cent before the economic crisis, then the figures for both indicators decreased as a result of the crisis: between the end of 2008 and the beginning of 2014, the proportion of businesses mentioning labour shortage was only between 0 and 6 per cent, while the proportion of those referring to skilled worker shortage was low between 2009 and the beginning of 2012: 6–14 per cent. The proportion of those reporting labour shortage started to grow at the end of 2014 and reached a peak at the end of 2016, when 40 per cent of respondents mentioned this problem. Since that time their proportion has been around 30 per cent. The proportion of those mentioning skilled worker shortage started to increase in the spring of 2012 and culminated in the spring of 2016 when 61 per cent of respondents reported this as a problem. Since then the proportion has been around 50 per cent in each data collection period.

Figure 1.3.6: The proportion of businesses reporting labour and skilled worker shortage as an obstacle to business activity, April 2000 – July 2017 (percentage)



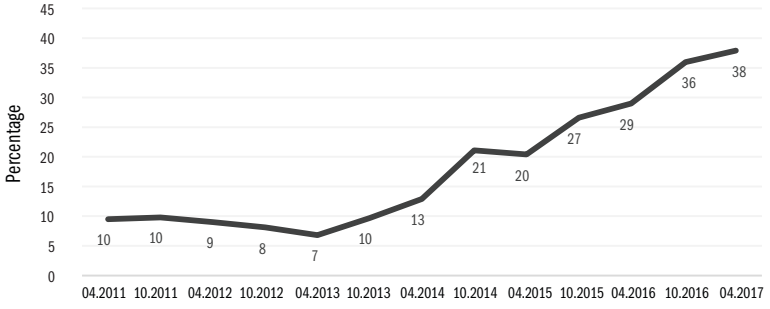
Source: *Kopint–Tárki*.

Surveys conducted by the Institute for Economic and Enterprise Research (IEER)

The business surveys of IEER indicate that about one in ten firms faced labour or skilled worker shortages between 2011 and 2013 (*Figure 1.3.7*). At the end of 2014, one in five (21 per cent) firms were facing the problem, then (apart from a short slowdown) the proportion of those complaining

started to grow continuously. In April 2017, 38% of respondents reported that labour and skilled worker shortage is a key obstacle to business (*Nábelek et al,* 2017).

Figure 1.3.7: The proportion of businesses reporting both labour and skilled worker shortage as an obstacle to business activity, April 2011 – April 2017 (percentage)



Note: N = 1,823–3,614.
Source: *IEER* business surveys.

Surveys conducted by GKI Economic Research (GKI) and the European Commission.

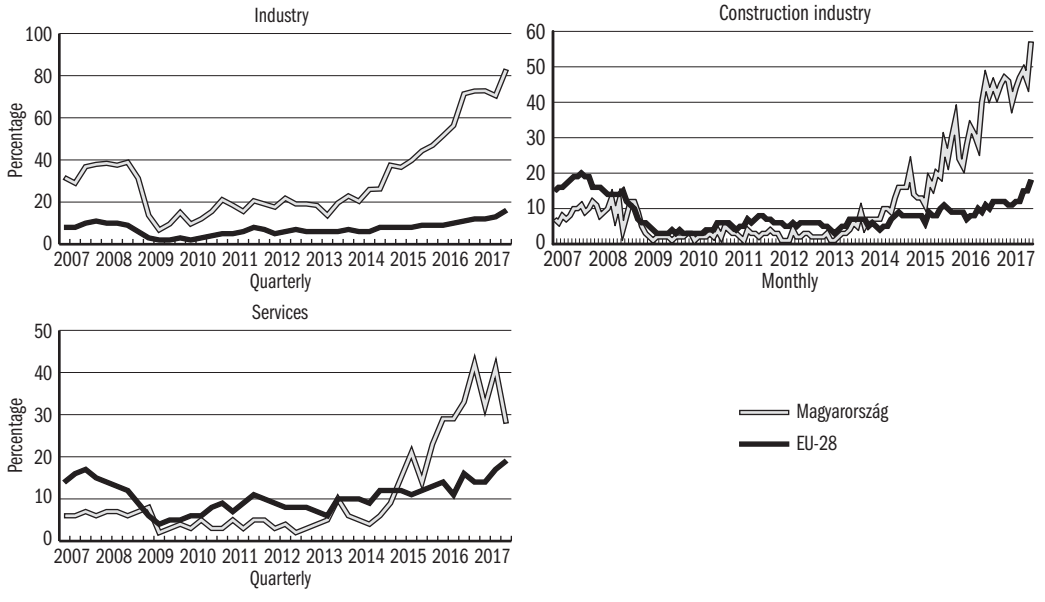
Figure 1.3.8 indicates the proportion of businesses mentioning labour shortage as an obstacle, broken down to sectors, in comparison with the EU average. The most recent data from 2017 suggest that the labour shortage perceived by Hungarian firms considerably exceeds the EU average in all three sectors. The proportion of firms complaining in the industry sector started to grow sharply in the second quarter of 2014, while the EU average only increased slightly. The difference was the most conspicuous in the third quarter of 2017, when 83 per cent of Hungarian businesses as opposed to 16 per cent of EU firms believed labour shortage is a major barrier to business. The construction industry and services experienced similar tendencies: while the proportion of those complaining showed a steep increase in Hungary (from 2014 in the service sector and from 2015 in the construction industry), the EU average grew modestly.

Figure 1.3.9 shows sectoral labour shortage in Hungary between 2007 and 2017. Industry was excessively affected by labour shortage, while the services sector and the construction industry experienced a much smaller and similar labour shortage in this period.

In 2007 and 2008, only manufacturing industry was characterised by high (29–39 per cent) labour shortage, which then diminished as a result of the economic crisis and thus in 2009 was nearly as low as the level in the construction industry and services. However, it started to increase again: between 2010 and 2014 it exceeded the figures of the other two sectors by 10–20 per-

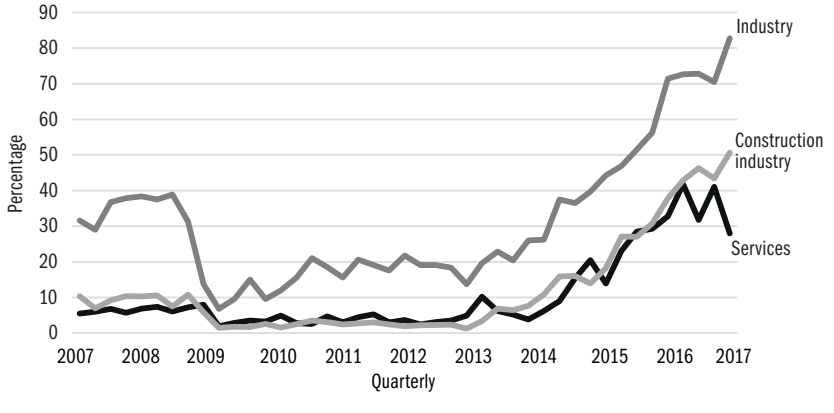
centage points. Then the difference was even larger at the end of 2014 and has been about 20–30 percentage points (sometimes reaching 40 percentage points) since that time.

Figure 1.3.8: The proportion of businesses reporting labour shortage as an obstacle to business activity broken down to economic sectors, in the EU and Hungary, 2007–2017 (percentage)



Source: *European Commission,* Hungarian data: *GKI*.

Figure 1.3.9: The proportion of businesses reporting labour shortage as an obstacle to business activity broken down to economic sectors in Hungary, 2007–2017 (percentage)

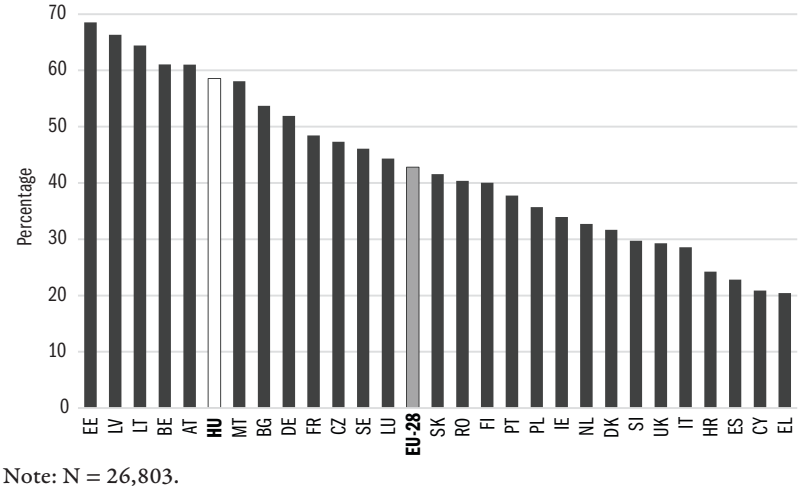


Note: Monthly data on the construction industry are provided as quarterly averages.
Source: *European Commission,* Hungarian data: *GKI*.

Data from the Eurofond European Company Survey

The Eurofond data draw attention to skills mismatch as a source of complaints. The most recent (2013) European Company Survey[3] indicate that four out of ten (42.8 per cent) European firms find it difficult to hire appropriately skilled employees – this is shown in *Figure 1.3.10* 59 per cent of Hungarian firms agree with it; only five member states (Estonia: 69, Latvia: 66, Lithuania: 64, Belgium: 61 and Austria: 61 per cent) reported more serious difficulties than Hungary.

Figure 1.3.10: The proportion of businesses in the EU member states finding it difficult to hire appropriately skilled employees, 2013 (percentage)



Note: N = 26,803.
Country codes are provided at *Figure 1.3.4*.
Source: Authors' calculations based on the 2013 database of the *European Company Survey*.

Hiring school leavers and experienced workers – Surveys by IEER

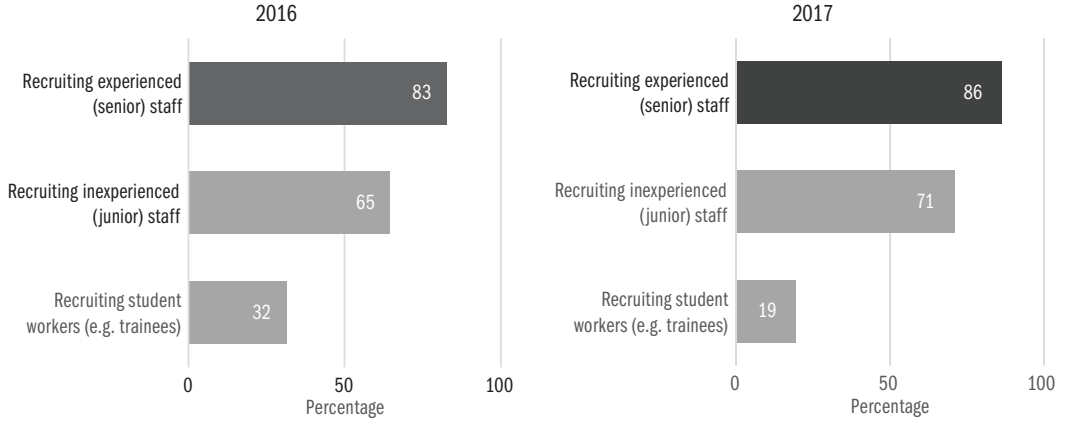
The findings of the mid-year business survey of IEER in 2016 (*Figures 1.3.11* and *1.3.12*) showed that, the majority (83 per cent) of firms facing labour shortage find it difficult to recruit experienced workers, nearly two-thirds (65 per cent) also find it difficult to hire freshers and about one-third (32 per cent) even find it difficult to recruit student workers. The quarterly figures of IEER were similar in 2017: most firms (86 per cent) found it difficult to hire experienced employees, followed by freshers (71 per cent) and student workers (19 per cent).[4]

In conclusion, the above surveys unanimously suggest that complaints of labour shortage, the number of vacancies reported to job centres and the shortage assessed in business surveys have been increasing in Hungary since 2013. At present Hungary is in the "top league" in Europe in terms of complaints of labour shortage.

3 European Company Survey.

4 The two data collections (the quarterly and biannual) are not comparable because they rely on different samples and adopt different data collection methodology. In addition, one of them is conducted in October, the other in July and therefore there may also be seasonal effects.

Figure 1.3.11: The proportion of businesses reporting labour shortage broken down to level of experience of workers they find difficult to recruit, October 2016 and July 2017 (per cent)



Note: 2016: N = 853–1,092, 2017: N = 144.
Source: *IEER*.

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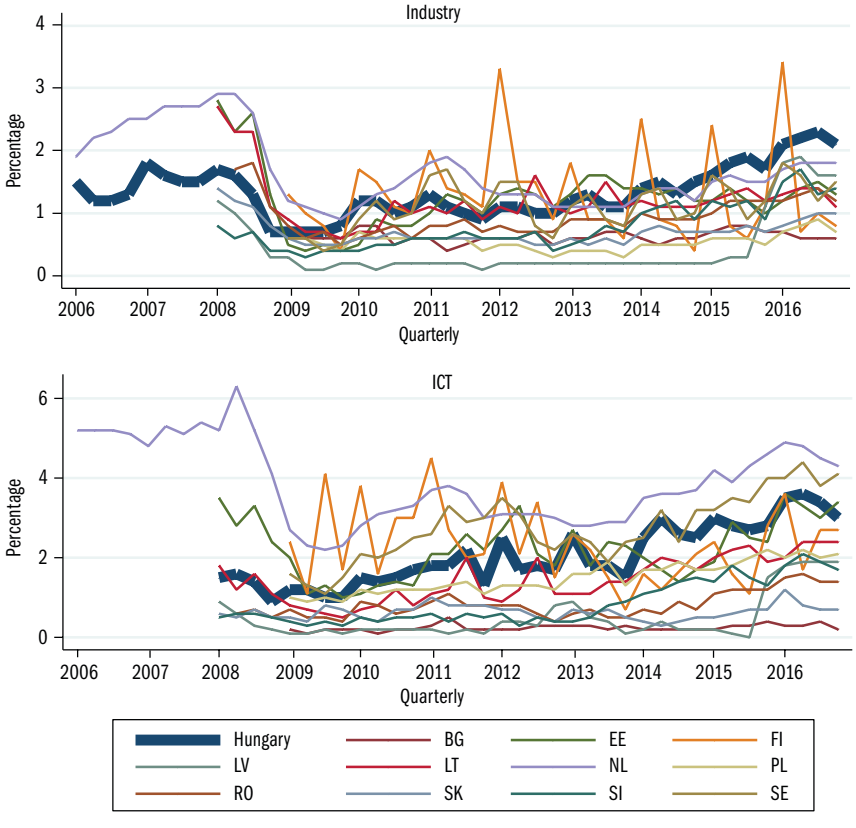
Annex 1.3

Figure A1.3: Vacancies in two sectors as a percentage of the total number of jobs, 2006–2016



Note: according to the Eurostat and HCSO methodology, the definition for job vacancy is "a post that is newly created, unoccupied or about to become vacant in the near the future (within 3 months), for which the employer is taking active steps (e.g. through advertisements, tendering, contacting the National Labour Office, private recruitment agencies, colleagues, friends or acquaintances etc.) to fill with an employee with an employment contract. A post cannot be regarded as a vacancy if it is to be filled with temporary workers, independent contractors, service contracts, by transferring their own employee from another job or with a pupil or student on unpaid, compulsory traineeship. Also posts reserved for those with an employment contract but not obliged to work due to permanent absence (parental leave, military service or sickness leave or unpaid leave exceeding 1 month) cannot be regarded as vacancies either. The rate of vacancies: the number of vacancies expressed as a percentage of total posts (headcount of those participating in the activity of the organisation + number of vacancies)." http://www.ksh.hu/docs/hun/modsz/modsz21.html.

1.4 DISTORTIONS IN VACANCY STATISTICS, CORPORATE AND JOB CENTRE SHORTAGE REPORTS

JÁNOS KÖLLŐ & JÚLIA VARGA

Reportings of labour shortage should be treated with caution for several reasons: not only because they are driven by interests, as mentioned in the Foreword of In Focus, or because it is of no consequence for businesses if they report recruitment intentions that they later relinquish.

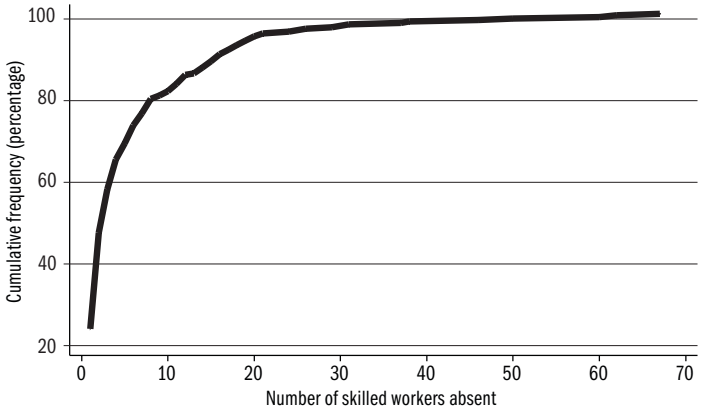
First of all, the type of question such as "How many persons are lacking at your company" do not usually specify the wage levels firms are willing to pay for the missing workers, or how many people would be missing at a higher wage level. This does not mean the question is pointless or the answers are meaningless – it indicates in which areas wage increase intentions or pressure on education policy is to be expected – but it cannot be directly used as an indicator of (excess) demand. Labour demand is not meaningful without wage levels, since it is a *conditional* quantity.

Secondly, these kind of shortage reports are *oversensitive*: their values may change to an extremely large extent as a result of minor changes in labour demand. In Poland, for example, the proportion of firms complaining of labour shortage increased from 42 per cent to 60 per cent in 2006–2007, while it is highly improbable that labour demand increased by nearly fifty per cent within a year (*Rutkowski,* 2007, p 25.). Neither was there increased labour demand four- or six fold in Hungary between 2013 and 2016, although the proportion of businesses reporting shortage grew at this rate. There are two reasons for this oversensitivity:

a) Companies where very few workers are missing also report shortage. The EBRD data collection on Hungary, Romania and Russia for the period of 1997–2000 showed that 36 per cent of Hungarian firms complained of skilled worker shortage but the missing headcount only accounted for 3.2–4.5 per cent of the skilled worker headcount of these firms and for 1.2–1.8 per cent of the total skilled worker headcount, according to estimates by *Commander–Köllő* (2008). When asked, also firms with only a few missing workers tend to point the finger at the insufficiency of supply. As seen in *Figure 1.4.1*, a quarter of the complaining businesses only lack one person, half of them lack one or two persons and two-thirds of them lack 1–4 persons to reach the skilled worker headcount aimed for.

It is apparent from the data reviewed in the previous subchapter that the situation is no different today. While at the end of 2016 80 per cent of manufacturing companies reported labour shortage (*Figure 1.3.9*), other data provided by them revealed that only 2 per cent of all (occupied and unoccupied) posts were vacant (*Figure 1.3.5*).

Figure 1.4.1: Distribution of the 279 firms reporting shortage in the EBRD survey, according to how many skilled workers they lack to reach their planned headcount



Source: Authors' calculations using data of the *EBRD-survey* from 2000 concerning Hungary.

b) The other cause of oversensitivity is that the same vacancy may appear at several points within a certain period. Growing recruitment difficulties are accompanied by an intensifying labour turnover, which in turn affects complaints of shortage because the more intensive flow of workers results in the intensifying movement of vacancies: when a worker moves from firm A to firm *B*, the vacancy at firm *B* moves to firm *A*, provided that firm A intends to maintain that job. When businesses answer the question on shortage based on their recent (involving a shorter or longer period not a point in time) experience, complaints multiply with increasing labour turnover and appear at several points of the vacancy chain. It should be noted that labour turnover indeed intensified in Hungary after the crisis: the Labour Force Survey of the HCSO indicates that the proportion of new entrants (starting their job in the month of the survey or in the previous month) grew from 3–3.5 per cent to 5 per cent in the age group below 35 years, and from a little over 2 per cent to over 3 per cent in the total workforce.[1]

Last but not least, shortage indicators do not always measure what they are intended for: without data on employment, job and regional mobility it is impossible to assess the *net* number of missing workers in an occupation. This is also demonstrated by the labour market information matrix, which is compiled by the public employment service on the basis of enterprise surveys.

Based on enterprise surveys, occupations are classified as ones "with deteriorating status" and ones "with improving status" on the basis of planned job cuts and staff increases reported in the enterprise survey, broken down into categories of extent of the job cuts and staff increases. The tables reveal that the same occupation is often included in both among occupations "with deteriorating status" and occupations "with improving status".

1 Average rates for the periods 1999–2009 and 2010–2016; authors' calculations. Public works participants are not included in this calculation, because their entry mobility is nine fold (!) that of actual employees: 21.6 per cent *versus* 2.4 per cent in the period of 1999–2016 on average.

We wish to demonstrate with data from the 2015 Occupational Barometer of the National Labour Office that very often the same occupations are found among "in-demand" occupations and ones "with deteriorating status" in the same headcount category. *Table 1.4.1* shows an extract from the 2015 edition of the labour market information matrix: the occupations which are included in both categories. The publication states that an occupation may be both in demand and also have deteriorating status but in different geographical areas, however, there are occupations that fall into both categories in the same regions or counties.

Table 1.4.1: Extract from the labour market information matrix of the National Labour Office

Occupations in demand, on the basis of planned staff increases	Occupations with deteriorating status on the basis of planned job cuts
At national level (100 persons or more)	
Simple industry occupation	Simple industry occupation
Simple agricultural labourer	Simple agricultural labourer
Forestry worker	Forestry worker
Heavy truck and lorry driver	Heavy truck and lorry driver
Shop salesperson	Shop salesperson
Hand packer	Hand packer
Freight handler	Freight handler
Locksmith	Locksmith
Shop cashier, ticket clerk	Shop cashier, ticket clerk
Welder, sheet metal worker	Welder, sheet metal worker
Machining worker	Machining worker
Bricklayer	Bricklayer
Bus driver	Bus driver
Waiter	Waiter
The Central Transdanubia region (100 persons or more)	
Mechanical machinery assembler	Mechanical machinery assembler
Assembler of other products	Assembler of other products
Simple forestry, hunting and fishery labourer	Simple forestry, hunting and fishery labourer
Electrical and electronic equipment assembler	Electrical and electronic equipment assembler
Cleaner and helper in offices, hotels and other establishments	Cleaner and helper in offices, hotels and other establishments

Source: *National Labour Office* Labour market barometer, 2015, based on data from the short-term labour market forecast survey in autumn 2014.

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1.5 SHORTAGE AND UNEMPLOYMENT

JÁNOS KÖLLŐ & JÚLIA VARGA

In order to describe the changes in the Hungarian labour market in the context of shortage and unemployment within the conceptual framework presented in the introductory chapter, further methodology problems must be tackled. The primary cause of the difficulty is that – due to the uncertain status of the massive public works schemes – Hungary has no clear indicator for unemployment at present.

The difficulties of measuring unemployment

Unemployment according to the LFS. The unemployment indicator measured in the Hungarian Labour Force Survey (LFS), which follows the ILO and OECD guidelines, and which is generally accepted and suitable for international comparison, defines the unemployed as persons who did not undertake income-generating work in the week prior to the survey, actively sought a job in the previous month and are able to start work within two weeks. The unemployment measured in this way had dropped below 250 by the end of 2016; however, it contains hardly any public works participants looking for a job. The LFS does not provide meaningful information about on-the-job search (including public works participants regarded as employees in the survey). Only *one per* cent of employees reported job search while in employment in the 2015–2016 LFS on average and only *one-tenth of them* entered a new job (and stayed there until the following quarterly survey), and conversely, only *one-fifteenth* of new entrants to a job reported a job search three months prior to entering the job.[1] This clearly indicates that the majority of employees do not reveal to the interviewer if they are looking for a new job and therefore the indicator compliant with the ILO–OECD standards is not suitable for measuring unemployment in the entire population also including public works participants, who do not have a real job.

The registered unemployed. The figure of the unemployed registered by the employment service is distorted by the removal of the unemployed temporarily in public works schemes from the registry for the period of their participation in the schemes. As opposed to the practice adopted in the majority of other countries, they are regarded as employees rather than active labour market program participants, even though the majority of them return to the register within a short time.[2]

The registered unemployed and public works participants together. Considering the unemployed and public works participants together is not without distortions either. This is because participation in public works schemes does not require registration as an unemployed person and in this way it is

1 Authors' calculations based on the 2015–2016 data collections of the LFS.

2 See the Chapter of *In Focus* on public works in the 2014 issue of the Hungarian Labour Market Yearbook (*Varga,* 2015).

problematic to simply "return" public works participants in the register. Furthermore – partly because of getting caught up in public works (*Molnár et al,* 2014) – some of the public works participants do not search and do not wish to have a job in the primary labour market and thus cannot be regarded as unemployed in the usual sense of the word.

Apparently, there is no "best option" in selecting an unemployment indicator and when selecting the second best option, the key issue is how to regard public works. There are several counterarguments against saying that anyone undertaking income-generating work is considered an employee:

– Public works wages fall by 36 per cent, or in the case of qualified workers by 33 per cent behind the minimum wage of the primary labour market and the guaranteed minimum wage for qualified workers (data from 2017).
– The wage does not depend on the productivity of the worker even over the long run.
– Terminating or not entering employment results in severe sanctions: the person loses their eligibility for unemployment assistance for three years.
– There is a huge difference between the levels of labour turnover: it is *an order of magnitude* higher in public works than in the primary labour market.[3]
– The majority of public works participants move back and forth between public works and unemployment. See *Box K1.5.*
– The government does not regard public works participation as "proper" employment: it is planned that from 2018 onwards only 12 months in three years could be spent in public works.[4]

3 The LFS has been measuring the number of entries to public works since 1999. Entry mobility (the proportion of those entering the program in the month of the interview or in the previous month relative to the total number of employees) was 21.6 per cent on average among public works participants between 1999 and 2016, as opposed to 2.4 per cent in the primary labour market. (Authors' calculations.)

4 Government regulation 1139/2017. (III. 20.) on certain labour market measures, Section 1.e): "...the regular re-entry of public works participants into public works schemes must be prevented by the gradual introduction, from 1 June 2018, of a maximum length of participation of one year within a period of three years, unless the business sector does not provide a realistic job opportunity for the individual, that is, he/she is unable to find employment".

K1.5 Public works participants in public works schemes and in the primary labour market

The persons included in the Labour Force Survey (LFS) of the Hungarian Central Statistical Office (HCSO) may be followed up for six quarters, at that point those exiting the survey are replaced by a new cohort selected randomly from the general population. *Table K.1.5.1* follows up on the eight and six cohorts observed as public works participants in the first LFS interview.

The work histories observed may be classified into three types. The first group includes persons who were always recorded as public works participants after entering the survey. The second group includes those who in addition to participating in public works were only registered unemployed or inactive, while the third group includes those who had a market job at least once. A total of 4,775 persons were observed in eight cohorts for four quarters and 981 were observed in six cohorts for six quarters. The survey was limited to people not in education, without a secondary school leaving qualification and aged 15–63.

The data show that the majority of persons observed as public works participants in the first interview (92 and 84 per cent in the two samples respectively) appear again only as public works participant or unemployed/inactive in the subsequent waves. The majority (80 and 70 per cent respectively) of those exiting public works at least once become unemployed for the first time or repeatedly (typically repeatedly).

Table K.1.5.1: The labour market history of public works participants in the Labour Force Survey of HCSO in the one year as well as one and a half years following the first data collection

A) Date of first data collection: Q1 2014 – Q4 2015 (follow-up for four quarters)		
What status did they have in the four consecutive data collections?	Average[a]	Standard deviation[b]
Public works participant on all four occasions	59.3	(5.4)
Only as unemployed or inactive in addition public works participation	32.3	(5.0)
In an actual job at least once	8.4	(3.8)
The number of persons observed	4,775	
B) Date of first data collection: Q1 2014 – Q4 2015 (follow-up for six quarters)		
What status did they have in the six consecutive data collections?	Average[a]	Standard deviation[b]
Public works participant on all six occasions	48.5	(3.8)
Only as unemployed or inactive in addition public works participation	36.0	(4.7)
In an actual job at least once	15.5	(4.4)
The number of persons observed	981	

[a] The average of the four and six data collections.
[b] Intertemporal variance of the quarterly values.
Persons observed as public works participants in the first data collection of the LFS in the period after 2013 are followed up for four or six quarters. The data are limited to people not in education, without a secondary school leaving qualification and aged 15–63.
Source: Authors' calculation.

Based on the above, the ILO–OECD measure is unfit for describing unemployment in the present situation. The number of the registered unemployed considerably underestimates, while their number together with public works participants to some extent overestimates, what we wish to measure: the number of those who do not have a job similar to workers in the primary labour market (similarly stable, at a similar wage level and providing similar promotion opportunities) but who wish to work and earn an income appropriate for their qualification category.

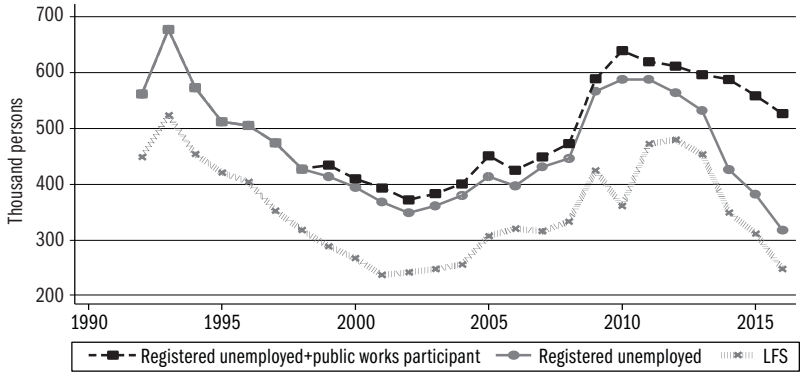
The major unemployment time series are presented in *Figure 1.5.1.* The unemployment as defined by ILO–OECD (LSF) has decreased considerably, following the increase after 2006 and the fast growth during the crisis, and at present it is near the levels observed around the turn of the millennium. However, this is irrelevant due to the above reasons. The number of the registered unemployed dropped from nearly six hundred thousand to slightly above three hundred thousand between 2010 and 2016. Nevertheless, their number including public works participants still exceeds half a million and is higher than at any time between the so-called Bokros package and the global economic crisis.[5]

The data indicate that while the demand conditions for expanding employment are available for some sectors and companies (major export markets are expanding, Hungarian consumption is improving and, as a result of EU grants,

5 The number of public works participants is obtained from the LFS because it is suitable for looking back for a longer period. Data from the LFS and the Institution-based Labour Statistics on public works participants has only differed slightly in the past seven-eight years (see *Eppich–Köllő,* 2014).

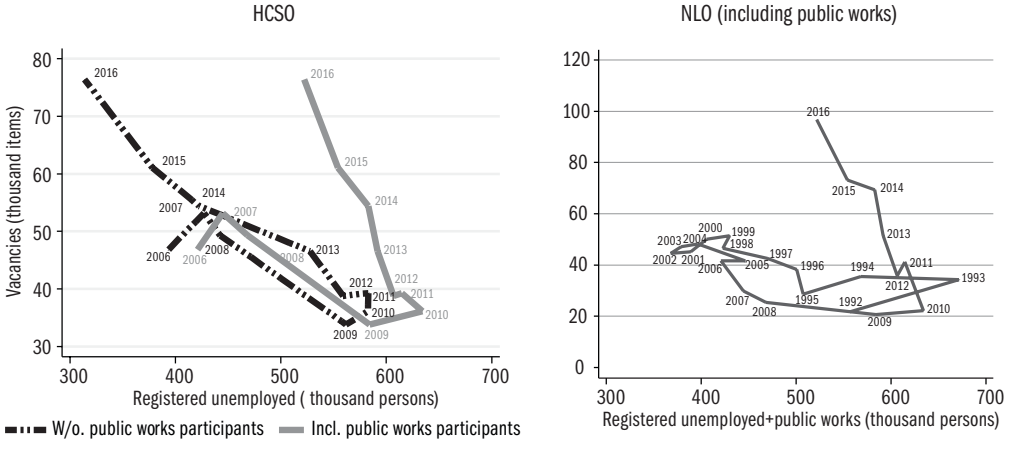
demand for investment is also relatively high), these sectors are unable or unwilling to absorb the existing – rather significant – labour reserve.

Figure 1.5.1: Unemployment between 1992 and 2016



As discussed in Subchapter 1.1, a "good equilibrium" can only emerge near the origin in the space of unemployment (U) and vacancies (V). Further away from the origin, there is a higher risk that the balance of job loss and job finding can only emerge at high U and V. The two parts of *Figure 1.5.2* show the movement of the Hungarian labour market in the U–V space. Unemployment is presented in the left-hand graph with and without public works participants, while the number of vacancies is depicted through HCSO data (left-hand graph), and the National Labour Office (NLO) (right-hand graph).

Figure 1.5.2: Movement of the Hungarian labour market in the space of vacancies and unemployment



The Hungarian labour market is seen moving outwards in the U–V space, unless public works participants are not regarded as unemployed and the HCSO vacancy statistics of the entire economy is used (left-hand graph,

dashed line). However, if we regard public works participants as an external "reserve" for the primary labour market, similarly to the registered unemployed (in other words, the same jobless person is included in the external reserve when he/she participates in public works and when he/she does not), it becomes obvious that the increase in vacancies did not lead to a significant decrease in the number of jobless persons. It is especially true for the lowest segment of the labour market: along with the huge growth in vacancies registered in job centres, half of which are reported by public works providers, the joint number of the registered unemployed and public works participants did not decline. These trends suggest structural mismatch and frictions, the most important of which will be discussed in Chapters 4 and 5 of *In Focus*.

Changes in the Beveridge curves in Europe

The movement of European countries in the *U–V* space – the relationship between unemployment and vacancies – is presented as Beveridge curves in *Figures 1.5.3–1.5.5.* The impact of the economic crisis is evident, just like differences between the countries in the period of recovery. Because the European countries (partly excepting Slovakia) do not have public works programmes similar to the ones in Hungary, the ILO–OECD unemployment indicators are used in the graphs. Vacancy figures are based on the abovementioned Eurostat statistics.

When unemployment and the proportion of vacancies move in opposing directions, it indicates the impact of economic cycles: periods of expansion are characterised by low unemployment and a high proportion of vacancies, while recession is characterised by the opposite. The outward movement of the curve, i.e. when the proportion of vacancies is higher at the same level of unemployment, indicates the deterioration of matching, as discussed in Subchapter 1.1.

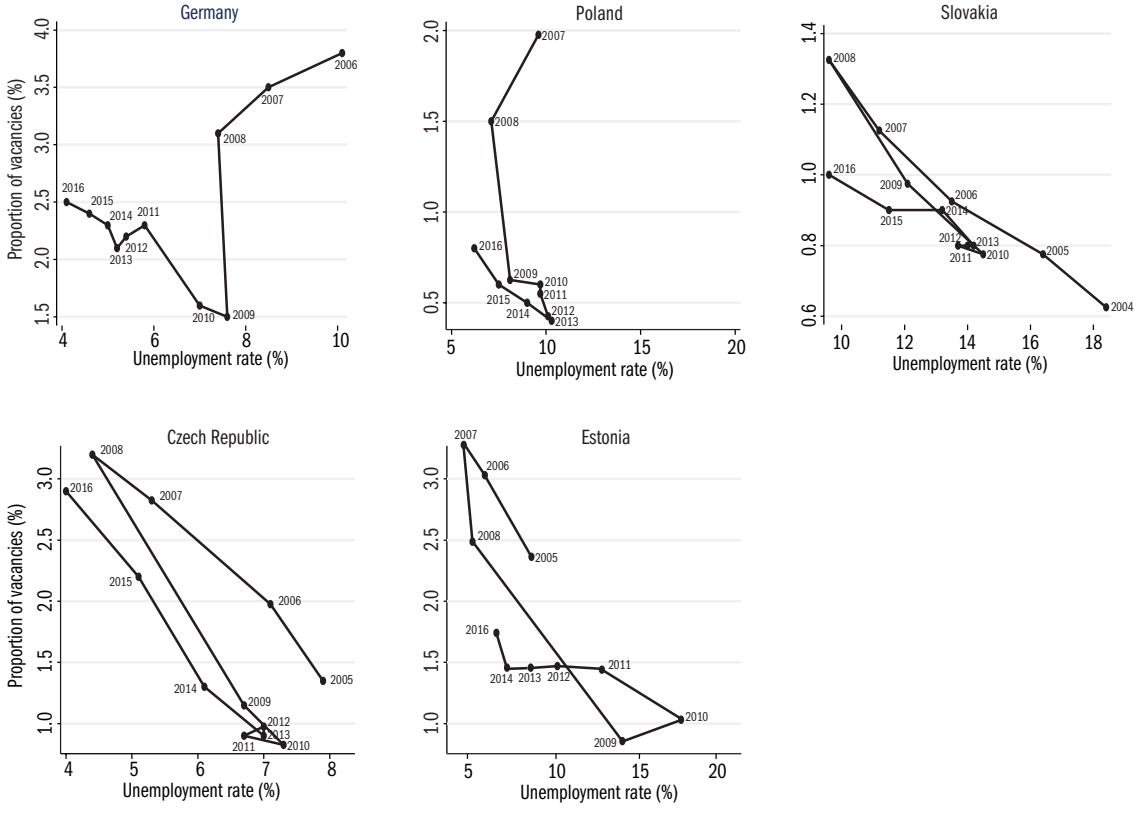
The Beveridge curve moved outwards during the crisis, from 2008–2009 onwards, in all European countries except Germany. Following that period differing trends are seen. *Figure 1.5.3* shows the curves of countries that after the crisis achieved better matching compared to pre-crisis times, while *Figure 1.5.4* includes countries that by and large returned to their pre-crisis state and finally *Figure 1.5.5* includes countries with deteriorating matching.

As a result of the crisis, the prior improving matching led to the sudden drop in the proportion of vacancies in Germany but after 2010 matching once again started to improve. There was a relatively small decline in matching followed by improvement in Poland, Slovakia and the Czech Republic and Estonia, where matching started to improve in 2010.

After the recession, the Netherlands, the United Kingdom, Lithuania, Latvia and Bulgaria managed to return to pre-crisis levels of matching. The pro-

portion of vacancies and unemployment rates are also similar to the levels before the crisis. Romania experienced improvement between 2015 and 2016, after which it achieved matching similar to or even slightly better than before the crisis.

Figure 1.5.3: Countries with improving matching

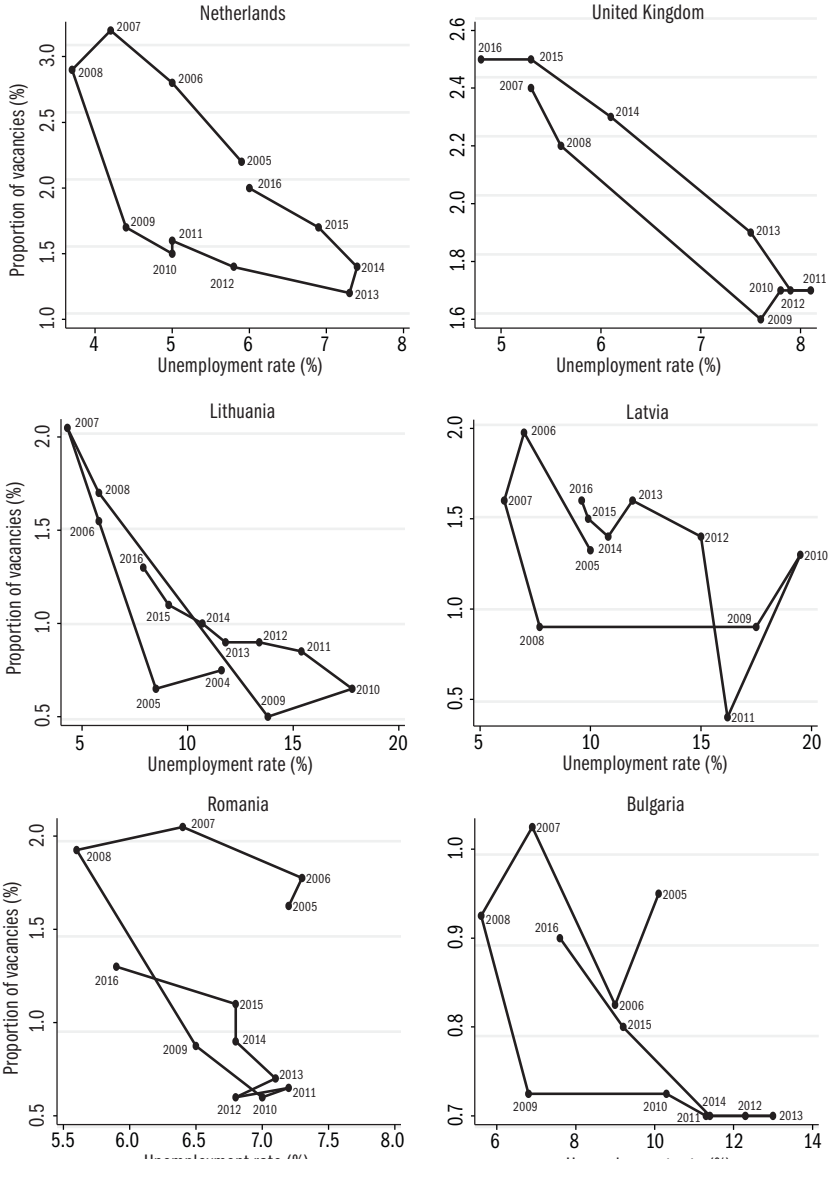


Source: Based on *Eurostat* data.

Finally, in some of the countries with deteriorating matching (Ireland, Sweden, Slovenia and Finland) the decrease in unemployment was accompanied by higher level and more intensive increase of vacancies following the crisis. Spain and Greece had a considerably longer crisis than other countries and, despite improvement in recent years, matching is still worse than before. Austria experienced improving matching between 2009 and 2011 but after that time the market moved outwards in the *U–V* space until 2016.

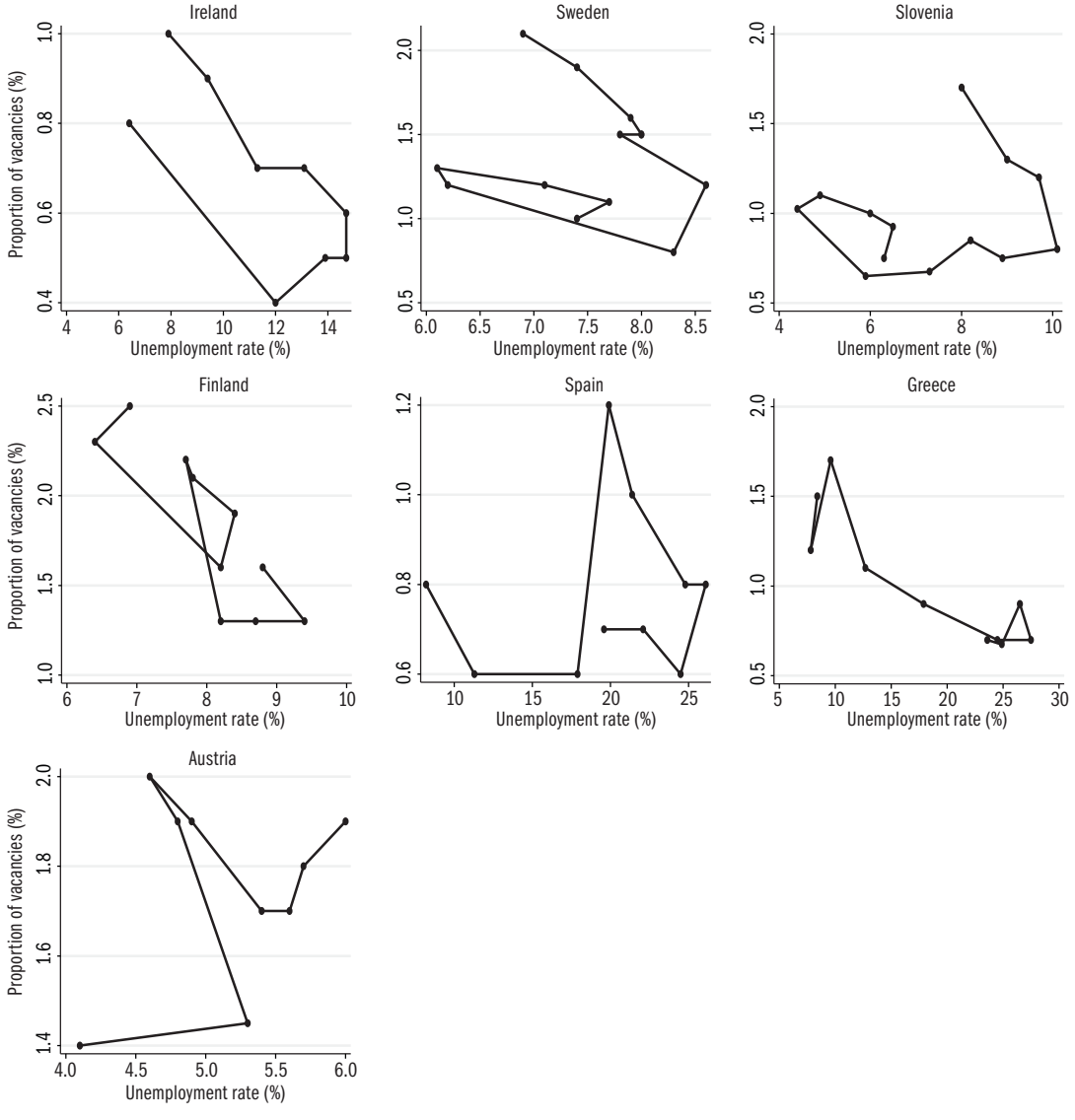
In conclusion, Hungary is not alone in showing increasing frictions and structural tensions: mainly Ireland, Sweden and Slovenia have had similar movements in the *U–V* space.

Figure 1.5.4: Countries returning to matching similar to levels before the crisis



Source: Based on *Eurostat* data.

Figure 1.5.5: Countries with declining matching



Source: Based on *Eurostat* data.

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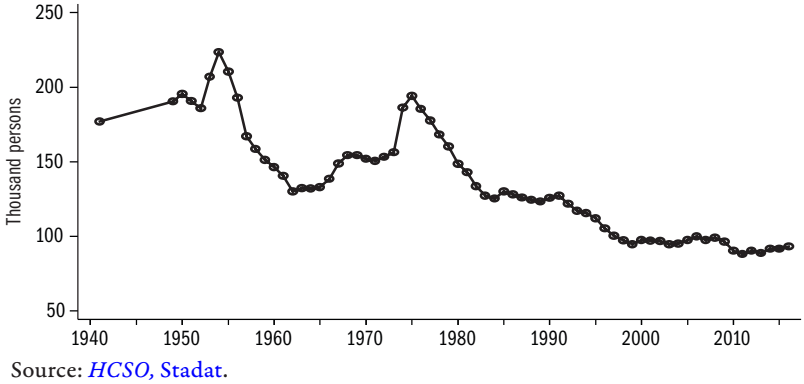
2. THE "USUAL SUSPECTS" – DEMOGRAPHIC REPLACEMENT AND EMPLOYMENT ABROAD

2.1 DEMOGRAPHIC REPLACEMENT

ZOLTÁN HERMANN & JÚLIA VARGA

Demographic replacement means the change in the composition of the population, which is affected by changes in birth rates and life expectancy of the population, changes in the educational attainment of entering and exiting cohorts as well as immigration and emigration. Demographic replacement of the active age population is also determined by changes in retirement regulations and education policy. Demographic replacement has an impact on labour supply and thus on trends in labour shortage. In recent years, populous age groups (the so-called "Ratkó children") have retired or are retiring and less and less populous ones enter the labour market (*Figure 2.1.1*). This Subchapter examines how this may influence the labour shortage. Only differences in birth rates and changes in education policy and retirement regulations are taken into account, immigration and emigration are not included. In addition to trends that have already taken place, expected future changes are also discussed.

Figure 2.1.1: The number of live births 1940–2016



Source: *HCSO,* Stadat.

The impact of demographic replacement on labour supply is estimated in a simple model. The model describes changes in the number of people potentially on the labour market. Demographic replacement is defined as the difference between the number of people entering the labour market from the school system and the number exiting the labour market (due to retirement or death). Demographic replacement in a given educational attainment category is as follows:

$$D_t^j = N_{t,k=entagej}^j - \left(\sum_{k=entagej}^{retage} N_{t-1,k}^j \times p_k^j + \mathrm{N}_{t,k=retage}^j \right), \quad (1)$$

where D is the balance of demographic replacement in the j educational attainment category in year t, while N is the number of people in the population aged k in the year concerned. The first element on the right-hand side of the equation is the number of new entrants to the labour market: the headcount of the cohort that reaches the entry age in year t (this is represented by the variable *entagej* relevant to educational attainment j). The second member represents the number of outgoing workers. Death in active working age (age between entry age and retirement age) is also regarded as exit. P represents the probability of death at age k in j educational attainment category. The other large group of exiters consist of retiring workers. In year t, the cohort reaching the effective retirement age (*retage*) in that year takes retirement.[1] Calculations have been made for women and men separately but – for convenience – equation (1) does not contain indexes designating gender.

Cumulating the different educational attainment categories, the balance of demographic replacement for the entire active age population is obtained:

$$D_t = \sum_j N^j_{t,k=entagej} - \left(\sum_j \sum_{k=entagej}^{retage} N^j_{t-1,k} \times p^j_k + \mathrm{N}_{t,k=retage} \right). \qquad (2)$$

The model roughly describes changes in the size of the active age population, relying on two important simplifying assumptions. Firstly, it is assumed that everyone retires when reaching the effective retirement age, that is, neither early retirement (e.g. due to invalidity), nor employment after retirement are taken into account. Secondly, for convenience, it is assumed that young people with a tertiary qualification enter the labour market at the age of 25, and with a lower qualification at the age of 20. Therefore, in each year, in each educational attainment category, the members of the same cohort enter the labour market. In fact, entrants belong to a few consecutive cohorts, their headcount would be possible to determine as the weighted average of the adjacent cohorts.[2]

The calculations are based on census data from 2011. The data are aggregated on the basis of cohorts and not educational attainment. When estimating death rates, death probability calculated from death rates published by HCSO in the early 2000's broken down to age, gender and qualification level were used for the whole period (i.e. death rates are assumed unchanged). Single year of age population estimates for each year are calculated using death probability, net of mortality after 2011 and calculated backwards before 2011.

The size of educational attainment categories is the same as the figure actually observed in the census in the case of cohorts born before 1987 (or before 1982 in the case of higher education graduates), while in the case of younger cohorts, the latest observed educational attainment proportions were applied, assuming that the proportions of educational attainment remain unchanged.[3]

The balance of demographic replacement in an educational attainment category depends on two factors: the difference in the size of cohorts entering

1 In years when the retirement age is specified for half years, we estimated that half of the cohort of the given year retires.

2 We opted for the simpler procedure because these weights are difficult to determine precisely, and they probably change over time.

3 We cannot assume that the education of younger cohorts had typically finished by the year of the census. Higher education graduates are assumed to achieve the educational attainment proportion that is largely considered final at the age of 30.

and exiting and the difference in the proportion of educational attainment categories within cohorts entering and exiting, i.e. long term changes in birth rate and schooling. In order to assess the relative weight of the two factors, we have calculated the balance of demographic replacement with no changes in birth rates, that is, with cohorts of equal size. The demographic replacement obtained in this way only indicates the impact of changes in the proportions of educational attainment. The balance of demographic replacement with unchanged population size is:

$$\tilde{D}_t^j = B_t^j - K_t^j \times \frac{\sum_j B_t}{\sum_j K_t}, \quad (3)$$

where B_t^j represents the number of entrants and K_t^j represents the number of outgoing workers in educational attainment category j, while B_t and K_t are the total number of entrants and outgoing workers in year t.[4]

Figure 2.1.2 shows the changes in the number of new entrants and outgoing workers and in demographic replacement broken down to gender in the entire active age population, and *Figure 2.1.3* shows the changes in the number of new entrants and outgoing workers broken down to gender in the various educational attainment categories. The extent of demographic replacement is given in thousand persons in *Table 2.1.1* and proportionately to the population in 2011 in *Table 2.1.2*.

4 In years when the number of outgoing workers differed not only because of the size of cohorts but also because, due to transitional rules, only a part of the cohort retired, this difference was adjusted first, that is, we made the calculations as if the whole cohort had retired.

Figure 2.1.2: Demographic replacement and the number of new entrants and outgoing workers in the active age population, 2001–2030

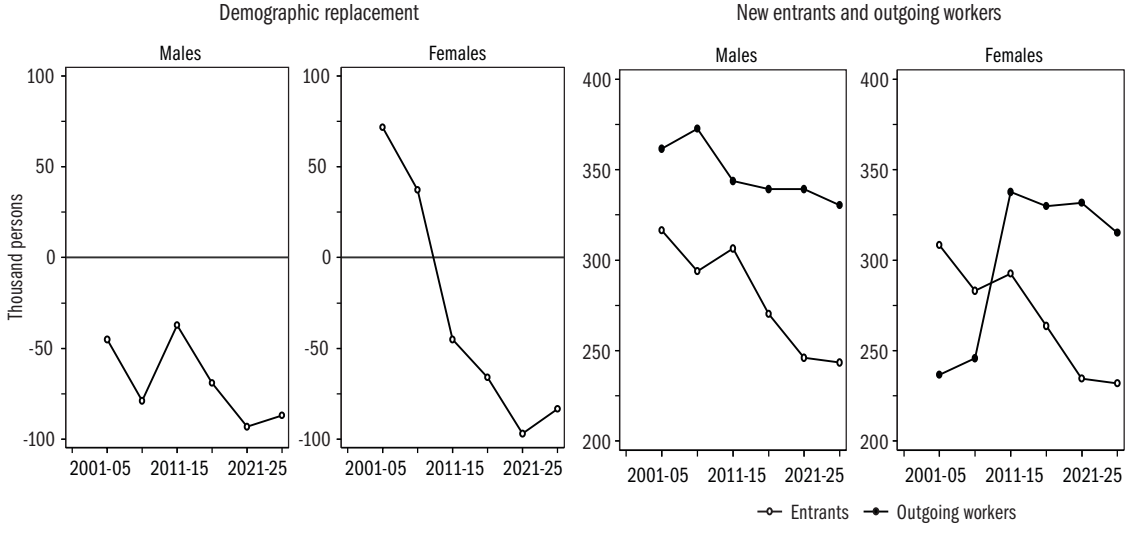
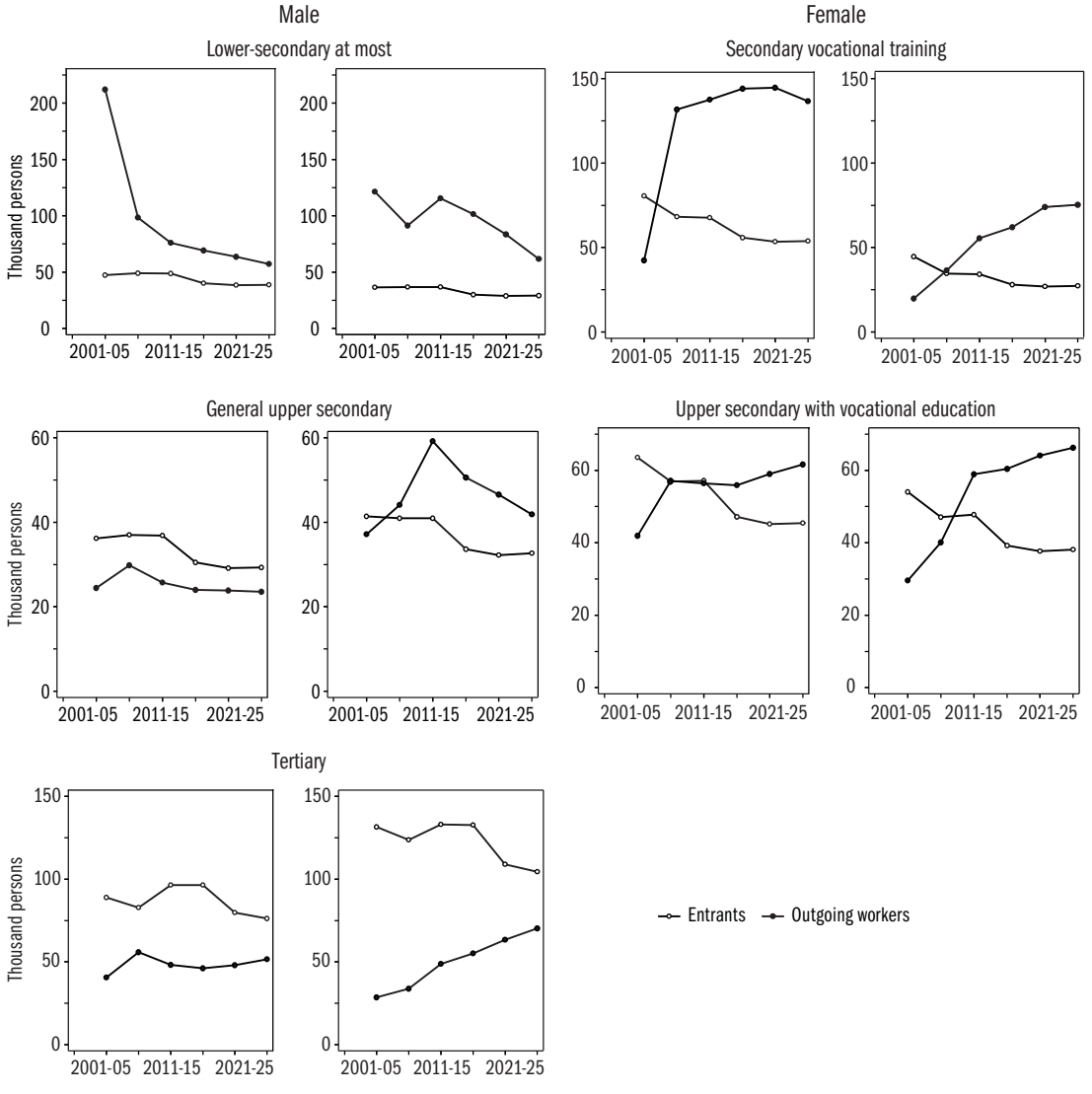


Figure 2.1.3: New entrants and outgoing workers broken down to educational attainment, 2001–2030



The size of the entire active age population decreased by 15 thousand between 2001 and 2010, which is primarily because the decreasing headcount of the cohorts in that period was offset by the increase of the retirement age of women. The size of the entire active age population will decrease by 217 thousand between 2010 and 2020 and by 360 thousand between 2020 and 2030.

The entering cohorts are more educated than the outgoing ones but because the outgoing cohorts are larger, the headcount of active-age people decreases in every educational attainment category except in the category of higher education graduates. The number of higher education graduates will increase by

260 thousand between 2011 and 2020, while the number of those with an upper secondary and vocational qualification will decrease by 40 thousand, the number of those with a general upper secondary qualification will decrease by nearly 18 thousand, the number of those with a vocational training certificate will decrease by 213 thousand and the number of those with a lower secondary qualification will decrease by 206 thousand.

Table 2.1.1: Demographic replacement between 2001–2030, by educational attainment and gender (thousand persons)

	Male			Female		
Educational attainment	2001–2010	2011–2020	2021–2030	2001–2010	2011–2020	2021–2030
Lower secondary at most	–213.9	–56.3	–43.6	–139.5	–150.0	–87.0
Vocational training certificate	–25.4	–158.1	–173.9	23.0	–55.2	–95.0
General upper secondary qualification (matura)	18.8	17.6	11.0	1.1	–35.2	–23.5
Upper secondary and vocational qualification	21.4	–8.0	–29.9	31.5	–32.3	–54.5
Tertiary	75.2	98.4	56.4	192.7	161.5	79.6
Total	–123.9	–106.3	–180.0	108.9	–111.1	–180.3

Table 2.1.2: Demographic replacement between 2001–2030, by educational attainment and gender in proportion to the active age population of 2011 (percentage)

	Male			Female		
Educational attainment	2001–2010	2011–2020	2021–2030	2001–2010	2011–2020	2021–2030
Lower secondary at most	–45.0	–11.8	–9.2	–24.6	–26.5	–15.4
Vocational training certificate	–2.4	–14.8	–16.3	3.9	–9.4	–16.2
General upper secondary qualification (matura)	7.4	6.9	4.4	0.3	–8.3	–5.5
Upper secondary and vocational qualification	4.0	–1.5	–5.6	5.4	–5.6	–9.4
Tertiary	15.1	19.8	11.3	27.5	23.1	11.4
Total	–4.4	–3.8	–6.4	3.8	–3.9	–6.3

There are substantial differences according to gender: there is a considerably greater increase in the number and proportion of higher education graduates and a decrease in the number and proportion of those with a lower secondary qualification at most among women. The proportion of men with a lower secondary qualification decreased dramatically, by more than 45 per cent between 2001 and 2010, because the outgoing cohorts had a high proportion of low-qualified men. A further significant decrease is expected between 2011 and 2020: by 12 per cent among men and by more than 26 per cent among women. The proportion of men with a vocational training certificate will decrease by 15 per cent and that of women by 9 per cent between 2011 and 2020 and a similar decrease is expected in the following decade. The proportion of men with a tertiary (higher education) qualification will increase by

20 per cent and that of women by 23 per cent between 2011 and 2020 and the following decade will see a slower – 11–11 per cent – growth unless there are considerable education policy changes.

Figure 2.1.4: The impact of changes in birth rates on demographic replacement broken down by educational attainment, 2001–2030

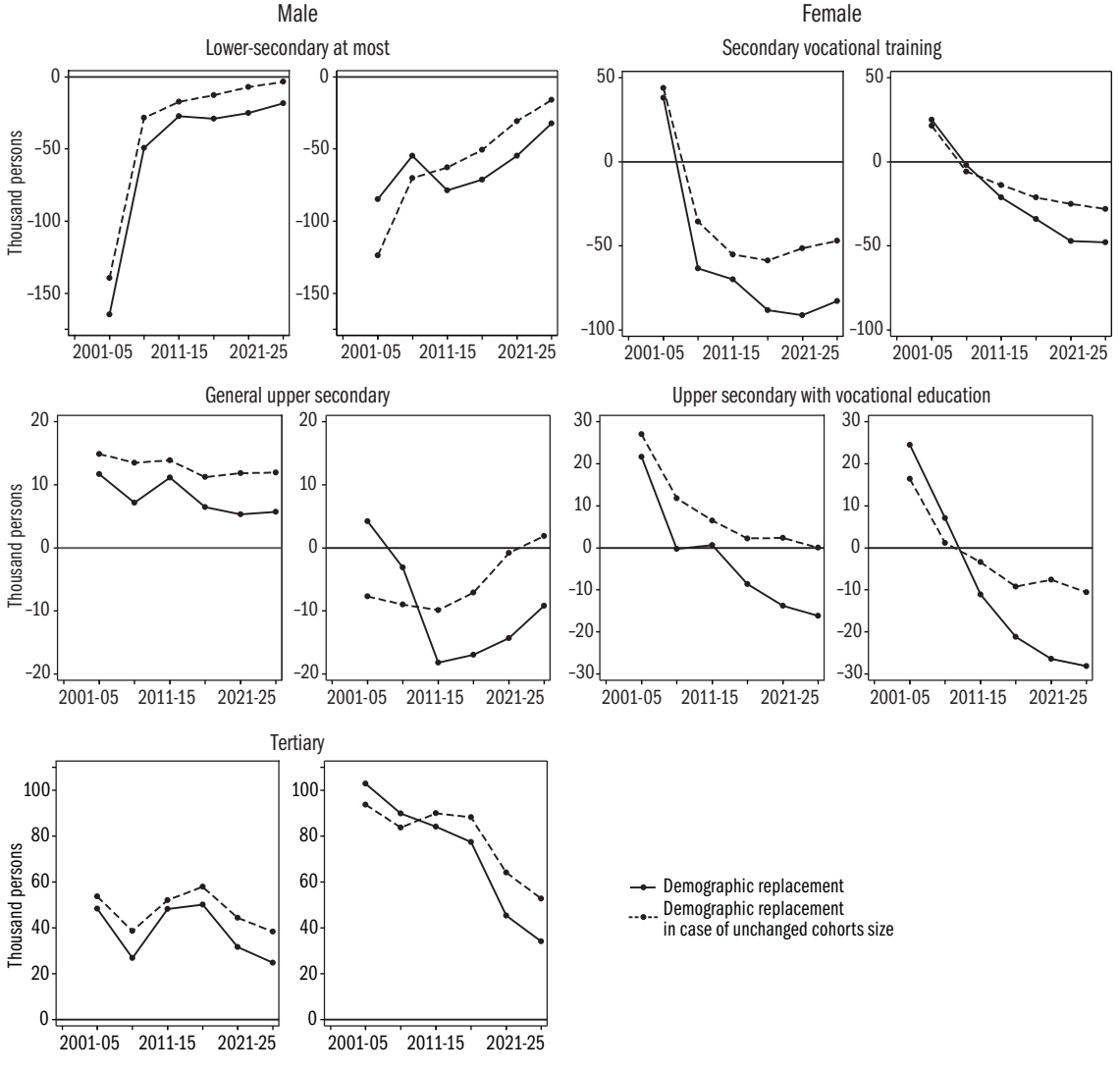


Figure 2.1.4 shows the estimates for the impact of the difference in the size of entering and outgoing cohorts on demographic replacement and how demographic replacement would change if birth rates were unchanged, that is, all cohorts were the same size. When the two curves are close to each other

and are largely parallel, it indicates that differences in schooling play a key role in demographic replacement, since identical cohort sizes would have resulted in the same increase/decrease in the headcounts of educational attainment categories.

As seen in *Figure 2.1.4*, this is the case among the lowest qualified – with lower secondary qualification at most – where the headcount would have decreased similarly in the case of identical cohort sizes. And this is also the case with higher education graduates, where the headcount would have increased similarly. Trends are mixed in the other educational attainment categories. In the general upper secondary category, the headcount of men would have increased to a similar extent with identical cohort sizes, because a larger proportion of men have obtained this qualification than before. However, in the demographic replacement of those with a vocational training certificate, changes in the size of cohorts played just as important a role as differences in schooling.

As a result of demographic replacement, the active age population will decrease by about 6 per cent between 2011 and 2020 but its educational/schooling composition will considerably improve. Although the decrease is significant, so far it has not been substantial enough to play a key role in labour shortage tendencies. Emigration, on the other hand – which we have not investigated – may reinforce the effect of these processes. In addition, in the following decade (until 2030) there will be larger decreases (of more than 12 per cent) in the number of active age workers and more significant changes in the schooling composition unless retirement regulations and education policies are amended.

2.2 THE IMPACT OF DEMOGRAPHIC REPLACEMENT ON EMPLOYMENT STRUCTURE

ÉVA CZETHOFFER & JÁNOS KÖLLŐ

The currently available data sources do not provide a comprehensive overview of the impact of demographic replacement in a broad sense – including entry to the labour market from education and immigration on the one hand, and, on the other, retirement, losing the capacity for work, death before retirement and emigration – on *employment structure*. By the individual-level integration of education, employment, healthcare and retirement registries there will be a possibility for a thorough investigation in a few years' time but at present it is only the Labour Force Survey (LFS) of the Hungarian Central Statistical Office (HCSO) that provides a comprehensive but – because of the small number of observations and the uncertainties of self-reported variables – necessarily inaccurate picture.

It is possible to identify those entering the labour market from education or entering retirement or permanent inactivity from the labour market in the LFS in several ways – relying on the panel aspect and the retrospective questions. The survey enables following a person for six quarters and the retrospective questions allow looking back for a further one year from the 1.5-year-long panel. Two questions of the survey were used for identifying the groups of entrants and outgoing workers, which refer to the activities of the respondent at the time of the survey and one year prior. *Entrants* are defined as persons working at the time of the survey and studying one year before it. *Outgoing workers* are persons reporting themselves as old age pensioners or incapacitated at the time of the survey and working one year prior to it. The occupation of outgoing workers is identified on the basis of the last HCSO code prior to retirement or inactivity, while that of entrants is identified on the basis of the code at the time of the survey.[1] Because of the low number of cases in the sample, several occupational groups and several periods were merged.[2]

The exit data in *Table 2.2.1* is approximately the same as the number of those exiting the labour market to retirement or incapacity, since the overwhelming majority of incapacitated persons claim to receive a disability pension or a similar benefit. 96 per cent of respondents reporting themselves to be old age pensioners responded to another question as receiving a pension in the January-March 2010 data collection of the LFS and vice versa: 96 per cent of those reporting receiving a pension identify themselves as old age pensioners when answering a question about their labour market status. Similarly, 99 per cent of those identifying themselves as incapacitated reported receiving a disability pension, while 87 per cent of those reporting receiving a disability pension identified themselves as incapacitated.

1 HSCO: Hungarian Standard Classification of Occupations. Occupations in the armed forces are not included.

2 The retrospective questions only reveal whether the respondent was in employment a year before but his/her job at that time was not necessarily his/her final one before exiting employment. Employment abroad or participation in public works schemes also qualify as employment. The database does not verify permanent emigration, which involves the dissolution of the household or exiting the household.

Table 2.2.1: The number of entrants to the labour market from education and from the labour market to retirement and/or incapacity according to estimates based on the Labour Force Survey of the HCSO, 2006–2015 (thousand persons)

	From education to work	From work to retirement	Balance (entrance-exit)
Those in graduate professions, senior positions, business leaders			
2006-2010	100	123	-23
2011-2015	97	115	-18
Those in other intellectual professions, office workers			
2006-2010	126	124	2
2011-2015	133	152	-19
Those in services (all occupations except industrial ones)			
2006-2010	91	86	5
2011-2015	114	105	9
Those in industrial occupations			
2006-2010	56	80	-24
2011-2015	57	58	-1
Assemblers, machine operators, those in elementary occupations			
2006-2010	58	110	-52
2011-2015	109	144	-35

Note: The table contains weighted totals, in thousand persons.
The number of observations: 9,937 entrants, 11,306 outgoing workers. The average cell size in the case of entrants is 662 persons, while in the case of outgoing workers it is 754 persons. The cases were weighted with the weights provided in the survey.
From education to work: working at the time of the data collection, studying one year prior to it. Respondents are placed into occupational categories based on their occupation at the time of data collection.
From work to retirement: pensioner or incapacitated at the time of data collection, working one year prior to it. Respondents are placed into occupational categories based on their last occupation. When identifying respondents, their self-classified labour market status is taken into account. Each person is included only once, at the first observation when he/she meets the above criteria to qualify as an entrant or outgoing worker (exiter).

It is only partially possible to verify the data externally. We estimate the joint number of those entering retirement or incapacity in the period of 2006–2010 to be 523 thousand. In the same period, the number of newly granted old-age, disability and trauma disability pensions was 501 thousand.[3] It is not possible to make similar calculations for the period of 2011–2015 because disability pensions were "abolished" (converted into a social security benefit), while most of the persons involved still identify themselves as being on disability pension. LFS data and data from the Central Administration of National Pension Insurance can only be collated with some inaccuracy because some of the persons in retirement in year t and working in year $t-1$ according to the the LFS do not retire in year t but in year $t-1$. In addition, the population entering retirement includes a considerable number of unemployed or inactive persons. Nevertheless, the orders of magnitudes are the same. The estimates for the entrants from education to the labour market cannot be externally verified. The only reference point is the number of graduates com-

3 *Fazekas–Blaskó* (2016) p. 251. The calculation does not contain data on the personnel of the armed forces.

pleting higher education, which was 162 thousand between 2006 and 2010.[4] The number of entrants to graduate occupations estimated in the table is significantly lower (100 thousand persons), but this is not necessarily contradictory, because some of the graduates do not take up employment, others find employment in jobs not requiring a higher education degree, while some of them go abroad and therefore are not included in the data collection a year after their graduation.

Finally, we should compare the estimates for the balances of demographic replacement with the changes in populations observed in the LFS. For this, the period of 2006–2010 is considered again and the data collections Q4 2005 and Q4 2010 of the LFS are used. The populations changed as follows (estimated balances from the table are given in brackets): graduate occupations 30 (–23), other intellectual 0 (2), services –28 (5), industry –88 (–24), unskilled and semi-skilled workers –12 (–52). The differences are not critical, considering that changes in populations are also influenced by unemployment (which was much higher at the end of 2010 than at the end of 2005 and mainly affected physical jobs), emigration (which primarily influenced the headcounts of skilled workers in the industry and service sectors), the expansion of public works programmes (resulting in an increase in the headcounts in elementary work) as well as taking up employment before completing higher education studies (as a result of which a lot of future graduates are observed in jobs not requiring a higher education degree).

Based on the above comparisons, estimates concerning demographic replacement may be regarded as a rough approximation. *The findings of the calculations are summarised below.*

Demographic replacement resulted in a loss in all occupational categories except the services sector and other intellectual occupations in 2006–2010. The most substantial loss was suffered by the unskilled and semi-skilled workforce despite an increase in entrants from education due to the excessive expansion of public works after 2011. The reason for this is because the impact of large cohorts of unskilled workers reaching the retirement age or losing their capacity to work was more significant.

The data do not confirm that demographic replacement or the different educational attainment levels of entrants and exiters endanger the supplies for industrial skilled labour. Between 2010 and 2015 the number of entrants and exiters was balanced in this sector, while demographic replacement caused a loss in graduate and other intellectual occupations.

4 Ibid. p. 228.

Reference

FAZEKAS KÁROLY–BLASKÓ ZSUZSA (eds) (2016): The Hungarian Labour Market, 2016. IE CERS HAS, Budapest.

2.3 LABOUR EMIGRATION AND LABOUR SHORTAGE

ÁGNES HÁRS & DÁVID SIMON

The public discourse regards it as obvious that the cause of labour shortage is specialists going abroad to work and additionally in professional circles it is a prevalent view that the reason for the increasingly frequent complaints of labour shortage is growing employment abroad. Even though labour migration in itself does not explain this phenomenon, the connection is obvious. This subchapter investigates the supply side of this relationship, the extent and selectivity of outward migration, the structure and characteristics of the jobs left behind as well as the dynamics of emigration and homecoming.

Few studies have examined the impact of outward migration on the labour market of countries of origin: the ones that did so, revealed the most significant impact on the emigration of qualified professionals, wages and wage differences. (*Docquier et al,* 2013). These impacts may vary considerably, depending on economic differences between countries and migration expectations (*Massey,* 1990). Since 2004, the gradual realization of the free movement of workers has brought about an accelerated East-West labour migration in the European Union, causing sudden, unexpected changes in the labour markets of both host countries and countries of origin (*Kahanec et al,* 2016). Studies evaluating the impact of outward migration using simulation models found that the most important beneficial effects on the labour markets of countries of origin are increasing wages and decreasing unemployment along with the potential adverse effects of labour shortage, especially in certain occupations coupled with increasing labour demand (*Zaiceva,* 2014). Wage effect in response to outward migration was seen in groups that were affected by especially strong outward migration (*Dustmann et al,* 2015; *Elsner,* 2013). In the Baltic countries, *Hazans* (2016) found innovative adaptation in response to the large scale outward migration.

Labour supply has decreased since 2004 due to continuous outward migration; and the increasingly frequent reporting of shortages as well as the labour shortage seen in the new EU member states in general has emerged virtually at the same time in the growing economies of the countries of origin in Eastern Europe (*Mara,* 2016). In the following, Hungarian specificities will be discussed: the impact of employment abroad, which started to expand later than in other Eastern European countries and which has been growing strongly since 2011.

Data, weighting and sample design

The assessment of migration and especially emigration is hindered by the lack of statistical data (*Docquier et al,* 2013), therefore we have adopted a new

method. We used the quarterly figures of the Labour Force Survey (LFS) of the Hungarian Central Statistical Office (HCSO) for the period 2006–2016. The LFS also contains the population of persons who work abroad but have a member of their household in Hungary; however, it does not contain those who moved abroad with their families.[1] Mirror statistics, i.e. the immigration data of other countries offer a more accurate picture of the total population of Hungarian citizens living abroad but they do not contain detailed information on activity and employment (*Hárs,* 2016). Such data are included in the 2011 census of some European host countries[2] – we relied on them to adjust the sample of workers exiting the Hungarian labour market in order to work abroad.

We adjusted the population working abroad, identified on the basis of LFS data, with weightings. We performed separate analyses for the three major host countries (Austria, Germany and the United Kingdom) and a joint analysis for the remaining countries. The number of workers seen in the LFS was adjusted to the total population observed in the mirror statistics (*Hárs,* 2016) by adjusting the population rate with the employment rate of the host countries estimated on the basis of the 2011 census (0.74 in the United Kingdom, 0.67 in Germany). The effect of seasonal fluctuations seen in the quarterly figures was taken into account according to the complete time series. In the case of Austria, where the number of commuters is considerable and commuters are included in the LFS data, quarterly figures from the Austrian Employment Service (AMS) were used. In the case of the remaining host countries, the mean of the weights used for the three major host countries were applied, assuming that the proportion of the "missing population" is similar in these countries. The weights obtained in this way were combined with the original weights adopted by the HCSO.

We presumed that the structure of employment abroad as well as its distribution by host countries, indicated by the LFS, is not considerably different in the total population living abroad, thus the weighted LFS statistics fairly accurately show the actual structure and proportions of the population working abroad.[3] *Figure 2.3.1* presents the estimated headcount of employees calculated from LFS data adjusted by mirror statistics.

The employment of the population aged 18 years or more in the period 2006–2016 was evaluated using the adjusted sample of the LFS, excluding the employment of old-age pensioners. LFS statistics contain those *working* abroad, therefore those unemployed, inactive or studying abroad are excluded (*Hárs–Simon*, 2016). When examining flows, entrants to employment abroad are defined as living in Hungary in the preceding quarter and working abroad in the next, while returnees are persons working abroad in the preceding quarter and working in Hungary in the next.[4]

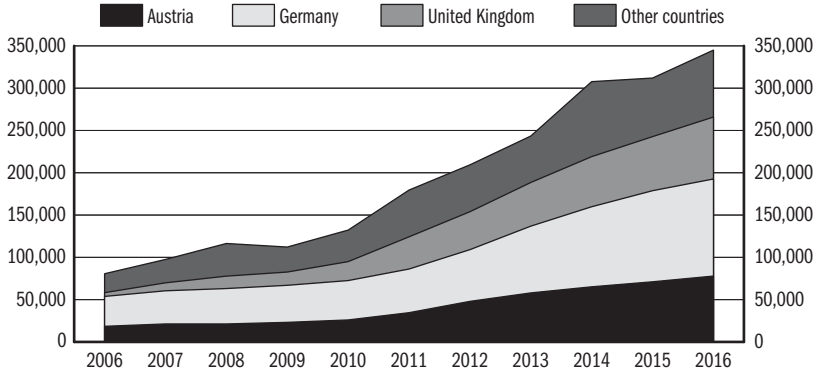
1 *Bodnár–Szabó* (2014) and *Hárs–Simon* (2016) examined both those working abroad and those commuting, while *Blaskó–Gödri* (2016) examined families that have moved.

2 See the Census.

3 Selection of migration differs by host countries. The differences between the selection of working abroad and moving abroad with the family are not known – however, selection is influenced by the labour demand of the host countries. Moving usually takes place in several stages: after a family member finds employment, the entire family moves, therefore events taking place before moving may be included in the LFS in the case of families too.

4 The LFS database enable us to follow the career of an individual for six quarters but because of panel attrition, this approach would provide a less accurate result of flow, and in the case of exiters an even higher rate of panel attrition is likely.

Figure 2.3.1: The estimated number of Hungarian citizens working abroad in major host countries, 2006–2016[a]



[a] Applying the employment rate estimated using the LFS data adjusted by mirror statistics.

Source: Authors' calculations using *LFS* data.

Based on the ISCO–88 categories, we developed occupational groups, identifying expected skill shortages, to be able to examine suspected shortages. The detailed categories are presented in *Table A2.3.1* of *Annex 2.3*.

Exit and return – the actual proportion of labour emigration

When discussing employment abroad, one usually thinks of outward migration from the Hungarian labour market; however, returnees must also be considered. (*Horváth,* 2016). A more accurate picture of labour emigration is obtained by also examining the balance of those entering and exiting employment abroad, since this balance is especially relevant for the impacts on the Hungarian labour market.[5]

The number of persons in employment abroad was compared to the combined headcount of those staying in Hungary in that quarter and those in employment abroad. This proportion quantifies the extent of potential labour shortage caused by employment abroad, assuming that everyone taking up employment abroad would also have a job in Hungary. *Exit rate, return rate and net rate are defined as the average proportion of those taking up employment abroad, those returning and taking up employment in Hungary and their balance respectively, relative to the combined headcount of the population concerned and those in employment in Hungary at the time of the exit, aged 18 years or more and below the retirement age.* In order to illustrate trends, the average proportions of the periods 2006–2010 and 2011–2016 were examined separately.[6] *Figure 2.3.2* presents the average annual proportions of the period of increasing outward migration after 2011.

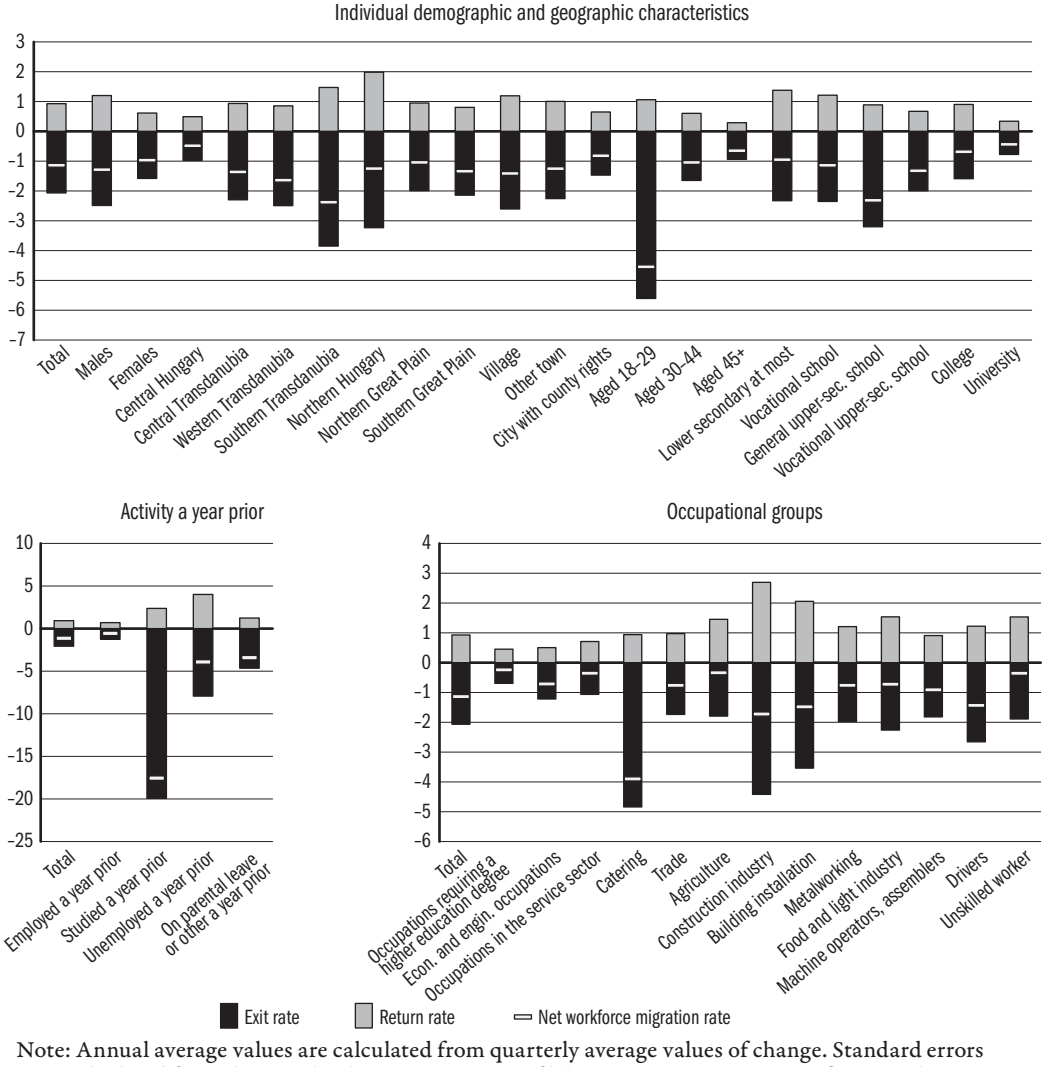
According to our estimations, slightly more than 2 per cent of workers aged 18 years or more and below the retirement age took up employment abroad annually on average between 2011 and 2016 but nearly half of these returned

5 When calculating the balance of migration, we made simplifications. Exiters and returnees are regarded as similarly skilled and thus we ignore that returnees may be less successful or less competitive. Further simplifications are made concerning returnees: it is assumed that they return to the region they have left and their educational attainment does not change (the data available did not enable a more detailed analysis of differences). However, it is analysed broken down into occupations – which occupations the exiters left and the returnees returned to. It enables us to measure the impact of employment abroad on employment in Hungary, broken down into occupational groups based on ISCO–88 (*Table A2.3.1*).

6 The detailed quarterly figures are presented in *Table A2.3.2*.

home and found employment in Hungary. Thus the net proportion of those absent due to employment abroad is estimated at more than 1 per cent. Between 2006 and 2010 the average proportion did not reach 0.6 per cent.

Figure 2.3.2: Average annual exit, return and net labour migration rates, 2011–2016



Note: Annual average values are calculated from quarterly average values of change. Standard errors are calculated from the sample; the net proportion of labour migration is not significant in the case of university and college graduates as well as in the service, trade, agricultural and construction industries, building installation, metalworking, food and light industry as well as unskilled jobs.

Exit rate: the average proportion of those taking up employment abroad relative to the combined headcount of the exiters and those in employment in Hungary at the time of the exit, aged 18 years or more and below the retirement age.

Return rate: the average proportion of those returning home and taking up employment relative to the combined headcount of the returnees and those in employment in Hungary at the time of the exit, aged 18 years or more and below the retirement age.

Net rate: the average proportion of the balance of exiters and returnees relative to the combined headcount of exiters and returnees and those in employment in Hungary at the time of the exit, aged 18 years or more and below the retirement age.

Southern Transdanubia and Northern Hungary are the *regions* with the highest proportion of exiters – well above the average. In Northern Hungary the proportion of returnees is also high, which reveals short-term, seasonal employment. In Western Transdanubia, with a lower exit and return rate, the proportion of net labour migration substantially exceeds the average, while Central Hungary is characterised by the lowest exit and net labour migration rates.

An especially high proportion of young people below 30 and secondary school graduates take up employment abroad, with a low proportion of returnees. Nevertheless, the exit and return rates of higher education graduates, especially university graduates, are estimated to be below the average.

Workers who had also been *in employment in the preceding year*, were less likely than the average to take up employment abroad, while those studying or unemployed in the preceding year moved abroad to work in higher proportions. Those unemployed in the preceding year also constitute a high proportion of returnees, which indicates that for them both employment abroad and in Hungary consists of short-term, precarious work.

Finally, it was also estimated how labour migration affects the members of different *occupational groups*. The last occupation in Hungary was included in the case of exit and the occupation taken up in Hungary in the case of return. The highest proportion of exit was seen in catering (cooks, waiters): the exit rate between 2011 and 2016 was 5 per cent on average annually, coupled with a relatively low return rate, thus net labour migration reduces the potential headcount by 4 per cent on average annually. The annual average exit rate is nearly 4.5 per cent in the construction industry and 3.5 per cent in building installation occupations, coupled with a relatively high return rate. The return rate is also relatively high in other industry-related occupations. A high share of drivers also find employment abroad and along with a relatively low return rate the annual average net labour migration results in a potential workforce reduction of nearly 1.5 per cent. In spite of frequent reporting of labour shortage in trade, the proportion of those leaving trade jobs behind turned out to be below average. However, this sector showed the highest increase in the exit rate compared to the period of 2006–2010.

The independent effects of demographic and labour market factors on employment abroad

Based on the migration patterns observed in the descriptive statistics, we examined how individual factors influence the probability of employment abroad, controlling for other factors. The average marginal effect and the changes over time of factors affecting the probability of exit and return were analysed using

logistic regression. The description of the model is included in *Table A2.3.2* of *Annex 2.3*. The findings, for five dates, about employment abroad and returning home are presented in *Table 2.3.1* and *Table 2.3.2* respectively.

Table 2.3.1: The marginal effect of individual factors on employment abroad

	Q1 2006	Q3 2008	Q1 2011	Q3 2013	Q1 2016
Female	–0.000968***	–0.001015***	–0.001049***	–0.001023***	–0.000833
Age					
Aged 18	0.000102***	0.000111***	0.000119***	0.000121***	0.000104
Aged 38	–0.000097***	–0.000112***	–0.000134***	–0.000168***	–0.000219***
Aged 48	–0.000079***	–0.000093***	–0.000113***	–0.000141***	–0.000183***
Aged 58	–0.000024***	–0.000032***	–0.000044***	–0.000062***	–0.000090***
Region					
Central Transdanubia	0.000463**	0.000625***	0.000878***	0.001282***	0.001944**
Western Transdanubia	0.001001***	0.001204***	0.001491***	0.001894***	0.002450***
Southern Transdanubia	0.001999***	0.002274***	0.002663***	0.003198***	0.003899***
Northern Hungary	0.001510***	0.001660***	0.001864***	0.002113***	0.002369***
Northern Great Plain	0.000848***	0.000862***	0.000860***	0.000797***	0.000567
Southern Great Plain	0.000797***	0.000899***	0.001027***	0.001172***	0.001293*
Type of municipality					
Other town	–0.000406*	–0.000304	–0.000141	0.000149	0.000689
City with county rights, capital city	–0.000723***	–0.000704***	–0.000665***	–0.000570**	–0.000337
Educational attainment					
Vocational school	0.000491**	0.000703***	0.001047***	0.001626***	0.002643***
General upper-secondary school	0.000898**	0.001056***	0.001307***	0.001704***	0.002344***
Vocational upper-secondary school	0.000882***	0.001127***	0.001514***	0.002143***	0.003195***
College	0.001543**	0.001873***	0.002392***	0.003220***	0.004569***
University	0.003434**	0.002848***	0.002405***	0.002033**	0.001648
Activity a year prior					
Studied a year prior	–0.000804**	–0.000639**	–0.000270	0.000548	0.002360
Unemployed a year prior	0.000488	0.001029***	0.001903***	0.003371***	0.005924***
On parental leave or other a year prior	–0.000782***	–0.000796***	–0.000811***	–0.000812***	–0.000767
Occupation					
Economic and engineering	0.000248	0.000334*	0.000472**	0.000698*	0.001085
Services	0.000520	0.000580	0.000655	0.000736	0.000784
Catering	0.003998***	0.004111***	0.004381***	0.004819***	0.005420***
Trade	0.000241	0.000396	0.000681	0.001227	0.002316
Agriculture	0.000182	0.000310	0.000549*	0.001013*	0.001954
Construction industry	0.002119***	0.002526***	0.003142***	0.004080***	0.005520**
Building installation	0.002336***	0.002654***	0.003136***	0.003849***	0.004890*
Skilled metalworking	0.001602***	0.001736***	0.001939***	0.002213***	0.002543
Food and light industry	0.003258***	0.002870***	0.002555***	0.002223***	0.001720
Machine operators, assemblers	0.000691**	0.000860***	0.001115***	0.001503***	0.002104*
Drivers	0.001527**	0.001898***	0.002467***	0.003352***	0.004760**
Unskilled work	0.000667**	0.000839***	0.001099***	0.001501***	0.002134*

Note: We used the Delta method to compute the 95 per cent confidence interval for the average marginal effect. Dependent variable: entering employment abroad.
Reference category: male, Central Hungary, village, a lower secondary qualification at most, was in employment in the preceding year, occupations requiring a higher education degree.

*** Significant at a 1 per cent level, ** significant at a 5 per cent level, * significant at a 10 per cent level. Coefficients relating to those aged 28 were not significant at any of the dates and therefore are not included in the table.

Table 2.3.2: The marginal effect of individual factors on the return to the Hungarian labour market

	Q1 2006	Q3 2008	Q1 2011	Q3 2013	Q1 2016
Female	-0.000492***	-0.000502***	-0.000527***	-0.000534***	-0.000420
Age					
Aged 38	-0.000019***	-0.000026***	-0.000039***	-0.000062***	-0.000106***
Aged 48	-0.000023***	-0.000028***	-0.000038***	-0.000055***	-0.000087***
Aged 58	-0.000014***	-0.000016***	-0.000021***	-0.000030***	-0.000046***
Region					
Central Transdanubia	0.000231**	0.000305**	0.000415***	0.0005563**	0.0006743
Western Transdanubia	0.000483	0.000505	0.000521***	0.000462*	0.000128
Southern Transdanubia	0.000643	0.000734	0.000864***	0.000998***	0.0009996
Northern Hungary	0.001078***	0.001169***	0.001316***	0.001477***	0.0015007*
Northern Great Plain	0.000412***	0.000453***	0.000495***	0.0004815**	0.0002345
Southern Great Plain	0.000207**	0.000256**	0.0003175**	0.0003617	0.0002747
Type of municipality					
Other town	0.000338**	0.000297**	0.000235**	0.000102	-0.000214
Activity a year prior					
Unemployed a year prior	0.000344*	0.000498*	0.000776***	0.001305***	0.002362**
On parental leave or other a year prior	-0.000033	-0.000134	-0.000285**	-0.000543***	-0.001030***
Occupation					
Catering	0.002424**	0.001810**	0.001364***	0.001006*	0.000665
Construction industry	0.000316	0.000700	0.001397***	0.002751**	0.005550*
Building installation	0.000189	0.000529	0.001161**	0.002420***	0.005090**
Skilled metalworking	-0.000025	0.000161	0.000497*	0.001156***	0.002538**
Food and light industry	-0.000078	0.000141	0.000577	0.001504*	0.003605
Machine operators, assemblers	-0.000037	0.000072	0.000251	0.000573*	0.001202
Drivers	-0.000065	0.000159	0.000601	0.001536**	0.003641
Unskilled work	-0.000083	0.000077	0.000369	0.000950**	0.002185*

Note: We used the Delta method to compute the 95 per cent confidence interval for the average marginal effect. Dependent variable: entering employment abroad. Reference category: male, Central Hungary, village, a lower secondary qualification at most, was in employment in the preceding year, occupations requiring a higher education degree

*** Significant at a 1 per cent level, ** significant at a 5 per cent level, * significant at a 10 per cent level. The coefficients for the following categories were not significant at any of the dates and therefore are not included in the table: ages 18 and 28, city with county rights, capital city, educational attainment (it was only weakly significant for college graduates in 2011:0.000995**), studied a year prior, economic and engineering occupations, occupations in the service sector, trade and agriculture.

The major findings indicate that the average marginal effect of being female reduces the probability of both taking up employment abroad and returning, compared to being male, and there is little change over time. As for age, the average marginal effect of being 18 years of age increases the probability of working abroad and this effect seems constant for some time but at the age of 28 the effect is no longer significant, while being 38 or older reduces the

probability of taking up employment abroad. The extremely high exit rate of the 18–29 age group seen in the descriptive statistics is only partly confirmed by the marginal estimates (only for the very young), suggesting that employment abroad may have been influenced by educational attainment level and other factors in addition to age.

Educational attainment has a considerable impact on taking up employment abroad; however, it has no significant impact on returning. The average marginal effect of educational attainment increases the probability of finding employment abroad in the case of all levels of educational attainment except lower-secondary qualification and the effect increases both with the qualification level and over time. Upper secondary qualification (Matura) gradually loses its stronger marginal effect compared to a vocational training certificate after 2011. Although the descriptive statistics showed an excessive outward migration of general upper-secondary school graduates, this may be influenced by other factors such as age or prior learning – the independent effect does not seem to be marked. The average marginal effect of having a higher education qualification proved to be the strongest: the effect of college education was strong throughout the entire period, while the marginal effect of university education exceeded that of college education until 2011, then started to decrease gradually and in 2016 did not show a significant effect. This finding may reflect that the opportunities available for, and the labour market attractiveness of, university graduates have changed because of the increasing employment abroad (in addition, due to proportions in the complete population, the number of higher education graduates in the sample is small, thus only substantial effects may be detected).

The *regional* effect is stronger in every region than in the region of Central Hungary. Similarly to the proportions observed in the descriptive statistics, the average marginal effect of Southern Transdanubia and Northern Hungary increases the probability of working abroad more than the other regions. The average marginal effect of Southern Transdanubia is especially strong and increases rapidly, while the effect of Northern Hungary is slightly lower. The average marginal effect of Western Transdanubia has been increasing considerably since 2011, probably due to the attraction of the Austrian labour market, which opened up completely in 2011. The marginal effect of the regions on return is substantially weaker and as opposed to the effect on exit, the most significant marginal effect on return was produced by Northern Hungary, similarly to the findings of the descriptive statistics. As for the place of residence, cities with county rights and the capital city have a weaker marginal effect on taking up employment abroad than villages, while a place of residence in other cities increases the probability of return.

Compared to being in employment a *year prior,* the average marginal effect of being unemployed increases, while being on parental leave or in other activities decreases, the probability of both taking up employment abroad and

returning to employment in Hungary. On the other hand, the marginal effect of studying in the preceding year did not seem to be significant, thus the strong impact seen in the descriptive statistics is due to other factors.

The effect of *occupations* on employment abroad is considerable. Compared to occupations requiring a higher education qualification, the average marginal effects of all other occupations on employment abroad were higher. The average marginal effects of catering, construction industry, building installation and driver occupations were substantial and increasing throughout the period and increased the probability of entering employment abroad by 0.5–0.55 per cent in 2016. The average marginal effects of machine operators, assemblers and unskilled work lagged behind but were still considerable, and increased the probability of employment abroad by around 0.25 per cent. The marginal effects of metalworking and food and light industry occupations were similar at first but then the effect was no more significant at the end of the period. The average marginal effects of trade and agricultural occupations were only significant in some years and were relatively modest. The average marginal effects of non-physical economic and engineering as well as service sector occupations were well below the level observed among manual occupations. The combined occupational groups probably hide the effects of individual occupations, such as doctors and nurses on outward migration (the sample size did not enable such detailed breakdown). The average marginal effects of individual occupations on return were smaller but return to construction industry, building installation and metalworking occupations is similar to the extent of exit, and return is similar to the findings of the descriptive statistics.

Conclusions

Our analysis investigated how outward migration contributes to labour shortage in addition to other factors. Increasing levels of employment abroad in itself resulted in a noticeable increase in the number of workers aged 18 years or more and below the retirement age, since the net proportion of labour migration, calculated as the balance of exiters and returnees, was more than 1 per cent between 2011 and 2016 on average annually. There is also selectivity of entry to employment abroad and to a lesser extent of return. This may have an impact on labour shortage in certain sectors. Young age, educational attainment, regions and occupations have a considerable impact. Both analyses indicated that an especially high proportion of workers leave Southern and Western Transdanubia in order to find employment abroad, while the proportion of returnees is low, thus it is the most likely for labour shortage to emerge here. The proportion of workers taking up employment abroad is also high in Northern Hungary but it is coupled with a relatively high return rate.

The descriptive statistics indicate there is a high proportion of general upper-secondary, vocational upper-secondary and vocational school graduates

among exiters, who are probably young and the effect of other factors, e.g. occupations, also contribute to the proportion. After controlling for all other factors, an important effect of higher level educational attainment was identified. Occupations had an especially strong effect on employment abroad: it is mainly workers in catering, construction, building installation as well as drivers who leave their jobs to find employment abroad. This may cause major shortage in these sectors, which is reflected in observed and registered labour shortage. All manual occupations slightly increase the probability of taking up employment abroad, which also corresponds to the increasing labour shortage observed in this category. Remarkably, in trade and agricultural occupations there is no significant outward migration. In white collar occupations in general the exit rate is low; however, in the case of certain subgroups such as doctors or nurses it was not possible to confirm marginal effects.

While outward migration is substantial, half of the exiters on average returned to Hungarian jobs between 2011 and 2016. However, the selectivity of return is unclear. There is no selectivity by educational attainment; selectivity is only confirmed for a few regions. As for occupations, the return rate is high in all industrial occupations but not in white collar occupations.

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Annex 2.3

Table A2.3.1: Transcoding ISCO–88 occupational groups and dividing them into groups

New code	Occupational groups	Description	ISCO–88 code
20	Occupations requiring a higher education degree	Management occupations, higher education graduates, occupations in the armed forces except for leaders of small organisations or departments	1, 2 & 0
31	Economic and engineering occupations requiring higher education or upper-secondary qualifications	Other economic, engineering and office occupations requiring higher education or upper-secondary qualifications + leaders of small organisations	311–321, 341–345, 4, 511
32	Occupations providing services requiring higher education or upper-secondary qualifications	Other occupations providing services requiring higher education or upper-secondary qualifications, except for catering and trade occupations + leaders of small organisations	322–334, 346–348, 512–516
34	Catering-related occupations	Catering (cook, waiter, barman)+ leaders of small organisations or departments	5122–5123
35	Trade-related occupations	Trade occupations + leaders of small organisations or departments	5210–5230
60	Agricultural skilled and unskilled work	Agricultural occupations and unskilled work + leaders of small organisations or departments	6, 92
70	Construction work	Construction industry occupations + leaders of small organisations or departments	7111–7129
71	Building installation	Building installation occupations	7131–7143
72	Skilled metalworking	Skilled metalworking occupations + leaders of small organisations or departments	7211–7311
73	Food and light industry skilled work	Food and other light industry occupations	7312–7442
81	Machine operator and assembler occupations	Machine operator and assembler (except for passenger car, taxi, van, bus, tram and heavy-duty vehicle drivers)	8
82	Drivers	Passenger car, taxi, van, bus, tram and heavy-duty vehicle drivers	8322–8324
90	Unskilled work	Unskilled work (except for agricultural work)	9

Table A2.3.2: Average exit, return and net labour migration rate of workers aged 18 years or more and below the retirement age, according to individual characteristics, 2006–2010 and 2011–2016 (per cent)

	2006–2010			2011–2016		
	exit rate	return rate	net labour migration rate	exit rate	return rate	net labour migration rate
Gender						
Total	0.28 (0.018)	0.11 (0.012)	0.17 (0.021)	0.52 (0.025)	0.23 (0.017)	0.28 (0.030)
Male	0.40 (0.029)	0.16 (0.019)	0.24 (0.035)	0.62 (0.037)	0.30 (0.024)	0.32 (0.044)
Female	0.14 (0.017)	0.06 (0.012)	0.09 (0.021)	0.39 (0.032)	0.15 (0.024)	0.24 (0.040)
Age						
18–29	0.64 (0.058)	0.10 (0.015)	0.55 (0.060)	1.40 (0.101)	0.27 (0.031)	1.14 (0.105)
30–44	0.26 (0.027)	0.06 (0.009)	0.20 (0.028)	0.41 (0.032)	0.15 (0.015)	0.26 (0.035)
45+	0.10 (0.017)	0.03 (0.007)	0.07 (0.018)	0.23 (0.026)	0.07 (0.010)	0.16 (0.028)
Region						
Central Hungary	0.09 (0.020)	0.02 (0.009)	0.07 (0.022)	0.24 (0.039	0.12 (0.031)	0.12 (0.050)
Central Transdanubia	0.16 (0.032)	0.09 (0.029)	ns	0.57 (0.075)	0.23 (–0.043)	0.34 (0.086)
Western Transdanubia	0.33 (0.052)	0.10 (0.030)	0.22 (0.060)	0.62 (0.069)	0.21 (0.048)	0.41 (0.084)
South Transdanubia	0.65 (0.098)	0.19 (0.045)	0.46 (0.107)	0.96 (0.119)	0.37 (0.059)	0.59 (0.132)
Northern Hungary	0.57 (0.076)	0.31 (0.063)	0.26 (0.099)	0.81 (0.084)	0.50 (0.069)	0.31 (0.109)
Northern Great Plain	0.31 (0.050)	0.17 (0.041)	0.14 (0.064)	0.50 (0.063)	0.24 (0.045)	0.26 (0.077)
Southern Great Plain	0.30 (0.048)	0.10 (0.032)	0.20 (0.057)	0.54 (0.063)	0.20 (0.038)	0.33 (0.073)
Type of municipality						
Village	0.42 (0.034)	0.14 (0.020)	0.28 (0.039)	0.65 (0.038)	0.30 (0.026)	0.35 (0.046)
Other city	0.30 (0.034)	0.16 (0.027)	0.14 (0.044)	0.56 (0.045)	0.25 (0.031)	0.31 (0.055)
City with county rights	0.15 (0.025)	0.06 (0.015)	0.09 (0.029)	0.37 (0.044)	0.16 (0.031)	0.20 (0.054)
Lower secondary qualification at most	0.29 (0.054)	0.15 (0.039)	0.14 (0.067)	0.58 (0.066)	0.34 (0.068)	0.24 (0.095)
Vocational school	0.39 (0.037)	0.18 (0.027)	0.21 (0.046)	0.59 (0.041)	0.30 (0.032)	(0.28 (0.052)
General upper-secondary school	0.29 (0.058)	0.09 (0.035)	0.20 (0.068)	0.80 (0.100)	0.22 (0.062)	0.58 (0.117)
Vocational upper-secondary school	0.27 (0.035)	0.07 (0.018)	0.20 (0.039)	0.50 (0.052)	0.17 (0.026)	0.33 (0.058)
College	0.13 (0.027)	0.08 (0.028)	ns	0.40 (0.074)	0.23 (0.047)	ns
University	0.13 (0.050)	ns	0.12 (0.050)	0.19 (0.049)	0.08 (0.037)	ns

	2006–2010			2011–2016		
	exit rate	return rate	net labour migration rate	exit rate	return rate	net labour migration rate
Activity a year prior						
In employment	0.20 (0.016)	0.09 (0.011)	0.12 (0.019)	0.31 (0.021)	0.17 (0.015)	0.14 (0.026)
Studied	1.55 (0.310)	ns	1.43 (0.316)	4.98 (0.598)	0.59 (0.272)	4.39 (0.657)
Was unemployed	1.12 (0.147)	0.62 (0.138)	0.50 (0.202)	1.98 (0.174)	1.00 (0.153)	0.98 (0.232)
On parental leave and other	0.72 (0.156)	0.23 (0.084)	0.50 (0.177)	1.16 (0.203)	0.31 (0.103)	0.85 0.227)
Educational attainment level						
Higher education	0.06 (0.022)	0.03 (0.013)	ns	0.17 (0.039)	0.11 (0.029)	ns
Occupation						
Economic and engineering	0.10 (0.027)	0.10 (0.030)	ns	0.30 (0.053)	0.13 (0.029)	0.18 (0.060)
Services	0.18 (0.048)	0.03 (0.016)	0.14 (0.050)	0.27 (0.057)	0.18 (0.058)	ns
Catering	0.74 (0.174)	0.43 (0.132)	ns	1.21 (0.195)	0.23 (0.072)	0.97 (0.208)
Trade	0.09 (0.027)	ns	ns	0.43 (0.099)	0.24 (0.082)	ns
Agriculture	0.12 (0.045)	0.06 (0.031)	ns	0.45 (0.089)	0.36 (0.093)	ns
Construction industry	0.61 (0.152)	0.30 (0.092)	ns	1.10 (0.199)	0.67 (0.191)	ns
Building installation	0.64 (0.146)	0.29 (0.107)	ns	0.88 (0.162)	0.51 (0.133)	ns
Metalworking	0.49 (0.080)	0.14 (0.037)	0.35 (0.088)	0.49 (0.084)	0.30 (0.052)	ns
Food and light industry	0.57 (0.114)	0.10 (0.043)	0.47 (0.122)	0.57 (0.132)	0.38 (0.154)	ns
Operator and assembler	0.24 (0.052)	0.13 (0.048)	ns	0.45 (0.066)	0.23 (0.045)	0.23 (0.080)
Driver	0.39 (0.125)	0.16 (0.082)	ns	0.66 (0.127)	0.31 (0.097)	0.36 (0.160)
Unskilled work	0.23 (0.047)	0.16 (0.050)	ns	0.47 (0.078)	0.38 (0.081)	ns
N (observations)	410,069			424,932		

Note: Standard errors in bracket, ns: not significant.

Exit rate: the average proportion of those taking up employment abroad relative to the combined headcount of the exiters and those in employment in Hungary at the time of the exit, aged 18 years or more and below the retirement age.

Return rate: the average proportion of those returning home and taking up employment relative to the combined headcount of the returnees and those in employment in Hungary at the time of the exit, aged 18 years or more and below the retirement age.

Net rate: the average proportion of the balance of exiters and returnees relative to the combined headcount of exiters and returnees and those in employment in Hungary at the time of the exit, aged 18 years or more and below the retirement age.

The standard error is given in brackets (percentage point), ns: the proportion estimation is not significant.

The description of the model

Two logistic regression models are used for evaluating the marginal probability outward and return migration, relative to the combined figure of exiters returnees and those remaining in employment in Hungary:

Model (1) – for the impact of individual factors on taking up employment abroad

Model (2) – for return from employment abroad.

The equation for both logistic regression model is as follows:

$$\ln\left(\frac{p}{1-p}\right) = b_0 + b_1X_{gen} + b_2X_{age} + b_3X^2_{age} + b_4X_{edu} +$$
$$+ b_5X_{occup.cat} + b_7X_{reg} + b_8X_{municip} + b_9X_{gen}t + b_{10}X_{age}t +$$
$$+ b_{11}X^2_{age}t + b_{12}X_{edu}t + b_{13}X_{occup.cat}t + b_{14}X_{occ.stat.1y.prior}t + b_{15}X_{reg}t +$$
$$+ b_{16}X_{municip}t,$$

where

p is the probability of the following outcomes compared to staying in employment in Hungary:

In model (1): taking up employment abroad,

In model (2): returning from abroad.

Demographic variables:

X_{gen} gender

X_{age} age

X_{edu} highest level of educational attainment

Labour market variables:

$X_{occup.cat}$ in model (1): combined occupational category in the earlier of the two quarters examined (t_0)

In model (2) combined occupational category in the later of the two quarters examined (t_1)

$X_{occ.stat.1y.prior}$ occupational status a year prior

Regional variables:

X_{reg} region

$X_{municip}$ type of municipality

t time (quarter)

The first model describes those leaving the Hungarian labour market, while the second model describes those returning to the Hungarian labour market. The independent variables of the two models only differ in the occupational category: the first model includes the one preceding the change, while the second includes the one following the change (in both cases it involves the occupational category of the exiters, returnees and those in the Hungarian labour market). Model parameters were estimated using heteroscedasticity-robust variance-covariance estimation.

The developers of the Hosmer–Lemeshow test also admit that a non-major divergence in fit may appear to be a significant error in the case of a large number of items (*Paul et al,* 2013), thus we did not adopt this test. The link tests (*Pregibon*, 1980) and the ROC-curve-analysis were applied instead, and the *c*-statistics based on this were used for evaluating the model fit. The Nagelkerke pseudo R^2 values are given for for both models (the parameters describing the model fit are presented in *Table A2.3.3*). In conclusion, the indices reveal that the independent variables explain the model of returnees to the labour market better than the model of exiters from the labour market.

Table A2.3.3: The fit indices of the model

	Model (1) Exiters from the labour market	Model (2) Returnees to the labour market
c-statistics	0.837	0.835
Link test: explanatory power of the model	0.704***	0.870**
Link test: divergence in fit	–0.0261	–0.010
Nagelkerke R^2	0.118	0.138

The values of *c*-statistics according to *Hosmer–Lemeshow* (2000) are acceptable above 0.7, very good above 0.8 and excellent above 0.9.

*** Significant at a 1 per cent level, ** significant at a 5 per cent level, * significant at a 10 per cent level 10.

3 RECRUITMENT DIFFICULTIES, BUSINESS OPPORTUNITIES AND WAGES – ENTERPRISE-LEVEL ANALYSIS

3.1 ENTERPRISES COMPLAINING ABOUT RECRUITMENT DIFFICULTIES

ISTVÁN JÁNOS TÓTH & ZSANNA NYÍRŐ

The present analysis, based on an empirical business survey, which collected data from the leaders of 3,185 firms,[1] examines the proportion and characteristics of firms facing labour shortage and discusses how labour shortage relates to the expected investment, the order book and the forecast wage increase of the firms concerned.

Difficulties in recruiting and retaining staff

About one in ten firms mentioned labour and skill shortage as an *obstacle to business activity* (recruitment difficulties) in the business surveys conducted between April 2011 and October 2013. Then this proportion rose sharply in October 2014 (to 21 per cent): every fifth firm regarded this problem as one of the three major obstacles to business activity. There was another substantial increase in October 2015, when 27 per cent of firms reported labour and skill shortages. One year later already 36 per cent of firms, and in April 2017, 38 per cent of firms mentioned this problem (*Nábelek et al.,* 2017).

In addition to the usual question of the business surveys (*"What factors have limited the business activity of your company the most in the past six months? Please choose a maximum of three answers."*), another, more general question on labour shortage was included in October 2016: "*Has your company faced any difficulties resulting from labour shortage in the previous 12 months?*" This question was answered by 2,647 company leaders and 53 per cent (1,392 company leaders) answered "yes". It was mainly exporting (74 per cent), industrial (67 per cent) and mostly foreign-owned (76 per cent) firms, those from Transdanubia (53 per cent) as well as medium (78 per cent) and large businesses (85 per cent) that reported labour shortage as a problem for their companies.

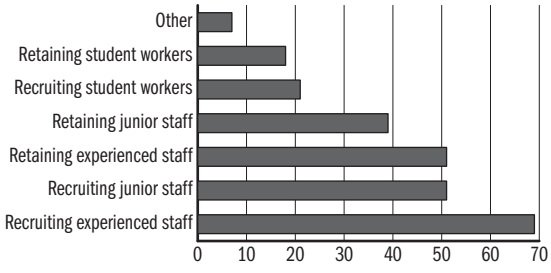
As for difficulties resulting from labour shortage, the recruitment of experienced staff presented a problem for most companies (69 per cent). Recruiting junior staff and retaining more experienced staff caused difficulties for about a half of the respondents (51–51 per cent). More than one-third of respondents (39 per cent) even found it difficult to retain junior staff, one-fifth of firms struggled to recruit student workers (for example trainees) (21 per cent) and retain trainees (18 per cent). 7 per cent of respondents selected another factor (*Figure 3.1.1*).

Nearly two-thirds of respondents (64 per cent) thought that labour shortage-related problems would worsen in 2017 in Hungary, about one-third of

1 The analysis relied on publicly available data of the Institute for Economic and Enterprise Research (IEER) of the Hungarian Chamber of Commerce and Industry. For the first version of the analysis see: *Nábelek et al.* (2017).

them (31 per cent) thought they would remain the same and only 5 per cent of them thought that these difficulties would abate.

Figure 3.1.1: The distribution of respondents according to the situations in which their companies faced difficulties resulting from labour shortage in October 2016 (per cent)



Note: N = 1255.
Source: *Institute of Economic and Enterprise Research* (*IEER*), Business Climate Survey, October 2016.

Multivariable analysis

The occurrence of labour shortage as a problem was assessed using a logit model. We aimed at finding out which companies face this problem more frequently and how the perception of labour shortage relates to the situation in business, the expectations and the order book of firms. It is possible that there are no relationships between them: that labour shortage is so general that it concerns heterogeneous groups of firms. If the problem is more characteristic of companies with a bad situation in business, poor prospects and stagnating order books, it probably concerns weaker companies unable to increase their turnover. If, however, there is a positive relationship between labour shortage and the situation in business and expectations concerning it, then labour shortage is more likely to affect firms that would otherwise be able to increase their turnover and profit. As for business characteristics, the sector, the size of firms, the proportion of exports within total turnover and the share of foreign ownership in registered capital were taken into account.

The findings (*Table 3.1.1*) clearly indicate that labour shortage in 2016 typically emerged among companies that considered their prospects good, had positive expectations for 2017 and expected their order books to grow. 8–10 percentage points more firms with a good or acceptable situation in business experienced labour shortage than firms in a bad situation in business. There is a weaker relationship with the expected situation in business: 6 percentage points more companies expecting a positive business situation reported this problem than companies expecting a deteriorating situation in business.

A considerable difference was also observed according to the order book: an 8 percentage point higher proportion of firms with growing order books reported recruitment difficulties, compared to firms which expected a stagnating or decreasing order book.

Table 3.1.1: "Has your company faced any difficulties resulting from labour shortage in the previous 12 months?" October 2016, logit estimation, average marginal effects

	(1)	(2)	(3)
Foreign ownership share (reference category: no foreign ownership)			
Foreign ownership: below 50 per cent	0.028	0.033	0.019
Foreign ownership: above 50 per cent	0.039	0.027	0.036
Sector (reference category: industry)			
Construction industry	0.154***	0.152***	0.154***
Trade	-0.055	-0.062*	-0.059*
Other services	-0.082***	-0.088***	-0.087***
Headcount (reference category: micro-enterprise)			
10–49 persons	0.294***	0.307***	0.299***
50–249 persons	0.358***	0.360***	0.367***
250- persons	0.434***	0.422***	0.434***
Share of export within turnover (reference category: no export)			
Below 33 per cent	0.057*	0.047	0.047
At 33–66 per cent	0.043	0.049	0.032
Above 66 per cent	0.101**	0.123**	0.091*
Current situation in business (reference category: bad)			
Satisfactory	0.080***	-	-
Good	0.098***	-	-
Expected situation in business (reference category: bad)			
Satisfactory		0.032	-
Good		0.063**	-
Order book (reference category: not growing)			
Increases			0.081***
Constant	yes	yes	yes
N	2414	2345	2459
LR χ^2 (degree of freedom = 13)	462.75	455.19	478.77
Pseudo R^2	0.1384	0.1401	0.1407

Note: Dependent variable: difficulty due to labour shortage, 0 – no, 1 – yes.
*** Significant at a 1 per cent level, ** significant at a 5 per cent level, * significant at a 10 per cent level.

The phenomenon was not restricted to the manufacturing industry; in fact, it was more marked in the construction industry and services sector than in manufacturing. A 15 percentage point higher proportion of construction companies reported labour shortage than manufacturing companies. Compared to micro-enterprises (firms employing 1–9 persons), companies of all other sizes perceived labour shortage as a problem more frequently. However, exporting and foreign ownership did not play a significant role.

Recruitment difficulties and wage increase intentions

It seems obvious to assume that firms facing labour shortage respond to it – among others – by raising wages. We examine in the following section whether firms reporting labour shortage in 2016 intended to raise wages in 2017. The findings of the October 2016 survey indicate that 55.4 per cent of firms (1477 of the 2665 firms included) intended to increase wages in 2017.

We have controlled for the ownership structure, sector, size (headcount) and the share of exports in the turnover of companies and also took the business expectations of companies into consideration. The latter were assessed by the expected changes in the order book. It can be assumed that companies with better business expectations are more likely to increase wages than those with deteriorating or stagnating prospects. Accordingly, firms which are able to increase their order books are more likely to plan wage increases. According to the results of business surveys to date, a higher proportion of exporting and foreign-owned firms as well as firms other than micro-enterprises had good business expectations and wage increase intentions. These factors are also worth considering when investigating links between labour shortage and wage increase intentions. In order to be able to evaluate the effect of labour shortage independent of the above factors, logit estimation was conducted. Because of the positive correlation between the expectations concerning the order book and the perception of labour shortage seen in *Table 3.1.1* the estimation was carried out not only for the total sample but also for the subsamples including companies expecting an increase and those not expecting an increase in the order books.

The findings presented in *Table 3.1.2* show that there is a significant positive relationship between perceiving labour shortage and the intention of firms to raise wages: a 19 percentage point larger proportion of companies facing labour shortage in 2016 intended to increase salaries in 2017.

As presumed, the proportion of firms planning to increase wages is significantly higher among those expecting their order books to increase than among those expecting stagnation or fall. It is also clear that recruitment difficulties have a stronger impact on the forecast wage increases of firms not expecting their order books to grow than those expecting it. It increases the probability of a wage increase by 21 percentage points in the former group and only by 14 percentage points in the latter.

The sample analysed herein is not suitable for examining to what extent the wage increases materialised – it will be presented in Subchapter 3.3, relying on a smaller sample, that the relationship between plans and actual outcomes is rather loose.

In conclusion, the findings suggest that it is mainly successful companies that report difficulties in recruiting and retaining staff, which is partly an inherent feature of the growth necessary for fulfilling an increased volume of orders.

Table 3.1.2: The estimation of wage increase intentions, October 2016, logit estimation, average marginal effects

	Total sample	Order book not growing	Order book growing
Difficulty due to labour shortage	0.193***	0.209***	0.140***
Foreign ownership share (reference category: none)			
Foreign ownership below 50 per cent	0.052	0.020	0.084
Foreign ownership above 50 per cent	0.049	0.002	0.101*
Sector (reference category: industry)			
Construction	–0.025	–0.035	0.013
Trade	0.037	0.059	–0.031
Other services	–0.062**	–0.059	–0.070
Headcount (reference category: micro-enterprise)			
10–49 persons	0.230***	0.238***	0.188***
50–249 persons	0.289***	0.362***	0.145**
250– persons	0.247***	0.253***	0.199***
Share of export in turnover (reference category: not exporting)			
Below 33 per cent	0.031	0.052	–0.014
At 33–66 per cent	0.101*	0.171**	0.003
Above 66 per cent	0.043	0.131*	–0.046
Order book (reference category: not growing)			
Growing	0.124***	–	–
Constant	yes	yes	yes
N	2347	1772	575
LR χ^2 (degree of freedom = 13)	534.57	389.15	75.96
Pseudo R^2	0.1666	0.1585	0.1140

Note: dependent variable: intended wage increase in 2017, 0 – no, 1 – yes.
*** Significant at a 1 per cent level, ** significant at a 5 per cent level, * significant at a 10 per cent level.

Reference

NÁBELEK FRUZSINA–HAJDU MIKLÓS–NYÍRŐ ZSANNA–TÓTH ISTVÁN JÁNOS (2017): A munkaerőhiány vállalati percepciója. Egy empirikus vizsgálat tapasztalata. (Business perception of labour shortage. Findings of an empirical survey) IEER, Budapest.

3.2 MANIFEST SHORTAGE – VACANCIES AND IDLE CAPACITIES

MIKLÓS HAJDU, JÁNOS KÖLLŐ & ISTVÁN JÁNOS TÓTH

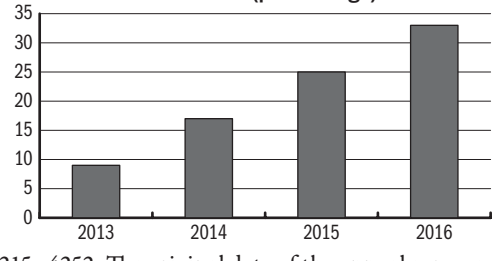
This subchapter discusses the kind of shortage termed "manifest" for the purpose of brevity, whereby companies are not able to fill already existing positions or fully utilise already available capacities, citing labour shortage as the cause. We have analysed how such shortage relates to certain enterprise characteristics (size, sector, region, ownership structure, share of exports, business prospects). The analysis relies on the data of the Hungarian Labour Market Forecast Survey (HLMF).[1] The relationship between shortages and wages is investigated in Subchapter 3.3, based on a smaller sample compiled by merging the HLMF and the Wage Survey databases.

Persisting vacancies

The HLMF assesses the number of persisting vacancies and their specific characteristics annually by surveying 4200 firms from the business sector, with at least 10 employees.[2] Due to a uniform data collection methodology and sampling procedure, the survey enables year-on-year comparison.

The proportion of companies reporting persisting vacancies[3] grew continuously between 2013 and 2016 by about 8 percentage points annually (*Figure 3.2.1*): while in 2013 only 9 per cent of companies reported recruitment difficulties, the proportion was 33 per cent in 2016.

Figure 3.2.1: The proportion of firms with persisting vacancies, 2013–2016 (percentage)



Note: N = 4215–4252. The original data of the annual surveys were weighted according to the contribution of the responding companies to the aggregate employment. For more details on the weighting see *IEER* (2016).
Source: *HLMF*.

The figures reveal that although the proportion of firms reporting recruitment difficulties increased three and a half times during the period, the median value of the proportion of persisting vacancies relative to the total number of jobs[4] grew from 2 per cent to 4 per cent, i.e. twofold, and its level was considerably lower (*Figure 3.2.2*).

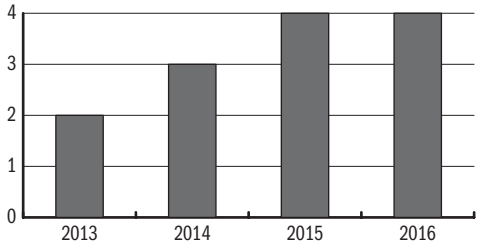
1 The Hungarian Labour Market Forecast (HLMF) is an online database of the joint national labour market survey of the Ministry for National Economy and the Institute for Economic and Enterprise Research (IEER) of the Hungarian Chamber of Commerce and Industry.

2 The surveys taking place in September and October once a year, coordinated by IEER cover about 7000 companies. The analysis presented here, however, only covers a subsample, since we did not assess persisting vacancies among companies with a headcount of 2–9. The most recent results of the research are available here.

3 Companies with persisting vacancies include companies that have at least one such vacancy.

4 It is the sum of persisting vacancies and the number of employees.

Figure 3.2.2: The proportion of persisting vacancies relative to the statistical headcount, 2013–2016 (percentage)

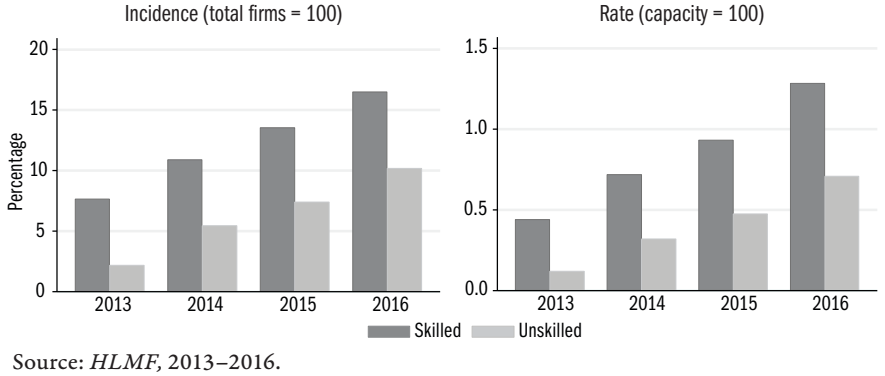


Note: N = 522–1847. The figure is based on the subsample of firms reporting persisting vacancies. The original data of the annual surveys were weighted according to the contribution of the responding companies to the aggregate employment. For more details on the weighting see *IEER* (2016).
Source: *HLMF*.

Idle capacities

The firms participating in the HLMF survey are asked about the scope of idle capacities and to what extent this idle capacity is attributable to the shortage of skilled and unskilled workers. The idle capacity attributable to labour shortage is measured by the product $C = (1 - c)l$, where c is the utilization rate of capacity ($0 \leq c \leq 1$) and l is the extent of idle capacity attributable to the shortage of skilled and unskilled workers ($0 \leq l \leq 1$), as reported by companies. The survey includes separate questions on the extent of idle capacity attributable to unskilled worker shortage and skilled worker shortage. Changes in the related indicators are presented in *Figure 3.2.3*.

Figure 3.2.3: The incidence of idle capacity due to skilled and unskilled worker shortage and the level of idle capacity, 2013–2016 (percentage)



Source: *HLMF,* 2013–2016.

The relationship of shortage indicators to key enterprise characteristics

Recruitment difficulties may affect various subgroups of firms to a different extent. Changes in the characteristics of groups of firms affected by recruitment

difficulties are analysed below, using regression models. Firstly, logit models are used for assessing the link between the key characteristics of companies and the incidence of unfilled *vacancies*. Then the *rates* of presistently unfilled vacancies and idle capacity attributable to labour shortage are evaluated using *fractional regression*[5] among firms which reported persisting vacancies and idle capacities.[6] The calculations relate to 2016 (Table *3.2.1*).

Manifest shortage occurs more often at exporting companies. When examining the presence of vacancies and idle capacity attributable to skilled worker shortage, a strong impact, significant even at a 99 per cent confidence level, was seen: these two symptoms occurred 9–10 per cent more often at companies with a share of exports above 50 per cent.

It is evident that larger firms are more likely to have at least one vacancy and to some extent also that regressions indicate lower rates at larger firms, since at smaller firms even the absence of one person constitutes a high proportion of shortage. Company size is included in the equations for controlling for other factors.

The occurrence of vacancies is above average in the construction industry, while the proportion of vacancies is high in construction and the service sector. Idle capacity is reported by trade companies in the highest proportion and the extent of idle capacity attributable to skilled worker shortage is the highest in industry and trade.

All the equations indicate less frequent occurrence or lower levels among wholly foreign-owned firms but coefficients are significant only in half of the cases.

As for regional differences, it is conspicuous that the area of Transdanubia not including Vas and Győr-Moson-Sopron counties in some cases has similar or higher shortage indicators than these two counties next to the Austrian border.

Finally, probably the most important finding is that coefficients for firms in a positive business situation are mostly negative (some of them may be considered zero), which is in sharp contrast with the findings presented in Subchapter 3.1. While complaints of labour shortage as an obstacle to development occur more frequently at companies in a good situation, manifest shortage is more characteristic of firms operating under adverse market conditions. In this case the results of fractional regressions are stronger: firms in a better situation in business more successfully avoid severe shortage.

Most coefficients for idle capacity attributable to unskilled worker shortage are not significant. Two parameters for industry, as an independent variable, are exceptions, indicating that manifest shortage is more frequent in industrial mass production, where a higher than average proportion of unskilled workers are employed and adjusting the capacity to changing labour market conditions is more difficult than in the service sector or in the construction industry.

5 We opted for the method of fractional regression because of the nature of the dependent variable (*Papke–Wooldridge*, 2008.) Fractional regression was calculated using Stata 14.1 *fracreg* command.

6 Thus the presence of the problem (whether there are recruitment difficulties at the companies involved) and the extent of the problem (that is, in the event the problem is present, what percentage of the total number of jobs it concerns) were modelled separately. The reason for that was to be able to draw conclusions on the severity of the problem based on the group of companies affected by it. By involving non-affected companies, the dependent variable would have been "0" in the majority of the cases.

Table 3.2.1: The relationship of shortage indicators to key enterprise characteristics in 2016, logit marginal effects and fractional regression coefficients

	V		*C*1		*C*2	
	0/1, logit	proportion, fractional regression	0/1, logit	proportion, fractional regression	0/1, logit	proportion, fractional regression
The share of exports (reference category: no exports)						
Below 50 per cent	–0.03	0.03	0.5**	0.08	0.04*	0.06
	(–0.75)	(0.63)	(2.28)	(1.32)	(1.67)	(0.76)
Above 51 per cent	0.11***	0.09	0.09***	0.13*	0.04*	0.11
	(–2.76)	(1.48)	(3.34)	(1.85)	(1.91)	(1.28)
Firm size (reference category: 10–19 workers)						
20–49 workers	0.02	–0.154***	0.01	–0.02	0.01	–0.09
	(–0.82)	(–2.85)	(0.6)	(–0.46)	(0.9)	(–1.18)
50–249 workers	0.08***	–0.521***	–0.01	–0.12*	0.03**	0
	(–2.86)	(–9.45)	(–0.64)	(–1.73)	(1.99)	(–0.04)
250– workers	0.191***	–0.632***	–0.01	–0.14*	0.07**	0.05
	(–5.07)	(–6.45)	(–0.19)	(–1.69)	(2.43)	(0.48)
Sector (reference category: agriculture)						
Industry	0.14***	0.087	0.09***	0.51***	0.04**	0.28**
	(3.93)	(0.92)	(4.72)	(5.58)	(2.24)	(2.14)
Construction	0.18***	0.166*	0.07***	0.4***	0	0.05
	(4.13)	(1.66)	(2.81)	(3.82)	(0.15)	(0.31)
Trade	0.06	0.108	0.12***	0.49***	0.01	0.02
	(1.4)	(1.02)	(4.26)	(4.91)	(0.26)	(0.17)
Services	0.14***	0.188*	0.09***	0.42***	0.05	0.22
	(3.31)	(1.7)	(3.23)	(4.12)	(1.53)	(1.44)
Ownership structure (reference category: wholly Hungarian-owned)						
Mixed	0.01	–0.005	–0.05	–0.12	–0.02	–0.2
	(0.18)	(–0.06)	(–1.28)	(–1.07)	(–0.65)	(–1.34)
Wholly foreign-owned	–0.03	–0.148**	–0.06**	–0.15*	–0.03	–0.13
	(–0.83)	(–2.52)	(–2.28)	(–1.95)	(–1.26)	(–1.18)
Region (reference category: Central Hungary)						
Transdanubia (excl. Győr-Moson-Sopron and Vas counties)	0.18***	0.107	0.14***	0.27***	0.1***	0.25**
	(4.93)	(1.43)	(4.91)	(3.64)	(3.48)	(2.27)
Great Plain and Northern Hungary	0.08**	0.067	0.11***	0.26***	0.05**	0.12
	(2.38)	(1.29)	(4.47)	(3.44)	(2.37)	(1.23)
Győr-Moson-Sopron and Vas counties	0.15***	0.018	0.12***	0.28***	0.06*	0.1
	(3.18)	(0.3)	(3.22)	(3.01)	(1.78)	(0.82)
Business prospects (reference category: bad)						
Satisfactory	0.05	–0.127*	0.04	0.03	0.05**	0.03
	(0.85)	(–1.87)	(1.31)	(0.41)	(2.52)	(0.19)
Good	0.01	–0.20***	–0.03	–0.20**	0.02	–0.1
	(0.17)	(–3.11)	(–1.01)	(–2.5)	(1.1)	(–0.76)

V = Occurrence of persisting vacancies (0/1), and their proportion
*C*1= Occurrence of idle capacity (0/1) and its proportion attributable to *skilled* worker shortage.
*C*2 = Occurrence of idle capacity (0/1) and its proportion attributable to *unskilled* worker shortage.
Note: Dependent variable: shortage indicator.
*** Significant at a 1 per cent level, ** significant at a 5 per cent level, * significant at a 10 per cent level.

The above estimations have also been carried out for other years (2013–2015) but the results are not presented here due to lack of space. Overall, the estimates indicated above average shortage at export companies and a somewhat less severe shortage at foreign-owned companies. Findings about regions and sectors are more mixed, varying by the year and by model specification.

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3.3 WAGE LEVELS, MANIFEST SHORTAGE, PLANNED AND ACTUAL PAY RISES

JÁNOS KÖLLŐ, LÁSZLÓ RESZEGI & ISTVÁN JÁNOS TÓTH

This chapter explores the link between the *wage levels* in the business sector and "manifest" shortages (already created but unfilled jobs as well as existing capacities unused due to the lack of skilled or unskilled workers) on the one hand, and how shortage affected planned and actual *wage increases*, on the other hand. We presume that firms paying wages below the market rate are more likely to complain of labour shortage and that firms facing shortages have a stronger tendency to raise wages, if they can afford it.

These questions can only be examined using a smaller sample – the database created by merging the 2015 HLMF[1] and the 2015 and 2016 Wage Surveys. Since only companies participating in all three surveys may be included in the analysis, the number of cases is smaller and may change in accordance with the presence of certain enterprise characteristics.

Wage levels and shortage

The wage levels in the business sector were assessed using the residual average wage estimate based on the data of the Wage Surveys. First, wage equations were estimated on workers in the for-profit sector using the 2015 Wage Survey and the following explanatory variables: gender, labour market experience and its square, the estimated number of years spent in education, sector, firm size and the county in which the plant is based. The equations were estimated for the total sample and separately for the low qualified (completing fewer than 10 grades) and qualified (completing more) subgroups. Then the enterprise-level residual average wage was determined as the company average of the differences between the observed and predicted individual wages. Wages were measured in logarithmic form.

Positive average residual wage means that a company pays its employees better than the *level expected* on the basis of the above variables, while *negative residual average wage* means that it *pays below the wage level expected* on the basis of workforce composition and enterprise characteristics.

The average values of shortage indicators and the number of companies in this sample is presented in *Table 3.3.1*. Using linear (OLS) regressions and binary probit models, we estimated how underutilisation related to residual wage levels in 2015. It was explored how the higher or lower level of residual wage affected the shortage indicators such as the incidence and proportion of persistently unfilled vacancies as well as the incidence and extent of idle capacity attributable to labour shortage. Because of the small number of cases, equations were only controlled for one further dummy variable, measuring

1 The Hungarian Labour Market Forecast is the online database of the joint, national labour market survey of the National Ministry for Economy and the Institute for Economic and Enterprise Research of the Chamber of Commerce and Industry.

the occurrence of investment. The results are presented, along with a detailed explanation, in *Table 3.3.2*.

Table 3.3.1: The average of shortage indicators and the number of cases in the sample analysed in this chapter

	Percentage	Cases
Presence of persisting vacancies	16.7	1539
Proportion of persisting vacancies	0.7	1539
Unable to fully utilise capacities due to the shortage of skilled workers	15.9	1527
Idle capacity due to the shortage of skilled workers	0.9	1527
Unable to fully utilise capacities due to the shortage of unskilled workers	9.0	965
Idle capacity due to the shortage of unskilled workers	0.5	965
Paying below the wage level expected on the basis of workforce composition (total staff)	54.3	1539
Paying below the wage level expected on the basis of workforce composition (skilled workers)	55.4	1527
Paying below the wage level expected on the basis of workforce composition (unskilled workers)	50.3	965

Source: The merged database of the 2015 *HLMF* and the Wage Survey.

Table 3.3.2: The impact of the enterprise-level residual wage on the occurrence and the value of shortage indicators, 2015, probit marginal effects and linear regression coefficients

	Impact on shortage indicator		Model	cases
	residual wage[b]	investment[c]		
Are there vacancies? (0/1)	–0.008 (0.3)	0.087*** (4.7)	Probit	1539
Vacancies (proportion)	–0.058** (2.5)	–0.005 (0.2)	OLS	1539
Unable to fully utilise capacities due to the shortage of skilled workers (0/1)[a]	–0.126*** (3.5)	0.087*** (4.9)	Probit	1527
Idle capacity due to the shortage of skilled workers (proportion)	–0.119*** (4.5)	0.076*** (3.0)	OLS	1527
Unable to fully utilise capacities due to the shortage of unskilled workers (0/1)	–0.013 (0.4)	0.049** (2.4)	Probit	965
Idle capacity due to the shortage of unskilled workers (proportion)	–0.035 (1.3)	0.069** (2.3)	OLS	965

[a] Idle capacity attributable to labour shortage: $C = (1 - c)l$, where c is the utilisation rate of capacity ($0 \leq c \leq 1$) and l is the extent of idle capacity attributable to the shortage of skilled and unskilled workers ($0 \leq l \leq 1$), as reported by companies.

[b] For estimating the enterprise-level residual average wage, see the main text. The first two blocks contain the enterprise-level residual average wage, while the others contain the residual wage estimated for the qualification groups.

[c] Binary variable with a value of 1 if the company made investment in 2015 and 0 if they did not make any.

T-values are provided in brackets. Standard errors were calculated using bootstrap resampling repeated 100 times. Interpreting the coefficients in the OLS (ordinary least square) model: the impact of one standard deviation of residual wage difference on the shortage indicator, measured in standard deviation units. As for the

probit model: marginal effect at the sample mean. Company size was also included in the equations; however, its coefficients were close to zero and not significant, thus they are not presented here.
Note: Dependent variables: shortage indicators.
*** Significant at a 1 per cent level, ** significant at a 5 per cent level, * significant at a 10 per cent level.
Source: The merged database of the 2015 *HLMF* and the Wage Survey.

The results indicate that the coefficients for the residual wage are negative in each case, suggesting that manifest shortages occur more often at firms paying below the market rate. However, effects are significant for only half of the indicators included. Strong effects were observed at companies paying their *skilled* workers below the market rate. Considering the estimated marginal effects (β) and the range of residual wages ($\sigma = 0.29$), it is seen that if the average enterprise-level wage is one standard deviation unit below the market rate, it increases the probability of idle capacity attributable to labour shortage by $\beta\sigma \approx 3.5$ percentage points. Results concerning *unskilled* workers are also negative but they are much weaker and not statistically significant. Results concerning vacancies as shortage indicators are also weaker.

At a given level of residual wage, shortage occurs more frequently and is more severe at firms that have made investments. It is important to note though that this is more likely to be interdependence than causality, because investment may both alleviate or worsen shortage. Additionally, sometimes investments are made as a result of shortage.

The opposite relationship between residual wage and complaints of shortage would work against the above interpretation. A firm facing shortage would probably like to increase wages, not decrease them: this would imply a positive relationship between shortage and residual wage. Observing a negative relationship between residual wages and complaints of shortage clearly indicates that there is an opposite effect: shortage arises more often at low-paying firms.

Furthermore, it is possible that wages below the market rate are compensated for by non-pecuniary benefits. However, it would be difficult to explain why these unobserved non-monetary benefits, such as above-average work conditions, convenient working hours, better promotion prospects and job security would entail more frequent and serious complaints of shortages. These factors, holding wages equal, tend to reduce the probability of shortage and weaken the negative relationship between residual wages and complaints.

Shortages and wage increase

The samples analysed lend themselves to investigating the relationship between shortage as well as planned and actual *wage increases* and also how the planned and actual increases relate to each other. Corporate intentions are of interest in themselves, as they depend not only on factors determining actual wage increases but also on the expectations of businesses. Consequently, it

cannot be expected even in principle that actual wage increases would equal the intended ones. However, it is reasonably expected that the two have a significant positive relationship: that companies plan changes in the wages they offer taking account of the factors actually influencing their wages.

The analysis relies on the 2015 HLMF and the 2015 and 2016 Wage Surveys. The HLMF survey was conducted in September–October 2015 and it provides information on wage increases planned for 2016. The related question was as follows: "*How is the average wage expected to change in 2016 (in nominal value) at your company (site) compared to the previous year?*" The figures for the actual wage increases obtained from the Wage Surveys also concern the increase in average wage between May 2015 and 2016. Although the two indicators do not exactly measure the same thing, a strong relationship is presumed between them, since the majority of companies raise wages in the first half of the year.

The effect of shortage indicators on planned and actual wage increases is evaluated using univariate regressions. We apply robust regression (Stata *rreg*) because of some extreme values in the changes of wage levels, which would imply ambiguous results in linear regression.

Table 3.3.3 suggests that it was only the presence and proportion of vacancies as well as the occurrence of idle capacity attributable to the shortages of skilled workers that affected 2016 wage increase plans. It may additionally contribute to the positive correlation that some factors (market opening, launching a new factory or shift) can result both in wage increase and (temporary) shortage at the same time.[2] However, effects are very weak even in univariate equations not controlled for additional effects: companies reporting vacancies in 2015 had only 0.7 percentage point faster wage increases for 2015–2016 than companies not complaining of shortages.

What is even more striking: complaints of shortage did not result in faster *actual* wage increase in any of the cases, compared to companies not reporting shortages – coefficients are positive in each case but not significant even at a 10 per cent level. It is partly due to the fact that planned and actual wage increases had a positive but loose relationship. When regressing the actual figures to the forecast (using a robust model again), the coefficient obtained is 0.31 and significant at 1 per cent level, that is, a one per cent faster planned wage increase was likely to result in an actual wage increase faster by only one-third of a per cent.[3]

Ideally, the relationships touched upon herein should be investigated using a sample that allows more detailed analysis. However, such data are not available: at present, the merged database of the 2015 *HLMF* and the 2015 and 2016 Wage Surveys is the largest, most recent and most reliable sample suitable for analysis. These data do not suggest a strong relationship between manifest shortage reported by firms and the pace of wage increase.

2 However, the qualitative results remain the same when a variable for firm size is also included in the model.

3 This is not modified by including investment or company size.

Table 3.3.3: The effect of the 2015 shortage indicators on the 2016 planned and 2015–2016 actual corporate average wage increase, robust regression coefficients

	Effect on the		The mean and the standard deviation of the shortage indicator
	planned	actual	
	wage increase measured at the logarithmic point		
Are there vacancies?	0.007***	0.003	0.172
	(3.1)	(0.32)	..
Proportion of vacancies	0.064**	0.105	0.007
	(2.0)	(0.66)	(0.025)
Unable to fully utilise capacities due to the shortage of skilled workers (0/1)	0.004*	0.006	0.159
	(1.8)	(0.6)	..
Idle capacity due to the shortage of skilled workers (shortage)	0.016	0.134	0.009
	(0.6)	(1.0)	(0.294)
Unable to fully utilise capacities due to the shortage of unskilled workers (0/1)	–0.000	–0.007	0.090
	(0.1)	(0.5)	..
Idle capacity due to the shortage of unskilled workers (proportion)	–0.013	0.041	0.005
	(0.3)	(0.2)	(0.021)
The mean and the standard deviation of wage increase	0.022	0.076	
Number of observations	869	869	

Note: Dependent variables: shortage indicators. Actual wage increases were calculated based on the average wage level of the business sector in May 2015 and 2016.
Source: The merged database of the 2015 *HLMF* and the 2015 and 2016 Wage Surveys.

Shortcuts for alleviating shortages

The above findings do not reveal everything about the impact of labour shortage on wages (and other forms of remuneration) for several reasons. Firstly, due to the lack of data, it is not possible to assess the changes in the wage levels of firms which do not face manifest shortage but still regard the workforce as a factor limiting their development. Secondly, the relationship between wage increase and shortage is not unidirectional: shortage in the past may lead to wage increase, which mitigates shortage. Simultaneity bias could only be avoided if we had variables which influence shortage but do not influence wage increase plans. However, we did not find such potential "instruments" in the available databases. Thirdly, some of the firms facing recruitment difficulties attempt to find solutions other than wage increase to alleviate shortage. Less productive companies, unable to raise wages, are easily prompted by lack of prospects to find grey, unlawful solutions.

A wide range of firms may be tempted to do that. The value added per head is 50 per cent lower at Hungarian companies in manufacturing and 60 per cent lower at Hungarian companies in the construction industry and ICT services than at foreign-owned companies (*HCSO,* 2017). Some of the for-

eign-owned companies – primarily the ones employing assemblers, machine operators and semi-skilled workers on the minimum wage – also offer below-average wages and this circle is more characterised by the value added per head typical of Hungarian firms (*Reszegi–Juhász,* 2013). These firms find it difficult to raise wages without risking going under. However, if they do not raise wages, the disadvantages arising from low productivity cumulate in a tighter labour market. Their headcount decreases because of the workforce drain of more productive firms. This erodes their earlier investments, the number of their vacancies increase and so does the proportion of fixed costs, while their revenues decrease, reducing their investment opportunities, including productivity enhancing investments, which would replace workforce. The only legal way for these firms would be development and innovation – they have also had the opportunity before, by relying on subsidised loans, for example in the Funding for Growth Scheme. Not having taken advantage of this opportunity suggests management problems. And firms trapped in a vicious circle are more likely to opt for grey or black, unlawful solutions.

This process is difficult to illustrate by data; thus we only provide some additional input in order to describe it. The source of information is primarily interviews with executives and the examples also come from them.

"All the workers are fast like hell, I don't want to work here", said an entrant after the probationary period as a good-bye to the manager of an exceptionally productive factory although he was offered a gross salary of HUF 300 thousand [about 970 Euro] for semi-skilled work. "I don't dare to discipline workers ignoring instructions because I'm afraid they'll quit", explains the executive of another company. "In autumn, there are so many workers on sick leave as if there was an epidemic – because it is harvest time. I know if someone is not ill but I don't want to check on him otherwise he might quit, although this absenteeism breaks up production", says the executive. The question of an applicant for a logistics job at the job interview: "Do I also have to pack goods and work with a forklift? I thought I'd just have to sit at the computer in the office all day". "I must leave to earn more because workers are paid less here", says a worker changing jobs every three or four years.

In addition to involuntary lenience with workers, unlawful ways also emerge, which owners blame on the struggle for survival, excusing themselves. Several firms do not register workers as a full-time, fully paid employee: the job is officially reported as a part-time job, while in reality it is full time and the difference is paid out off-the-books. This practice is frequent in trade, catering and hospitality. Overtime is often compensated in another way because paying it would be twice as expensive. "I didn't understand why I have to tell the net pay to applicants at interviews. Then I asked a thirtysomething applicant who answered that because he had never been registered as a full time employee!" All these are paid out from unlawful sales, made without issuing an

invoice, or purchasing bills of costs, or from the dividends at best. If shortage becomes prevalent, this kind of unlawful behaviour will probably proliferate among less productive firms.

* * *

Considering that the direct analysis of the relationship between labour shortage and wages, based on enterprise-level data, can only be performed using small samples and a limited set of variables, the next subchapter will explore indirectly, over a longer time-frame and based on individual data, whether the trends in wages reflect intensifying labour shortage.

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3.4 LONG-TERM TRENDS IN RELATIVE WAGES. ARE THERE ANY SIGNS INDICATING SHORTAGE?

ÉVA CZETHOFFER & JÁNOS KÖLLŐ

Wage increase has considerably accelerated in the last two years and many explain it by the emergence of shortage. In 2016, there was an outstanding real wage increase near or at the level of earlier peaks (1994, 2001–2003, 2005), while the various shortage indicators have also started to grow rapidly.[1] This does not necessarily imply that there is causality between the two phenomena. A possible causality is assessed through indirect effects in the subchapter (while Subchapter 3.3 analyses the direct relationship between certain shortage indicators and wages). We examined whether wages in the groups of workers and firms impacted more strongly by the changes on the supply side (headcount loss, emigration, retirement) or are "well-known" to be affected by labour shortage (skilled workers, manufacturing companies) increased more rapidly.

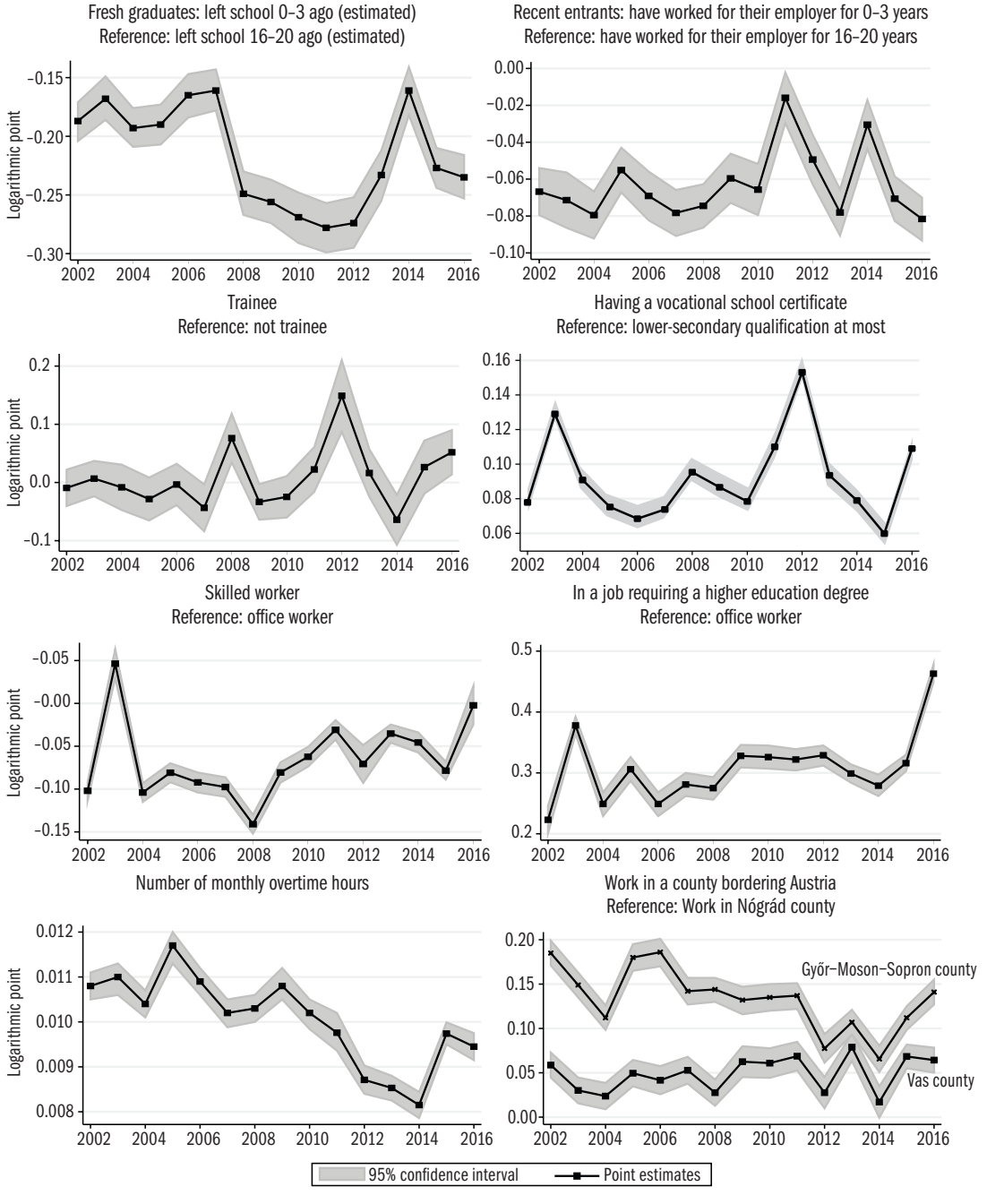
Wage growth was explored in two steps. First, we estimated individual wage equations from the millennium to 2016 and drew conclusions from the changes in the impact of individual and contextual characteristics on wages in order to examine the potential role of recruitment difficulties. Then, we evaluated the impact of enterprise characteristics, including workforce composition on annual enterprise-level wage increase. The study below only discusses the parameter time series of variables suitable for (indirectly) identifying shortage; the detailed results are available upon request in a Stata or Excel database. The research was restricted to the business sector.

Figure 3.4.1 shows how the wages of fresh graduates, trainees, recent entrants, those with a vocational school certificate, skilled workers and higher education graduates changed between 2002 and 2016. For more explanation on the graphs, see the note below the figure.

The wage disadvantage of *fresh graduates* relative to those in the labour market for 16–20 years ranged between 17–27 per cent and decreased in the period 2014–2016, compared to the period of the economic crisis and recovery, but it did not drop below the level seen in the 2000s. No marked break is observed in the period when complaints of shortage became more frequent. Similarly, there is no marked break in the case of *employees working for their present employer for a maximum of three years*: their wage disadvantage relative to employees working for their employer for 16–20 years ranged between 4–8 per cent, except for two years, and it has not decreased recently. A slightly growing trend is seen in the time series of *trainees* but the wages at the end of the period are not significantly different from wages in the early 2000s; additionally, there is no sharp change between 2013 and 2016, in the period of growing recruitment difficulties.

1 For more details, see the section titled *Statistical data*.

Figure 3.4.1: The impact of individual factors on the monthly gross wages,[a] regression coefficients



[a] The graphs indicate how many logarithmic points (or, if multiplied by one hundred, roughly how many percentage) is the gross wage of the category lower or higher than the that of the reference category. The curve indicating the effect of overtime

shows by how many logarithmic points one hour of monthly overtime increases the monthly gross wage. The grey areas (the confidence intervals) indicate that the strength of the effect is estimated to be between the limits shown, with a 5 per cent risk of errors. All effects are partial, that is, they are valid if controlling for all other factors. The equations contained the following variables: gender, time spent in the labour market, time at employer, educational attainment level, occupation (based on the one-digit codes of the Hungarian Standard Classification of Occupations), trainee, number of overtime hours, part-time employment, fixed-term contract, majority foreign ownership of employer, sector, county where sites are located. The estimation only covers the business sector.

Note: Dependent variable: logarithm of monthly gross wage.
Source: Wage Surveys, 2002–2016.

The time series of the wage advantage of those with a *vocational school certificate* (those who obtained a certificate not entitling them to higher education studies) does not show a growing tendency of relative wages, which would boost the supply of workforce with this level of qualification. At the same time, the wages of *skilled workers* began to grow strongly after the trough in 2008: their wage disadvantage relative to office workers (15 per cent) had completely disappeared by 2016. A sharp change is observed in the wage increase of those working in *occupations requiring a higher education degree* (also compared to office workers) in 2015–2016.

Surprisingly, instead of a rise, there was a decline in the contribution of *overtime* to earnings: while ten hours a month overtime increased the monthly gross wage by 11 per cent in 2002, this effect decreased to 9 per cent in 2016, which is a small but statistically significant change.

Finally, wages (controlling for all other factors) did not increase among *those working near the Western border*, in Győr-Sopron-Moson and Vas counties, which are the most affected by commuting to Austria: wages in the former rose slightly but continuously, wages in the latter dropped slightly compared to the reference, Nógrád county.

A separate figure presents trends in *sectoral wage differentials*, controlled for workforce composition, company size, ownership and geographical location (*Figure 3.4.2*). Two tendencies are worth noting: wage advantage in the financial sector decreased considerably after 2006 and the position of manufacturing industry improved after 2012.[2]

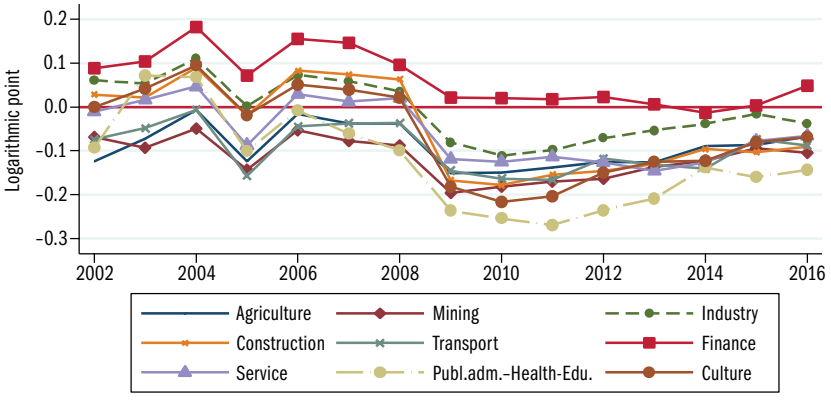
Overall, there were only two cases when the tendencies in individual wages changed in a direction and extent that would imply that labour shortage may play a role at all: one is the increased the appreciation of *occupations requiring a higher education degree*, the other is improvements in wages in *industry*. None of the other variables included either in the figures or in the analysis in general changed in a way that would suggest a strong relationship between the increasing occurrence of shortage and accelerating wage hikes.

The enterprise-level regressions based on short (biannual) panel data explain *changes* in annual average wages from 2002–2003 to 2015–2016. The most relevant time series of parameters are included in *Figure 3.4.3*.

2 In this case we did not present the confidence intervals for the point estimates for the purposes of clarity.

Figure 3.4.2: Sectoral wage advantages, 2002–2016

Sectoral wage differentials 2002–2016; Reference: Energy and water



Companies with many *employees approaching the retirement age* are more affected by the scarcity of supply. The effect of the higher proportion of elderly employees increased after 2005 but the period of more severe shortage did not have an impact on this tendency. The point estimates indicate an increase but the confidence intervals measured at the beginning and end of the period overlap, that is, the difference is not statistically significant.[3]

The *proportion of young people* was accompanied by above average growth rate of wages in the entire period of the analysis, except for one year. Companies employing more young people are impacted by fluctuation and emigration (increasing among young people) more than the average, which may have played a role in the acceleration of wage growth after 2008. However, the confidence intervals estimated for the years before and after the crisis also overlap in this case.

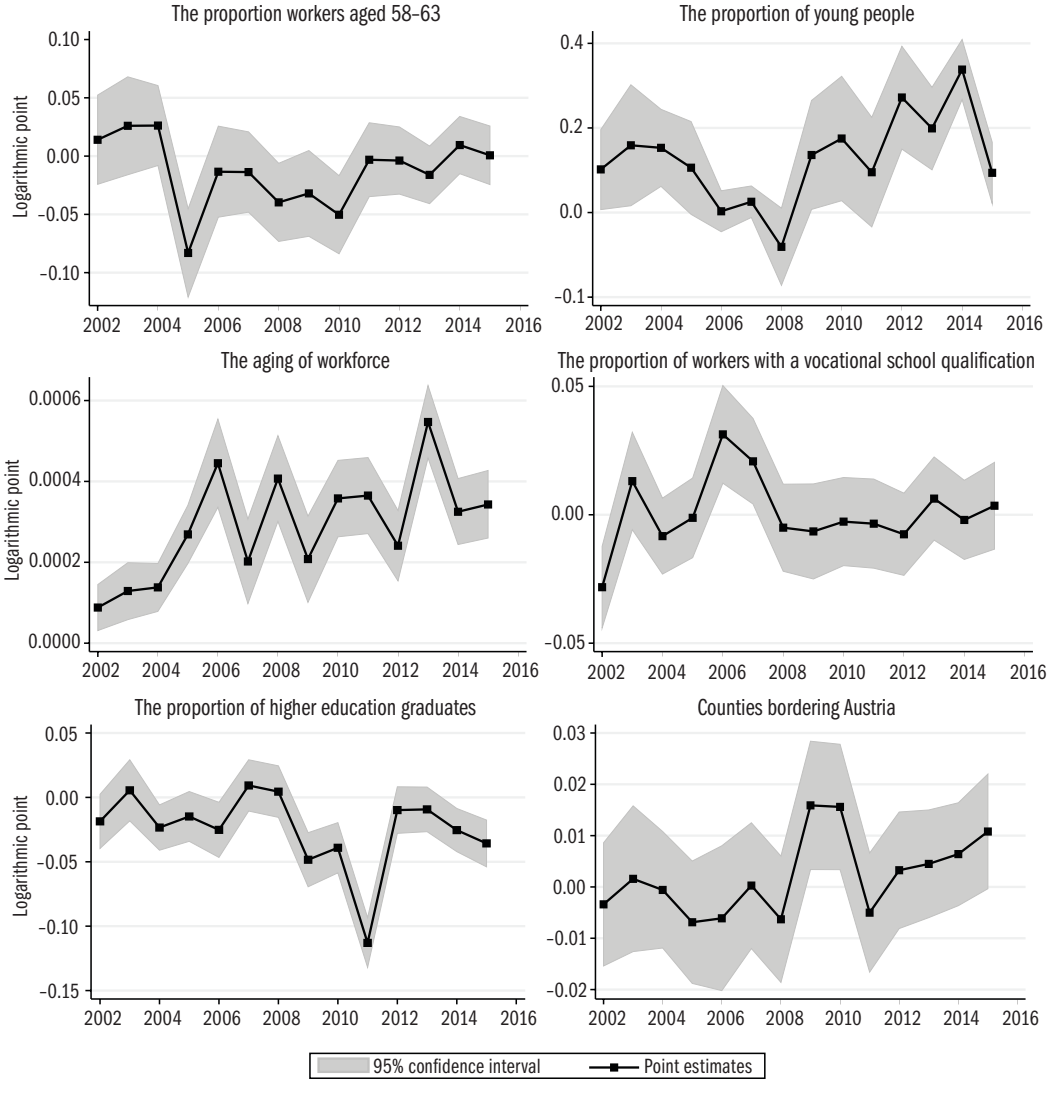
Labour turnover: when there is no churning, the average tenure of employees increases by one year within a year – if the figure is higher, it indicates the aging of the company. This was accompanied by above-average *wage growth* during the entire period studied, which suggests the failure of efforts for ensuring supply rather than intentionally neglecting it. The relationship grew stronger; however, not after 2013 but continuously over the whole period examined.

Firms employing more workers with a *vocational school qualification* raised wages at an average rate over the whole period examined (except for 2003–2004). This pattern did not alter in the years of more frequent complaints of skilled worker shortage in 2013–2016. The effect of the proportion of *higher education graduates* did not change after 2013 either.

At firms with one or more sites in Győr-Sopron-Moson or Vas counties, point estimates suggest a gradual acceleration of wage growth but figures calculated for the beginning and end of the period do not differ significantly.

3 It is worth noting that the aging of workforce impacts the various occupations, sectors and regions similarly; however, there are extreme differences at enterprise level: according to the data of the National Pension Insurance, 60 per cent of firms have no employees approaching the retirement age (aged 59–63), while at the remaining 40 per cent their proportion is more than twice the overall average.

Figure 3.4.3: The effect of workforce composition on corporate average wage,[a] regression coefficients



[a] The graphs indicate how many logarithmic points (or, if multiplied by one hundred, roughly how many percentage) was the average corporate wage growth faster or slower as a result of a one unit change in the explanatory variable. The grey areas (the confidence intervals) indicate that the strength of the effect is estimated to be between the limits shown, with a 5 per cent risk of errors. All effects are partial, that is, they are valid if controlling for all other factors. The equations contained the following variables not presented in the figure: the proportion males, the proportion of graduates from general upper-secondary and vocational upper-secondary schools, the proportion of workers on minimum wage, the proportion workers with a fixed-term contract, headcount, sector. Young = finished school a maximum of three years ago (estimated value). The aging of workforce = change in the aver-

age service time in a year. The years refer to base years. The estimation only covers the business sector.
Note: Dependent variable: the logarithm of the annual changes in corporate average wages.
Source: Wage Surveys, 2002–2016.

* * *

In conclusion, the data on relative wages, obtained from a large sample, do not indicate that labour shortage would play a decisive role in the rapid wage growth of recent years. Point estimates suggest rising wages among young people, in skilled worker positions and occupations requiring a higher education degree as well as in industry. They also show faster corporate wage increase at companies more affected by demographic replacement, staff turnover and emigration but hardly any of the changes are significant and the point estimates indicate long-term tendencies instead of a sharp break in the years of worsening labour shortage. Although there have been several cases (e.g. in large shopping centres) of significant pay rises resulting from increasingly severe recruitment difficulties, these did not alter the Hungarian wage hierarchy until 2016.

4 LABOUR SHORTAGE AND VOCATIONAL EDUCATION

4.1 VOCATIONAL TRAINING

JÁNOS KÖLLŐ

The first plans concerning the restructuring of vocational education and training and higher education had emerged several years before complaints of shortage intensified. These plans – regardless of the reasons for which they were developed – however, were entirely in accordance with the criticism of education voiced by the Chamber of Commerce and Industry and other entrepreneurial forums concerning severe skilled worker shortage and also with their recommendations on increasing the importance of vocational training. Before starting to analyse the diagnosis and therapy developed by the Chamber and the Ministry, it is worth discussing three important but probably less well-known facts.[1]

Vocational training losing importance?

Contrary to popular belief, secondary vocational education and training did *not* lose significance following the political changeover of the 90s, only its structure altered. Uncertified vocational training (VET) receded to the same extent as vocational secondary education (combined with a Matura and referred to as VSS henceforth) expanded.[2] As a result of the two trends the proportion of young people in an age-group entering the labour market with a vocational qualification has been roughly stable over the past twenty years. The proportion of young people with VET qualification dropped from 35–36 per cent to 32–33 per cent, while the share of those passing a vocational qualification in VSS (and some of them entering higher education and obtaining a degree) was higher in 2013 (nearly fifty per cent) than at any time since 1985, the start of the surveys of the study *Hajdu et al* (2015).

VET graduates in the labour market: who are they?

In the past twenty-five years, the occupational composition of VET graduates has changed considerably. A significant proportion of them already worked as unskilled or semi-skilled workers twenty years ago: according to the 1996 Wage Survey, 27 per cent of them worked as assemblers, machine operators or in elementary occupations. However, this had increased to 46 per cent by 2016 (including public works participants) in the entire economy and 52 per cent (excluding public works participants) at companies with more than one hundred employees, according to the Wage Survey.

Table 4.1.1 presents the recent developments of the trend in detail. The proportion of VET graduates working in public works schemes – primarily

1 The chapter relies strongly on *Hajdu et al* (2015).

2 The two main school types are referred to by their better-known names: *vocational school* (*szakiskola*) and *upper-secondary vocational school* (*szakközépiskola*). However, officially the former has been renamed as upper-secondary vocational school (szakközépiskola) and the latter as specialised upper-secondary general school or specialised gymnasium.

unskilled work – increased from 2.4 per cent to 6.2 per cent between 2011 and 2016. The share of those working in the primary labour market in elementary occupations, as assemblers or machine operators also rose slightly, while the share of those employed as skilled workers decreased from 48–50 per cent to 42–43 per cent. 8–10 per cent of these worked as technicians or in a clerical, office job during the whole period reviewed. Overall, the majority of graduates from VET are at present employed as unskilled or semi-skilled workers.

Table 4.1.1: The occupational composition of graduates from VET and VSS in 2011–2016, percentage

	2011	2012	2013	2014	2015	2016
Public works participant						
VET	2.4	3.7	5.4	3.0	5.7	6.2
VSS	1.1	1.5	2.1	1.1	2.7	2.7
Assembler, operator, elementary occupations						
VET	39.9	37.3	41.4	40.2	43.1	41.6
VSS	18.0	18.6	19.5	17.7	19.0	18.4
Skilled worker						
VET	48.0	50.0	45.0	47.2	43.2	42.3
VSS	24.1	20.6	23.5	25.8	24.4	25.3
Other						
VET	9.7	8.8	8.2	9.6	8.0	9.9
VSS	56.8	59.3	54.9	55.9	53.9	53.2
Total						
VET	100.0	100.0	100.0	100.0	100.0	100.0
VSS	100.0	100.0	100.0	100.0	100.0	100.0
The share VSS graduates among skilled workers	22.6	18.3	23.1	24.8	25.0	25.9

Source: Wage Surveys.

The figures are much better in the case of VSS graduates: the proportion of those participating in public works schemes is still very low and the proportion of those working as assemblers, operators and unskilled workers did not increase either. The share of those in skilled worker positions slightly increased, while the share of those in white collar jobs slightly decreased. As the final row of the table shows, the share of those with a Matura among skilled workers has reached 25–26 per cent in recent years.

The market value of a vocational qualification with or without a Matura

Even though employers state they primarily need vocational graduates who underwent practical training and were not burdened with the task of preparing for a Matura, they do not value such employees even in manual occupations as much as VSS graduates.

As *Table 4.1.2* indicates, as a result of the continuously increasing minimum wage, the wage advantage of all more educated groups decreased in 2011–2016 compared to those completing 0–8 grades. However, what is more significant for our analysis is the difference between the two major groups participating in manual skilled work.

Table 4.1.2: The wage advantage of VSS graduates in various occupational groups compared to those with a lower secondary qualification at most (0–8 grades) in 2011–2016 (percentage)

Qualification and occupation	2011	2012	2013	2014	2015	2016
Operators, assemblers and elementary occupations						
VET	9.2	5.7	7.9	7.3	4.4	4.9
VSS	25.6	21.1	18.0	17.8	18.5	17.6
Skilled work						
VET	12.2	9.2	11.8	13.3	10.9	10.6
VSS	25.1	24.6	23.2	20.7	20.9	21.7
Technicians, clerks, office jobs						
VET	39.2	32.9	36.1	30.9	35.1	37.9
VSS	61.4	50.5	52.2	46.6	55.5	50.9
Upper-secondary general school graduates	49.3	41.9	40.0	36.5	40.6	40.2
Higher education graduates	174.8	151.2	152.3	143.8	157.1	147.6

The figures show the wage advantage of those with various qualifications working in various occupational groups compared to those with a lower-secondary qualification at most (grades 0–8) in the primary labour market as a percentage. Wage advantages were calculated by regression models, controlled for gender, labour market experience, industries and sectors (private versus public sector), not including public works schemes, as a percentage, thus if the difference in logarithm is b, the figure in the table e^b. All estimated parameters are significant at a 0.01 level, and the t-values are two or three digit figures.

Source: Wage Surveys.

The wage advantage of VSS graduates in *elementary occupations* was 16 percentage points over VET graduates in 2011 and was 12 percentage points at the end of the period; their wage advantage in *skilled labour* did not change much over the period (13 and 11 percentage points respectively) and decreased significantly only in *white-collar* occupations, from 21 to 13 percentage points. We did not include public works schemes in the comparison, since wages are not set by the market in that sector.

The differences at the end of the period are presented in more detail in *Table 4.1.3.* Overall, VSS graduates earned 27–28 per cent more than VET graduates in 2016. It was partly due to their more favourable occupational composition. When controlling for occupations (four-digit HSCO categories), there is still a roughly 6 per cent wage advantage, and when focusing on skilled work, the advantage is 8–10 per cent. When looking at the difference between those working at the same *employer*, the wage advantage is 15–16 per cent, partly because upper-secondary vocational school

graduates are more likely to be recruited or promoted to better paid jobs at individual firms.[3]

Table 4.1.3: The proportions of vocational school and upper-secondary vocational school graduates and the wage advantage of the latter over the former in 2016

Wage advantage	VET	VSS	Wage advantage of VSS over VET	95% confidence interval[a]	Number of cases
	Proportion, per cent				
Total wage advantage	22.2	18.4	27.3	26.6–28.0	255,327
Within occupations	22.2	18.4	6.0	5.5–6.5	255,327
– excl. HSCO 8–9[b]	17.9	21.4	8.8	8.1–9.5	183,179
Within firm	22.2	18.4	15.6	15.3–16.2	255,327
In specific occupations					
Locksmiths, machining workers, welders[c]	70.0	13.7	12.9	9.8–16.0	5,618
Industrial mechanics[d]	49.5	25.4	11.9	8.3–14.0	5,798
Construction mechanics[e]	65.5	16.0	12.4	8.7–16.4	2,979
Social workers	9.6	25.8	25.1	18.2–33.5	860
Shop assistants[f]	40.1	35.4	5.1	4.0–6.2	9,860
HSCO 8–9[g]	36.2	13.4	11.6	10.4–13.0	57,849

[a] We can claim, with a less than 5% risk of error, that the wage advantage falls within these limits.
[b] HSCO 8–9: Assembler, machine operator, other elementary occupations.
[c] Locksmiths, machining workers, welders: locksmiths 50%, machining workers 22%, welders 18%, other 10%.
[d] Industrial mechanics: motor vehicle mechanics 54%, electrical mechanics 19%, machinery repairmen 10%, other 17%.
[e] Construction mechanics: electrician 41%, plumbers and gas fitters 35%, other 24%.
[f] Shop assistants: shop assistant 81%, cashier 12%, other 7%.
[g] Assembler or operator 50%, in elementary occupations 50%. Excluding public works participants.
Methods: the wage advantage was estimated by regression equations, which contained the following control variables: gender, labour market experience and its square as well as dummy variables standing for four-digit HSCO codes and anonymised employer codes when calculating within-occupation and within-firm wage advantages. The difference in percentage is e^b if the estimated logarithmic difference is b.
Source: Wage Survey, 2016.

When observing the most popular blue-collar occupations, it is conspicuous that upper-secondary vocational school graduates are employed in this segment at the same rate as their proportion in the total workforce. Their wage advantage as locksmiths, machining workers, welders as well as industrial and construction mechanics is 12–13 per cent, as social workers it is 25 per cent and even as shop assistants it is 4–6 per cent. Their wage advantage is also significant, 10–13 per cent, when working as unskilled or semi-skilled workers.

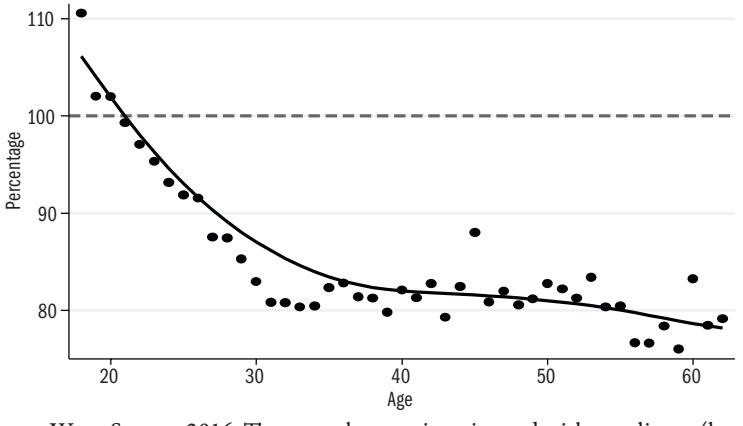
The wage advantage strongly depends on age. VET graduates entering the labour market earn somewhat more than VSS graduates of the same age but they already have a substantial wage disadvantage at the age of 25. This is

3 The confidence intervals are presented because the number of cases is low due to the breakdown to occupations.

not a new phenomenon and does not indicate the (allegedly) improving market perception of VET graduates: similar curves are presented by *Hajdu et al* (2015) for other years following the political changeover.

The wage disadvantage of vocational school graduates increases by age, which indicates the lack of transferability of skills acquired in vocational schools: because of competences improving adaptability, the Matura loses its market value at a slower pace than a vocational school certificate (*Figure 4.1.1*).

Figure 4.1.1: The wage of VET graduates compared to the wage of VSS graduates by single years of age in 2016



Source: Wage Survey, 2016. The smooth curve is estimated with non-linear (lowess) regression.

That the fast depreciation of the VET certificate is due to the low levels of cognitive skills is confirmed by not conclusive but important direct evidence from the ALL Survey (Adult Literacy and Lifeskills Survey), in which Hungary participated in 2008.[4]

Table 4.1.4 presents how the reading, literacy, document interpretation and simple numeracy skills assessed by ALL tests change by age among Hungarian manual workers who accomplished 11 or 12 grades. (The survey does not identify the VET qualification but typically workers with 11 completed grades have graduated from there, while those who completed 12 grades and employed as manual workers typically graduated from a VSS). The coefficients show by how many points the test results decreased, on a 0–500 scale, if the respondent is one year older.

The assessed basic skills deteriorate by age in both groups but the rate of deterioration is much greater among workers with a VET certificate. Among the former, test scores are typically 0.4–0.5 points lower when respondents are a year older, while among the VSS graduates, all but one effect are below 0.3, half of them are below 0.2 and half of the cases are not even significant at a 10 per cent level, and none of them is significant at a 1 per cent level. The

4 The evidence would be conclusive only if instead of a cross-sectional study, we were able to follow the changes in the skills of persons with differing qualifications for 30–40 years.

statistical tests presented in the last and the last but one column disaffirm the identity of the slope of the age-score curves in all cases.[5]

Table 4.1.4: Changes in ALL test scores according to age among manual workers who completed 11 or 12 grades

Dependent variable: test score	Coefficient	t-value	Coefficient	t-value	Wald F	Sign.
Grades completed:	11 grades		12 grades			
Literacy test						
1	–0.43***	3.78	–0.17	1.37	19.5	0.0000
2	–0.44***	3.94	–0.26**	2.30	10.7	0.0011
3	–0.36***	3.16	–0.10	0.87	19.3	0.0000
4	–0.45***	3.92	–0.23*	1.93	15.9	0.0001
5	–0.42***	3.81	–0.19	1.64	16.7	0.0000
Document interpretation tests						
1	–0.44***	3.55	–0.23*	1.73	10.1	0.0016
2	–0.48***	4.01	–0.31**	2.50	8.4	0.0039
3	–0.47***	3.89	–0.29**	2.27	8.7	0.0033
4	–0.47***	3.93	–0.27**	2.18	10.9	0.0010
5	–0.40***	3.23	–0.26**	2.08	4.5	0.0340
Numeracy skills tests						
1	–0.28***	2.61	–0.06	0.50	15.6	0.0001
2	–0.40***	3.56	–0.12	1.05	24.4	0.0000
3	–0.44***	4.12	–0.24**	2.17	11.8	0.0006
4	–0.32***	2.96	–0.09	0.79	17.6	0.0000
5	–0.17**	2.56	–0.05	0.41	16.1	0.0001

Note: Adult Literacy and Lifeskills Survey (ALL, 2008), Hungarian subsample, 1206 persons.
Source: Author's calculation using the microdata of the Hungarian subsample of the ALL survey.

The left-side of the equations contained the score of one of the tests, while the right side contained the interactions of age and educational attainment level (11 or 12 grades). The coefficients show by how many points the test results decreased, on a 0–500 scale, at a given educational attainment level if the respondent is one year older. The sample includes persons who completed 11 or 12 grades and were working as manual workers at the time of the survey (their ISCO1 HSCO1 code was higher than 4). The standard errors, used for the t-values were estimated using the 30 replication weights included in the survey and the jackknife method. The Wald test measures at what significance level the coefficients of the two groups may be considered different.

Only part of the sample lends itself for analysing how the measured cognitive skills are valued by the market, because data on wage is only available for half of the respondents of the Hungarian sample of ALL.[6] According to the regression on available data (*Table 4.1.5*), the higher score was associated with higher wages, even when controlling for education attainment and age: the

5 For more details on the ALL survey, see *OECD and Statistics Canada* (2005, 2011), *Statistics Canada* (2011), *Köllő* (2014).

6 Data on wage is lacking more often in the case of men but its availability is independent of age and educational attainment level.

elasticity of wage to the test score is positive, with the the point estimate being 0.43 (although the confidence interval is rather wide: 0.05–0.8).

Table 4.1.5: The impact of the average score achieved in ALL on monthly wages among Hungarian workers who completed 9–12 grades

Dependent variable: the logarithm of monthly wage	Coefficient	t-value	Confidence interval
The logarithm of average test score	0.43	2.2	0.05-0.80
Educational attainment (year)	0.11	3.3	0.04-0.18
Labour market experience (year)	0.07	3.3	0.02-0.07
-its square (x100)	-0.05	3.2	-0.08-0.02
Constant	7.00		

Note: The number of cases is 619 and the fit of the function is 0.045. The sample includes persons who completed 11 or 12 grades and were working as manual workers at the time of the survey (their ISCO1 HSCO1 code was higher than 4). The standard errors, used for the t-values were estimated using the 30 replication weights included in the survey and the jackknife method. Confidence interval: we can claim, with a less than 5% risk of error, that the coefficient falls within these limits.
Source: Author's calculation using the microdata of the Hungarian subsample of the ALL.

On the reforms of vocational education

The above findings call into question whether Hungarian companies have a considerable excess demand for VET graduates in order to fill skilled worker jobs. At present, half of vocational school graduates are employed as unskilled or semi-skilled workers. Wage levels do not indicate that firms would value VET graduates more than VSS graduates in any occupations. On the contrary, the latter are better paid even in traditional skilled manual occupations (machining worker, locksmith, welder, mechanic) by 12–13 percentage points, and nor was the situation affected by the slight increase in the relative wages of skilled workers with a vocational school certificate after 2011.

This applies to the workforce trained in the *current* system and to the *current* standards of vocational training, and apparently the corporate sector does not believe in securing better employees from this supply by raising wages.

The scepticism towards the average quality of vocational school graduates of the current system is highly justified. VET schools perform worse than VSS and upper-secondary general schools in developing the most important basic skills of pupils, even when controlling for test scores achieved in lower-secondary education and for social background. In the case of pupils with average skills, in the standard deviation of the test scores in grade 8 (–0,5, +0,5), VET schools contribute *one-third* of standard deviation less to the mathematics and literacy skills of pupils than VSS schools (*Hajdu et al,* 2015). Grade repetition and dropping out is widespread (*Kertesi–Kézdi,* 2010; *Fehérvári,* 2015).

Based on the findings, the most important question about "skilled worker shortage" is whether the current reforms to secondary vocational education

and training provide a solution to the rapid skills obsolescence of vocational school graduates and whether the individual (and society in general) loses the value provided by this school type. As the above tables suggest, this would primarily require appropriate resilience and learning skills, which are based on the basic skills necessary for learning.

How do reforms implemented in secondary vocational education after 2010 serve this purpose? These reforms included changes in the student proportions between VET and VSS to the advantage of the former; the shortening of VET, curtailing general education within VET; relaxing the requirements to be met by VET teachers; placing VETs under the control of the Ministry for National Economy and reducing the compulsory school age – in line with the vision that the Hungarian economy needs less general education and more "skilled workers fit for fighting" and that the education system should be better adapted to "labour market demand".

Hungarian reforms are modelled on the "German-style" dual VET, which is also characteristic of the Nordic countries. However, pupils enter these systems with considerably more general education and their graduates are much less restricted to the world of skilled manual labour than in Hungary.

In *Germany,* vocational school pupils start training for their occupation after 7,155 or 7,950 hours of general education (depending on the Länder), while in Hungary they start it after 5,742 hours (*Hajdu et al,* 2015). For a better illustration of scale, in terms of the length of general education it is as if Hungarian VET pupils attended basic (primary and lower-secondary) school for ten or eleven years instead of eight years, or after VET they attended a twelfth general upper-secondary grade and one or two more grades in college or university. Following the reduction in the number of general education lessons in VET, Hungarian pupils have had less of this education when entering the labour market, than German pupils had *before* starting VET (*Varga,* 2017).[7]

In *Denmark*, another country regarded as a role model, the three-grade, practical vocational training, with a strong participation of enterprises, is based on a 9-grade basic school and often another, preparatory, grade between the two. Due to this and the quality of education, there was an enormous difference between Hungarian and Danish vocational school graduates already before the radical reduction of general education in Hungary. The Danish graduates of apprenticeship education and training are markedly better at writing, reading and counting and perform complex work in a much higher proportion – the more intensive adult education and training also plays a role in this. Two-thirds of them speak English, while this figure is less than one per cent for the Hungarians. The Danish vocational training is far from aiming solely at producing "skilled workers fit for fighting": nearly forty per cent of vocational school graduates work as technicians, clerks, office workers, low- or mid-level managers or entrepreneurs. In Hungary,

7 *Varga* (2017) found that following the reforms, the total number of general education lessons of Hungarian vocational school pupils *after* the completion of the school is still 737 or 1,532 lessons lower than the number of general education lessons German pupils had *before* entering VET.

the proportion of the upwardly mobile is only 10 per cent (see *Hajdu et al,* 2015 and *Table 4.1.1*).

Vocational training reforms will probably increase the supply of vocational school graduates in the short run, trained to the current standards, without forcing enterprises to raise wages but in-depth curricular reforms, updating the skills of teachers and renewing the teaching staff will require a longer time. Even if this takes place, the length of vocational training will decrease and the average standards of quality are likely to decline, especially regarding the development of skills needed for adaptation, over a lengthy transitional period. This study does not aim at determining whether the price paid for fulfilling the current demand of employers (half of which is for skilled, the other half of which is for unskilled and semi-skilled workers) is too high. Nevertheless, it is safe to assume that there is such a price, which is paid by those concerned and also by society indirectly through deteriorating employability, lower wages and a faster obsolescence of skills acquired in education over a shorter or longer period.

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4.2 THE CAREER PLANS' OF 15 YEAR OLDS: WHO WANTS TO ENTER STEM?[1]

ZSUZSA BLASKO & ARTUR POKROPEK

STEM in this report stands for occupations in the fields of Science, Technology, Engineering and Mathematics that are either at the Professional or the Assistant Professional level, requiring at least higher secondary education. Labour market forecasts predict a continuous increase of demand for STEM skills across the European labour markets (*Cedefop,* 2016). Between 2015 and 2025 it is expected that in Hungary 85,000 new STEM positions will open up.[2] As STEM workers are employed in the technologically most advanced and potentially most productive sectors of the labour market, the prospect of shortages in STEM labour has been named one of the main barriers to economic growth in the first half of the 21st century in Europe (*Caprile et al.,* 2015, *EC,* 2015).

All over the world, males are overrepresented in the STEM workforce. This tendency is particularly strong in Engineering and ICT that were among the twenty most segregated jobs in Europe in 2010 (*Burchell et al.,* 2014). Between 2010 and 2015 in Hungary, four out of five engineers and ICT workers were males.[3] The gender segregation is of course apparent in (higher) education already. In 2015, women accounted for no more than 20% of the ICT students and 23% of the Engineering students in the Hungarian higher education institutions. On the other hand there was no difference in the number of men and women studying Sciences, Maths and Statistics.[4]

Women's underrepresentation in the STEM workforce is associated with several negative consequences. First, women's absence from these areas reduces the pool of potential applicants and can therefore contribute to the labour shortage. Secondly, it can also lead to a loss of talent if capable women choose not to go to STEM for external reasons. Absence of women in the STEM occupations also contributes to the gender wage gap as STEM jobs tend to be among the best paid ones all over Europe (*Goos et al.,* 2013),[5] including Hungary (*Veroszta,* 2015). Gender segregation in the labour market also has a tendency to reproduce itself as observed gender patterns influence young people's career decisions, reinforcing existing gender stereotypes about the masculine or feminine nature of the occupations (*Jarman et al.,* 2012).[6]

In what follows, we analyse the career plans of 15-year old students to better understand their motivations to choose or not to choose a STEM career. Career plans at this age are not only fairly realistic and reflective of students' abilities, school achievements and motivations but they also influence their later educational choices, and this way they also serve as self-fulfilling prophecies (*OECD,* 2015). Even though we are not aware of any longitudinal study

1 This paper is based on a major comparative study on students' STEM career plans, that used PISA data from the 28 EU Member States, prepared for the European Commission Joint Research Centre. (See: *Blasko at al.,* 2018). The views expressed are purely those of the authors and may not in any circumstance be regarded as stating an official position of the European Commission.

2 Cedefop.

3 Own calculations from LFS data.

4 Own calculations from Eurostat data (Eurostat: Students enrolled in tertiary education by education level, programme orientation, sex and field of education [educ_uoe_enrt03])

5 It is important to note that in Goos's study a STEM definition different from ours was applied that included Medical occupations but excluded occupations in Informatics and Computing.

6 For an overview of the Hungarian context see also (*Konczosné–Mészáros,* 2015, *Csőke et al.,* 2013; *Schadt–Péntek,* 2013). Further details can also be found on the following websites:. Vs.hu; Tizperciskola.blog.hu.

that would directly link adolescents' occupational plans to their actual labour market careers many years later, research has shown that these plans are rather good predictors of the occupational prestige achieved (*Ashby–Schoon,* 2010, *Croll,* 2008; *Schoon et al.,* 2007, *Sikora–Saha,* 2011), as well as of the subject-choice in higher education in general (*Tai et al.,* 2006, *Sikora,* 2014) and of choosing a STEM field of study in particular (*Morgan et al.,* 2013). Further, adolescents' occupational plans are already well reflecting the gender-segregation observed in the labour markets (*Sikora–Pokropek,* 2011, *Morgan et al.,* 2013, *Sikora,* 2014).

Thus our study is based on the idea that adolescents' career plans represent a significant stage along the path leading to the labour market. Even though students after age 15 will still face several selections and self-selections, this early choice will no doubt influence the later ones. Career plans of the adolescents and the labour market processes mutually reinforce each other, therefore by analysing young people's gendered career plans we expect also to better understand the gender-segregation apparent in the labour market.[7]

Data

For the purposes of this study, PISA data from 2015 was used. In that year 5,658 students from 245 Hungarian schools participated in PISA, and the sample was representative for the 15 year olds in the country. The measure of student career expectations was constructed from the following single question: "*What kind of job do you expect to have when you are about 30 years old? Write the job title.*" The responses were coded using ISCO08. To identify STEM occupations for the purposes of this study we have chosen the categorisation of occupations previously applied e.g. by *Caprile et al.* (2015) and also in a report published by the EC (*EC,* 2015). Accordingly, the following ISCO08 subgroups were classified as STEM: 21 Science and engineering professionals; 25 Information and communications technology professionals; 31 Science and engineering associate professionals; 35 Information and communication technicians.

Results show that in 2015, 28,3% of boys but only 7,7% of girls were considering entering STEM in Hungary. The majority of these students (25,5 and 7,1% respectively) were planning to become a professional in one of the STEM fields, and only a small minority had an assistant professional occupation in mind. Hungarian girls lag behind the European average, as across Europe, 10,3% of the 15 year old girls were planning to work in STEM. Consequently, the gender gap in Hungary, which is calculated as the difference between the share of boys and girls who want to work in STEM, is slightly bigger than the European average (20,6 versus 18,7 percentage points). The Hungarian value is closest to the Slovakian, the Croatian, and the Portuguese gender gap.

7 A similar approach, but a very different research method was used in a study commissioned by the University of Obuda. The study was looking at female students career plans at the high school and relied on interviews and focus-group methodology (*Krolify*, 2012).

Table 4.2.1: Career plans of the 15 year olds in Hungary, percentages

Career plan	Boys	Girls	Total
STEM			
Science and Engineering Professionals (ISCO 21)	15.5	6.1	10.9
Information and communication technology professionals (ISCO 25)	10.0	1.0	5.5
Science and engineering associate professionals (ISCO 31)	2.4	0.7	1.6
Information and communication technicians (ISCO 35)	0.4	0.0	0.2
Non-STEM	71.7	92.3	81.8
Together	100.0	100.0	100.0
(N)	(2,207)	(2,175)	(4,382)[a]

[a] 20% of the students in Hungary did not provide a valid answer to this question. In this table they are not included. In the multivariate analyses, *Multiple imputation technique by chained equation* (*Royston,* 2004) was applied to replace their missing values.

Source: *PISA* 2015. Own calculations.

Who wants to enter STEM?

The key dependent variable in this report is a student's expectation of working in a STEM occupation at age 30, coded 1 for science occupations and 0 for non-science occupations. To estimate the probability of choosing a STEM occupation, Logit models were estimated. As main independent variables in our models, we included gender, science test scores, science self-efficacy (student's self-confidence in being able to carry out science-related tasks), instrumental motivation (students' beliefs that studying science is useful for their future career), self-assessed ICT competence and whether or not they attend mathematics or science lessons outside the compulsory schooling.[8] In the models, we also controlled for the socio-demographic background of the students as well as some characteristics of the school. Interaction effects between gender and some other independent variables were also considered.

The following variables were added to the models. Social background was assessed by parental socio-economic status (ESCS); a dummy variable indicating if at least one parent is working in a STEM job and ICT equipment available in the parental home. School-level variables: female ratio in the school; science teaching resources in the school; science club available in the school; availability of science competitions in the school; vocational vs. non-vocational school. Continuous variables were standardised to have a mean value of 0 and standard deviation of 1. In this paper only statistically significant ($p \leq 0.05$) associations are discussed. Details of the models and a full discussion of the estimation procedure are available upon request from the authors.

Not surprisingly, science test scores are very strong predictors of STEM career choices: only few students with low achievement consider a STEM career, while among the highest-achievers, the ratio is around 50%.[9] Contrary to the common assumptions, it is also clear that science achievements have nothing to do with the gender gap in STEM career choices as boys and girls achieve very similar scores on this PISA test. However, the extent to which achievement in science is conducive to a plan to work in science in the future is different for

8 Ideally, a more balanced representation of science, mathematics and ICT competencies and attitudes should be used. PISA 2015 however, was focused on sciences and does not provide equal details about other subject areas.

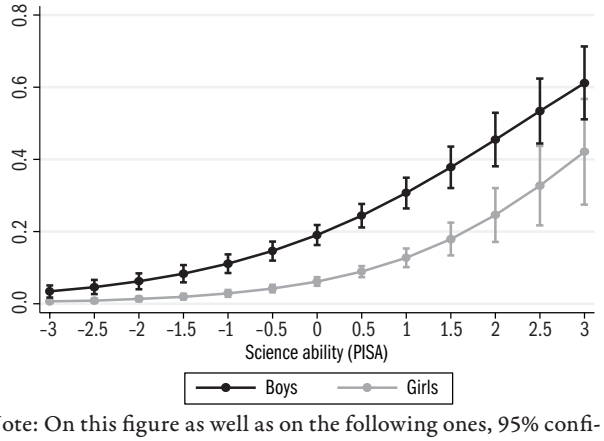
9 The importance of science achievement is also shown by the increase of the explained variance (from 4 to 16%) when this variable is added to the baseline model with gender as the single independent variable.

males and females. *Figure 4.2.1* depicts the estimated probabilities of opting for a STEM career for males and females at different levels of science scores.

Figure 4.2.1 – and the following figures alike – shows how the independent variable in the logit model affects the probabilities predicted with the estimated coefficients. This is represented by the average marginal effect, which is the average of the effect of the given variable with all the other effects being held constant for each individual. In the case of a dummy variable – like gender – this effect is simply the difference of the probabilities predicted for the two possible values. On *Figure 4.2.1,* this effect referring to students with an average science test score can be calculated as the difference between the predicted probabilities at value 0 on the horizontal axis and it equals to 0.128. Interaction effects included in the models take this analysis a step further. They indicate how the average marginal effect of gender varies depending of the level of the other variable – in this case, science score. These different levels of the gender-effect can be depicted at the different values of the horizontal axis, representing PISA science test scores: the effect of gender depends on science-achievement. But the opposite is also true: the average marginal effect of science-achievement varies by sex and thus has an unequal effect on the career choices of boys and girls. Higher test-scores are associated with greater probabilities of choosing a STEM career across both genders, but for boys, this increase in the probabilities is bigger, at least up to an achievement-level 1.5 standard deviations above the average.

Results show that the gender gap in STEM choices not only remains significant when the test scores are held constant, but its size is even increasing somewhat as we move towards the higher achievers. Boys for example, whose test score exceeds the average by 2.5 standard deviations demonstrate 53.4% probability of opting for a STEM career, while across girls with a similar achievement the respective probability is only 32.7%. If girls who do well in science but do not plan to make a STEM career are considered as talent-loss for STEM, then from our results a substantial talent loss can be identified.

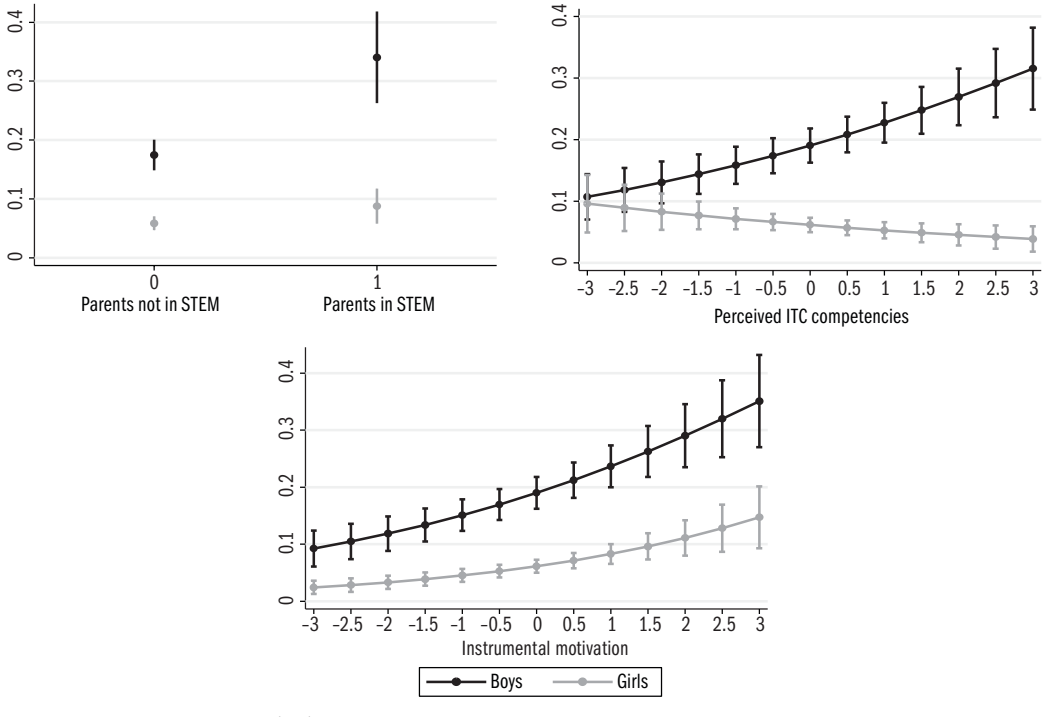
Figure 4.2.1: Predicted probabilities of expecting a STEM career. Logit models. The effect of gender and science achievement



Note: On this figure as well as on the following ones, 95% confidence intervals around the estimated probabilities are shown.
Source: *PISA* 2015. Own calculations.

Science achievement is not the only factor that influences boys' and girls' choices in different ways. First, boys are also further motivated to choose a related career if they have a parent working in a STEM occupation. If this is the case, sons show an increased probability of opting for STEM (34.0% instead of 17.5% – see in *Figure 4.2.2*). For girls however, parents' occupation does not make a difference in this respect. More interestingly from an educational policy point of view, girls are also less responsive than boys to the levels of ICT-competence they develop (self-evaluation), as well as to their levels of instrumental motivation. While boys with higher levels of self-evaluated ICT skills are also more likely than others to plan a STEM career, among girls, no such association can be found. Further, instrumental motivation is also more strongly related to the career choices of boys than of girls – although in this case some positive association even in the case of girls occurs. In this respect however, girls are also at a disadvantage because they are less likely to believe that science subjects will be useful for their future labour market opportunities. Other individual variables assessed in this study were not found to be related to students' career plans.

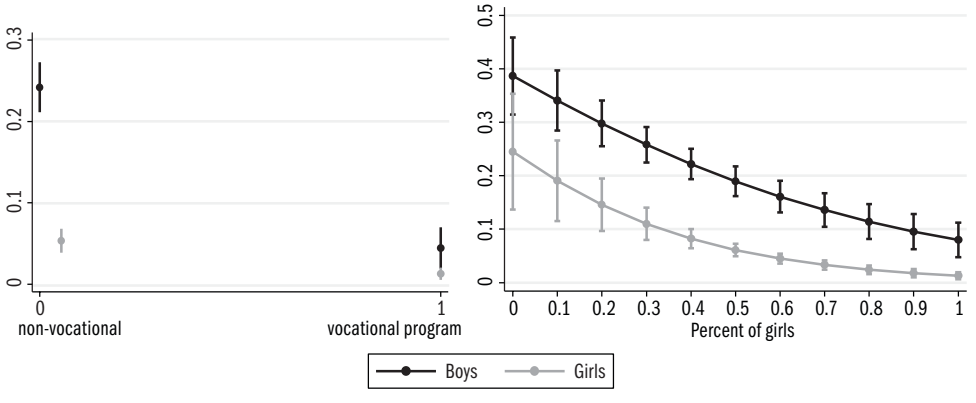
Figure 4.2.2: The effects of parents' occupation, subjective ICT competencies and instrumental motivations on boys' and girls' estimated probabilities of choosing a STEM career



Source: *PISA* 2015. Own calculations.

As one could expect, students in different types of school also tend to have different career plans. First, students in non-vocational schools are significantly more likely to consider a STEM occupation than students in the vocational schools and this holds both for boys and girls. As a high proportion of vocational students in Hungary will not achieve a qualification that would entitle him/her for higher education studies, this is not a very surprising finding (*Figure 4.2.3*). Further, we also find that the share of females in the school is negatively related to the probabilities that a student in that school would be interested in pursuing a career in STEM. This finding seems to contradict the expectations that female-dominance in the school can reduce gender-stereotyping and therefore can make girls more confident to consider gender-atypical careers (*Schneeweis–Zweimüller,* 2012). Instead, we would rather interpret this finding as an indication that by age 15 girls are already more likely to be concentrated in schools without a strong science-profile.

Figure 4.2.3: The effects of programme-orientation and share of girls in the school on boys' and girls' estimated probabilities of choosing a STEM career



Source: *PISA* 2015. Own calculations.

Conclusions

The main drivers of STEM career choices that were identified in this study include science abilities, (self-perceived) ICT skills and the level of understanding of how science knowledge can be useful in the labour market. While boys will certainly gain some additional motivation from an improvement in these areas, for girls, only a limited increase (science abilities and instrumental motivation) or no increase (ICT skills) in the interest for STEM occupations can be expected. From this it follows that the gender gap in students' interest for STEM occupations can not significantly be influenced by the factors assessed here. Altogether our results suggest that strong gender segregation in the career choices develop before age 15 and already by this time girls even tend to be in schools that reduce their probabilities of choosing a STEM career. This is in

line with research suggesting that children develop their perceptions of what is compatible with prescribed gender norms from a very early age onwards as part of the gender role socialisation process, and this understanding will continue guiding their interest as well as their career decisions later on. STEM areas remain to be associated with masculine, rather than feminine qualities and these stereotypes are culturally deeply rooted in our societies. Moreover, the same stereotypes also orient girls who are strong in science more towards healthcare and medical jobs (*Charles,* 2003, *Charles–Bradley,* 2002, *Sikora–Pokropek,* 2012). International comparative studies further suggest that this type of gender-segregation is particularly strong in the more affluent, democratic countries where gender-egalitarianism is well developed (*Sikora–Pokropek,* 2012). From these it follows that reducing the gender gap in STEM is not an objective that is easy to achieve and if anything, then early-childhood interventions need to be considered if this goal is to be achieved.

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5 THE ROLE OF ADAPTABILITY

5.1 WHAT ARE THE TENDENCIES IN DEMAND? THE APPRECIATION OF NON-COGNITIVE SKILLS[1]

KÁROLY FAZEKAS

Nobel-laureate economist James Heckman gave a definite answer in a presentation held in 2016 to the question of how education policy can provide solutions to eliminating the increasing gap between the skills needed by the economy undergoing revolutionary transformation and the supply of labour. "We can reduce inequality, foster inclusion, and promote social mobility by solving the skills problem. ... Invest in prevention, not remediation. Invest in flourishing lives, not in correcting problems after they appear." (*Heckman,* 2016.)

Heckman's suggestion must be interpreted in the *lifecycle investment framework*, adopted by him and his colleagues, which is related to the literature of human capital investment. The main principle behind this theory is that the earlier the stage of life is in which we invest in people's skills, the higher the individual and social rate of return will be. According to the economic approach it does matter when, how and for what skills the limited resources are spent on in order to enhance society's welfare.

Countries achieving outstanding success in economic development in the past few decades were the ones that efficiently developed the cognitive skills of participants of education and training systems. This link is clearly demonstrated by analyses linking the national averages of tests measuring the cognitive skills of pupils with data on the economic growth of individual countries. Collating the PISA scores of 50 countries between 1960 and 2000 with their GDP growth rates, *Hanushek–Woessmann* (2012) revealed that there is a strong and significant relationship between the rate of long-term growth and the tendencies in the test scores.

The cognitive skills of pupils also have a substantial impact on their later life: there is a close relationship between the level of cognitive skills and a later probability of unemployment, social deviances as well as health, life expectancy and expected income (*Burks et al,* 2009). These findings are also supported by the growing recognition of educational attainment and the markedly increasing returns on more advanced qualifications. This phenomenon is placed in a broader context by the literature on skill biased technological change, which explains why demand for labour and relative wage returns decrease among low-qualified and low-skilled workers.

However, something has changed in recent years. Not least because of the information technology revolution going on in the world, there have been significant changes in wage returns and in the probability of unemployment in the developed economies. The graphs comparing educational attainment lev-

1 The more extended original version of this paper was published in the January 2017 issue of *Magyar Tudomány* (Hungarian Science).

els and the expected wage and probability of unemployment, until now showing a positive linear relationship, now increasingly show a U curve. While the position of higher education graduates has significantly improved and that of the low qualified has slightly improved, the relative labour market position of those with mid-level qualifications has been deteriorating continuously. This tendency reflects developments in the sectoral and occupational structure of the economy: the increase both in professions requiring more advanced qualifications and cognitive skills and in low-skill occupations of the expanding service sector (*Autor,* 2011; *Autor–Dorn,* 2013; *Adecco Group,* 2017).

At the same time, analyses indicate that the changing *task content of occupations* plays a more important role in this process than changes in the occupational structure. Considering the changes in the content of tasks, there is a new development in the labour market of developed countries, which has not previously been fully explored: *the growing share and importance of tasks requiring non-cognitive skills* (*Whitmore et al,* 2016). This was first pointed out by the widely cited study of *Autor et al* (2003). In the period they examined (1960–2000), the share of tasks requiring non-routine cognitive and social skills continuously increased in the labour market of the United States, while the share of (routine and non-routine) manual tasks and the share of those requiring routine cognitive skills declined.

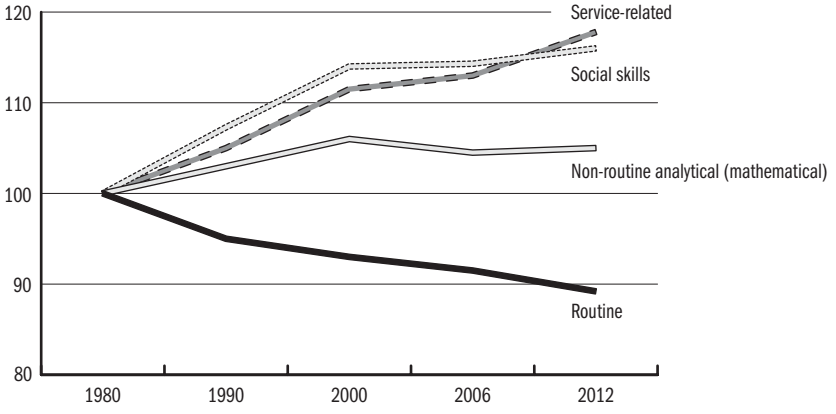
Technological development has continued to reduce the proportion of routine tasks in developed economies over the last decades because of their automation. At the same time, the share of tasks based on social skills and cooperation skills grew steadily. The increase in the share of tasks requiring cognitive Science, Technology, Engineering and Mathematics, (STEM) skills is hardly surprising. Numerous papers discuss the assessment of this process, the state-of-the-art teaching of STEM skills as well as the short- and long-term effects of developing STEM skills (for more details, see Subchapter 4.2 of *In Focus*). The U shape curve presented in *Autor et al* (2003) well demonstrates the increasing significance of advanced STEM skills and cognitive skills in general in the labour market.

Based on the updated data of *Autor–Price* (2013) and *Autor et al* (2003), *Deming* (2015) provided a more detailed insight into the nature of the polarisation of job tasks in the period 1980–2012. It highlighted an important and recently especially growing, new trend. On the one hand, the share of relatively easily automated, routine cognitive tasks *continuously decreases*. On the other hand, the share of tasks requiring cognitive STEM skills increases at first but then *stagnates* and the share of tasks requiring non-cognitive, soft skills and of tasks related to services *steadily increases*.

Deming explains that the obvious polarisation of the labour market is because while routine tasks are increasingly automated, tasks requiring cooperation, interpersonal, soft, non-cognitive skills and emotional intelligence are

– to date – not affected by the expanding use of robotisation and artificial intelligence in developed countries. However, the expansion of service sector related tasks does not result solely from technological development. It is reinforced by sweeping urbanisation as well as the dramatic increase in healthcare, nursing and tasks relating to care of the elderly resulting from demographic tendencies, especially the aging of societies (*Brunello–Schlotter*, 2011).

Figure 5.1.1: Changes in the nature of job tasks in the United States, 1980–2012



Source: *Deming* (2015), *Whitmore et al* (2016).

The importance of non-cognitive skills

The integration of the impacts of non-cognitive skills supporting cooperation and business efficiency in economic thinking and especially their quantitative analysis present considerable difficulties. Economics strives towards including researched phenomena in a coherent theoretic framework. Economic research has to fulfil the requirement that the concepts integrated in the framework are well-defined, with a meaning clear and unambiguous for everybody. While in the case of cognitive skills, the concepts describing the skills are unambiguous and the skills are measurable with standard methods, thus the results are possible to incorporate in a theoretic framework and the impacts of the variables may be modelled and tested, the economic analysis of the impact of non-cognitive skills is far more challenging (*Scorza et al,* 2015).

Non-cognitive skills are traditionally researched by psychology, especially personality psychology. This scientific discipline has achieved major results in defining and researching personality traits. Economic research primarily relied on the findings of personality psychology research to identify the concepts describing non-cognitive skills which were integrated in theoretical models analysing the role of human capital (*Heckman,* 2012). Nevertheless, the integration was challenging, since there was no consensus regarding

the precise definition of personality traits and about measuring their qualities and very few studies measured personality traits or explored their causal relationship with life events.

The majority of studies on non-cognitive skills in demand in the labour market contain lists of personality traits deemed important for their labour market relevance on the basis of general observation or specific experience relevant to an area at best – for example interviews conducted with business executives. These lists are compiled according to the priorities of their compilers and include overlapping terms and synonyms, which are difficult to distinguish. Understandably, researchers tried to create groups that describe personality traits with different labour market impacts and individual social consequences from a specific aspect or differentiate between them.

The Big Five model, widely used in personality psychology and relatively widely accepted in economic analysis, organises the non-cognitive skills into five groups: extraversion, agreeableness, conscientiousness, emotional stability and openness. This grouping is essentially the result of semantic statistical analysis of English language texts but several studies confirm that these skills are universal and the same five groups of skills may be distinguished in other languages and cultures. *Table 5.1.1* lists the content of the groups of skills and the notions most related to each group of skills. The advantage of this model is that there is consensus among researchers about the meaning of the groups of skills, there are more or less standardised methods for measuring their quality and the findings of assessments may be integrated in economic models.

Table 5.1.1: Non-cognitive skills belonging to the Big Five groups of skills

Conscientiousness	Agreeableness	Emotional stability	Openness	Extraversion
Dependability	Collaboration	Confidence	Creativity	Assertiveness
Grit	Collegiality	Coping with stress	Curiosity	Cheerfulness
Organisation	Generosity	Moderation	Global awareness	Communication
Persistence	Honesty	Resilience	Growth mindset	Friendliness
Planning	Integrity	Self-consciousness	Imagination	Leadership
Punctuality	Kindness	Self-esteem	Innovation	Liveliness
Responsibility	Trustworthiness	Self-regulation	Tolerance	Sociability

Source: *Roberts et al* (2015) p. 10.

The relationship between economics and personality psychology nonetheless is not unidirectional. Economics, while utilising the definitions and test results used for measuring skills, also contributes to clarifying the content of concepts, standardising assessment procedures and exploring causalities. Several papers draw attention to the importance of interdisciplinary dialogue and joint research programmes with the involvement of economists, psychologists, behaviourists, brain scientists, education researchers and researchers

from other disciplines. Heckman himself also calls attention to the influential results of anthropological research conducted in this field (*Stasz,* 2001; *Heckman et al,* 2014).

The labour market impacts of personality traits have recently been investigated by several studies. Findings tend to indicate that non-cognitive skills influence success in the labour market at least as strongly as cognitive skills (*Carneiro et al,* 2007). However, several studies highlight the methodological difficulties and weaknesses of these kinds of analyses. They often examine the labour market impact of only one non-cognitive skill and ignore the interactions between individual skills as well as the reciprocal influence of cognitive and non-cognitive skills. In this respect, recent research applying new data analysis methods and statistical procedures, e.g. machine learning, in order to create a nomenclature with better explanatory power (*Mareckova–Pohlmeier,* 2017) is truly remarkable. Relying on these methods, and on sufficiently large meta-databases, it is possible to identify the most relevant skills in terms of impact on the labour market (one should not only examine the impact of skills deemed important according to one's own priorities).

The economic research of James J. Heckman and his colleagues on the role of non-cognitive skills – mostly conducted in the *Center for the Economics of Human Development* of the University of Chicago – is widely known. Findings concerning the returns on investment in skills development are of utmost importance. This research is closely linked to research into the neurological basis of cognitive processes (*Heckman,* 2007a, b) and rely on the results of long-term, longitudinal studies on the individual and social impact of non-cognitive skills (*Knudsen et al*, 2006). These analyses highlighted the decisive role of parenting and family background as well as the significance of early childhood education and care in lifelong learning. Furthermore, they confirmed that the development of non-cognitive skills in childhood and early childhood have far-reaching consequences on the entire economy and society. The non-cognitive skills observed in childhood have an impact, among others, on the educational attainment observed in adulthood, on the incidence of teenage pregnancy and the probability of smoking and delinquency (*Borghans et al,* 2008; *Bowles et al,* 2001; *Knudsen et al,* 2006).

The econometric models related to the theoretical framework developed and continuously refined by Heckman and his colleagues revealed the impact of several (seemingly unrelated) variables (weight at birth, height, nutrition, mental disorders) on the quality of life of young generations. *Heckman–Kautz* (2012) also emphasise the need for interdisciplinary dialogue in the analysis of the impacts of non-cognitive skills, and that economics contributes to it by precisely defining different skills, developing the various assessment methods of different skills and revealing the social and economic impacts of the qualities of these skills.

Why has the importance of non-cognitive skills been increasing in recent years?

Non-cognitive skills have not only been given priority in forecasts for the future but also in evaluating current situations. Several complaints from corporate management in recent years called attention, in addition to the well-known cognitive skill gap, to the growing difficulties in finding employees fulfilling the requirements for non-cognitive skills (*Casner-Lotto–Barrington,* 2006). The increasing demand for well-developed non-cognitive skills is also reflected in the increase in the labour market return to these skills. *Weinberger* (2014) reveals that the relationship between the non-cognitive skills and the expected incomes and the probability of permanent employment in the labour market of the United States in the case of those born in 1973–1974 is much stronger than in the case of those born in 1953–1954.

The most important reason for the growing demand for non-cognitive skills is related to the nature of technological development. Jobs requiring employees who are open to changes, emotionally stable and have flexible thinking are less exposed to the crowding-out effect of new technologies (*Bode et al,* 2016). Additionally, accelerating technological development, the proliferation of flexible work arrangements and the increasing embeddedness of firms in the global economy increasingly require open, flexible and innovative employees, who are able to communicate and cooperate with people from other cultures.

The second important factor is the accelerating urbanisation and the resulting increased demand in personal and cultural services. Personal relationships, emotional intelligence, imagination, empathy and openness have major importance in the jobs in this sector.

The third important factor is the aging of developed societies, which is accompanied by a growing demand for workers for healthcare and nursing tasks. This is also an area where, in addition to specific expertise, empathy, emotional adjustment, perseverance and social skills are also needed.

Opportunities for developing non-cognitive skills

The opinion that basic personality traits, as opposed to cognitive skills, do not change during our life is now considered outdated. Several longitudinal studies (*Cunnigham et al,* 2002; *Roberts et al,* 2015) confirmed empirically that different skills change significantly, albeit to a different extent, and are possible to develop in the various phases of life (*Heckman–Kautz,* 2013). Undoubtedly, the principal environment of developing non-cognitive skills in early childhood is parenting and early childhood education and care. Non-cognitive skills development programmes in early childhood and school age have a strong positive impact on the development of the cognitive skills of children. However, it is also true that if these early childhood programmes

are not followed up by well-targeted development in later stages, their effect diminishes over time (*OECD,* 2015).

Numerous research results confirm that non-cognitive skills may be successfully developed in primary, secondary and even in tertiary education and we have several non-cognitive skills which are also possible to develop in adult education. For example, research into the impacts of programmes developing non-cognitive skills at school indicated that well targeted and well implemented programmes often achieve more significant results than several cognitive skill development interventions (*Cunha et al,* 2006; *Losel–Beelmann,* 2003).

The lack of non-cognitive skills in disadvantaged families influences the development of cognitive skills. In an emotionally healthy, stress-free environment it is considerably easier to develop the cognitive skills of children. The intergenerational effects of the development of non-cognitive skills are especially important. For example, in families living in a disadvantaged and stressful environment, the non-cognitive skill development of children should be accompanied by the the non-cognitive skill development of parents in order to enable them to provide an appropriate family background for the development of the cognitive and non-cognitive skills of their children. Non-cognitive skill development at school should never be limited to individual development programmes. Programmes that also cover the non-cognitive skill development of families and local communities are the most successful.

Which are the non-cognitive skills whose development is particularly important in certain life stages and what are the methods suitable for effectively developing them? Relevant education science research and practical development programmes understandably focus on skills that support achievements at school (such as diligence, discipline, sense of duty, strength of character). There are several initiatives aiming at the development of non-cognitive skills of pupils through a school subject embedded in the curriculum. According to meta-analyses investigating the impacts of these programmes, the majority have a positive impact – albeit to a varying extent – on the later life events of pupils.

However, the most important tool of the childhood development of non-cognitive skills is the school environment itself and the educational activities of teachers. The expertise, motivation and moral commitment of teachers have a decisive role in the non-cognitive skill development of pupils. This impact is pointed out by *Heckman et al* in their study published in 2014, comparing the life events of pupils completing upper-secondary school with a General Education Development test (GED) and those who finally pass a GED but have dropped out of school prior to it. According to *Heckman et al* (2014), the findings that among pupils with the same GED-results, the labour market success of those actually attending the entire upper-secondary school con-

siderably exceeds that of pupils dropping out confirm the positive impact of school as the most appropriate institution for non-cognitive skill development.

Solely detecting the impact does not reveal anything about the mechanisms schools resort to when developing these skills. The development of non-cognitive skills definitely requires teachers to have expertise and motivation different from those needed for developing cognitive skills. The extent teachers are able to develop the imagination, cooperation skills, cultural tolerance, endurance and perseverance of pupils when teaching various school subjects is of utmost importance. The effectiveness of this complex pedagogical work also substantially influences the successful development of cognitive skills.

In addition to assessing the non-cognitive skills of pupils, several recent initiatives aimed at assessing and supporting the relevant activities of teachers and schools. The Every Student Succeeds Act of the United States, replacing the No Child Left Behind Act in 2015, enables the supplementation of the cognitive tests – which are part of the evaluation of schools' performance – with non-cognitive skills assessments. *The Brookings Soft Skills Report Card* was developed by the Brookings Institute with the aim of supporting teachers in the evaluation of non-cognitive skills, encouraging schools to develop these skills and support the work of teachers in this field (*Whitehurst,* 2016).

Having recognised the increasing importance of non-cognitive skills, the OECD published a report in 2013 concerning the social and emotional skills of 24 thousand students. PISA tests are planned to be supplemented by items suitable for assessing non-cognitive skills (*OECD,* 2015a, b). From 2018 onwards, the mathematical, literacy and science tests of PISA will be complemented by tests measuring global competences. Global competences are defined as skills enabling pupils to interpret global, intercultural phenomena, apply differing perspectives and cooperate creatively with people having grown up in different cultures. Tools assessing non-cognitive skills are certainly not value-free. On the contrary, they assume that families, schools, development institutions and teachers impart not only knowledge but also values. Respect for human dignity, tolerance and empathy form the basis of the harmonious functioning of society, innovation capacity and economic development in all societies.

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5.2 LABOUR MOBILITY IN HUNGARY

JÚLIA VARGA

The occupational composition of all dynamic economies changes constantly: new occupations emerge and some of the old occupations disappear. This process is influenced by numerous factors: changes in technology, foreign trade, the composition of the population in terms of age and educational attainment level, and the regulatory environment and labour market institutions. In addition, individuals may also change jobs for several reasons: the insufficient alignment of qualification and job, changes in personal circumstances (such as marital status or health), changes in the labour market, career progress or the search period typical of the early phases of a labour market career (*job-shopping*), etc.

One of the preconditions of labour mobility is the transferability of (some of) the skills and knowledge across professions. Therefore, school education, higher education, training and lifelong learning policies have a profound impact on labour mobility. In countries where education policy places emphasis on acquiring general knowledge and encourages participation in lifelong learning, there is more labour mobility and it is easier to adjust to changing labour market demands. However, in countries where school education focuses on occupation-specific knowledge, labour mobility is more limited (*Johnson,* 1979; *Krueger–Kumar,* 2004; *ILO,* 2010).

Low labour mobility may increase labour shortage. It hinders the continuous adaptation of businesses and slows down the flow of labour from declining industries to expanding ones (see for example *Davis–Haltiwanger,* 2014). Although some of the newly created jobs are filled by fresh graduates as well as returnees from inactivity and unemployment, the majority is filled by workers previously employed in other occupations. *Figure 5.2.1* presents the composition of entrants to newly created jobs broken down by prior labour market status (using four-digit HSCO codes) in the period between 1997 and 2014. The findings show that the share of entrants from inactivity decreased and the share of entrants from unemployment stagnated, while the share of entrants from another occupation increased from 60 per cent to 80 per cent. The proportion of those entering newly created jobs from unemployment slightly grew after 2004 but entrants previously employed in other occupations still have a significant role.

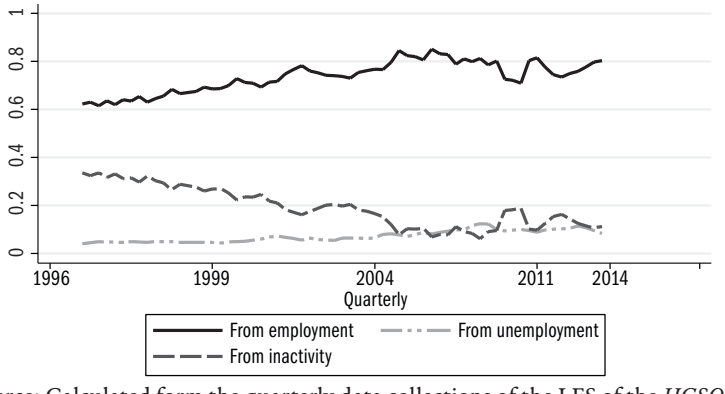
In the following it is discussed how the intensity of labour mobility has changed in Hungary and what individual characteristics influence the probability of switching occupations. The analysis is based on the individual-level data of the panel database developed from the data collections of the LFS of the Central Statistical Office between 1997–2014.[1] As in earlier studies,

1 The quarterly LFS surveys of the Central Statistical Office cover approximately 70 thousand persons in each quarter. The sample is replaced in a rotation procedure. Individuals of households included in the sample are observed for six consecutive quarters and in this way the data of individuals observed in the consecutive quarters may be integrated in a panel, which enables the observation of their occupational changes.

labour mobility is measured by changes in the occupational classifications over two consecutive quarters (*Boeri–Flinn,* 1997; *Berde–Scharle,* 2004; *Elek–Szabó,* 2016). The value of and change in this indicator depends on the timeframe and the level of aggregation of the occupational classification used for measuring mobility. Not even the most detailed, four-digit HSCO occupational classification can describe all occupational changes. Individuals may progress considerably in their career without changing their original occupational classification. Several amendments have been made to the HSCO classification, which also makes the tracking of occupational changes more complicated. In the period examined (1997–2014), there was a major revision of the HSCO classification.[2] In order to facilitate comparison, we merged the two classification systems and re-coded the findings on the basis of the integrated system.[3] We analysed the occupational changes of the different qualification levels using three types of classification: the most detailed four-digit classification, the two-digit classification and the aggregated occupational groups.[4]

Figure 5.2.2 presents the proportions of occupation changers among employees, analysed according to the four-digit and two-digit HSCO classification and the aggregated occupational groups. Obviously, the more detailed is the classification used, the higher the proportion of occupation changers.

Figure 5.2.1: The composition of entrants to newly created jobs broken down according to prior labour market status



Source: Calculated form the quarterly data collections of the LFS of the *HCSO*.

The extent of mobility in the total of all qualification levels ranged between 0.5–0.8 per cent in the aggregated occupational groups, 0.5–1.8 per cent in the two-digit and 0.7–2.5 per cent in the four-digit HSCO classification quarterly. These proportions are very low by international comparison, much lower than in the majority of European countries, lower than in the low labour mobility level of the Southern European countries and are only comparable to some former communist countries (*Andersen et al,* 2008; *Dex et al,*

2 The system of occupations revised in 1996 (HSCO–93) was in effect from 1 January 1997 until 31 December 2010, at which date a newly revised HSCO took effect.

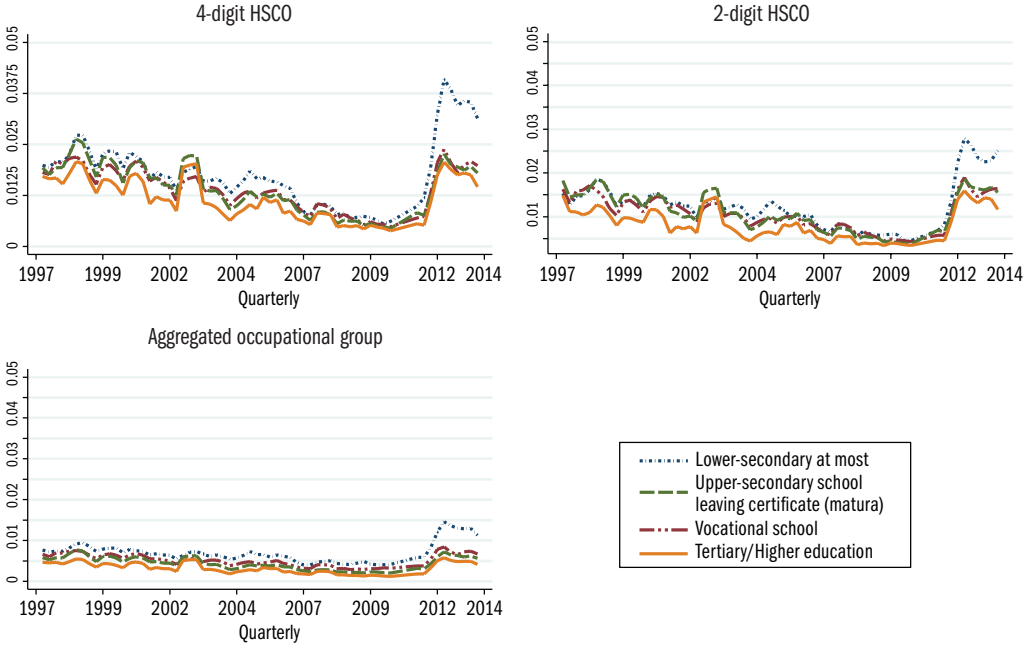
3 The re-coding was undertaken by *Melinda Tir* and the author is grateful for the input provided by her.

4 When developing the aggregated occupational groups, we intended to classify occupations in roughly homogenous groups (the classification is presented in *Table A5.2.1* of *Annex 5.2*).

2007; *Lalé,* 2012; *Burda–Bachmann,* 2008; *Barone et al,* 2011; *Vavřinová–Krčková,* 2015).

As regards educational attainment levels, the share of occupation changers was the highest among those with a lower secondary qualification at most and it was the lowest among higher education graduates according to each of the classification types. *Figure 5.2.2* indicates that the increase in labour mobility after 2011 was considerably larger among those with a lower secondary qualification at most than at other qualification levels. This increase in the labour mobility of the low-qualified was mainly due to the changes in occupations of public works participants. The share of public works participants among occupation changers with a lower secondary qualification at most started to increase sharply from 2010 and reached 40 per cent in 2014 (*Figure 5.2.3*).

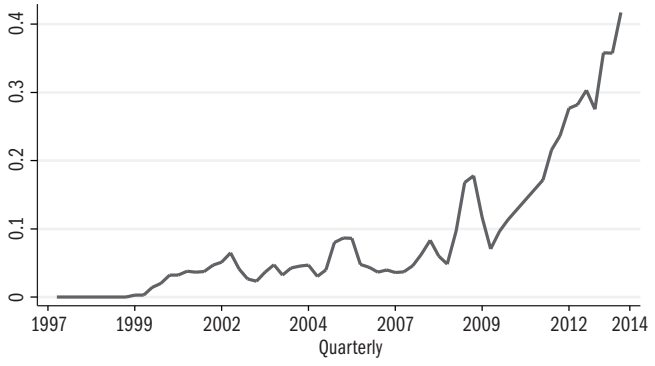
Figure 5.2.2: The share of occupation changers among employees analysed according to the four-digit and two-digit HSCO classification and the aggregated occupational groups, Q2 1997 – Q1 2014



Source: Author's calculations using the Q1 1997 – Q1 2014 LFS data of the *HCSO,* moving average smoothing over three quarters.

The factors of labour mobility were examined using two models. Model (1) analyses the probability of occupation change, regardless of the direction of occupation change (upward, downward or without a change in level) and model (2) analyses a subsample of occupation changers and whether they moved upward, downward or to an occupation at the same level.

Figure 5.2.3: The proportion of public works participants among occupation changers with a lower secondary qualification at most



Source: Author's calculations using the Q1 1997 – Q1 2014 LFS data of the *HCSO,* moving average smoothing over three quarters.

Model (1) describing the probability of occupation change is as follows:

$$Y_{ij}=X_i'\beta_j+\alpha\, ED_i+\delta_j+\varepsilon_{ij}, \qquad (1)$$

where Y_{ij} indicates the probability of an individual changing occupation, i shows the individuals, ED_i the category-level variables describing the educational attainment of the individual and j the outcomes. X_i describes the characteristics of the individual, δ_j the fixed effects of years and ε_{ij} is a normally distributed random error. Labour mobility ($y = 1$) takes place when the latent variable $Y_{ij} > 0$, where $Y_{ij} = 1$ if the individual changed occupations between two quarters and $Y_{ij} = 0$ if he did not change occupations.

Model (2) is written as follows:

$$Z_{iq}=X_i'\beta_q+\alpha\, ED_q+\delta_q+\varepsilon_{iq}, \qquad (2)$$

where η_{ij} is multivariate normally distributed. Z_{iq} is the probability of observing the qth outcome in the case of the ith individual and $Z_{iq} > Z_{ij}$ if $j \neq q$.

We applied the model analysing labour mobility with two outcomes to the various levels of mobility: for occupational changes between two-digit HSCO groups, four-digit HSCO groups and the aggregated occupational groups. We defined occupation changers as those whose two-digit or four-digit HSCO codes or aggregated occupational groups in a quarter and the previous one were different but who were in employment in both quarters.

In the second model, we identified the direction of occupational changes on the basis of transfer between one-digit HSCO groups, excluding the group "Occupations in the armed forces". The HSCO classification is hierarchical: when moving downwards in the main categories, an increasingly higher formal qualification and skill level are needed to fill positions. Although one-digit HSCO classification enables only a rough comparison, a more de-

tailed classification would have made it difficult to distinguish between the directions of occupational changes. An upward mobility is defined as a new occupation of smaller value in the one-digit HSCO groups, downward mobility is defined as a new occupation with a higher value and unchanged in the occupational hierarchy if the value did not change.

The findings of model (1), with two outcomes for the probability of occupational change – the marginal effects at sample mean – are included in *Table 5.2.1*. The findings show that higher education graduates are significantly less likely to change occupations than the reference category of upper-secondary school graduates with a Matura, between either two-digit, four-digit HSCO categories or aggregated occupational groups. Vocational school graduates are also significantly less likely to change occupations between two-digit and four-digit HSCO groups than the reference category and there is no significant difference between vocational school graduates and upper-secondary school graduates with a Matura when considering aggregated occupational groups. Neither is there a significant difference between those with a lower-secondary school qualification and upper-secondary school graduates with a Matura in occupation change between two-digit or four-digit HSCO groups, although the former are more likely to move between aggregated occupational groups.

Our findings on the impact of educational attainment level are in accordance with theoretical assumptions about occupation-specific human capital (*Shaw,* 1984, 1987*; Dolton–Kidd,* 1998*; Kambourov–Manovskii,* 2009; *Sullivan,* 2010). At educational attainment levels where more occupation-specific skills are obtained – vocational school qualification and higher education qualification in Hungary – labour mobility is lower. This is because occupation-specific skills may be lost upon occupational change and this forces vocational graduates to stay in their occupations and higher education graduates to stay in their occupational groups.

Increasing occupation-specific skills tend to decrease the likelihood of labour mobility in general. The more time someone spends at an employer, that is, the more occupation-specific skills and expertise they have acquired, the lower the likelihood is of occupational change– according to all of the occupational classifications. However, if controlling for tenure at the employer concerned, the increase in experience increases the probability of labour mobility. The estimates show that, controlling for other factors, men are more likely to change occupations than women. Public works participants were also more likely to change occupations when mobility is examined in terms of four-digit HSCO categories or aggregate occupational groups.

Table 5.2.2 presents the estimates of the determining factors of the direction of labour mobility, that is, the results of the multinomial probit model. The educational attainment level has a significant impact on the direction of la-

bour mobility. Marginal effects indicate that occupation changers with a lower-secondary qualification are 12 per cent less likely to move upwards and are 13 per cent more likely to move downwards than the reference category of upper-secondary school graduates with a Matura. Vocational school qualification reduces the probability of upward labour mobility by 10 per cent and increases the probability of downward mobility by 10 per cent. In contrast, higher education graduates are 11 per cent more likely to move upward in the occupational hierarchy and are 11 per cent less likely to move downwards than members of the reference group.

Table 5.2.1: The decisive factors of labour mobility – probit models with two outcomes

	Marginal effect (*dy/dx*)		
	Two-digit HSCO category change	Four-digit HSCO category change	Change in aggregated occupational groups
Gender (Male= 1)	0.002*	0.003*	0.001*
	(0.0004)	(0.0004)	(0.0005)
Lower-secondary qualification	–0.001	0.000	0.002***
	(0.0005)	(0.0007)	(0.0008)
Vocational school qualification	–0.001*	–0.002*	0.000
	(0.0004)	(0.0005)	(0.0006)
Higher education qualification	–0.002*	–0.002*	–0.004*
	(0.0005)	(0.0007)	(0.0007)
Experience	0.000*	0.000*	0.001*
	(0.0001)	(0.0001)	(0.0001)
Experience2	0.000*	0.000*	0.000*
	(0.0000)	(0.0000)	(0.0000)
Tenure	–0.002*	–0.003*	–0.005*
	(0.0001)	(0.0001)	(0.0001)
Tenure2	0.000*	0.000*	0.000*
	(0.0000)	(0.0000)	(0.0000)
Single	0.001	0.001	0.001
	(0.0005)	(0.0005)	(0.0006)
Child aged 0–6 in the household	0.000	0.000	0.001**
	(0.0005)	(0.0005)	(0.0006)
Child aged 7–18 in the household	0.001	0.000	0.000
	(0.0004)	(0.0005)	(0.0005)
Public works participation	–0.001	0.008*	0.015*
	(0.0092)	(0.0016)	(0.0018)
Abroad	–0.001	–0.001	–0.001
	(0.0014)	(0.0017)	(0.0018)
Fixed effect of year	Yes	Yes	Yes

Reference category: female, upper-secondary school graduate with a Matura, not single, without children aged 0–6 in the household, without children aged 7–18 in the household, not public works participant, the site of her employer is not abroad.
*** Significant at a 1 per cent level, ** at a 5 per cent level, * at a 10 per cent level.

Table 5.2.2: Determining factors of the direction of labour mobility

	Marginal effect (*dy/dx*)	
Variable	upward	downward
Gender (male= 1)	–0.04	0.03
	(0.02)	(0.02)
Lower-secondary qualification	–0.12*	0.13*
	(0.03)	(0.02)
Vocational school qualification	–0.10*	0.10*
	(0.02)	(0.02)
Higher education qualification	0.11*	–0.11*
	(0.03)	(0.02)
Experience	0.00	0.00
	(0.00)	(0.00)
Experience2	0.00	0.00
	(0.00)	(0.00)
Tenure	0.00	0.00
	(0.00)	(0.00)
Tenure2	0.00	0.00
	(0.00)	(0.00)
Single	–0.01	–0.01
	(0.02)	(0.02)
Child aged 0–6 in the household	0.05	–0.03
	(0.02)	(0.02)
Child aged 7–18 in the household	0.01	–0.01
	(0.02)	(0.01)
Public works participation	–0.02	0.04
	(0.03)	(0.03)
Abroad	0.01	–0.03
	(0.06)	(0.05)
Fixed effect of year	Yes	Yes

Note: Multinomial probit model, reference: the level of occupation remains unchanged following occupational change.
Reference category: female, upper-secondary school graduate with a Matura, not single, without children aged 0–6 in the household, without children aged 7–18 in the household, not public works participant, the site of her employer is not abroad.
*** Significant at a 1 per cent level, ** at a 5 per cent level, * at a 10 per cent level.

The results of the models reveal that there is a lower likelihood of labour mobility among those who have acquired more occupation-specific skills either in formal education (for example vocational school graduates and higher education graduates) or in on-the-job training (those with a longer traineeship at an employer). The low labour mobility among higher education graduates is probably due to the focus of Hungarian higher education on occupation-specific knowledge: students are provided mainly occupation-specific education from the start of their Bachelor studies and this was only slightly altered by the introduction of the Bologna system.

However, higher education graduates and vocational school graduates differ in the direction of their labour mobility. Vocational school graduates are less

mobile and are more likely to move downwards in the occupational hierarchy. This indicates that on the one hand, changing their occupation is not voluntary, and on the other hand that they can only use their transferable skills in lower-level jobs. In other words, the level of their general competences does not enable them to move upwards in the occupational hierarchy.

The findings show that the extent of labour mobility may also contribute to labour shortage in Hungary. It is especially worrisome that the occupational changes of vocational school graduates have a downward tendency and that their transferable human capital only enables them to fill lower level occupations.

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Annex 5.2

Table A5.2.1: Aggregated occupational groups

	Occupational group	HSCO category		Occupational group	HSCO category
1	Armed forces	Occupations of armed forces requiring a higher education qualification; Occupations of armed forces requiring an upper-secondary qualification; Occupations of armed forces not requiring an upper-secondary qualification	13	Culture 2	Culture, sports, arts and religion-based occupations not requiring a higher education qualification
2	Legislation	Legislators, heads of public administration and special interest organisations	14	Trade	Trade and catering occupations
3	Management	Managing directors, production and specialised services managers	15	Service	Service occupations
4	STEM	Technical, information technology and science professionals	16	Agriculture	Agricultural occupations; forestry occupations; game-farming occupations; fisheries occupations; food industry occupations
5	Healthcare 1	Health professionals	17	Light industry	Light industry occupations
6	Social welfare 1	Social services professionals	18	Metal and electrical industry	Metal and electrical industry occupations
7	Education	Educators and teachers	19	Construction	Construction industry occupations
8	Economy, law, social science	Business, legal and social sciences professionals	20	Handicrafts	Handicraft occupations
9	Culture 1	Culture, sports, arts and religion-related professionals	21	Other industry	Other industry and construction industry occupations
10	Technicians	Technicians and other related technical professionals	22	Operators	Manufacturing machine operators; assemblers; stationary machine operators; drivers and mobile machinery operators
11	Healthcare 2	Healthcare occupations (not requiring a higher education qualification)	23	Unskilled	Elementary occupations not requiring a qualification
12	Social welfare 2	Educational assistants, social welfare and labour market services related occupations			

5.3 KNOWLEDGE ACCUMULATION IN ADULTHOOD

JÁNOS KÖLLŐ

Adult learning, predominantly taking place in non-formal or informal settings, has outstanding importance in acquiring the skills which are in demand in the economy. Although the basics of knowledge and learning ability are learnt at school and within the family during childhood, most of the practical skills are acquired and updated after leaving school. If empirical knowledge does not accumulate because there is nowhere or nobody to learn from or where there is a lack of willingness or resources, the economy punishes this with lower wages and a higher risk of unemployment. It is especially true when one has to adapt to technological changes. One of the most important reasons for labour shortage can be weak learning ability and insufficient basic skills required for lifelong learning.

We have comparable international data on knowledge accumulation in adulthood from two international OECD-coordinated surveys, the *Adult Literacy and Lifeskills Survey* (*ALL*), and the *International Adult Literacy Survey* (*IALS*). See *OECD–Statistics Canada* (2011) and *Statistics Canada* (2011). Hungary did not participate in the earlier data collections of the more recent, ongoing OECD survey, Programme for International Assessment of Adult Competencies (PIAAC). This short chapter relies on the ALL surveys and – partly intentionally, partly involuntarily – restricts the analysis to those with a *lower-secondary qualification at most*. Intentionally because they are the core of the long-term unemployed, who were unable to find employment even during the post-crisis recovery (see *Chapter 3*), and involuntarily because, although the findings are probably less marked but also relevant to vocational school graduates, they are difficult (and in some countries impossible) to identify in the survey.

The variables related to adult learning are presented in five categories in *Table 5.3.1*. The columns include average values of the nine participating countries, the Hungarian average, the ranking of Hungary and the average of the country closest to Hungary in the ranking. The data relate tpo the population aged 16–54 years, who completed a maximum of ten grades and are not in education. The reference year is 2008.

Indicators concerning *formal adult education and training* – similarly to other surveys (*Pulay,* 2010, *Torlone–Federighi,* 2010) – show that Hungary falls behind to a considerable degree: the share of unqualified Hungarians participating in courses or practical training in the 12 months prior to the interview is lower than the half of the sample mean. Italy has similarly low figures, even lower than Hungary.

Table 5.3.1: The participation of the working age population with a maximum of ten completed grades and not in education in various forms of adult learning – ALL, 2008 (per cent)

	ALL average	Hungary	Ranking	Closest country (ALL value)
Formal training				
Course in the previous 12 months	22.6	7.6	8	Italy (7.2)
Practical training at a company or institution	14.4	6.1	8	Italy (3.3)
Informal learning				
Learning by experimenting, trial-and-error[a]	56.4	15.8	9	Italy (25.1)
Learning upon advice from others, imitating[a]	48.3	13.8	9	Italy (24.0)
Reading a manual, guide, technical specification[a]	33.5	12.0	9	Italy (18.0)
Learning with a computer, on the Internet (outside a training course)[a]	26.9	4.1	9	Italy (10.7)
Using TV or video for learning[a]	24.4	7.6	9	Holland (13.8)
Attending a workshop[a]	14.8	5.1	8	Italy (4.0)
Visiting a museum or exhibition on a guided tour[a]	12.4	2.1	9	Italy (8.6)
Attending trade fairs, presentations, conferences[a]	12.1	2.4	9	Bermuda (6.7)
Independent information gathering, education, entertainment				
Newspaper[a]	84.7	79.2	8	Italy (76.6)
Magazine[a]	79.5	67.4	9	Italy (74.7)
Has he/she ever used the Internet?	76.7	54.4	9	Italy (56.7)
Has at least 25 books	61.3	56.1	8	Italy (48.2)
Reading letters, notes, email[a]	59.1	42.2	8	Italy (38.4)
Does he/she use a computer at home?	57.3	36.4	8	Italy (29.8)
Bookshop, shops selling books[a]	52.2	59.9	4	Holland (58.5)
Library[a]	29.1	13.1	9	Italy (13.5)
Watching TV (number of hours estimated)[b]	2.9	3.3	1	US (3.0)
More than five hours watching TV	10.9	18.9	1	US (17.0)
Civil integration				
Participation in a sports club[c]	17.1	2.2	9	Italy (9.5)
Charitable fundraising[c]	12.3	3.0	9	Holland (3.7)
Participation in group of worship[c]	11.4	4.2	9	Switzerland (5.1)
Participation in a local school group[c]	9.9	1.8	9	Italy (5.0)
Collecting food, clothes for charity[c]	9.8	1.9	9	Holland (3.2)
Participating in a cultural or leisure activity[c]	8.6	1.8	9	Italy (3.7)
Other volunteering[c]	8.0	2.5	8	Italy (1.9)
Counsel, teach or train others as a volunteer[c]	7.4	0.1	9	Italy (2.1)
Unpaid member of a board[c]	7.3	2.2	9	Italy (2.9)
Participation in another group or organisation[c]	6.0	3.7	8	Italy (1.6)
Participation in a political organisation[c]	2.7	0.8	9	Canada (1.7)
Literacy at work				
Employment rate (E)	62.8	42.3	9	US (57.7)
Number of writing-reading-numeracy tasks at work (T)	5.2	2.0	9	Italy (3.0)
Literacy impulse at work (E×T)[d]	3.3	0.8	9	Italy (1.8)

Sample: population aged 16–54 years, who have completed a maximum of 10 grades and are not in education, from nine countries (number of cases in brackets): Bermuda (179), US (312), Holland (486), Canada (2,800), Hungary (631), Norway (611), Italy (1,917), Switzerland (505), New-Zealand (639). The samples interviewed in

different languages in Switzerland and Canada are merged. Sample mean: the unweighted average of individually weighted national averages.
[a] At least occasionally.
[b] The figures were calculated based on class averages (0.5 hour, 1.5 hours, 3.5 hours) and in the case of the top, open category, based on one-and-a-half times the lower limit. The average obtained in this way is close to the findings of the time-use survey of the Central Statistical Office: 3.1 hours among those with a lower-secondary qualification at most.
[c] At the time of the interview.
[d] This index is intended to describe the influence affecting the total unqualified population through the fact that some of its members are employed and at least occasionally carry out writing-reading-numeracy tasks. The number of tasks occurring is 17.
Source: Individual data of the Adult Literacy and Lifeskills Survey (*OECD–Statistics Canada,* 2011), author's calculation.

The second block of *Table 5.3.1* mainly contains *types of informal learning* where the interviewee gains knowledge under the supervision or with the direct or indirect assistance of others or imitating others. In these activities, the Hungarian level of participation does not reach one-third of the sample mean, in some cases it is even much lower than that. Hungary is the last in the ranking in all but one of the activities, dramatically lagging behind even the last but one country (which is Italy in six out of eight cases).

The third block contains variables of *information gathering, education and entertainment* which do not necessarily require the participation of others: reading, writing, watching television, using a computer or surfing the Internet. Hungary ranks last or last but one (preceding Italy) in this field also, except for two activities. Quite a number of participants have visited shops selling (among other items) books (4th placein the ranking) and this block also contains the only activity in which Hungary ranks first: watching TV and spending more than five hours a day by watching TV.

The fourth block provides an overview of the various forms of *civil integration*. Success in the labour market depends greatly on non-cognitive in addition to cognitive skills, for example communication and people skills, being open to new and different ideas as well as reliability (*Bowles–Gintis,* 1976, *Heckman–Rubinstein,* 2001, *Heckman et al,* 2006). The questionnaire of the ALL survey does not directly assess non-cognitive skills but provides plenty of information on activities that develop them: including all forums of civic interaction where unqualified individuals are able to be in touch with more qualified people, share goals and work together. The level of civic engagement among the unqualified is low in the entire sample: it only exceeds ten per cent in the case of sports and leisure, religious groups and charitable fundraising. However, the figures are even lower, between zero and four per cent, in Hungary. We rank last in nine of the eleven indicators and last but one in the remaining two indicators.

Last but not least, there is a dramatic lag in terms of *work as a source of literacy*. This is described by an index which accounts for the probability of em-

ployment and the exposure to literacy at work. The product of employment probability and the number of literacy tasks at work – i.e. the probability of treatment times the dose – more or less reflects the strength of this influence, in which there is a more than twofold difference between Hungary and the last but one (Italy again), and a fourfold difference compared to the sample mean.

A single table is of course unable to provide a full picture of post-school knowledge accumulation.[1] Nevertheless it is capable of calling attention to serious problems in this field: Hungary ranks last in 23 out of 34 activities and last but one in eight activities, and it only ranks first in passive television watching not for learning purposes. It is impossible to decide and is not necessarily a matter to be decided whether it is a cause or effect: whether joblessness restricts social contacts, knowledge accumulation and income, while knowledge deprived of development and poverty restrict employment and the building of social relationships, which in turn prevents the uptake of the reserve supply of the unemployed by businesses.

It would be a self-deception if we looked at Italy, which also lags behind, to seek comfort. In Hungary, smallholders, shops and workshops disappeared in the decades of state socialism and this sector was unable to recover following the political changeover to reach the level of Southern European countries, which have preserved the traditional structure of their economy. Family-owned small enterprises are able to ward off troubles resulting from skill gaps more effectively because of their personal network and are more tolerant towards losses arising from them. In contrast, low-qualified Hungarians cannot count on the traditional family-owned small business sector as a lifebelt.

1 The question is analysed in more detail by comparing Hungary, Norway and Italy in *Köllő* (2013, 2014).

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5.4 MIGHT TRAINING PROGRAMMES EASE LABOUR SHORTAGE? THE TARGETING AND EFFECTIVENESS OF TRAINING PROGRAMMES ORGANISED OR FINANCED BY LOCAL EMPLOYMENT OFFICES OF THE HUNGARIAN PUBLIC EMPLOYMENT SERVICE

ANNA ADAMECZ-VÖLGYI, MÁRTON CSILLAG, TAMÁS MOLNÁR & ÁGOTA SCHARLE

One of the prime roles of public employment services is to make the matching between the demand and supply for labour more efficient. In Hungary, this function is increasingly relevant, as demand grew primarily for a skilled workforce over recent years, while the majority of the unemployed are either uneducated or their professions are obsolete. Providing training for the unemployed could in principle contribute to the alleviation of the shortage of labour, if the number of training offers provided by employment centres are adequate, the training programmes are of good quality and are targeted at those in need.

In this short study, we examine two questions. Firstly: how did the number and composition of those who took part in training programmes change? Secondly: how did the effectiveness of these programmes evolve between 2010 and 2013?

Development of the number and the composition of participants of the retraining programs

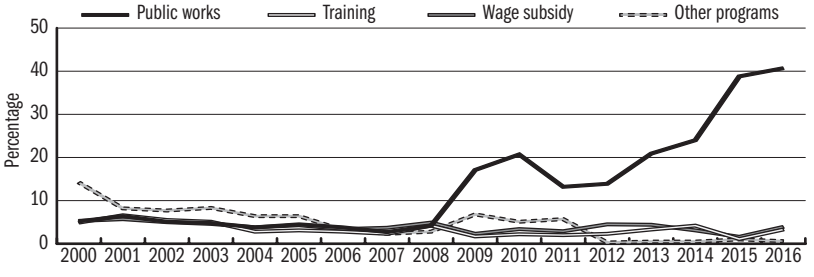
While the amount spent on training job seekers (10–20 billion HUF) was nearing that of the expenditure for public employment (20–30 billion HUF) in the few years before 2008, during the crisis the latter significantly increased, whereas spending on training began to decrease. However, the truly remarkable change in direction occurred in 2012, when training expenditures dropped from 7 billion HUF in 2011 to 878 million HUF in 2012, according to data from Eurostat. In the following two years, the expenditures on training remained at the same low level, and only increased substantially in 2015.

While in the period between 2004 and 2007, 25–27 thousand participants entered the training programmes, during the financial crisis (between 2008 and 2010), 38–42 thousand people took part. Subsequently, the number of entrants to the training programmes decreased continuously (with a significant annual fluctuation).[1] If we examine the same figures in terms of the percentage of quasi-unemployed (those who are registered unemployed, those in public works and those who participated in active measures) who took part in the training programs, no clear tendency can be observed (*Figure 5.4.1*). Although this rate was still above 5% in the early 2000's, since 2004, the proportion of

1 It is important to emphasize that we do not analyze the short training programmes organized for public works participants.

those participating in the training has been stagnating with significant annual fluctuation. Thus, the proportion of those participating in the training fluctuated between 1% and 4% of the unemployed, with an average of around 2,7%.

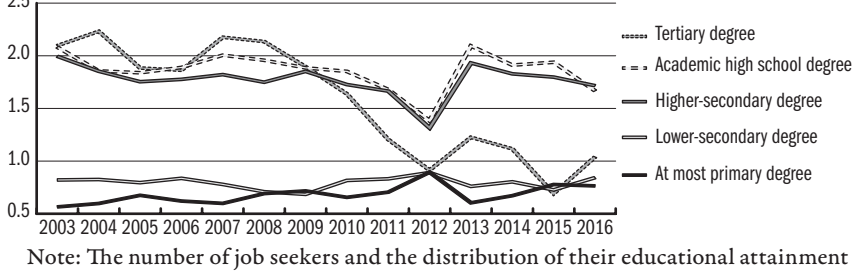
Figure 5.4.1: Participation in labour market programs (percentage of the unemployed)



Note: Annual numbers in October, the total number of registered unemployed and program participants is 100%.
Source: *National Employment Service* (*NES*).

The composition of training participants in terms of their educational attainment changed somewhat over recent years. The proportion of those in training who have completed either primary school at most or vocational school relative to their proportion among all registered unemployed fluctuated around 80% between 2010 and 2016. It is worth noting that these two groups account for more than 70% of the quasi-unemployed (including those in public works). By contrast, the unemployed who graduated from secondary school are significantly more likely to participate in retraining programs. At the same time, since 2009, the over-representation of job seekers with college or university qualifications in training has substantially declined, and over the last three years, the over-representation of those with secondary qualifications has also decreased. As a result, while during the period between 2003 and 2009, the proportion of people with at least secondary school diplomas among the training participants was 1.8–2 times higher than their share among the unemployed, since 2010 this ratio has fallen to around 1.5 (*Figure 5.4.2*).

Figure 5.4.2:The distribution of training participants in terms of their educational attainment compared to their proportion within the unemployed



Note: The number of job seekers and the distribution of their educational attainment were calculated on the basis of NES data, we used data from 2015 for the ratio of

high school and vocational high school or technicum graduates, in the absence of 2016 breakdown. The public employment data for 2011–2012 are from the calculation of Ágota Scharle based on the semi-aggregated branch level data obtained from the FOKA database, and show the monthly average of the participants, for the period 2013–2016, the public employment data were calculated on the basis of the BM Public Employment Portal data. For 2010 and the preceding period, the number of public employees was calculated on the basis of the actual number at the end of October, the breakdown by educational level was considered constant in the absence of data, the proportions were based on the average distribution between 2011 and 2013.

Source: *NES, BM* Public Works Portal, *FOKA*.

The selection of participation in training programmess and their effects

The data

Our analysis is based on the personal data from the unemployment register. The complete sample of training participants and a 10% random sample with replacement of non-participant job seekers was used for the analysis.[2, 3] The database covers those who (1) either had registered jobseeker or public worker status on January 1st, 2010, or (2) entered the unemployment registry or a public works programme[4] between January 1st, 2010 and December 31st, 2014, or (3) entered supported training in this period.[5] From training programmes, we exclude those related to public works (so-called winter public works programmes, for more information see *Busch,* 2015), as their content significantly deviated from the retraining provided to registered job seekers.[6]

The selection into training participation

In the first step, we present the characteristics of training participants; subsequently, we examine which factors explained admission to training programmes in each year with linear probability models. *Figure 5.4.3* shows the composition of jobseekers participating in training during this period, based on their educational qualifications. Between 2010 and 2014, the composition of training participants was relatively stable in terms of their educational qualifications. There was a slight increase in the proportion of jobseekers with low, maximum primary school qualifications. We see a similar picture when looking at the factors of age and labour market experience. The proportion of those aged below 25 increased from 35% to 40%, the proportion of those with no earlier labour market experience increased from 21% to 31% between 2010 and 2014.

The composition of training participants is determined by two mechanisms: the selection to registered unemployed status, namely the composition of job seekers, and, the selection from jobseeker status to training. *Table 5.4.1* shows how the probability of training participation is influenced by the job seekers' characteristics. We estimated linear probability models in each year. On the left hand side of the models there is a binary variable capturing job-

2 Sampling of non-participant jobseekers was needed for technical reasons.

3 Comparing to the earlier, Hungarian version of this chapter, this version was updated in three ways. First, in the earlier version, we only used a 10% random sample of training participants. Second, in the meantime, we gained access to employment data and examined the effects of training on the probability of formal employment (and not on the probability of exiting unemployment status). Third, we extended the control group with those in public works.

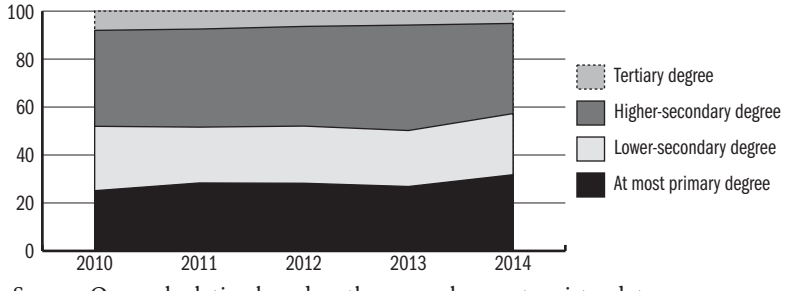
4 In 2010, the data do not register those on all public works programmes, only those on a small-scale public works scheme ("közhasznú munka" in Hungarian).

5 Those individuals who, besides the training, received other active measures were kept in the sample; at the same time, those individuals who entered a retraining program from a non-registered job seeker status were discarded.

6 Although nearly half of the training programmes (47.8%) developed basic competences, a third of them were semi-skilled programmes and only about a fifth of them were OKJ training in 2013, in 2014, the proportion of basic training programmes decreased to below 1%, while the rate of OKJ training leapt to over 62% (*Busch,* 2015).

seekers' training participation, while on the right hand side their individual characteristics. These characteristics were: educational attainment, age, gender, being labour market entrant, whether worked at least one day in the previous calendar year, whether spent at least one day in unemployment in the previous calendar year, whether spent at least one day in public works in the previous calendar year, the date of entering unemployment, and the employment centre's code (employment centre fixed effect). In *Table 5.4.2,* training programmes are differentiated based on whether their lengths exceed 90 days, as longer training courses typically aimed at providing a professional (vocational) qualification, while shorter courses are more heterogeneous.[7]

Figure 5.4.3: The composition of participating job seekers according to their educational attainment



Source: Own calculation based on the unemployment register data.

Table 5.4.1: Selection into training, by the year of training entry

	Entering training in				
	2010	2011	2012	2013	2014
Education. Base category: at most lower-secondary degree					
Upper-secondary degree	0.14***	0.23***	0.19***	0.17***	0.07***
	(0.006)	(0.009)	(0.006)	(0.006)	(0.004)
Tertiary degree	0.05***	0.02***	0.03***	0.06***	0.02***
	(0.007)	(0.013)	(0.010)	(0.011)	(0.008)
Age below 25	0.05***	0.08***	0.09***	0.11***	0.09***
	(0.005)	(0.008)	(0.007)	(0.008)	(0.007)
Male	0.01***	0.04***	0.03***	0.03***	0.02***
	(0.004)	(0.006)	(0.006)	(0.004)	(0.004)
Labour market entrants	0.02***	0.05***	0.07***	0.08***	0.03***
	(0.005)	(0.008)	(0.008)	(0.007)	(0.008)
Unemployed in the previous calendar year		-0.08***	-0.18***	-0.25***	-0.63***
		(0.006)	(0.008)	(0.009)	(0.008)
Employed in the previous calendar year		0.04***	0.08***	0.09***	0.01***
		(0.005)	(0.005)	(0.004)	(0.004)
Public worker in the previous calendar year		-0.06***	-0.06***	-0.06***	-0.04***
		(0.020)	(0.008)	(0.006)	(0.004)
No. of obs.	34,217	23,516	35,831	50,680	62,967

Note: Linear probability models to predict the probability of training participation in each year. Each column is derived from a separate estimate. Other control vari-

7 This latter category can have as an objective: (a) development of basic competences and motivation, (b) courses for obtaining a specific license (fork-lift driver etc.) and (c) financial and entrepreneurial skills formation.

ables not indicated in the table: branch office FE, date of entry into the register.
Clustered robust standard errors at the settlement level are in brackets.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Own estimates based on unemployment registry data.

Table 5.4.2: Selection into training, by the length of trainings

	Entering training in									
	2010		2011		2012		2013		2014	
	≤ 90 days	> 90 days	≤ 90 days	> 90 days	≤ 90 days	> 90 days	≤ 90 days	> 90 days	≤ 90 days	> 90 days
Education. Base category: at most lower-secondary degree										
Upper-secondary degree	0.20***	0.18***	0.14***	0.27***	0.10***	0.21***	0.09***	0.19***	0.03***	0.06***
	(0.011)	(0.007)	(0.010)	(0.010)	(0.008)	(0.006)	(0.010)	(0.006)	(0.004)	(0.005)
Tertiary degree	0.17***	0.20***	0.18***	0.35***	0.12***	0.26***	0.05***	0.20***	0.01*	0.03***
	(0.016)	(0.009)	(0.021)	(0.015)	(0.018)	(0.012)	(0.016)	(0.012)	(0.007)	(0.008)
Age below 25	0.05***	0.07***	0.06***	0.09***	0.05***	0.10***	0.06***	0.12***	0.03***	0.08***
	(0.010)	(0.006)	(0.011)	(0.009)	(0.009)	(0.007)	(0.008)	(0.008)	(0.005)	(0.006)
Male	0.06***	0	0.07***	0.01**	0.08***	0.00	0.08***	0.00	0.04***	-0.01**
	(0.009)	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.004)	(0.004)
Labour market entrants	0.06***	0.03***	0.11***	0.06***	0.10***	0.09***	0.08***	0.09***	0.02**	0.04***
	(0.013)	(0.006)	(0.015)	(0.009)	(0.014)	(0.009)	(0.011)	(0.008)	(0.006)	(0.007)
Unemployed in the previous calendar year			-0.22***	-0.12***	-0.50***	-0.23***	-0.57***	-0.30***	-0.77***	-0.69***
			(0.009)	(0.007)	(0.012)	(0.010)	(0.019)	(0.011)	(0.008)	(0.007)
Employed in the previous calendar year			0.04***	0.04***	0.07***	0.08***	0.08***	0.09***	0.01***	0.00
			(0.007)	(0.006)	(0.006)	(0.005)	(0.005)	(0.004)	(0.003)	(0.003)
Public worker in the previous calendar year			-0.04**	-0.06***	-0.02***	-0.05***	-0.04***	-0.05***	-0.02***	-0.03***
			(0.020)	(0.020)	(0.006)	(0.008)	(0.005)	(0.006)	(0.003)	(0.003)
No. of obs.	13,924	25,289	13,388	19,378	20,389	30,676	30,841	43,916	53,588	56,651

Note: Linear probability models to predict the probability of training participation in each year. Each column is derived from a separate estimate. Other control variables not indicated in the table: branch office FE, date of entry into the register.
Clustered robust standard errors at the settlement level are in brackets.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Source: Own estimates based on unemployment registry data.

Examining the selection of entering training, it seems that the effect of educational attainment on the probability of entering training slightly decreased between 2010 and 2014 (*Table 5.4.1*). In 2010, job seekers with at least an upper-secondary degree were 14 percentage points more likely to enter training than those with at most a lower-secondary degree. By 2014, this surplus decreased to 7 percentage points. On the other hand, the positive selection of training participants (cream skimming) is underlined by the fact that those who worked in the previous calendar year are more likely, while those who were unemployed or public worker in the previous calendar year are less likely, to participate in training.

Table 5.4.2 shows that there is no difference between shorter (max. 90 days) and longer (longer than 90 days) training programmes in terms of change of

selection. It is true for both the shorter and longer training programmes that the magnitude of influence of individual factors, especially educational attainment, has decreased between 2010 and 2014. Nevertheless, job seekers with higher educational qualifications were more likely to enter longer training programmes in every year.

The effects of training participation on employment

The causal effect of training participation is estimated using statistical matching. Our main identification assumption is that we observe all variables driving training participation and employment outcomes (age, gender, educational attainment, date of entering unemployment, employment experience, the number of days spent in unemployment/public works/employment in the previous calendar year, career entrant status); thus, no unobserved variables exist that might simultaneously influence both. We estimate the impact of training programmes on the probability of being employed: we assume that if training was effective, training participants would be more likely to be employed after the training, but not before.

We use nearest neighbour matching based on estimated participation probabilities (propensity scores) on the subsamples of training participants who entered training in one particular month (treated), and, on the 10% random sample of jobseekers in registered unemployed or public worker status in the same month (controls). We estimate the propensity scores using probit models separately in each month of 2010–2014 and complete the matching procedure on the common support.[8] We match at least one neighbour to each treated individuals (i.e., the one with the closest propensity score on the common support), and we estimate both average treatment effects (ATE) and average treatment effects on the treated (ATET). The ATE capture the effects of training on an average unemployed person, based on the characteristics of both treated and control individuals, whereas the ATET capture the effects of training on the actual training participants. As will be seen from our results, ATE are a bit larger than ATET, because training participants are positively selected vis-à-vis non-participant jobseekers, and, the impact of training is larger for jobseekers with lower initial labour market potential.

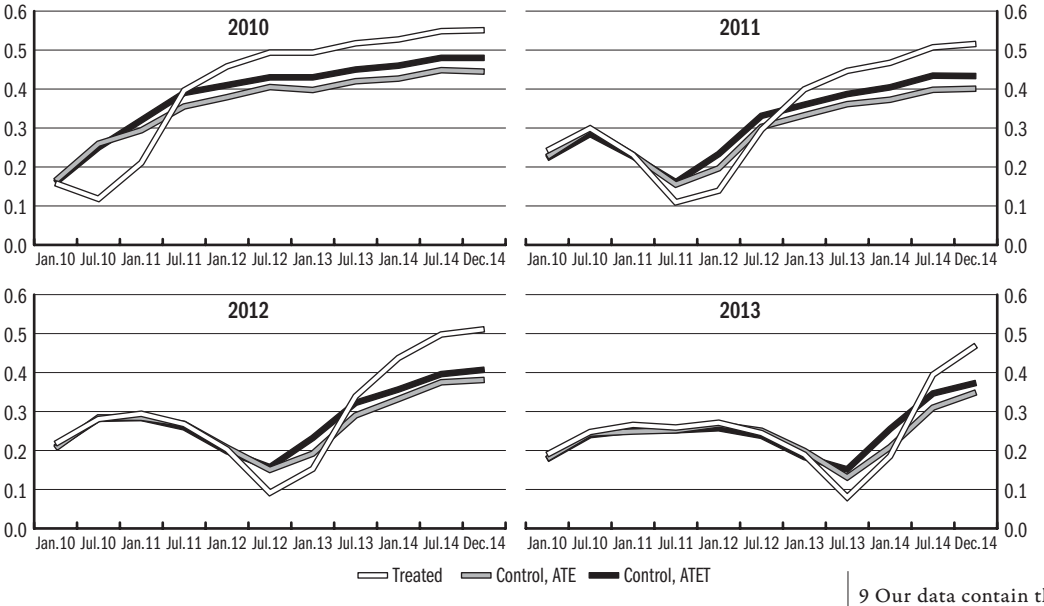
The outcome indicator we use is employment status following the training, and, for robustness check, we estimate the "effect" of training before it had taken place as well. Practically, we construct a set of outcome variables capturing whether jobseekers were employed on every 180th day between January 1, 2010 and December 31, 2014. For each year, we estimate the yearly average of monthly treatment effects, and plot the probability of employment in the treated and control groups for each 180th day.

Figure 5.4.4 shows the probability of employment on the matched sample (i.e. after eliminating individual differences) in the treated and control groups,

8 The results of the estimated probability models and the balance of the sample after matching can be obtained from the authors.

before, during and after the training. Before the training, there are no differences in the probability of employment between the treated and control groups; thus, our matching approach seems to be valid. In the year of the training, the probability of employment drops in the treated group: they are not likely to work as they participate in training; this is the so-called lock-in effect. After the training, the probability of employment goes up by 7–10 percentage points each year, and, at least in the sample of those observed for more years after the training (i.e. those in training in 2010–2012), the effects do not vanish in the mid-term. Also note that the probability of employment decreases in both the treated and control groups before training as they gradually enter unemployment; this phenomenon is the well-documented Ashenfelter's dip.

Figure 5.4.4: The effect of training on the probability of employment, by the year of training entry



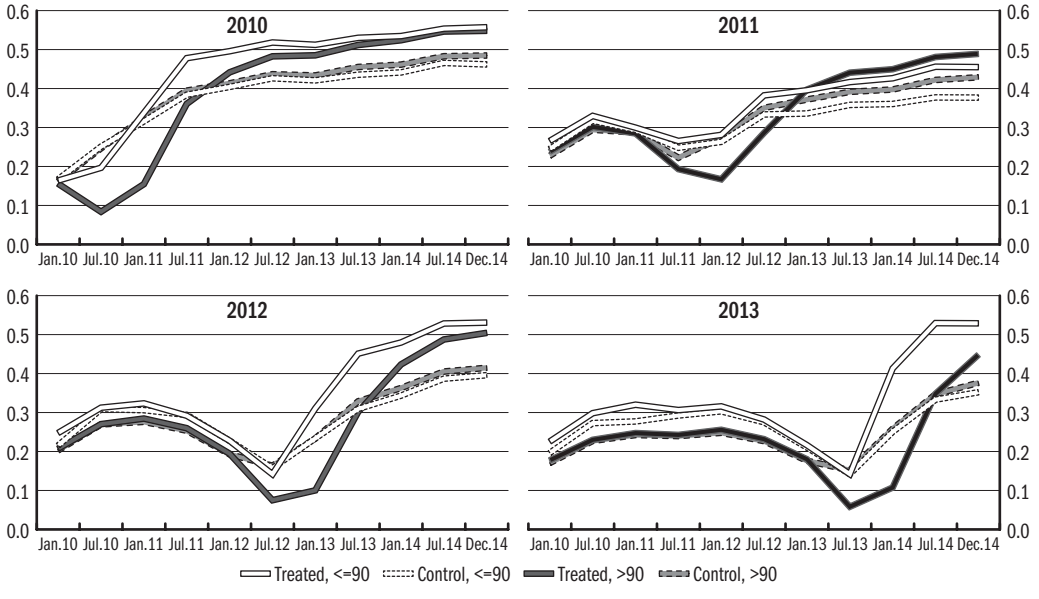
Note: The yearly effects are the sample size-weighted averages of the monthly effects. The employment probabilities of the treated group are average employment probabilities of the treated group in the matched samples. The employment probabilities of the control group are set as the employment probabilities of the treated group in the matched samples minus the estimated average treatment effects (ATE) or average treatment effects on the treated (ATET).
Source: Own estimates based on unemployment registry data.

Figure 5.4.5 shows the results broken down by length of training.[9] In the case of training programmes longer than 90 days, the lock-in effect is longer than that of shorter courses. In the case of training courses shorter than 90 days, we measure the effects of 4–10% points at the end of the first calendar year after training. In the case of long training courses, it is about a year and a half

9 Our data contain the actual lengths of training participation, not the intended (official) lengths of training. Thus, for example, if a jobseeker dropped out of an officially 6-month training programme after 80 days, the data show 80 days (and not the 6 months). This fact may introduce a bias into our estimates in the sense that if some jobseekers dropped out of a longer-than-90-day training programme after less-than-90-days because they found a job in the meantime, we overestimate the effects of shorter training participation.

after entering training that the probability of employment exceeds that of the control group. Considering jobseekers participating in training in 2010 and 2011, it seems that the medium to long term effects of shorter and longer training programmes do not differ in a statistical sense. This does not necessarily mean that the same training in shorter form is equally as effective in the long term as the longer one. In the database we use, we do not see the type (OKJ training, IT training, etc.) and the content of training (profession, language training, etc.). Nevertheless, we may assume that job seekers with different individual characteristics get into short or long training programmes, which alone determines how quickly they find employment after the given training.

Figure 5.4.5: The effect of training on the probability of employment, by the length of training



Note: The yearly effects are the sample size-weighted averages of the monthly effects. The employment probabilities of the treated group are average employment probabilities of the treated group in the matched samples. The employment probabilities of the control group are set as the employment probabilities of the treated group in the matched samples minus the estimated average treatment effects on the treated (ATET).
Source: Own estimates based on unemployment registry data.

The effects of training participation on the days spent in employment are summarized in *Table 5.4.3.* The positive effects of short training programmes occur already in the first calendar year after entering training when training participants spent 24–68 more days in employment than matched control non-participants. Starting from the second year after training, the order of magnitude of the effects varies between 26–50 days and stays at this level

throughout the observation period. In the case of long training programmes, due to longer lock-in effects, the positive impact may appear only a year later, but, this is not necessarily the case. In this timeframe, it seems that the effects of short and long training programmes equalize after three years.

Table 5.4.3: The effect of training on the number of days spent in employment

	Effects on the number of days in employment in			
	2011	2012	2013	2014
Entry to training in 2010				
All training	–2.050	19.06***	24.45***	25.71***
SE	3.231	3.726	3.796	3.836
≤ 90 days	26.39***	31.93***	31.55***	31.19***
SE	5.846	6.489	6.455	6.512
>90 days	–14.33***	14.07***	20.89***	23.13***
SE	3.707	4.421	4.530	4.578
Entry to training in 2011				
All training		–9.36**	20.43***	26.74***
SE		4.466	5.140	5.329
≤ 90 days		23.64**	25.66**	34.13***
SE		8.406	9.310	9.678
>90 days		–25.37***	17.89***	24.08***
SE		4.816	5.774	5.961
Entry to training in 2012				
All training			4.380	34.59***
SE			4.132	4.752
≤ 90 days			47.78***	49.97***
SE			8.503	9.392
>90 days			–10.30**	28.04***
SE			4.544	5.442
Entry to training in 2013				
All training				11.93***
SE				3.69
≤ 90 days				67.59***
SE				6.91
>90 days				–7.23*
SE				4.16

Note: Results after matching, average treatment effects on the treated (ATET). The yearly effects are the sample size-weighted averages of the monthly effects. SE refers to robust standard errors.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Source: Own estimates based on unemployment registry data.

The potential effects of shorter and longer training programmes are determined by at least three components: the selection of jobseekers into the two types of training; the relative quality of the two types of training; and, as we have seen, longer training courses have a longer lock-in effect. On the sample of participants in 2010 and 2011, we observed that in the short term, the effect of shorter training courses appears sooner, but in the long term, the ef-

fects of shorter and longer training programmes did not differ in a statistical sense. This may be due to the trade-off between the positive impacts of longer training and the negative impacts of longer lock-in periods: longer training programmes are likely to increase the human capital of participants more, however, at the same time, the lock-in effect keeps them away from the labour market longer and can make finding a job more difficult.

The potential selection to shorter and longer training and its impact on their employment effects are examined in *Table 5.4.4*.

Table 5.4.4: The effect of training on the number of days spent in employment, by educational level and the length of training

	Low-educated		High-educated	
	Entering training in		Entering training in	
	≤ 90 days	> 90 days	≤ 90 days	> 90 days
Effects 1 year after training				
2010	37.50***	7.86	13.66	-30.67***
SE	7.187	5.008	9.150	5.185
2011	38.46***	5.34	14.33	-39.77***
SE	10.026	6.733	12.887	6.568
2012	49.22***	8.32	42.81***	-24.48***
SE	10.340	6.085	13.670	6.451
2013	58.00***	9.37*	84.36***	-21.00***
SE	8.731	5.476	11.230	5.740
Effects 2 years after training				
2010	39.36***	31.11***	23.65**	2.31
SE	8.031	6.067	9.988	6.125
2011	41.49***	40.96***	19.580	4.62
SE	10.886	8.276	13.775	7.702
2012	56.90***	42.21***	40.97**	18.34**
SE	11.631	7.480	14.847	7.591
Effects 3 years after training				
2010	38.26***	36.53***	25.70**	9.66
SE	8.253	6.285	9.754	6.231
2011	45.22***	50.86***	27.01*	10.88
SE	11.444	8.615	14.210	7.957

Note: Results after matching, average treatment effects on the treated (ATET). The yearly effects are the sample size-weighted averages of the monthly effects. SE refers to robust standard errors.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Source: Own estimates based on unemployment registry data.

If less (or more) educated jobseekers are more (or less) likely to participate in longer training, this mechanism could affect the effectiveness of training in two ways. On the one hand, low-educated jobseekers are in a worse initial labour market situation, and therefore, for them, the marginal effect of longer training might be greater (assuming decreasing returns). On the other hand, it is also possible that high-educated jobseekers, who face employment barri-

ers that we do not observe in the data, are more likely to participate in longer training than high-educated jobseekers not facing such barriers. Thus, for them, the potential impact of longer training might be hindered by their unobserved labour market disadvantage. *Table 5.4.4* shows the impacts of short and long training for low-educated (i.e., those having at most a lower-secondary degree) and high-educated (i.e., those having at least a higher-secondary degree) jobseekers. The impact of training on the employment probability of low-educated jobseekers seems to be more pronounced, especially in the case of long training. The lock-in effect of long training is significantly higher for high-educated jobseekers. In fact, we find very weak evidence that long training programmes are effective at all for high-educated jobseekers.

Summary

Finally, we briefly discuss the extent to which an expansion of training programmes and the modification of their objectives can lead to positive results. In the period under review compared to the first half of the 2000's, a significantly smaller proportion of job seekers entered supported training, at the same time, the positive selection of training participants based on educational attainment decreased. The latter is a positive development as our results show that training is more effective for low-educated jobseekers. However, it is unfortunate that in the course of 2015 and 2016, there were fewer than 8.5 thousand training participants with at most lower-secondary school education, while between 2012 and 2014, this figure was almost double. From our analysis, it is also apparent that longer training programmes do not necessarily lead to greater effects in the medium term (3–4 years after entering training) than shorter courses.[10] In other words, it is conceivable that a greater number of the relatively shorter programmes, targeting job seekers with a lower educational attainment, can significantly improve employment (and mitigate the labour shortage) within the foreseeable future (1–2 years).

10 In recent years, the regulatory background of training for job seekers also changed, which, through the selection and targeting of the training, could have also influenced their efficiency. The National Institute of Vocational and Adult Education has opened on December 15, 2014, in turn, the National Labour Office was closed on January 1, 2015, in the new structure, training targeting job seekers is managed by the Deputy State Secretary for Vocational Training and Adult Education under the Minister of National Economy (*Cseres-Gergely–Varadovics,* 2015).

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