European Commission

Employment and Social Developments in Europe

Determinants of skills matching - The role of institutions

Working paper

2020/02

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EUROPEAN COMMISSION

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European Commission
Directorate-General for Employment Social Affairs and Inclusion
Directorate A

Luxembourg: Publications Office of the European Union, 2020

PDF ISBN 978-92-76-20289-9 doi:10.2767/353442 KE-04-20-378-EN-N

Abstract

This paper presents the results of a factor analysis, based on the information provided by 70 variables for 26 Member States, identifying three main dimensions that explain good labour market and social outcomes. The results broadly confirm the taxonomy proposed in the "Variety of Capitalism" (VoC) literature: Coordinated Market Economies include the Northern Member States (plus NL, DE), show-ing evidence that social institutions matter: Market coordination through social dialogue between workers and firms is supportive of economic success and resilience. Institutions are conducive to high employment standards and high labour productivity, notably as they help make effective use of work-ers' qualifications and talents (i.e., they improve matching). Further regression analyses on micro data support these findings.

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1. Introduction

In the European Union (EU), and in the industrialised world as a whole, economies have been maintaining competitiveness through continuous deepening into capital. Labour has been substituted by capital where low labour productivity and rising labour-capital cost-ratios induced firms to do so. Another motivation for firms to invest in capital has been more complementary to labour, hence conducive to higher employment: to equip workers with innovative new capital, enhancing competitiveness, supporting productivity growth and containing labour costs per unit of production.[1] That is, while capital intensity has tended to increase in EU Member States in the course of technological progress, it has increased for very different reasons. Thimann (2015) has seen a number of EU countries where unit labour costs increased as productivity grew less fast than labour costs. Companies have tended to displace workers by cheaper capital wherever technically feasible. In other countries, buoyant productivity gains have outpaced wage increases, dragging down unit labour costs[2], increasing competitiveness and creating new jobs.

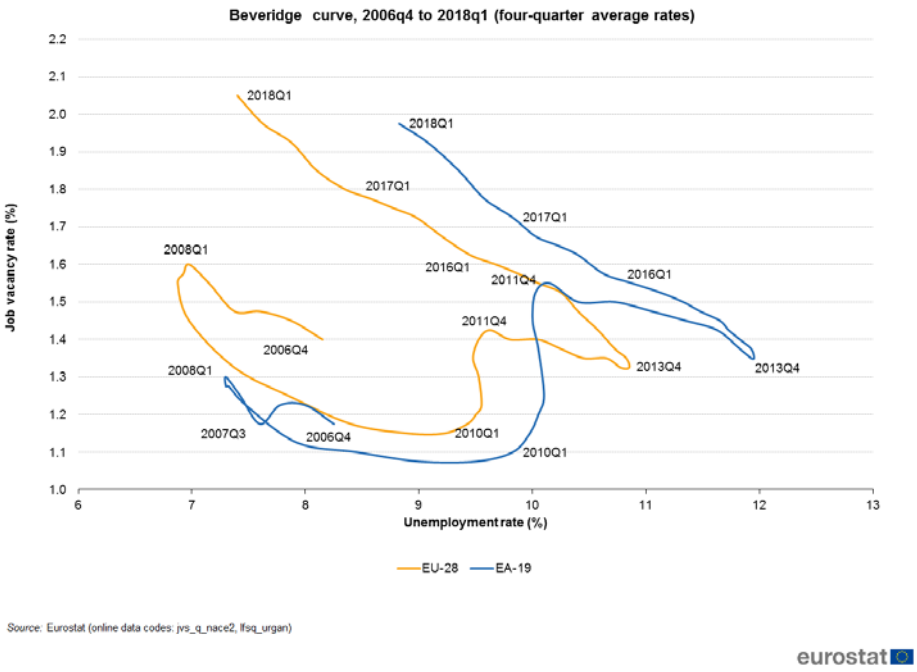
The European Commission's 2018 Employment and Social Development in Europe review (ESDE 2018) finds that whether technological change displaces labour or accelerates job production depends on the availability of skilled and qualified workers[3] and on whether this human capital is efficiently used[4]. In the context of labour organisation, the 19th century industrial revolution was characterised by a simplification of tasks that allowed optimising processes performed by highly specialised, yet low-qualified workers. This is no longer a reality. Technological change today is what scholars refer to as *skill- and routine-biased*: It favours workers with higher skills and qualifications[5] (Frey and Osborne, 2017) while allowing routine-tasks to be outsourced from labour to capital.[6] In other words, there is a strong complementarity between skills and qualifications on the one hand and capital on the other hand. Physical investment is most likely to be complementary to job creation where workers are well skilled and best prepared to work with the very innovative capital firms need to stay competitive (ESDE 2018, chapter 2) [7]. In short: It takes skilled labour for capital investments to generate new jobs.

The supply of skills and qualifications depends on demographic and labour market trends, on an individual's opportunities to invest into education and training (Cedefop, 2016a, ESDE 2018, Ch. 3). However, what if the existing supply does not match with the qualifications needed in respective occupations?

If an unemployed person's skills or her qualifications do not match current job vacancies, she will be unlikely to find a job without investment in her skills. Mismatches are likely to play a major detrimental role for the functioning of the labour market where high unemployment coincides with numerous job vacancies. During the crisis years 2008 – 2010 unemployment increased strongly while firms reduced the number of vacancies. The trade-off has also been visible since 2013 in the course of the

[1] European Commission (2018), Employment and Social Developments in Europe (ESDE) 2018, Chapter 2.
[2] For example, between 1999 and 2008, France, Greece or Italy increased their productivity by only 7% whereas nominal wages were boosted by more than 40%. On the other hand, Austria, Belgium or Finland lifted their real productivity by 12% and their nominal wages by more than 22%.
[3] Chapters 2 and 3 in ESDE.
[4] Goldin et al.. 1998.
[5] A person's qualification level is seen here her formal education according to the International Standard Classification of Education (ISCED), while skills are specific competencies she needs in order to perform her job, irrespective of her formal qualification. They include, for example, ICT proficiency, her reading capacity, or her social skills.
[6] European Commission (2019, forthcoming): Labour Market and Wage Developments in Europe (ESDE) 2019, Chapter 4
[7] See Berger et al (2009) for the model used for simulating the effect of higher qualifications and skills in ESDE 2018. It incorporates the capital-skills-complementarity.

economic and labour market recovery, but in reverse direction: unemployment has declined while firms have posted more vacancies (Eurostat[8]).



What is more, the Beverage curve has shifted upwards: At given unemployment levels there were more job vacancies than in the period towards 2010, and vice versa. The crisis seems thus to have exacerbated matching problems on EU labour markets, leaving many firms with open vacancies and many workers without a job. In other words: in the context of demographic change (reducing the stock of talents) and digitalisation (calling for more talented people) resources are not efficiently used, pulling up unemployment, but also aggravating problems of labour market duality and lowering the economy's growth prospects in the long run (see model simulation in the Box).

Box: Frictions in job matching: Modelling the macro-economic impact

A simulation with DG EMPL's labour market model (Berger et al, 2009) assumes a decline of the matching probability on Spain's labour market. Firms post vacancies, but only a share of those vacancies can be filled. Likewise, workers provide labour units to the market, but only a share of these units find a match on the market. We assume that both shares decline at any level of qualification, the extent of the decline being so that unemployment rises in the long run by 0.6 ppt., compared with the reference scenario. However, bad labour market matching will lead to more problems than just a general increase of unemployment. Firstly, low-qualified workers are suffering more (-0.9 ppt.) than the average from the worsening of job matching, exacerbating Spain's already significant problems of labour market segmentation. As firms are less successful in filling given vacancies, the unmet labour demand is likely to push wages, especially in the low-qualification segment, further crowding out low-qualified workers from the market. Secondly, lower employment will also reduce investment, as less labour needs to be equipped with new capital. As a result, GDP will be lower than in the reference scenario (-0.6%)

[8] See https://ec.europa.eu/eurostat/statistics-explained/index.php/Job_vacancy_and_unemployment_rates_-_Beveridge_curve

Labour market mismatches related to a person's skills profile are referred to as 'horizontal' if her skills-content (the type of skills) would not match a specific profile demanded by firms. Another form of allocative inefficiency is a 'vertical' mismatch where a person's formal qualifications are higher or lower than those required on the job.[9]

Can appropriate policy responses lower the probability of a mismatch? Or put differently, how can institutions mitigate potential mismatches? Institutions include labour market policies such as vocational education and training. They include the design of the welfare state; they also include the way bargaining on wages and working conditions is organised and the role social partners[10] play in representing their members' interests on the labour market.

We start by reviewing literature on institutions and their impact on labour market coordination. Next, based on numerous indicators we run a factor analysis identifying the three main dimensions that describe labour market and social outcomes. Based on similarities between countries in their performance around these factors we run a cluster analysis identifying a taxonomy of capitalist institutions, before putting the main dimensions to the test. That is, we treat them as macro-economic variables in a regression on individual (micro) data to find that they are highly significant when explaining the impact of institutions on the matching of skills at individual level.

2. A taxonomy of capitalist institutions

Reasons for skills mismatch can be cyclical of nature: Increasing demand for specific products or services would trigger demand for related skills as well, causing skill shortages if supply fails to catch up fast enough. On the other hand, a cyclical demand slump would cause temporary under-utilisation of certain skills. By contrast, structural forms of mismatches typically occur as new markets develop but fail to gravitate the necessary skills equally as fast – either because resources are still tied to traditional industries or the education and training systems form qualifications and skills that do not match what is needed for developing new, innovative products.

While those macro-economic drivers of skill mismatches are well documented,[11] this paper will explore the role of institutions in the emergence of skill mismatches. Institutions such as labour market regulation build on values and preferences that prevail in a society. Values also determine the impact of these institutions on the functioning of a society. Take wage negotiations, for example. Cooperation between firms and workers functions very differently across countries, and these differences are due to different cultural contexts in which these negotiations take place (Hall and Soskice, 2001). Therefore, institutions are seen here (1) as the framework of rules within which firms and workers operate and (2) the way they cooperate.[12] Institutions thus include the way countries organise social welfare, employment protection, and the way representatives of employees and employers work together in order to shape working conditions,[13] a process referred to as *social dialogue*. Formally or informally, institutions determine the mode of cooperation between the social partners (Lallement, 2011). This cooperation goes well beyond wage bargaining. In an increasingly digitalised environment with skills having

[9] Desjardins et al (2011).
[10] Trade unions and employers' organisations.
[11] European Commission (2015).
[12] Institutions can broadly be defined as 'the set of implicit or explicit rules, norms or contractual arrangements, and organizations that govern market transactions'. (See Freeman (1999), p.4.) From a much broader perspective one can see institutions as a set of formal and informal rules determining human behaviour in specific situations.
[13] Below we will differentiate mostly between the wage bargaining institutions, such as the work councils and trade unions, and labour market institutions, such as vocational training, unemployment insurance or employment protection.

to adjust to fast-evolving product markets, vocational training and education programmes have moved into the very centre of social partners' concerns.[14]

2.1 Three types of capitalism: 'Variety of Capitalism' literature

Table 1		
Coordinated Market Economies	**Mixed Market Economies**	**Liberal Market Economies**
Austria Belgium Denmark Finland Germany Netherlands	France Greece Italy Portugal Spain	Czech Republic Estonia Hungary Ireland Latvia Poland Slovenia United Kingdom
Source: Hall (2017)		

In order to understand the impact of institutions on labour markets in different countries, we draw on the **Varieties of Capitalism** (VoC) literature. It describes how institutions explain market outcomes in different types of 'capitalist' economies. VoC literature distinguishes Coordinated Market Economies (CME), Mixed Market Economies (MME) and Liberal Market Economies (LME).[15]

CME – Coordination between workers and firms: Industries in Coordinated Market Economies tend to rely on highly skilled[16] workers. They tend to be specialized, and therefore need very specific skills. Welfare states are typically strong, supporting training and incentivising the acquisition of these skills (Soskice, 2007). However, specific skills make job matching less probable, potentially putting employees in a vulnerable position relative to their employers. Therefore, employment and wage protection were found strong in CMEs. Stronger protection strengthens workers' bargaining position relative to their employers (Soskice, 2007). Rather than bargaining themselves with workers, firms are thus inclined to organise themselves and do the wage bargaining at industry level where they deal with industry-wide trade unions, both partners being able to flexibly respond to the industry-specific market context. Wage bargaining in Germany, for example, mainly happens at industry level with minimum wages set by the government. Likewise, workers' training in CMEs tends to be provided for by industry-wide employer associations and trade unions[17] while governments limit themselves to the coordination and support of training programmes. A higher degree of job protection may increase job quality, but may also hinder the diffusion of new technologies from firm to firm, as workers stay longer with a firm even if conditions are sub-optimal (Hall and Soskice, 2001).

MME – State intervention: a protection shield against market pressure: Labour unions in Mixed Market Economies are more fragmented, employers' associations less developed than in CMEs. Hence, firms' associations and trade unions are to a lesser extent in a position to engage in wage bargaining, employment protection or workplace regulations than would be the case in CMEs (Hassel, 2014). The state therefore has a stronger role in providing those public goods. According to Molina and Rhodes (2007), MMEs show lower levels of social protection than CMEs, yet stronger employment protection. In addition, the level of investment in specific skills tends to be lower in these countries than in CMEs. In turn, lower skills tend to dampen investment in new technologies that would increase competitiveness. Furthermore, Molina and Rhodes argue that overall product market regulation is stricter in MMEs, which lowers competitive pressure for established firms as market entries become more difficult. Firms in MMEs 'compete mainly over the price'[18] rather than through innova-

[14] Employment and Social Developments in Europe 2018, Chapters 3 and 6.
[15] Hall and Soskice (2001), The conceptualization might differ across specific analyses, i.e. some authors do not use the MMEs, but rather differentiate between specificities within the group of CMEs. Iversen et al. (2016) for example distinguish broadly speaking between northern and southern European economies
[16] We use the terms 'skills' and 'qualifications' as synonyms unless differently specified.
[17] Soskice et al. (2001). This is the case in Germany, for example.
[18] Molina et al. (2007), p. 226.

tion stimulated by better skills. As opposed to CMEs, state intervention tends to bail out actors in economic distress following adverse shocks, yet without focussing on providing means and incentives to maintain (or restore) competitiveness. As Hassel (2014) points out, governments in MMEs tend to protect firms from foreign acquisition, the role of the state as a lender of last resort being rather strong.

LME – Coordination through the market: Liberal Market Economies (LME) can be found in the Anglo-Saxon and in Eastern European countries. Trade unions tend to be less powerful than in CMEs, so are employers' associations. Firms are thus unilaterally governed by managers. Under these circumstances, economy-wide wage coordination is more difficult to achieve. Instead, both firms and workers tend to rely on market forces to resolve coordination problems such as the setting of wages or the negotiation on working conditions (Hall and Soskice, 2001). Wages are determined by supply of and demand for skills. In order to remain competitive, companies offer in-house training to complement the general education acquired in educational institutions. Due to less stringent employment protection, labour markets are more fluid than in CMEs which, according to Hall and Soskice (2001), facilitates the transfer of technological progress across firms and workers as 'the movement of scientists and engineers from one company to another' becomes easier.[19]

The degree of coordination thus distinguishes the three broad types of 'capitalist' economies. One of the main differences between them is the extent to which workers and firms cooperate to determine wages and working conditions. From LME, over MME to CME the degree of coordination and cooperation between workers and firms tend to increase. Literature on the VoC attributes different growth models to the three clusters. Due to higher competitiveness, growth of CMEs is rather based on exports while in MMSs growth relies on domestic demand.

2.2 Institutions and the matching of skills

Regarding the role of institutions in the process of coordination and the matching of skills one can come to the following hypotheses based on the relevant literature:

Better matching through centralised wage bargaining and training

Dahl et al (2013) find that decentralised wage bargaining increases wage dispersion. If wages are set at decentralized level (i.e., at the level of the firm) individual characteristics, such as the workers' productivity, their skills, their experience can be better taken into account. On the other hand, under centralized bargaining, 'egalitarian union preferences are easier accomplished'.[20] Dahl et al. find that decentralisation leads to more wage dispersion across sectors. On the other hand, centralised wage bargaining tends to compress the wage spectrum: Wages of low and highly skilled workers became more similar, that is, skilled workers become relatively less costly. Lower premiums for skills would increase the incentives for firms to employ skilled workers or to upskill less skilled workers.[21] While upskilling would directly reduce the risk of a mismatch, the low relative price of skills would improve chances for skilled workers to actually find a job. However, government support to workers may be necessary as lower wage premiums for skills may otherwise dissuade workers from investing in new skills.

Better matching through strong social protection

[19] Soskice et al. (2001), p. 31.
[20] See Dahl et al. (2013), p. 502.
[21] Firms would be motivated to offer vocational education and training (Busemeyer et al., 2012, Trampusch et al., 2012).

Firms in CMEs depend on the availability of skills, which are often very specific (Goergen et al, 2012). For example, in these countries, strong job protection increases the employees' incentives to invest in specific skills. Some countries combine lower employment protection with more generous social welfare in order to protect those who fall unemployed. These countries also tend to invest more in vocational training. These are the 'Flexicurity' models for which the Netherlands, Norway and especially Denmark have become prominent examples (Goergen et al., 2012). Workers have a stronger incentive to invest in specific skills as there is a safety net in place in case they become redundant, not being able to quickly find a new post given their specific skills profile. The safety net would also reduce the pressure to accept the next available job even if there is a low match with the person's skills. As a result, especially in the absence of strong employment protection, the generosity of unemployment benefits should positively affect the matching of skills.

Our aim is to identify the determinants of skills matching, in particular: the impact of labour market institutions thereon. We proceed in two steps. Firstly, we use a factor analysis based on a comprehensive dataset at aggregate (country) level in order to identify key factors describing labour markets, skills matching and productivity. These main factors will allow us build clusters of EU countries that differ with respect to their institutional setup. Those clusters are then used as 'fixed effects' in a subsequent analysis of individual (micro) data from the Labour Force Survey in order to explore how institutions influence people's risk of having a job that does not match their individual qualifications. Finally, we turn to micro data from Eurofound's Working Conditions Survey, exploring the reasons for a workers' self-perceived over- or under-qualification.

3. What is Capitalism? Identifying its principal components

In a factor analysis[22], a broad set of variables that describe labour market and social conditions in EU countries is narrowed down to a few core dimensions. The principle is very simple: First, groups of correlated variables are separated from other (non-correlated) variables. Second, for each group of correlated variables *one* factor is extracted which should show strong correlation to each variable in the group and therefore should describe the group of variables *in its entirety*. Thus, the extraction of a factor happens in a way as to maximise correlation of this factor with some original variables while minimising correlation with other variables.[23] Moreover, the extracted factors should be uncorrelated. This is to make sure that all extracted factors describe *different dimensions* of labour market and social conditions.

The dataset is thus being reduced to a few uncorrelated factors, which still explain a significant share of the original data's cross-country variability. The original dataset was composed of 70 variables for which we have 26 observations each.[24] We use four thematic sets of indicators. They describe (1) skills matching and education, (2) productivity and competitiveness, (3) institutions and (4) the functioning of labour market.

[22] The accurate term here is “Principal Component Analysis” (PCA). We use the terms PCA and factor analysis as synonyms although strictly speaking they are not the same (for example, see Bartlein, 2020)
[23] In other words, a broad set of variables describing labour market and social conditions in EU countries is narrowed down to a few dimensions. Based on correlations between sets of variables, groups of variables are ‘filtered out’ and separated from other variables on which there is no correlation. See ESDE (2011), p. 210.
[24] Croatia and Malta are not included due to missing data.

3.1 Three main factors describing the functioning of the labour market

The factor analysis reduces these 70 variables to a set of only three main dimensions (factors). Those are listed in Table 2, together with the data sources. Some variables may require more detailed description, see **Annex 1**. Despite substantial reduction of the number of variables, the factors still explain more than half of the original variables' variation (i.e., the variables' differences across countries). The table shows how the original variables (rows) correlate with the three main dimensions (columns), i.e., how the factor 'loads' on each variable. We suppressed the factor loading where it is lower than 0.5 in absolute terms. Factor loadings make it possible to interpret the three factors.

3.1.1 Social institutions promote wages and productivity (Factor 1)

The first factor offers the greatest explanatory power. It accounts for 30 percent of the original data's variation and is strongly related to those variables that explain labour market and wage bargaining institutions. We call it 'Social institutions promote wages and productivity'.

Countries scoring high on this factor tend to be those where:

- **bargaining coverage is high**, i.e., many wage-earners have the right to bargain on wages,
- **trade union density is high**, i.e., many wage-earners are organised in trade unions,,
- **social partners coordinate working conditions through sectoral-level agreements** rather than leave it to the market (or to individual companies)**,**
- **trade union authority is high**, i.e. unions are powerful in the sense that they have authority over their own funding and/or a large strike fund and/or formal authority over representatives at the workplace.[25]

On the other hand, Factor 1 shows strong **negative** correlation

- with the **existence of a *statutory* minimum wage**,
- with the degree to which minimum wage setting is centralised (and authorised by the government).

[25] Visser (2016).

Table 2: 70 variables and their factors loadings on 3 main dimensions of social and labour market conditions

	Factors		
	Institutions, training and innovation support wages & productivity (INST)	Good skills, good employment, good social outcomes (LABM)	Mismatches depress wage growth and increase unemployment (MATCH)
Education and Matching			
SMI - Skills Mismatch Indicator (European Commission)			
SMI_HIGH_ED - Skills Mismatch Indicator, restricted for highly qualified workers (European Commission)			.622
Lifelong Learning (LFS)	.703		
NEET 15-24 (LFS)		-.782	
Share of tertiary educated people 30-34 (LFS)		.611	
Share of low-educated people 25-64 (LFS)		-.584	
Share of low-educated people 30-34 (LFS)		-.698	
Share of low reading scores in OECD, PISA-Study)		-.625	
Share of low maths scores (OECD, PISA-Study)		-.707	
Share of low sciences scores (OECD, PISA-Study		-.647	
Individuals who have basic or above basic overall digital skills (Europ. Commission: Eurostat, DG CNECT)	.607	.644	
Tertiary graduates in science and technology per 1000 of population aged 20-29, 2012 (Eurostat, OECD, UNESCO)			
Percentage of adult population participating in education and training (aged 25-64) - men (LFS)	.741		
Percentage of adult population participating in education and training (aged 25-64) - women (LFS)	.670		
Annual expenditure in primary (ISCED 1) and secondary (ISCED 2-4) education per capita age group 6-18 (2011) (EES)			
Overqualified graduates (%) by age group 25-34 for high educational level possessed across countries, 2016 (CEDEFOP)			.618
Share of over-qualified (EWCS)			
Share of under-qualified (EWCS)			
Skills matching index (ESI)			-.821
Qualification mismatch indicator (OECD)			.629
Early leavers from education and training (LFS)		-.684	
Services: Horizontal mismatch rate (field of study mismatch), age 15-34, at least upper secondary education (LFS)			-.543
Social Sciences: Horizontal mismatch rate (field of study mismatch), age 15-34, at least upper secondary education (LFS)			
Science, Maths, Computing: Horizontal mismatch rate (field of study mismatch), age 15-34, at least upper secondary education (LFS)	-.523		
Engineering: Horizontal mismatch rate (field of study mismatch), age 15-34, at least upper secondary education (LFS)		-.648	
Productivity and Competitiveness			
GDP per capita, % of EU28 (NA)	.738		
Wage growth (NA)			-.752
Compensation per employee (NA)	.807		
Compensation of employees per hour worked (NA)	.831		
Percentage of EU28 total (based on million purchasing power standards), current prices Nominal labour productivity per worker (NA)	.530		
Percentage of EU28 total (based on million purchasing power standards), current prices Nominal labour productivity per hour worked (NA)	.653		
Nominal unit labour cost based on persons t / t-10 (NA)			-.837
Nominal unit labour cost based on hours worked t / t-10 (NA)			-.825
Real Unit Labour Costs, chance since 2010 (NA)			-.732
Institutions			
Collective bargaining, coverage rate (ICTWSS)	.883		
Union Centralisation (ICTWSS)			
Formal authority of trade unions (ICTWSS)	.663		
Collective bargaining at company level (ECS)			
Collective bargaining at sectoral/regional level (ECS)	.779		
Collective bargaining for given occupation (ECS)	.550		.506
Collective bargaining, cross sectoral level (ECS)			
Minimum Wage Setting centralised (ICTWSS)	-.580		
Statutory Minimum Wage (ICTWSS)	-.578		
Union Density (ICTWSS)	.653		
Union role at sectoral level (ICTWSS)			
Child care 2016 (share of children 0-3 cared for)(SILC)	.787		
Inactivity due to personal and family responsibilities - women (LFS)			
Tax wedge on labour cost (tax rate on low wage earners) (OECD, Eurostat)			-.601
Inactivity trap for the second member of a couple: marginal effective tax rate on labour income from a second member of a couple moving from social assistance to work (OECD, Eurostat)			
Social protection expenditure (% of GDP) (Eurostat)	.790		
People at-risk-of poverty or social exclusion - total (SILC)		-.733	
Expenditure on Active Labour Market Policies in % of GDP (LMP)	.639		
Functioning of the Labour Market			
Unemployment rate 2017 (LFS)		-.520	.611
In-Work Poverty risk 2016 (SILC)		-.733	
Employment impact of parenthood 2017 (Empl rate 20-49 with vs. without children 0-6) (LFS)			-.552
Empl Share innovative services (LFS)	.579		
Job vacancy rate (% of total posts that are vacant) (JVS)		.559	
Newly Employed (share of people in current job 12 months or less in total employment) (LFS)		.521	
Share of employees working in involuntary fixed-term or part-time contracts -women (LFS)			.568
Share of enterprises providing ICT training (LFS)	.629	.504	
Share of Human Resources in sciences and technlogy (HRST)	.720	.580	
Connectivity dimension of the Digital Economy and Society Index (DESI) (Europ. Commission, DG CONNECT)	.558	.557	
Employment Rate 2017 (LFS)		.765	
Activivy Rate 2017 (LFS)		.679	
Employment gender pap 2017 (LFS)		-.517	
Share of employees in highly qualified occupations (LFS)		.626	
Share of employees in Elementary Occupations (LFS)			

Sources in brackets: Eurostat EU Labour Force Survey (LFS), Eurostat EU Survey of Income and Living Conditions (SILC), Eurostat National Accounts (NA), Eurostat Educational Expenditure Statistics (EES), Eurofound European Company Survey 2013 (ECS), Eurofound European Working Conditions Survey 2015 (EWCS), Visser (2015, 2016) (ICTWSS), Cedefop European Skills Index 2016 (ESI), Qualification Mismatch Indicator, OECD (2017a).

In other words: a high score on the first factor stands for high participation in social dialogue where workers are represented by strong trade unions engaged in coordinated collective wage bargaining at

sectoral (rather than firm) level. Governmental intervention is limited to setting statutory minimum wages. The shaping-out of this factor reveals that engagement in social partnership alleviates the pressure on government interventions to legislate on minimum wages or influence these wages.

Moreover, the factor loads strongly and positively on:

- higher labour productivity and higher labour compensation,
- lifelong learning,
- indicators depicting the 'digital economy': the share of employment in innovative services, digital connectivity, above-average digital skills,
- expenditure on social protection and labour market policies (LMP),
- childcare intensity.

The higher the factor's score for a country the more tends to be its spending on social welfare, its digital orientation, its focus on relevant skills and on higher productivity (and higher wages). The finding supports the notion of **high social standards, together with social dialogue supported by strong trade unions, being supportive to strong productivity performance**.

3.1.2 Good skills promote inclusive labour markets (Factor 2)

The second factor explains some 15% of the overall data variation. We call it "good skills promote inclusive labour markets" as it is strongly biased towards the skills/education dimension and a country's labour market performance. Those countries score high on Factor 2 that combine

- low NEET rates, low shares of low-educated young people, a low share of low-achievers in PISA (and few early-school leavers), a high share of 30-34 years-olds with tertiary education.

In other words: There is strong evidence **that adequate skills open good employment prospects**.

3.1.3 Matching problems go along with low wage growth (Factor 3)

The third factor explains almost 8% of the data variation and strongly relates skills and qualification mismatches to low wage dynamics. Unlike the first two factors, it has thus a negative connotation (therefore highlighted in red in Table 2). We call it 'matching problems depress wage growth' as the factor loads positively on

- variables describing a significant over-qualification of highly educated workers and the OECD's qualification mismatch indicator (OECD, 2015),
- the rate of unemployment,

while at the same time, the factor is negatively linked to

- growth rates of wages and unit labour costs.

Countries scoring high on this factor combine **low wage dynamics with high unemployment and significant matching problems on the labour market**. Under such labour market conditions, workers are in a weaker bargaining position vis-a-vis firms. They therefore are not in the position to push hard on higher wages.

3.2 A typology of labour market and social conditions

The three factors illustrate the existence of closer links between different institutional variables and labour market outcomes (Factor 3 being inverted towards positive interpretation):

	Dimension covered	Abbreviation used
Factor 1	Social institutions & innovation ↔ Productivity performance	Institutions/Productivity
Factor 2	Skills supply ↔ Inclusive employment	Skills/Inclusive Labour Market
Factor 3	Matching of skills ↔ High wage dynamics [1)]	Matching/Wage Growth

[1)] Factor 3 inverted to achieve positive link for all factors

Those three factors explain **different dimensions** of labour market functioning. The method of their extraction ensures that the correlation between the factors is minimised; the factors are in that sense 'orthogonal' (uncorrelated). The fact that we can interpret these factors the way it happened in section 3.1 thus leads us to one early conclusion: The shaping-out of Factor 1 speaks for a positive link between high productivity (and high wage levels) and a certain 'conducive' institutional setup, i.e., a set-up that combines strong social dialogue with high social standards. Yet Factor 1 is uncorrelated with the other factors. Therefore, such 'conducive setup' will not in itself guarantee high and inclusive employment (Factor 2) or fast-growing wages (Factor 3). For these goals to achieve, obviously more conditions need to be fulfilled.

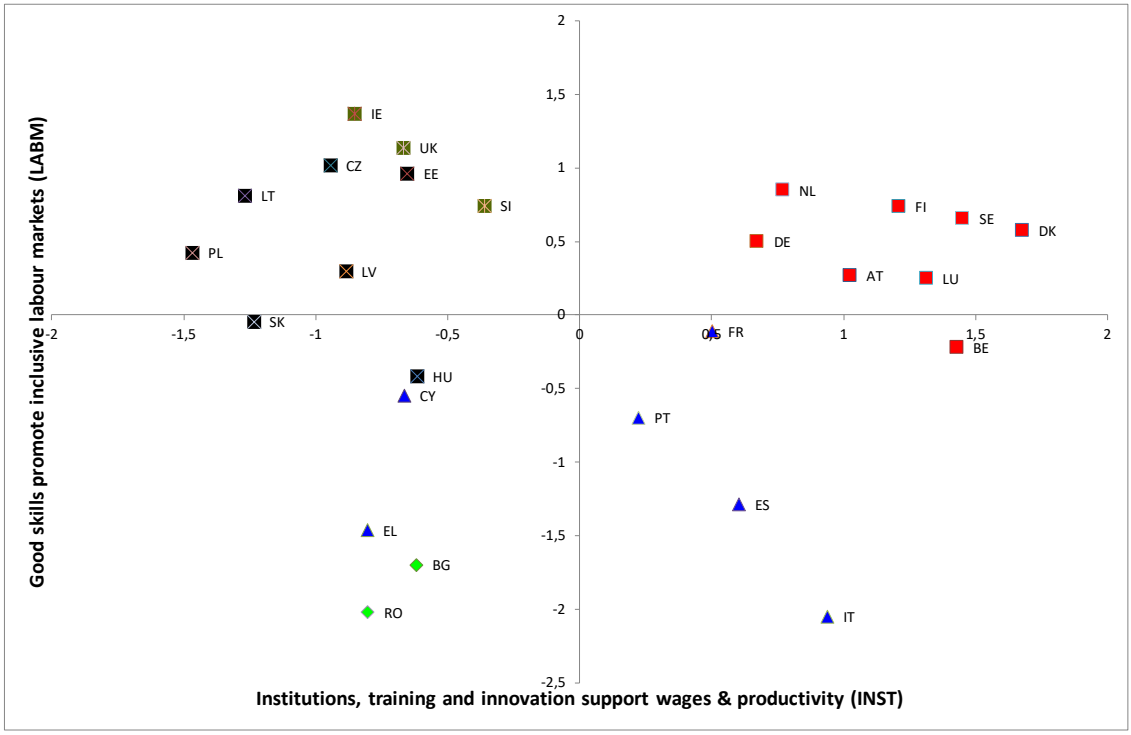
Figures 1 and 2 show how 26 EU countries score on the three main factors. North-western countries tend to combine institutions conducive to high productivity with a skill mix that promotes good labour market performance. Eastern Member States tend to perform well on matching & wage growth and (except Romania and Bulgaria) on the 'skills promote inclusive labour markets' factor (Factor 2); but they also reveal clear problems with the functioning of institutions. In southern Europe, matching problems indicate the prevalence of dual labour markets while the level of skills tends to be below average.

Given these country-scores along the three factors, can we build clusters of countries that make it possible to identify a **taxonomy of labour market and social conditions**? Using hierarchical clustering, we build groups of countries based on their similarity according to the three core labour market dimensions identified above.[26] The table below displays the solution for five-clusters. Although our approach does not include variables that describe corporative governance or competition,[27] our five-cluster solution matches well the above-mentioned VoC literature's taxonomy of capitalist economies. There are two particularities though:

- Bulgaria and Romania have not been classified by VoC literature to our knowledge. The analysis here confirms that both countries are distinct from any other cluster so that they form an own group. Their score on **Skills/Inclusive Labour Market** is much lower than for other Eastern European countries of Cluster 3.
- The liberal market economies (LME) are split in two different clusters, mainly because Eastern European countries that joined the EU in 2004 tend to show higher wage growth rates and therefore tend to show higher scores on the **Matching/Wage Growth** factor than Cluster-4-countries (notably the United Kingdom and Ireland).

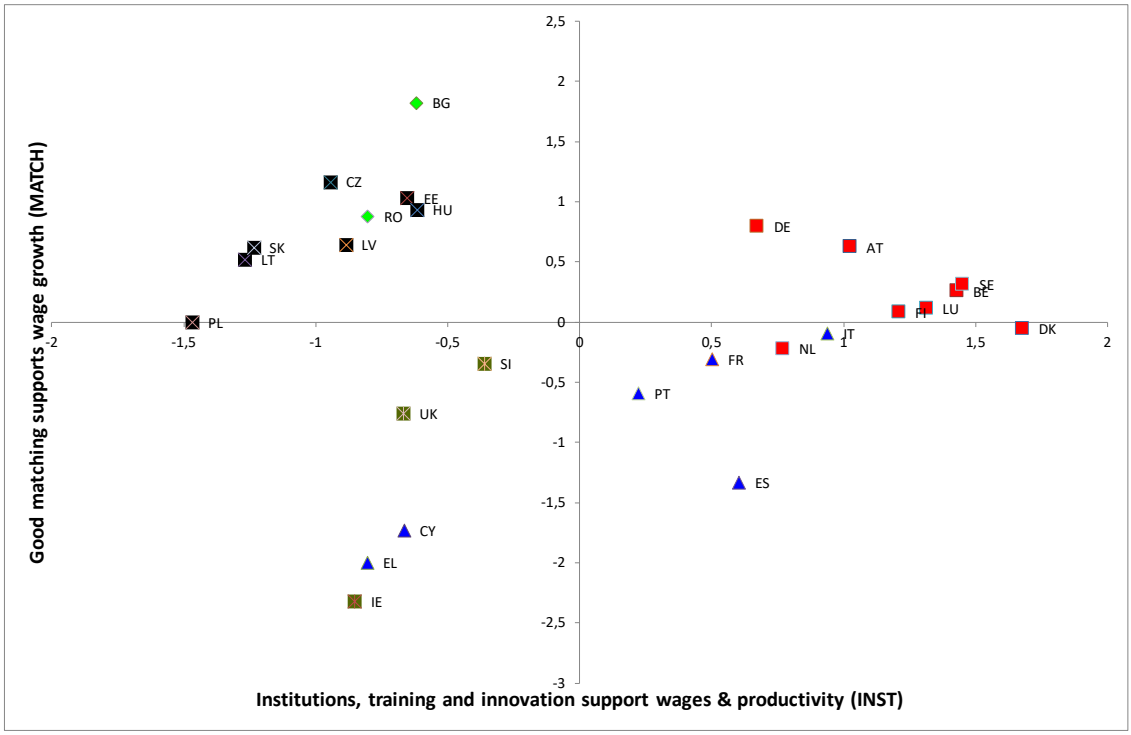
[26] A similar approach has been taken in ESDE (2011).
[27] VoC literature tends to also include variables describing the governance of firms or relations between different firms, see Hall and Soskice (2001), p. 7.

Figure 1 – Main dimensions of labour market functioning, Factor 'Institutions/Productivity' against Factor 'Skills/Inclusive Labour Market': Central and northern Europe tend to combine high social standards, good skills, high productivity growth



Source: Authors' calculations based on data sources specified in Table 2.

Figure 2 – Main dimensions of labour market functioning, Factor 'Institutions/Productivity' against Factor 'Matching/Wage Growth': Matching problems and low wage dynamics in southern Europe and Ireland



Source: Authors' calculations based on data sources specified in Table 2.

Table 3: Cluster analysis results in five clusters of countries that match VoC literature.

Cluster 1: Coordinated Market Economies	**Cluster 2:** Mixed Market Economies	**Cluster 3:** Liberal Market Economies (1)	**Cluster 4:** Liberal Market Economies (2)	**Cluster 5:** Catching up economies
Austria	France	Czech Republic	Ireland	Bulgaria
Belgium	Italy	Estonia	United Kingdom	Romania
Denmark	Portugal	Hungary	Slovenia	
Germany	Cyprus	Latvia		
Finland	Greece	Lithuania		
Luxembourg		Poland		
Netherlands		Slovakia		
Sweden				

Variety of Capitalism-literature is largely confirmed.

North-western European countries of Cluster 1 regroup VoC's Coordinated Market Economies. They score high on the **Institutions/Productivity** factor. That is, in these countries trade unions tend to play a major role in wage bargaining which tends to happen in a coordinated way: Workers and employers balance out their respective interests in a social dialogue at collective, mostly sectoral level with minimum government interference. Centralised wage bargaining dominates. Investment in workers' training is necessary for forming specific skills, as industries tend to be innovative and highly competitive, yet highly specialized. Both spending on labour market policies and on social welfare tend to be significant. Indeed, the high score on the **Skills/Inclusive Labour Market** factor signals high engagement in life-long learning, the take-up of vocational training, and an array of different skills-variables, including complex problem-solving skills and digital skills. Compared with the other clusters, high labour productivity allows for both higher wages and higher social standards. It also allows for stronger job protection, which is considered necessary by unions as job losses have severe consequences in an environment of high specialisation.

Anglo-Saxon and Eastern-European countries of Clusters 3 and 4 correspond to LMEs in the above-cited VoC literature. They tend to score high on **Skills/Inclusive Labour Market** as they show stable labour markets (low unemployment). A low score on **Institutions** mainly reflects the way workers and firms define wages and working conditions: they are shaped by market forces rather than coordinated by social partners. In the absence of a coordinated social dialogue, firms tend to negotiate with workers at individual level, productivity performance being the main criterion rather than social considerations. Social protection expenditure is low, and the role of the welfare state tends not to go beyond defined minimum standards. The low score in **Matching/Wage Growth** in the Anglo-Saxon Cluster 4 reveals that there is little scope for strong wage increases due to the workers' limited bargaining power, and due to the economy's strong exposure to global competition in small open countries such as Ireland or Slovenia. By contrast, Eastern European countries of Cluster 3 tend to see higher wage growth, as they are less open and/or are still in the process of economic catching-up after the 2004 accession to the EU.

Ireland: A special case

Literature considers Ireland a peculiar form of LME. It scores lowest on the **Matching** factor but highest on **Skills/inclusive Labour Market** Indeed, Ireland has a well-educated, well skilled workforce, and its economy has been close to full employment. Yet Ireland is the only EU country where wages and labour costs have declined since 2010. One reason is that Ireland's local firms lag behind in terms of competitiveness and productivity growth. Recent economic growth has been fuelled by foreign direct investment (Agostini et al., 2016), i.e., foreign-owned, multinational companies (Jin and Westmore, 2018). Those differences in productivity have led to wider wage gaps between employees of foreign and domestic firms. In the wake of foreign capital's high mobility, Jin and Westmore (2018) conclude that Ireland needed major improvement of *domestic* businesses' productivity growth that would allow for higher wage growth in this part of the economy. Indeed, "diversify the economy and improve the productivity of Irish firms" has been one of the core Country-Specific Recommendation Ireland has received within the European Semester (European Commission, 2019, p. 8). Agostini et al. (2016) see institutional factors behind low wage growth rates: Ireland's voluntarist approach to social partnership, with its non-legally enforceable collective agreements, had left workers in a weaker position when bargaining wages. With bargaining power concentrated on firms rather than workers, moderation was the outcome of social pacts after the crisis. Finally, low social benefit levels may not constitute a strong incentive for workers to bargain hard for higher wages. In the course of Ireland's post-crisis fiscal consolidation effort, the 2017 level of social protection spending was back down at 15% of GDP, still above the pre-crisis level, but only around half of what EU countries spend on average.[1] Finally, employment protection legislation is amongst the loosest in the EU. VoC literature sees these findings relevant for Ireland's low performance on a number of skill matching indicators. There is little incentive for highly specialised industries to invest in specific skills if job protection is loose and/or social security safety nets are weak. Skills matching problems are the result.

[1] Eurostat, variable code tps00098

Southern Economies of Cluster 2 show a very diverse pattern in terms of **Institutions**, and therefore correspond to the Mixed Economies section in VoC literature. They have in common low scores on both the **Skills/Inclusive Labour Market** and the **Matching/Wage Growth** dimension and are therefore regrouped to one cluster. These economies tend to suffer from labour market dualities as flexibility on the labour market has mainly been achieved through great popularity of non-standard, especially temporary contracts, while high unemployment persists. Workers' skills tend to not match what firms need. Spain, Cyprus and Greece are severely affected by matching problems that make it difficult for people outside the labour market to find a job, and force many workers taking up jobs at skill levels way below their qualifications. Those three countries have all received Recommendations related to the reduction of skills mismatches during the European Semester surveillance exercise (2019).[28]

[28] European Commission (2019).

Romania and Bulgaria have not been assigned to any of the three types of capitalism by VoC analysis. After accession to the EU in 2007, these countries are in the process of fast economic and labour market transition. Though still far away from EU standards[29], wages are climbing the fastest in the EU[30], which explains the above-average score in the **Matching/Wage Growth** dimension. Workers' bargaining power is limited by the setup of **Institutions**: Both workers' coverage by collective bargaining agreements and trade union density are amongst the lowest in the EU. Agreements on wages and working conditions are usually achieved at the level of the company rather than collectively at sectoral level.[31] The Country Specific Recommendations for Romania suggested to improve the functioning of Social Dialogue.[32]

Southern countries: A diverse picture

Italy scores lowest on the **Skills/Inclusive Labour Market** factor. Fana et al. (2017) confirm that lacking labour market inclusiveness is a major problem in Italy. So do the EU Country-Specific Recommendations which, in the view of Italy's below-average skills-performance emphasise that Italy should "improve educational outcomes, also through adequate and targeted investment, and foster upskilling, including by strengthening digital skills".[1] There have been a series of structural reforms since 2012, many of them have aimed at increasing flexibility in the labour market by facilitating the use of non-standard employment. Yet vulnerable groups, such as women and young people, suffer from high unemployment and low incentives to join the labour market. Indeed, Italy's 2019 activity rate stood at 70.5% for people aged 20-64, the lowest in the EU, and a high share of its active population is unemployed (10%) despite recent improvements. Low qualifications and skills contribute to that problem. Many young people in Italy drop out from school early, many stay idle after school, not participating in employment nor in education or training.[2]

Greece and **Cyprus** score low on all of the above-mentioned factors. This reflects not only the low take-up rates of adult education and training but also a low trade union density that goes together with the overall trend away from coordinated collective bargaining agreements towards individual negotiation. In Greece, wage standards have been set by the government in order to meet the conditions of the 'Troika'[3] for receiving financial support. In this framework, significance of uncoordinated company level wage agreements has increased, and employee associations warn that this trend may signal further decentralisation and the erosion of collective agreements as an instrument of coordinated wage bargaining.[4] The Commission's 2020 European Semester Country Report for Greece highlights in addition a lack of digital skills among the population and a pronounced skills mismatch. [5]

1) European Commission (2019), p. 12.

2) The Early School Leavers rate stands at 14% while the NEET rate for people aged16-24 is one of the highest in the EU (20.1%).

3) The International Monetary Fund, the European Commission and the European Central Bank.

4) See https://www.worker-participation.eu/National-Industrial-Relations/Countries/Greece/Collective-Bargaining

5) See https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020SC0507&from=EN

[29] GDP per capita in Romania and Bulgaria stand at 24% and 20% of the EU-average, resp. (Eurostat 2017 National Accounts).
[30] Over the last ten years, average hourly compensation has increased by more than 70% Romania, almost 90% in Bulgaria after controlling for purchasing power differences (EU-average: 18%). Source: Eurostat 2017 National Accounts.
[31] Eurofound (2015).
[32] European Commission (2019).

Main findings of the factor and cluster analysis

The 70 core indicators used in our Factor and subsequent Cluster analysis explain labour market and social conditions in the EU. More than half of the cross-country differences in these variables can be explained by three main dimensions, which can be seen as principal components of labour market and social lives in Europe. We cluster EU countries across these three main dimensions and find that the resulting country-clusters match well those identified by the Variety of Capitalism literature developed by Hall and Soskice (2001) and other authors. The factor explaining most of the original variables' cross-country differences is the **Institutions**-factor that relates high social standards to coordinated, collective wage bargaining and high productivity. The shaping-out of the Institutions-factor from the core indicators is evidence that high social standards and a cooperative social dialogue, both promoting training, can promote higher productivity.

As for the cluster analysis, the existence of the 'Coordinated Market Economies' cluster is evidence that countries can well score high on all three factors: Countries in the CME cluster combine good labour market outcomes, high productivity growth and skills that match well to the needs of the labour market. The story behind this finding is straightforward: Coordinated social institutions in CMEs promote well-functioning training schemes. Training improves skills, also reducing the risk of mismatch. As a result, both productivity and employment increase. The three main dimensions of labour market and social conditions can thus be complementary to each other.

If one of the three dimensions of labour market and social conditions misses, it will have to be substitutied by other sources. In Liberal Market Economies, spending on labour market policies is rather low. Moreover, social institutions are less coordinated as negotiations on wages and working conditions tends to be decentralised. Rather than by social dialogue, wages would be shaped by market forces that would ensure that skills generate a wage premium that would broaden the wage spread between skilled and unskilled labour. Workers would then be motivated to invest in skills, see section 2.2 above. Better skills would then be a result of this incentive rather than social partners providing training opportunities. Indeed, like coordinated Market Economies, Liberal Market Economies tend to also score above average on the **Skills/Inclusive Labour Market** factor.

4. The principal components put to the test

Our three main dimensions of capitalism form the analytical grounding for finding a categorisation of capitalist economies that broadly confirms VoC literature. One of these factors, the **Matching/Wage Growth** dimension, correlates with variables that describe how well skills supplied by workers match the requirements of firms. As factors are extracted in a way as to minimise correlation amongst them, the implicit assumption is that **Matching/Wage Growth** is independent of the remaining two factors **Institutions/Training/Productivity** and **Skills/Inclusive Labour Market**.

Factor independence (orthogonality) is necessary in order to identify the principal components of labour market and social conditions in the EU at macro (country) level. At individual level, however, such assumption would not hold. Individuals' skills match (or do not match) specific job profiles for a number of reasons which include their individual socio-demographic background, but also macro-factors such as the business cycle or their country's institutional setup. While dropping the assumption of orthogonality we test the relevance of the above-identified principal components **Institutions/Productivity** and **Skills/Inclusive Labour Market** for a worker's risk of suffering a skill-mismatch. In other words, the ‘matching’ part of **Matching/Wage Growth** becomes the dependent

variable in a regression, with **Institutions/Productivity** and **Skills/Inclusive Labour Market** being on the list of explanatory variables.

4.1 Why workers are over-qualified

The **Matching/Wage Growth** dimension above incorporates a series of correlated indicators. It includes measures of both the level of skills (specific competencies) and formal education. It also includes variables that describe horizontal[33] and vertical[34] mismatches. Structural horizontal mismatches that lead to unemployment or inactivity are difficult to measure as there is an array of potential reasons why a person is not in employment. In addition, matching of a person's skills content with specific job content is hard to evaluate. We therefore focus on vertical matching: the determinants of over-qualification of a worker for a particular job, comparing her formal education level with the level of skills her job requires.

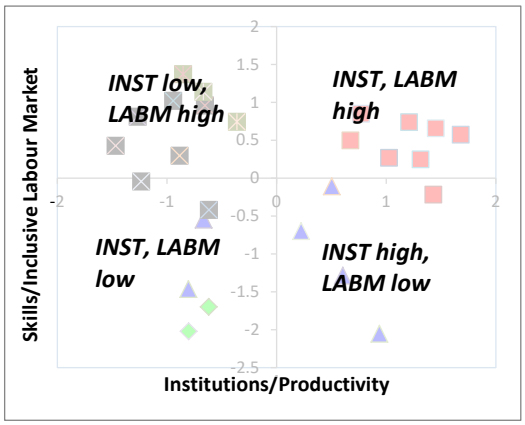
Thus, operationalising a mismatch at individual level is most straightforward when comparing a person's skills or qualifications with the requirements of her current job. In other words: to explore the reasons for a person being over-qualified. We look at over-qualification using a pooled set of individualised (micro) data from the Labour Force Survey for the years 2014 to 2016. We define over-qualification in two alternative ways:

- Variable OQ_H: highly (tertiary) educated[35] people aged between 15 and 64 are over-qualified if they work in occupations that requires skills at low or medium level,[36] namely: Elementary occupations[37], clerical workers, services and sales workers, skilled agricultural workers, craftsmen or plant and machine operators.
- Variable OQ_MH: highly or medium-educated persons aged between 15 and 64 are over-qualified if they work in an elementary occupation (those require only very low skills). Indeed, over-qualification is not only a problem of tertiary-educated workers.

One of our explanatory variables is called SEGMENT. It is used as a fixed effect equal for all workers in a given country. However, rather than 26 country dummies (country fixed effects) usually used to control for country-specific differences, SEGMENT builds four groups of countries, assigning each of the 26 Member States to one of these groups. The groups distinguish the four situations directly following **Figure 1** above. Where do countries position themselves in a field defined by two main dimensions of capitalism: Factor **Institutions/Productivity** (INST) and Factor **Skills/Inclusive Labour Market** (LABM)?

[33] Horizontal mismatches are referred to as a situation where the type of skills or qualification does not match with the needs of firms.
[34] A person's job requires a level of skills/qualification below or above her own level.
[35] International Standard Classification of Education (ISCED) levels 5 and higher.
[36] International Standard Classification of Occupations (ISCO), levels 4 to 9. On a scale from 1 to 4, the International Labour Office attributes a skill level of 1 to elementary occupations (ISCO 9), a level of 2 to the other occupations mentioned (ISCO 4-8). See https://www.ilo.org/public/english/bureau/stat/isco/isco08/index.htm (ISCO-08, part 1, p. 14).
[37] ISCO level 9. Elementary occupations consist of simple or routine tasks.

Figure 3: Variable SEGMENT: Four situations are being distinguished.



Other explanatory variables include:

- FBORN, which captures a person's migration background, that is, her region of birth. It distinguishes three categories of foreign-born people: those born in an EU country that made the EU before the 2004 enlargement (EU-15 as "western EU"), those born in EU countries that joined the EU in 2004 (EU-10 as "Eastern EU"), and those born the remaining three EU countries (EU-3): Bulgaria, Romania or Croatia. The fourth category consists of people who migrated from outside the EU (Extra-EU).
- Education: only relevant for OQ_MH where highly and medium-educated workers have to be distinguished.
- Finally, we control for the reference year as we pool three years' survey data.
- Sex and Age.

Table 4: Variable SEGMENT: Four situations are being distinguished. The odds of being over-qualified, relative to respective reference category (=1).

	Age (covariate)	OQ_H neg.	OQ_MH neg.
FBORN	EU-15	0.8	1.3
	EU-10	2.5	5.7
born in…	EU-3	4.0	5.2
	Extra_EU	1.7	3.6
	Native born	*Ref (=1)*	*Ref (=1)*
Sex	Males	1.2	0.6
	Females	*Ref (=1)*	*Ref (=1)*
Education	High		0.2
	Medium		*Ref (=1)*
SEGMENT	INST, LABM high	0.9	0.8
	INST high, LABM low	1.2	1.1
	INST, LABM low	2.0	1.04
	INST low, LABM high	*Ref (=1)*	*Ref (=1)*
Reference year	2014	1.04	1.00
	2015	1.02	1.00
	2016	*Ref (=1)*	*Ref (=1)*

Source: Authors' calculations based on Eurostat EU LFS 2014-2016. Values not significant at 1% are printed in light grey.

The odds ratios in Table 4 show the odds of over-qualification for a certain category of workers relative to a reference group. The odds rate for the reference group is normalised to a value of one and highlighted in red.

All else being equal,

- FBORN: … foreign-born workers tend to stand a much higher risk of being over-qualified than people born in their own country, a finding largely confirming earlier Commission analysis.[38] The respective risk OQ_H for highly qualified mobile EU citizens from Romania, Bulgaria and Croatia (EU-3) is four times the risk for native-born people in the EU and still 2.5 times as high as high for people from Eastern European Member States that joined in 2004 (EU-10). The respective relative odds ratios tend to be even higher if one considers the risk of medium and highly qualified workers of working in elementary occupations (OQ_MH). Relative to native-borns, third-country migrants also face higher risks of being over-qualified. However, migration from third countries may be more selective than intra-EU mobility. This is why the risk of over-qualification tends to be lower for workers from outside the EU compared with mobile EU citizens from Eastern European Member States.
- Sex: … the risk for highly qualified men of working in lower-profile occupations is 20% higher than for women. However, in the case of at least medium-qualified people the risk of working in the lowest category of occupations (elementary jobs), the risk for men is 40% lower. Working over-qualified in elementary jobs is truly a female phenomenon.
- Age[39]: … the risk tends to be the lower the older the worker is. Concerning highly educated workers the risk of over-qualification (OQ_H) is the highest for young people. However, the link between age and the risk of working over-qualified in elementary jobs is not significant (OQ_MH). The latter problem seems to affect people (women) at all ages.
- Reference year: … the closer the respective survey year is to the crisis-year 2013, the higher is the risk for highly educated people of being over-qualified. A stagnant economy with low labour demand forces well-educated people to work below their qualifications, competing with lower-qualified workers for lower-profile jobs. Considering people working over-qualified in elementary occupations, this link becomes insignificant. There seems to be demand for workers in those jobs no matter where we are on the business cycle.

Most importantly, our core variable SEGMENT is highly significant in both specifications. We find:

- Both LABM and INST matter: For given LABM, an improvement of INST will lower the risk of over-qualification. Likewise, for given INST, improving LABM will lower the risk. Hence, in a given country, both social institutions and skill-supported well functioning of the labour market help skilled people find a match on the labour market.
- Positive interaction: The risk of being over-qualified is the lowest in countries performing **above** average in **both** LABM and INST. This is true for both OQ_H and OQ_MH. The two dimensions INST and LABM seem to reinforce one another's positive impact on a worker's matching probability. This affects workers from almost all countries classified by VoC as Co-ordinated Market Economies.
- Negative interaction: On the other hand, countries combining **below**-average performance in **both** LABM and INST, the risk OQ_H is by far the highest. In this most unfavourable case there seems to be a strong negative interaction between the two dimensions that affects highly educated workers.
- This is not the case for people working over-qualified in elementary jobs. Overall, the impact of both LABM and INST on OQ_MH tends to be lower than on OQ_H. It seems that the phe-

[38] See also European Commission (2016).
[39] As a non-classified metric variable, Age is used as covariate in the regression. The Age-variable's coefficient cannot be interpreted the same way as the other classified independent (explanatory) variables.

nomenon of people being forced to working over-qualified in very low-profile jobs seems to be a constant in all institutional and labour market constellations. It may be a problem so persistent that standard policy interventions in these fields may not be sufficient for reducing the severest over-qualification risks of well-trained workers.

4.2 Why workers feel over-skilled

A person can be over-qualified because her formal qualification (education level) is below the level of skills the job requires. She may also feel over-qualified because she has specific or generic skills (competencies) that are not used on her job. Those may come from her education but may as well be a result of a more informal acquisition of capabilities, such as training, experience, or even hobbies. In this broader context, we use data from Eurofound's 2015 European Working Conditions Survey (EWCS) on 44.000 individuals from 35 European countries in order to better understand why people feel either over-qualified.

The survey question 'Which of the following statements would best describe your skills in your work?' (Q64) comes with the following response options:

1. 'I need further training to cope well with my duties'.
2. 'My present skills correspond well with my duties.'
3. 'I have the skills to cope with more demanding duties.'

Obviously, options 1 and 3 refer to situation of self-perceived under- and over-qualification, the latter being far more significant (28% of the responses in 2015, compared with 14% feeling under-qualified).[40] We treat response #3 as dependent variable of a logistic regression and ask what individual factors drive a person's perception of feeling over-qualified.[41]

Table 5: EWCS 2015: The odds of being over-qualified, relative to respective reference category (=1).

Independent variables		Odds Ratio	
Education	01 - Early childhood education (ISCED 0)	Base Model	-
	02 - Primary education (ISCED 1)		0.911
	03 - Lower secondary education (ISCED 2)		0.996
	04 - Upper secondary education (ISCED 3)		0.889
	05 - Post-secondary non-tertiary education (ISCED 4)		1
	06 – Short-cycle tertiary education (ISCED 5)		1.114
	07 – Bachelor or equivalent (ISCED 5)		1.086
	08 – Master or equivalent (ISCED 5)		1.082
	09 – Doctorate or equivalent (ISCED 6)		-
Sex	Male		1,14***
	Female		1
Age	Below 25		0.935
	25-34		1.046
	35-44		1.035
	45-55		1.014
	55 and older		1
Alternative model extensions to the Base Model			
Migrant?	yes	Extended Model 1	1.177***
	no		1
Workers representatives exist?	yes	Extended Model 2	0.867***
	no		1
SEGMENT (Country group)	INST, LABM high	Extended Model 3	0.774***
	INST high, LABM low		0.840***
	INST, LABM low		1.216***
	INST low, LABM high		1

Source: Author's calculations based on Eurofound's 2015 EWCS

Again, the table shows the odds (risk) of feeling over-qualified for each variable, relative to a reference category, which is normalised to a value of one and highlighted in red. A Base Model takes only the three basic socio-demographic parameters into account: education, age, and sex.

[40] Eurofound (2017), p. 108.
[41] That is, a dummy variable is set to a value of 1 if a person choses response #3, zero otherwise.

- Sex: For example, an odds rate of 1.14 for males in the category 'Sex' implies that, age and education being the same, men stand a risk 14% higher than women of perceiving themselves over-qualified on their job. '***' indicates that the difference is statistically highly significant.
- Education and age: In line with the expectations, self-perceived over-qualification risks tend to increase with higher education, and they tend to increase with younger age. However, these differences are surprisingly low and all statistically insignificant.

We extend the Base Model, adding a set of supplementary variables one by one (alternating).[42] For given sex, age and education:

- Migrant status: Foreign-born people are affected to a much higher extent by over-qualification than native-born colleagues (+18%).
- Workers representation exists: There is strong evidence for workers representations (such as a trade union or a works council) to have a beneficial impact on skills matching. In firms where such representation is in place, the perception of over-qualification risk is significantly lower (-13%). This suggests that employee representations have a coordinating effect. Indeed OECD (2018) finds similar results and argue that a workplace employee representation increases training opportunities. In countries such as Finland or Germany, Social partners run campaigns to increase attractiveness of VET programs. Moreover, they are often involved in the design of these programs (Cedefop, 2014).
- The variable SEGMENT is the same as used in Table 4 above in the case of formal over-qualification. The findings are very similar: From the factor analysis we had extracted the dimensions **Institutions/Productivity** (short: INST) and Factor **Skills/Inclusive Labour Market** (LABM).
    - Both LABM and INST matter: Both LABM and INST exercise a positive influence on skills matching.
    - Interaction: The two dimensions reinforce each other. We find by far the lowest risk of perceived over-qualification in countries that combine high INST and high LABM. Where both dimensions score low, the risk of over-qualification is by far the highest.

5. Conclusion

- The Variety of Capitalism literature (VoC) following Hall and Soskice (2001) distinguishes three major types of capitalistic economies. Liberal Market Economies (LME) rely on market forces when it comes to determine workers' allocation to jobs, working conditions and wages. On the other side of the scale, in Coordinated Market Economies (CME), social partners seek active coordination of wages and working conditions in a framework of supportive institutions. In addition, more generous welfare systems in CMEs act as a safety net to catch those not (yet) successful in a global competition for jobs, products, or resources.
- A comprehensive set of 70 indicators that describe Member States' labour market and social conditions can be melted down by a factor analysis to just three main dimensions (factors). Despite this substantial reduction, those factors describe more than half of the original dataset's cross-country differences. Capitalist economies differ by:

    1. the extent to which supportive and reliable institutions lead to high productivity (Institutions/Productivity),

[42] We do not specify one single equation with all these variables. Given the sample is much smaller than is the case in the above analysis that uses the Labour Force Survey. Crossing all variables could bring the sub-sample below reliability limits.

2. the extent to which skills and qualifications lead to better labour market performance and social outcomes (Skills/Inclusive Labour Market),
3. the extent to which good matches of skills and qualifications with job requirements comes along with higher wage growth (Matching/Wage Growth).

- These factors can be extracted from the comprehensive dataset for one reason: There is complementarity between what is measured by the underlying variables. For 'Institutions/Productivity' this means that high social standards and a cooperative social dialogue, both promoting training, are conducive to higher productivity. For 'Skills/Inclusive Labour Market' it implies that promoting workers' access to the acquisition of skills and qualifications will improve people's labour market performance.
- The scores of 26 Member States on the factors allow for regrouping them into clusters. We find a 'taxonomy of capitalist economies' that matches the types of capitalism developed by the Variety of Capitalism literature (VoC).
- North-western EU Member States (DE, NL, AT, LU, BE, FI, SE, DK) build the one cluster that tends to score high on all three core dimensions. It corresponds to the VoC's Coordinated Market Economies (CME).
- The shaping-out of the CME cluster is evidence that social institutions do matter, and that market coordination settled in a social dialogue between workers and firms is supportive rather than an obstacle to economic success. They can be conducive to high employment standards, high labour productivity – and to firms making effective use of their workers' qualifications and talents (i.e., good matching). Such an institutional setup facilitates the implementation of reforms that may become necessary in the contex of deep structural transformations – such as the digital and green transition.
- Moreover, labour markets of countries in the CME cluster have overcome the 2008-2010 economic crisis more successfully, also because of higher investment in skills. Therefore, also in the current context of the Covid-19 pandemic, coordinated institutions may be the crucial factor for higher resilience of labour markets following large-scale adverse shocks.
- We put these findings to the test, exploring micro-data and asking what factors determine the matching of labour supply and demand from individual workers' point of view. Using 'over-qualification' as a proxy for non-matching of an individual, we find that the conditions expressed by the core dimensions of VoC are relevant for job matching. The risk of being formally over-qualified or having higher skills than used on the job tends to be lower where countries score higher on the Institutions/Productivity dimension (factor). It also tends to be lower where countries score higher on the Skills/Inclusive Labour Market dimension. What is more, both dimensions reinforce one another's positive impact on a worker's matching probability. A well-functioning social dialogue, paired with appropriate labour market and welfare policies, promote skills and productivity and in turn generate inclusive labour markets.
- Social dialogue matters also at individual level: The existence of a workers' representation in a firm reduces a worker's risk of being over-skilled and is thus conducive to better skills matching.

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Annex I

Important variables included in the factor analysis: a short description[43]

Skills, education and mismatch indicators

The first indicator of Table 2 for skills mismatch, denoted by SMI, is defined as 'the weighted absolute deviation between the share of education groups in employment and their share in the population'.[44] It measures the degree to which employed people's skill-composition deviates from what is found amongst the entire population. The stronger the difference the higher would be the mismatch as skills in demand would not match supply. A second macro-indicator for skills mismatch restricts similar information to highly educated workers. It is denoted SMI_HIGH_ED and measures the number of the highly educated (ISCED level 5 and higher) unemployed workers as a proportion of all unemployed workers.

Apart from those macro-level mismatch indicators, the factor analysis also uses variables that describe a skills mismatch at individual level, for example: the share of low-achieving students in the disciplines Maths, Reading and Sciences. These indicators are based on the OECD PISA study[45]. Furthermore, the analysis includes the qualification mismatch indicator by the OECD (2015). Further variables that describe skills/education and matching are:

- the share of young people having left school early (without graduating),
- the share of individuals aged 30-34 having a tertiary education,
- the share of tertiary graduates with a degree in science and technology (aged 20 to 29),
- individuals aged 15-24 not in employment, education or training (NEET).
- the share of adults (aged 25-64), participating in education and training, men and women separately.

Indicators related to collective bargaining and social dialogue

As of labour market institutions, we measure those related to the welfare system and those linked to collective bargaining and social dialogue. For the latter (taken from Visser, 2015):

- Collective bargaining coverage rate (WCB): The share of workers covered by collective agreements.
- Union centralisation (CENT): Summary measure of centralisation of wage bargaining.
- Formal trade union authority (AUTH): Summary measure of formal authority of unions regarding wage setting at peak and sectoral level.
- Statutory Minimum Wage (NMW): The indicator ranges from 0 (no statutory minimum wage) to 2 (statutory cross-sectoral minimum wages exist).
- Minimum Wage Setting Centralised (NMS): The indicator ranges from 0 to 8 (0: no statutory minimum wage, 4: minimum wage set through tripartite negotiations, 8: minimum wage set by government).
- Union density (UD): Union density rate, net union membership as a proportion of wage and salary earners in employment.

[43] For sources and references of the variables used, see description of Table 2
[44] See also European Commission (2013, 2015)
[45] OECD (2016b).

- Union role at sectoral level (Unagr): The value is 2 if the union negotiates enforceable agreements at the sectoral level and has veto power over company agreements; its value is 1 if it negotiates agreements at sector level and allows for limited variation between companies; a value of 0 implies that unions do not negotiate sectoral agreements at all.

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