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Hiroaki Miyamoto^{1*} and Nujin Suphaphiphat²

Mitigating Long-term Unemployment in Europe

Abstract

While unemployment rates in Europe declined after the global financial crisis until 2018/2019, the incidence of long-term unemployment, the share of people who have been unemployed for >1 year to the total unemployed, remained high. Moreover, the COVID-19 pandemic could aggravate the long-term unemployment. This paper explores the factors associated with long-term unemployment in European countries using a panel of 25 European countries over the period 2000–2018. We find that skill mismatches, labor market matching efficiency, and labor market policies are associated with the incidence of long-term unemployment. Among the different types of active labor market policies, training and startup incentives are found to be effective in reducing long-term unemployment.

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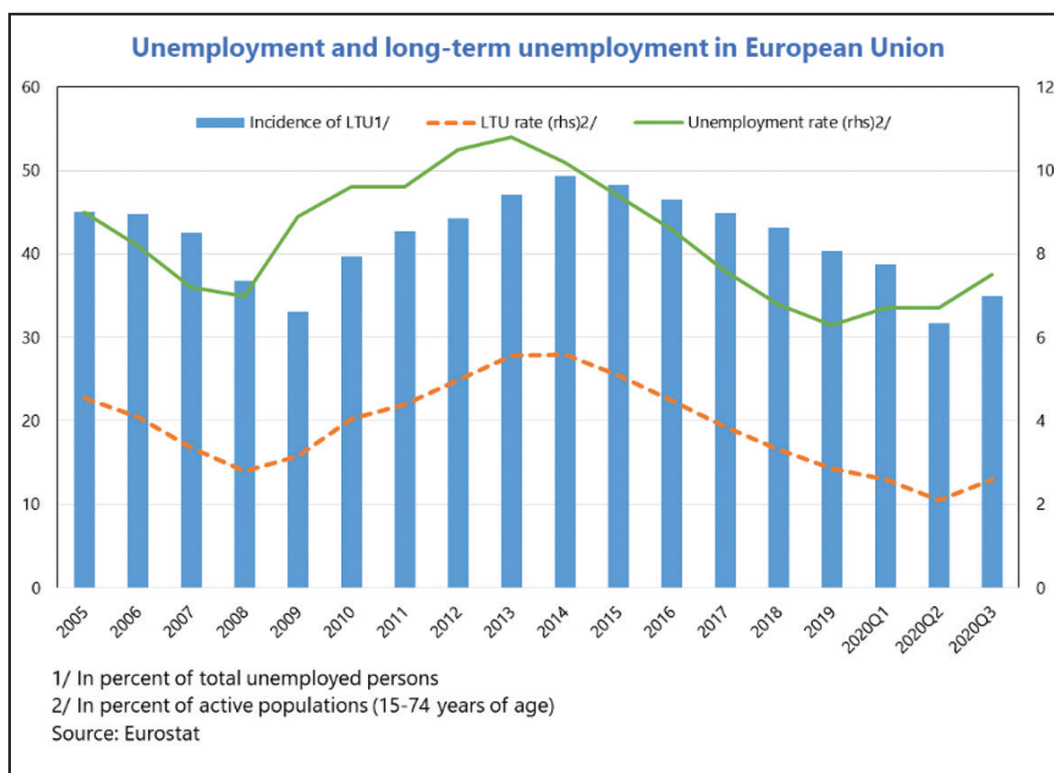
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1 Introduction

While the labor market situation improved alongside the economic recovery since 2014 through 2019, the incidence of long-term unemployment (LTU) remained high in the European Union (EU). The unemployment rate in the EU increased significantly during the global financial crisis (GFC), peaked in 2013, and then fell considerably to the level below the pre-GFC period at about 6% in 2019. However, the incidence of LTU, the share of people who have been unemployed for >1 year to the total unemployed, remained higher than the pre-GFC level (average 2005–2008). During 2016–2019, about 45% of the total unemployed were LTU, albeit down from 50% in 2014.



The COVID-19 crisis could further increase LTU. The pandemic and consequent lockdown have brought about a sharp contraction of activity and pushed up underemployment and unemployment, particularly for low-skilled employees who cannot work from home. The unemployment rate in Europe rose from 6.3% in 2019 to 7.5% in 2020 (Q3), despite comprehensive support programs from the government.¹ Despite the gradual recovery, such a weak labor market and post-COVID reallocation would likely increase the pool of the long-term unemployed due to labor market hysteresis (Blanchard and Summers, 1986; Ball et al., 2017). Policies to reduce the long-term unemployed will contribute to limiting the scarring effect of the COVID-crisis on the labor market and overall economy.

LTU has an adverse impact on individuals and the whole economy. LTU causes significant mental and material stress for those who are affected through loss of income and social link with communities. Nichols et al. (2013) present extensive evidence of the negative consequences of

¹ At the time of this writing, the latest data available in Eurostat is for 2020 (Q3). The impact of the COVID-19 crisis may not be fully reflected in the data, as long-term unemployed have been unemployed for >12 months.

LTU, not only pertaining to economic loss but also to worsening mental and physical health, and higher mortality rates.² Furthermore, LTU in parents could hamper children's educational progress and lower their future earnings. From the macroeconomic perspective, LTU has adverse consequences on the economy through deterioration of human capital from skill erosion and higher probability of exiting the labor market. Machin and Manning (1999) note that a high incidence of LTU means that unemployment is disproportionately concentrated on a small group of individuals and that it will be a potent cause of income inequality, given that a lack of work is the most important cause of poverty among working-age households in most European countries.

Using the panel data of 25 European countries over the period 2000–2018, this paper finds that skill mismatches and labor market matching efficiency are associated with the incidence of LTU. When skills of the unemployed no longer meet labor demand, it contributes to protracted unemployment. The erosion of skills during unemployment would worsen the situation. In addition, the incidence of LTU is negatively associated with the labor market matching efficiency that we estimate.

The estimation of labor market matching efficiency is another contribution of this paper. Most studies measure labor market matching efficiency through the shift of “the Beveridge curve,” the inverse relationship between unemployment and vacancies. That is, an outward shift of the Beveridge curve indicates a decline in labor market matching efficiency.³ Nonetheless, a shift in the Beveridge curve could reflect temporary, cyclical, and demand-driven shocks, rather than structural changes in the labor market (i.e., matching efficiency). Our paper addresses the issue by estimating labor market matching efficiency based on a search-matching theory of 25 EU countries and offers a cross-country perspective on the development of job market matching efficiency in Europe.

Our analysis also finds that training and startup incentives are negatively associated with the incidence of LTU. These are consistent with the literature on the effects of active labor market policies (ALMPs) on employment, which shows that training and private sector employment programs are generally more effective in alleviating unemployment in the medium-to-long term, while direct job creation is less effective (Card et al., 2010, 2018). In addition, startup incentives and measures aimed at vulnerable groups (including the LTU) are more effective than other ALMPs in reducing unemployment.

Our results imply that a high incidence of LTU could be alleviated through ensuring adequate spending on effective ALMPs, addressing skill mismatches, and enhancing labor market matching efficiency. These policies would also facilitate the transition to the post-COVID labor market, in which the use of digitalization and automation across sectors will be accelerated and the companies could increasingly depend on short-term contracts and freelance workers to ensure their flexibility (World Economic Forum, 2020; Forbes, 2020).

2 The relationship between unemployment and health has been extensively explored. While it is well-known that unemployment is associated with adverse health outcomes (see, for example, Wilson and Walker, 1993), there remains unresolved debate about its causal relationship. There are also some studies that examines how unemployment affects measures of well-being such as happiness and life satisfaction (Clark and Oswald, 1994; Lucas et al. 2004).

3 The theory posits that given other things constant, lower job matching efficiency—an outward shift in the Beveridge curve—leads to higher unemployment rate at a given vacancy rate.

- *Spending on effective ALMPs:* Although there are no one-size-fits-all policies, there is a case for higher spending on *effective* ALMP programs, particularly for countries facing high LTU while spending less on effective ALMPs than the EU average. Such increase could be achieved through rebalancing the ALMP spending toward effective programs, including training and private sector incentives.
- *Addressing skill mismatches:* Apart from upgrading skills through education and training programs, policy interventions should correctly identify skills for the current and future needs. One of the most important skills, which is and will be increasingly critical for the EU labor force, is digital skills. In particular, the Cedefop's European skills and jobs survey (ESJS) indicates that digital skill gaps in Europe are still large on average. Policies to develop a digital competence would help to improve skill matching for the region.
- *Improving labor market matching efficiency:* According to our estimates, labor market matching efficiency for the EU generally declined after the GFC. One of the key instruments to improve the job matching efficiency, particularly for the disadvantaged and the long-term unemployed, is to strengthen the role of public employment services (PES).

Our contributions complement various other studies. Among them is Bentolila and Jansen (2016), which discusses the patterns and causes of LTU in Europe and identifies the possible remedies primarily through case studies. Bentolila and Jansen (2016) find that European LTU was largely due to reduced aggregate demand and rigid labor market institutions, and as in this study, they point out that appropriate ALMPs can mitigate LTU. Our paper differs from Bentolila and Jansen (2016) in that because our paper points out not only the importance of ALMPs but also the matching efficiency and skill mismatch, particularly with respect to digital skills.

The remainder of the paper is organized as follows. Section 2 presents labor market developments over the 2000–2018 period in European countries with a focus on LTU. Section 3 describes the empirical methodology. Section 4 presents the main findings. Section 5 discusses the potential drivers of the LTU, their developments in Europe, and policy implications. Finally, Section VI draws the conclusions.

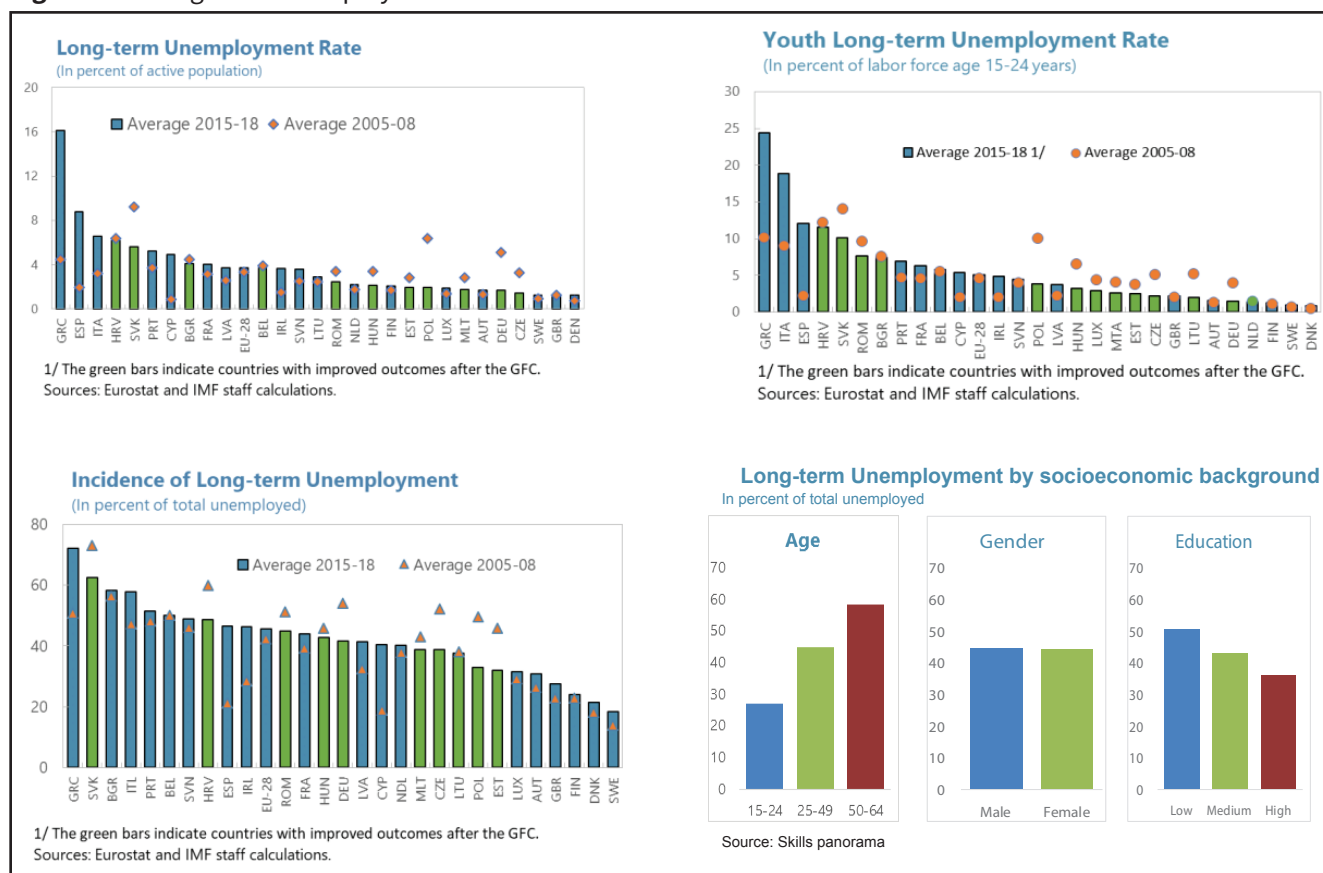
2 LTU in Europe

LTU is typically measured by two indicators: the LTU rate and the incidence of LTU. The LTU rate measures a share of the long-term unemployed to the total labor force, while the incidence of LTU measures a share of the long-term unemployed to the total unemployed. This section documents the recent trends of LTU using both indicators in Europe (Figure 1).

2.1 LTU rate

LTU remained a key challenge in some European countries, especially for those who were hit the hardest during the GFC. As of 2018/2019, the LTU rate of Greece was the highest, where almost one in five working-age population were LTU. Along with Spain, the LTU rate in Greece

Figure 1. Long-term unemployment indicators.^{1/}



increased about fourfold after the GFC, compared with the pre-crisis period. Nonetheless, there were significant improvements in the LTU rates in some countries, many of which were the new member states (NMS).⁴ For instance, the LTU rate in the Czech Republic halved from 3.3% during 2005–2008 to <1.5% in 2018.

In some countries, the youth LTU rates remained high historically and increased significantly after the GFC. Countries with high LTU rates tend to have very high long-term youth-unemployment rates. These include Greece, Italy, Spain, Croatia, and Slovakia. Between pre- and post-GFC, the most significant increases in LTU rates among young people were seen in Greece (>15 percentage points), Italy, and Spain (about 10 percentage points increases). Overall, the youth LTU rates declined significantly in Germany and in many NMS, particularly in Poland, the Czech Republic, Hungary, and Slovakia.

2.2 Incidence of LTU

Despite significant improvement in the LTU rate, the incidence of LTU remained elevated in the EU. After the GFC, the EU average of the incidence of LTU slightly increased to 46%, compared to 43% during 2005–2008. Greece had the highest level of incidence of LTU after the crisis, where almost three-fourths of the unemployed were long-term, followed by Slovakia, Italy, and Bulgaria. Generally, when the LTU rate improved, the incidence of LTU also declined. The

4 NMS includes Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia.

exceptions include Bulgaria and Belgium, where LTU rates declined after the GFC but the incidence of LTU increased, suggesting that LTU could be attributed to structural factors.

The incidence of LTU varied across demographic groups. Across age groups, the incidence of LTU in the EU was the highest in people with the age group of ≥ 50 years: 60% of the unemployed in that cohort were out of job for >12 months. By gender, the incidence of LTU appeared to be similar for male and female. By education levels, the incidence of LTU was the highest in those with low skill levels. Depending on the structure of the labor force and the LTU risk, either the low-skilled or those with medium skill levels represented the largest group among the unemployed. The risk of falling into LTU among those with an intermediate skill level was still high in several EU countries, including Greece, Spain, Croatia, Portugal, Slovakia, and Ireland.⁵

2.3 Impact of LTU

Addressing LTU would alleviate poverty and social exclusion, and would be beneficial for many EU countries, particularly those with demographic challenges. LTU has adverse consequences for individuals and the economy as the long-term unemployed tend to suffer from low social mobility and face higher risk of poverty. Even those who are reemployed tend to earn less than in their previous jobs and are demoted from their past careers (Nichols et al., 2013). Getting jobs for the long-term unemployed would bolster income and alleviate poverty. For countries facing demographic challenges, integrating the long-term unemployed into the labor market (and also discouraged persons) would help to alleviate the issue as they are a potential source of productive labor. LTU also has negative effects on youths' prospects and their risk of social exclusion. Existing studies show that experiencing a protracted unemployment not only strongly affects all dimensions of a young person's psychological wellbeing and quality of life but also weakens their future employment outcomes as well as trust in institutions (Eurofound, 2017; Duell et al., 2016).

3 Empirical analysis

This section investigates the factors associated with the high incidence of LTU in Europe. Our analysis proceeds in two steps. First, we regress the incidence of LTU on each explanatory variable separately. This allows us to get information about the co-movements between the incidence of LTU and the variable of interest. Second, we run full multivariate regressions to explore the drivers of LTU.

3.1 Methodology and data

To explore the potential drivers of LTU, we consider the following panel regression model:

$$LTU_{it} = \gamma_1 X_{it} + \gamma_2 Z_{it} + \eta_i + \nu_t + \varepsilon_{it}, \quad i = 1, \dots, N; t = 1, \dots, T,$$

⁵ Another interesting aspect is to assess factor contributing to the incidence of LTU at a regional level (Elhorst, 2003). Nonetheless, our study is bounded by data limitation, particularly on ALMP spending at a regional level.

where LTU_{it} denotes the incidence of LTU of country i in year t , X_{it} is a vector of macroeconomic variables, and Z_{it} is a vector of policy variables. We have fixed effects for country (η_i) and time (ν_t) to account for unobserved country-specific heterogeneity and the global common factor, and ε_{it} is a random error term.

Regressors comprise macroeconomic and labor market variables. We include lagged GDP growth, inflation rate, skill mismatches, and estimated labor market matching efficiency. Based on the Okun's law and the Philips' curve, economic growth and inflation rate are inversely associated with unemployment and, to some extent, LTU. Moreover, LTU could be a result of the unemployed having skills that do not match demand and low matching efficiency (Pissarides, 2000). As the incidence of LTU is known to be persistent, we also include the lagged incidence of LTU (one lag). For policy variables, our model includes both passive labor market policies (PLMPs) and ALMPs as well as a tax wedge. The literature shows that certain types of ALMPs are effective in reducing LTU (Card et al., 2010, 2018; Kluge et al., 2019). Moreover, unemployment benefits and a tax wedge also play some roles in reducing LTU (Bassanini and Duval, 2006; OECD, 2006).

We use annual data of 25 European countries over the period 2000–2018 (see Appendix A). Data for all variables (including underlying data for estimated variables) come from the Eurostat database. Labor market policy variables include both expenditures on ALMPs and PLMPs. They are defined as public spending on labor market policies (LMP) per unemployed and expressed in percentage of GDP per capita, which is often used in the empirical research on unemployment (Arpaia et al., 2014). Skill mismatch is calculated as a sum square of the differences between the shares of population and employment by education attainment (see Section 5). Matching efficiency is computed using the matching function approach (see Section 5 and Appendix B). Table 1 presents the descriptive statistics and pairwise correlations for the incidence of LTU and its potential drivers.

Table 1 shows that the correlations between the incidence of LTU and its potential drivers are of expected signs. The incidence of LTU is negatively correlated with the lagged GDP growth rate and the inflation rate as suggested by the Okun's law and the Phillips curve. A positive correlation (0.41) between the incidence of LTU and skill mismatch is as expected. In line with the prediction of the search and matching model (Pissarides, 2000), the incidence of LTU and labor market matching efficiency are negatively correlated with the correlation of -0.37 . Furthermore, the incidence of LTU is also positively correlated with the youths who are not in employment, education, or training (NEET). Finally, there is a negative relationship between the incidence of LTU and expenditures in LMP.

3.2 Main findings

3.2.1 Simple regressions

The incidence of LTU is persistent and negatively associated with GDP growth (Table 2). The incidence of LTU is positively correlated with its own lag, indicating some degree of persistence in LTU. According to a European Commission's assessment using longitudinal EU-LFS data, the persistence of LTU was the highest in Bulgaria, Greece, Lithuania, and Slovakia (European Commission, 2016). Moreover, consistent with Okun's law, which shows a negative relationship

between GDP growth and unemployment rate, we find that higher economic growth is associated with lower incidence of LTU. However, our result shows that inflation does not have a statistically significant association with the incidence of LTU.

Labor market characteristics and policy intervention are associated with the incidence of LTU in expected directions (Table 2). An increase in skill mismatches and a higher share of NEET are statistically associated with higher incidence of LTU, while a decline in labor market matching efficiency is associated with higher incidence of LTU, in line with predictions from

Table 1 Summary statistics

	LTU	Growth rate	Inflation rate	Skill mismatch	Matching efficiency	NEET rate	Tax wedge	LMP
Mean	0.42	0.05	0.03	14.52	0.68	14.65	37.53	0.37
Std. Dev.	0.13	0.07	0.03	8.08	0.53	5.46	7.36	0.29
Min	0.09	-0.3	-0.02	0.77	0.16	4.1	11.9	0.03
Max	0.76	0.35	0.46	43.13	4.61	32.5	51.4	2.13
Correlation Matrix								
LTU	1.00							
Growth rate (lagged)	-0.03	1.00						
Inflation rate	-0.14	0.44	1.00					
Skill mismatch	0.41	0.12	0.13	1.00				
Matching efficiency	-0.37	0.02	0.08	-0.24	1.00			
NEET rate	0.66	-0.17	-0.08	0.47	-0.01	1.00		
Tax wedge	0.01	0.03	0.17	0.18	-0.16	-0.08	1.00	
LMP	-0.51	-0.10	-0.13	-0.26	0.24	-0.49	-0.05	1.00

Source: Authors' calculations.

the search and matching theory. The tax wedge is often considered to be one of the main determinants of long-term and/or structural unemployment, as a high tax wedge may discourage employers from creating new jobs (OECD, 2006; Gianella et al., 2008; Orlandi, 2012). However, we find that the variable is not statistically significant in our analysis. Finally, we find that a more generous labor market policy intervention (including both unemployment benefits and ALMPs) is associated with a lower incidence of LTU.⁶

Since existing studies find that different types of ALMPs have different impacts on LTU, we now disaggregate our analysis by types of ALMPs. ALMPs consist of training, employment incentives, supported employment and rehabilitation, direct job creation, and startup incentives (see Section 5 for more details). The results (Table 3, columns 1–5) show that except for direct job creation, all ALMPs have significant impacts on LTU, in line with the literature (Card et al., 2018).

3.2.2 Full multivariate analysis with individual ALMPs

Full multivariate regression shows that skill mismatches, matching efficiency, and some

⁶ We have a similar result by using the lagged labor market policies.

Table 2 Simple regressions**Dependent Variable: Incidence of LTU**

	1	2	3	4	5	6	7
Lag of LTU	0.813*** (0.031)***	0.785*** (0.032)	0.740*** (0.032)	0.656*** (0.045)	0.722*** (0.030)	0.802*** (0.033)	0.763*** (0.036)
Lag of GDP growth	-0.245 (0.039)		-0.247*** (0.039)	-0.269*** (0.048)	-0.111*** (0.040)	-0.248*** (0.043)	-0.282*** (0.044)
Inflation rate		-0.041 (0.095)					
Skill mismatches			0.003*** (0.001)				
Matching efficiency				-0.079*** (0.014)			
NEET					0.009*** (0.001)		
TAX wedge						0.002 (0.001)	
Labor market policies							-0.119*** (0.029)
N	456	453	429	256	439	362	368

Notes: All models are estimated with a constant and time-effects. Robust Standard errors in parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively. All regressions include time and country fixed effects.

types of LMP play an important role in explaining the incidence of LTU. The results (Table 3, column 6) show that lag of LTU, lag of GDP growth, skill mismatches, and matching efficiency are statistically significant and have the expected signs. Moreover, among ALMPs, training and startup incentives appear significant at explaining the incidence of LTU. Finally, although existing studies find that higher unemployment benefits could lead to higher incidence of LTU, we find that the impact is not statistically significant in the full multivariate regression.

Our findings on the effects of ALMPs are line with the literature. Training programs and private sector incentives have been found to be effective at addressing LTU. Using meta-analysis, Card et al. (2018) find that long-term unemployed persons benefit more from ALMPs than other unemployed persons, particularly if there is emphasis on improving their human capital. Training measures tend to show positive medium- and long-run results (Card et al. 2010, 2018), but it is important to ensure that trained skills and competences serve the labor market demand (European Employment Observatory, 2012). Various studies (Rodriguez-Planas, 2010; Escudero, 2018) show that startup incentives are found to be effective in reducing unemployment and increasing employment in advanced economies, particularly for vulnerable and low-skilled people who face limited options in the labor market. Based on Caliendo and Künn (2011), startup incentives are associated with a “double dividend” when subsidized firms create more jobs in the future. Generally, direct job creation in the public sector is found to be the least effective measure.

The literature has found that the design of the ALMPs is also important in determining the LMP effectiveness. Levy et al. (2019) find that program length, monetary incentives,

Table 3 Multivariate regressions with individual ALMPs**Dependent Variable: Incidence of LTU**

	1	2	3	4	5	6
Lag of LTU	0.794*** (0.034)	0.777*** (0.034)	0.837*** (0.035)	0.812*** (0.037)	0.824*** (0.035)	0.562*** (0.069)
Lag of GDP growth	-0.277*** (0.043)	-0.267*** (0.044)	-0.263*** (0.051)	-0.263*** (0.049)	-0.267*** (0.045)	-0.164*** (0.069)
ALMP						
Training	-0.496*** (0.145)					-0.666* (0.375)
Employment incentives		-0.625*** (0.156)				-0.180 (0.373)
Supported employment and rehabilitation			-0.213* (0.124)			0.578 (0.582)
Direct job creation				-0.103 (0.091)		-0.280 (0.797)
Start-up incentives					-1.398** (0.579)	-3.411** (1.648)
Unemployment benefits						0.024 (0.133)
Skill mismatches						0.003*** (0.001)
Matching efficiency						-0.042** (0.016)
N	372	370	290	327	339	136

Notes: All models are estimated with a constant and time-effects. Robust Standard errors in parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively. All regressions include time and country fixed effects.

individualized follow-up, and activity targeting are important for determining the effectiveness of the interventions. Similarly, Meager and Evans (1998) show that smaller scale and well-targeted programs to jobseekers' potential and employers' need are more effective than larger schemes. Duell (2012) find that early identification and intervention are important for increasing the effectiveness of ALMPs. Focusing on youth unemployment, Caliendo and Schmid (2016) find a positive impact of job search assistance on employment but more mixed effects for training and wage subsidies. Nonetheless, Duell (2012) argue that pre-vocational measures, such as vocational guidance and individualized counseling, can improve the effectiveness of integrating unemployed youth into the labor market. Finally, focusing on European ALMPs including job search assistance, Kluge (2010) find that private sector incentive schemes, including startup incentives and wage subsidies, and job search assistance programs "services and sanction" are effective.

Table 4 Robustness check**Dependent Variable: Incidence of LTU**

	(1) Bench- mark	(2) DPD	(3) OLS	(4) NMS	(5) EPL
Lag of LTU	0.562*** (0.069)	0.540*** (0.100)	0.60*** (0.060)	0.420** (0.160)	0.441*** (0.105)
Lag of GDP growth	-0.164*** (0.069)	-0.030 (0.080)	-0.30*** (0.060)	0.510* (0.270)	-0.164 (0.135)
ALMP					
Training	-0.666* (0.375)	-0.620* (0.370)	-0.46 (0.400)	-2.750** (1.030)	-0.431 (0.618)
Employment incentives	-0.180 (0.373)	-0.170 (0.410)	-0.25 (0.300)	1.060 (1.040)	-0.223 (0.587)
Supported employment and rehabilitation	0.578 (0.582)	0.750 (0.580)	-0.21 (0.590)	1.350 (1.130)	1.355 (1.756)
Direct job creation	-0.280 (0.797)	-1.010 (0.820)	-0.24 (0.820)	0.390 (2.120)	-1.962 (1.489)
Start-up incentives	-3.411** (1.648)	-3.530** (1.700)	-2.97* (1.590)	-9.190** (3.440)	-4.240* (2.465)
Unemployment benefits	0.020 (0.130)	-0.020 (0.130)	0.03 (0.140)	-0.990 (0.700)	
Skill mismatches	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.004 (0.003)	0.003** (0.001)
Matching efficiency	-0.042** (0.016)	-0.040*** (0.020)	-0.04*** (0.020)	-0.200* (0.110)	-0.432** (0.020)
Employment Protection					0.005 (0.035)
N	136	116	136	60	134

Notes: All models are estimated with a constant and time-effects. Robust standard errors are in parentheses. *, **, and *** denote statistical significance at 10%, 5%, and 1%, respectively. All regressions include time and country fixed effects.

Labor market matching efficiency, an ability to match the unemployed with vacancies, is also important for employability of the long-term unemployed. Many studies (Jackman et al., 1990; Franz, 1987; Johansen, 2004; Arpaia and Turrini, 2014; and Bova et al., 2016) find a negative relationship between the incidence of LTU and labor market matching efficiency. For example, Arpaia and Turrini (2014) find that a high incidence of LTU has been associated with declining matching efficiency in Europe after the GFC. The quantitative analysis of search and matching models also shows that a lower labor market matching efficiency accounts for higher incidence of LTU in the United States after the GFC (Kroft et al., 2016 and Hall and Schulhofer-Wohl, 2018).

3.3 Robustness

The main results are broadly robust. A significant degree of persistence in LTU implies that our estimators could be biased as the lagged dependent variable is correlated with the error

term. To account for dynamic effects and address the endogeneity problem, we also perform dynamic panel data estimation as in Arellano and Bond (1991). The results are shown in column (2) of Table 4. Similar to the fixed-effect estimation, the incidence of LTU is associated with skill mismatches, matching efficiencies, and some types of ALMPs. For robustness check, we also perform OLS estimation on the pooled data [Table 4, column (3)]. The results are similar to those of the benchmark and dynamic panel data estimation, although training is not statistically significant.

The incidence of LTU appears to be more sensitive to economic growth, matching efficiency, and ALMPs in the NMS. We now apply the fixed-effect panel data estimation but limit the sample to the NMS. Column (4) of Table 4 shows that while the qualitative results remain broadly unchanged, the size of coefficients on economic growth, matching efficiency, and ALMPs become larger for the NMS.

Employment protection is not found to be associated with the incidence of LTU. The role of employment protection legislation (EPL) on unemployment has been discussed in the literature. Its impact on LTU remains mixed in empirical studies. For example, OECD (2004) finds that strict employment protection increases the incidence of LTU, while Heckman and Pagés-Serra (2000) show that EPL has no effect on LTU. By using the indicator of EPL developed by OECD, we find that EPL does not have statistically significant impact on the incidence of LTU.

4 Understanding the potential drivers of LTU

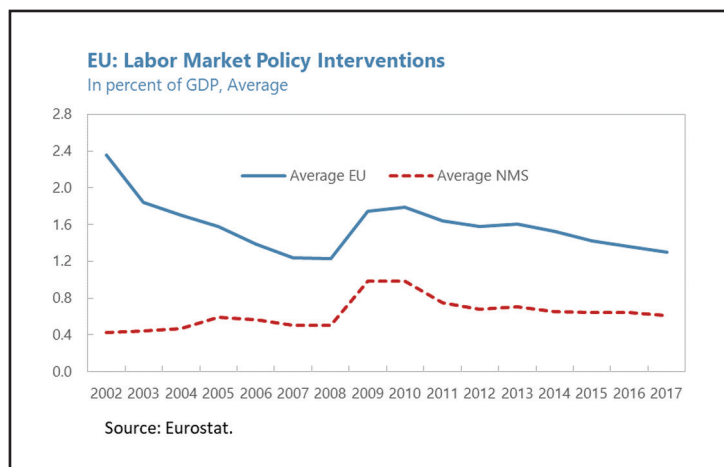
This section focuses on three areas for potential policy intervention, which have been found significant for explaining the incidence of LTU in the EU countries. Our analysis shows that labor market policy intervention, skill mismatches, and matching efficiency are associated with the incidence of LTU. These variables are discussed in detail, including by presenting their developments and trends in the EU and suggesting policy implications drawn from various case studies.

4.1 Labor market policy interventions: what, how, and which ones?

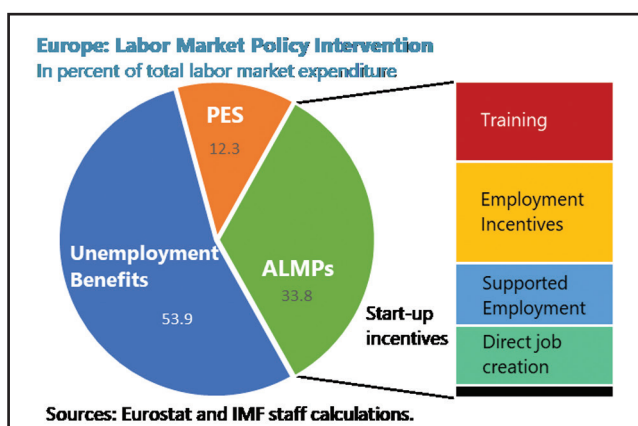
Labor market policy interventions cover labor market services, PLMPs, and ALMPs. The Eurostat database breaks down LMP intervention into three main categories: (1) labor market services, (2) PLMPs, and (3) ALMPs. Labor market services cover all services of the PES and any other publicly funded services for jobseekers. It generally includes “services and sanctions” and aims at enhancing job search efficiency (see Section 4.3). Second, PLMPs cover financial supports that aim to compensate jobseekers for loss of income during unemployment. They include unemployment benefits and incomes that facilitate early retirement. Finally, ALMPs cover policies that activate jobseekers to find employment. They comprise training, employment incentives, startup incentives, supported employment and rehabilitation, and direct job creation.

The levels and types of spending in labor market policy intervention varied considerably across Europe. These reflected diverse labor market characteristics, challenges, and government’s priorities across countries. In 2017, the average LMP spending for the whole EU was

at 1.3% of GDP but differed significantly across countries. In general, LMP spending in the advanced economies was twice as large as those in the NMS. By country, spending on LMP interventions ranged from just 0.1% of GDP in Romania to 3% of GDP in Denmark. In many countries, spending on LMP interventions peaked during the GFC and continued to decline to the levels slightly below the pre-crisis level. These countries included Denmark, Germany, Ireland, France, the Netherlands, Portugal, Romania, Sweden, and Finland.

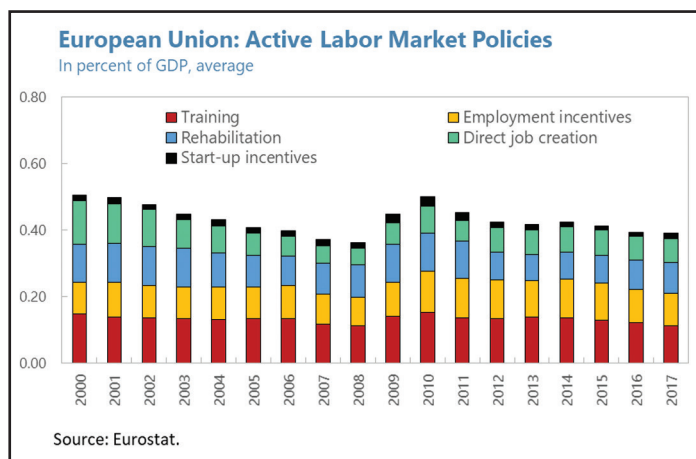


Most countries allocated the largest share of LMP resources on PLMPs, followed by ALMPs and PES, respectively. In 2017, Cyprus and Bulgaria allocated more than three-quarters of its LMP resources to PLMPs, in contrast with Hungary and Malta, where the shares of spending on PLMPs were about 20% and 15% of the total labor market expenditure, respectively. For the EU average, about half of the LMP interventions spending was allocated to PLMPs (mostly in unemployment benefits), and one-third was spent on ALMPs. Some countries, however, put spending priorities on ALMPs. They included Czech Republic, Denmark, Croatia, Lithuania, Luxembourg, Hungary, and Poland. Malta was the only country among the EU that spent the largest share of LMP on labor market services (i.e., PES).

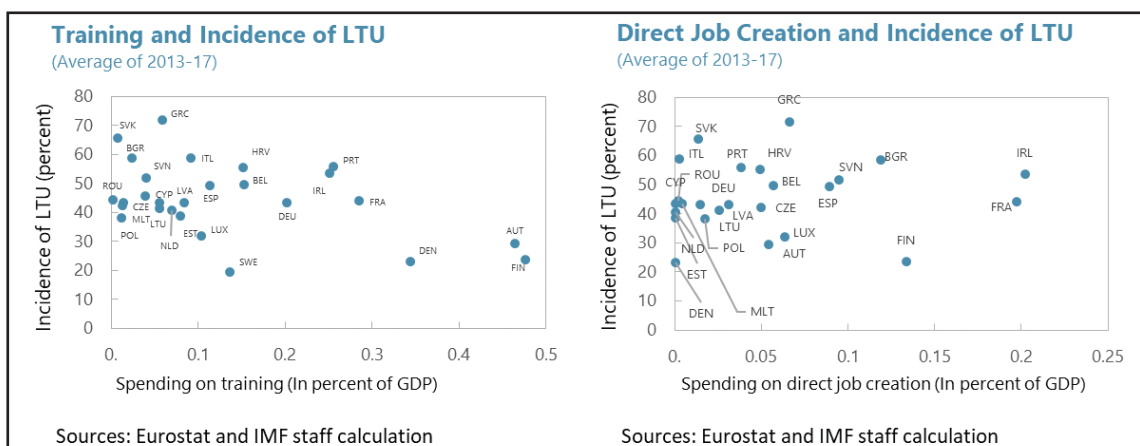


Across different types of ALMPs, most countries allocated resources to employment incentives, followed by training programs. On average, EU countries spent one-third of ALMPs on employment incentives in 2017, followed by training (about 30%), rehabilitation, and direct job creation, respectively. Startup incentives generally accounted for a very small share in most

countries (<5%), with exceptions for Spain, Poland, Sweden, and Croatia. There were significant country-level variations of ALMP spending. Austria, Germany, France, Croatia, Latvia, Portugal, and Finland prioritized their spending on the training programs, whereas Bulgaria, Greece, Hungary, and Slovenia spent the largest share of their ALMP budgets on direct job creation.



Selected ALMPs and Incidence of LTU



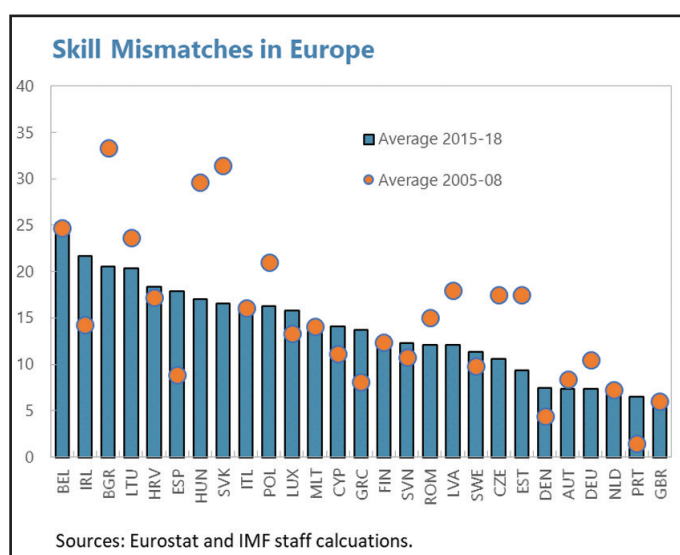
Policy implications: Existing literature, successful country experiences, and our findings point to the following implications for designing ALMPs.

- *Ensure adequate spending on effective ALMPs:* In many countries with high LTU rates and incidence, spending on effective ALMPs could be increased while safeguarding efficiency. For example, in Bulgaria, spending on overall ALMPs was among the lowest in the EU, while the incidence of LTU was among the highest. Moreover, within the ALMPs, direct job creation received the largest allocation of resources. In this case, there is a room to increase both the overall envelope of ALMP spending and shift spending away from direct job creation toward training programs and startup incentives.
- *Apply coherent and comprehensive approach:* ALMPs should support various groups of LTU, including the vulnerable groups and those discouraged from work (inactive population). In general, combining different types of ALMPs, including training, counseling, and subsidies, appears to be more effective. For countries with high LTU rates, ALMPs should be widespread with additional measures for disadvantaged group, while in countries with low LTU rates, more tailored programs to disadvantaged groups would be more effective.

4.2 Skill mismatches: closing the digital skills gap

Skill mismatches are defined as imbalances between skills demanded for labor and skills available in labor supply. Ideally, the proper way to measure skill mismatch would require data on vacancies and unemployment separately for different skill levels, proxied by education. The higher is the discrepancy between vacancies and unemployment within a particular skill compared with that prevailing throughout the whole economy, the higher the associated degree of mismatch. As vacancies by education level are not available, we follow Estevao and Tsounta (2011) and construct a mismatch indicator as differences between employment and working-age population by education groups.

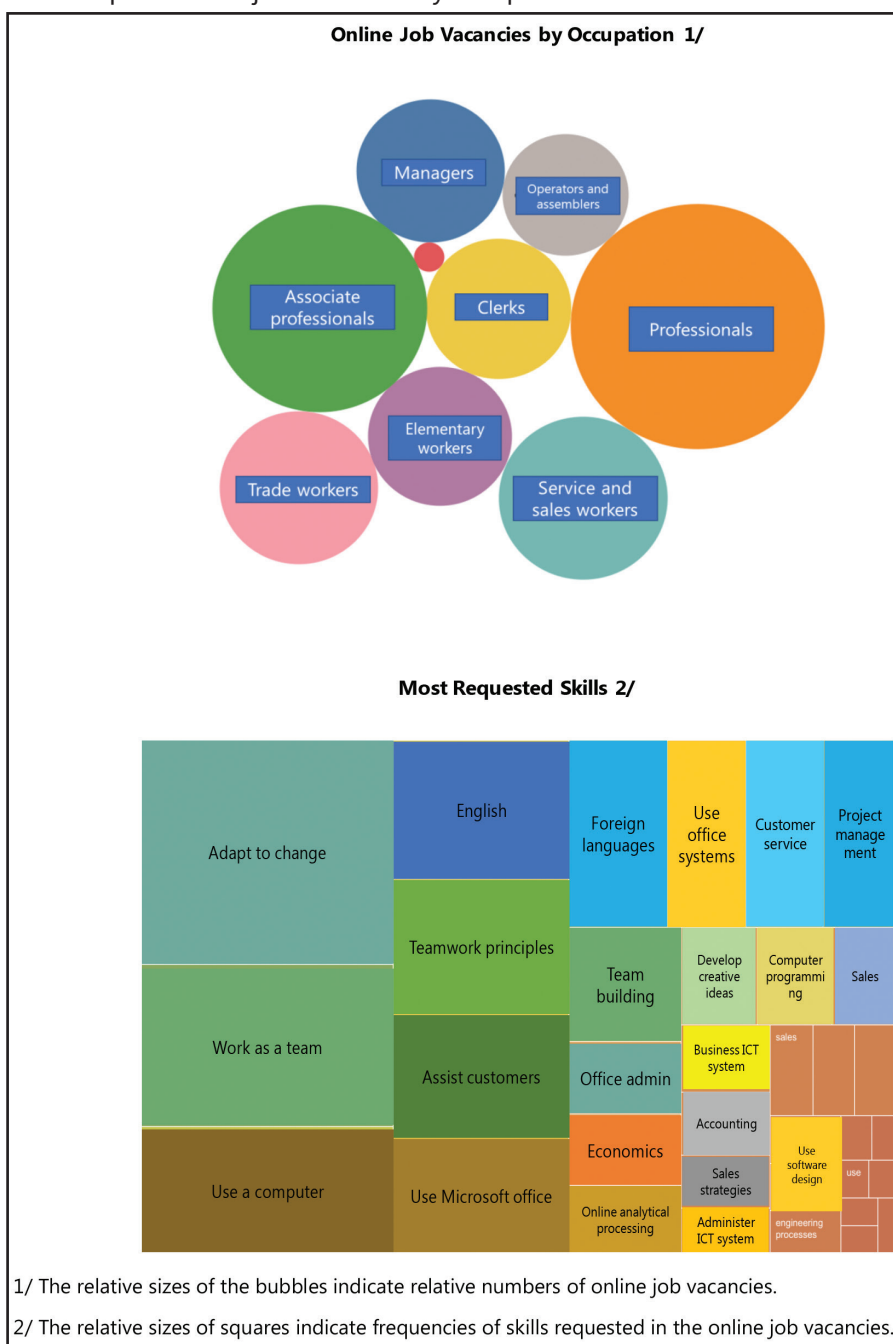
The degree of skill mismatches varied greatly across the EU and across time. Skill mismatches appeared to be high in Belgium, Ireland, and Bulgaria, while they were low in the Netherlands, Portugal, and the United Kingdom. Relative to pre-GFC, about half of the EU member states experienced an improvement in skill matching. The largest improvements occurred in many NMS. In contrast, skill mismatches deteriorated after the GFC in many advanced countries, including Ireland, Greece, Spain, and Portugal.



Digital skills are a prerequisite for the current and future of work (Figure 2). Changes in skill demand and supply have resulted in difficulty for firms to find employees with the right skills (Cedefop, 2018a). In light of a growing digitalized economy, the skills that will be increasingly in high demand include digital skills. Based on Cedefop's skills online vacancy analysis tool, almost half of the vacancies were related to Information and Communication Technologies (ICT), healthcare, science, and business and retail sectors and they are expected to increase in the future (Cedefop, 2018b). Many of these vacancies require some knowledge of digital skills. According to the ESJS in 2014, >85% of the EU employers required at least basic ICT skills to perform the job. Going forward, future structural transformation of the EU labor markets will be accompanied by a high demand for digital skills. The experience of the COVID-19 lockdown will further increase the premium of digital skills.

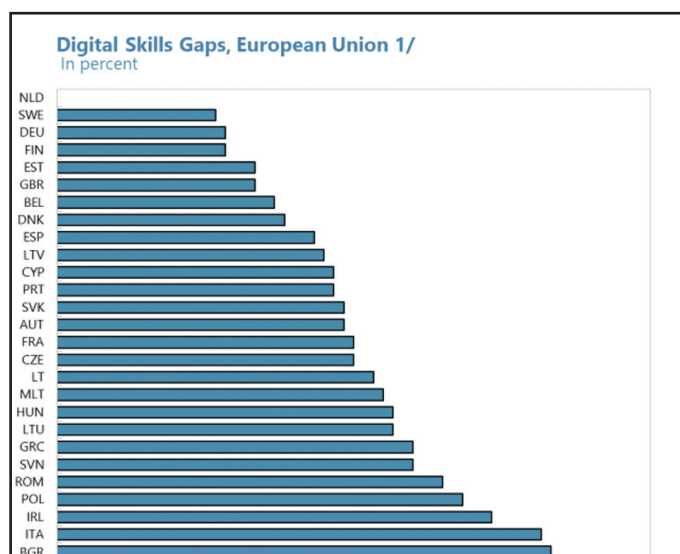
Despite the growing importance of digital skills in the EU labor market, digital skill gaps—measured by the difference between the percentage of employees who need at least the

Figure 2 European online job vacancies by occupation and skills.



Source: Cedefop’s Skills Online Vacancy Analysis Tool for Europe.

basic level of ICT skills to work and the percentage of individuals who have at least basic and overall digital skills—remained high in the EU. All countries except the Netherlands experienced skill gaps of at least 15%, where digital skill gaps in Bulgaria, Croatia, and Italy were as high as 50%.



Policy implications: Based on the experiences of the world's best performers in the area of digital skills, digital literacy can be strengthened through policies aimed at creating a conducive environment for the development of digital skills, and sectoral policies focusing on education and training.

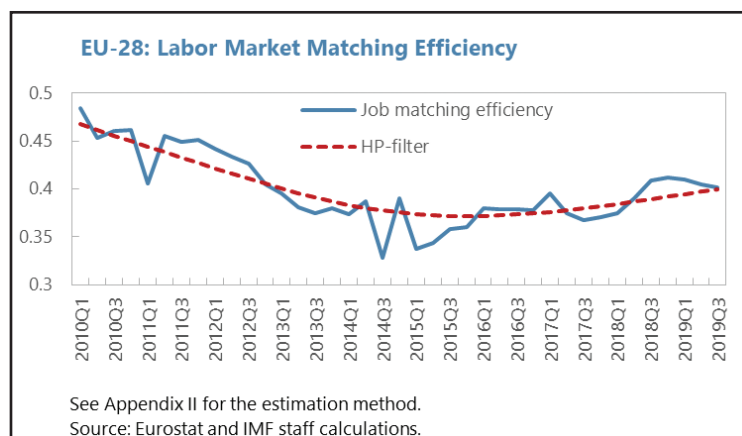
- Create a digital-friendly economy by investing in technological infrastructure and promoting digitalization of businesses. High-quality and extensive access to technological infrastructure such as telecommunication networks and access to Internet can deepen the penetration of technology. Based on the Digital Economy and Society Index (DESI), Denmark, Finland, Luxembourg, the Netherlands, and Sweden have the most advanced digital connectivity, while Greece, Croatia, and Lithuania still have room for improvement, particularly on the coverage and take-up of the ultrafast broadband. Furthermore, promoting digitalization of businesses could foster the development of digital skills, as growing uses of technology in businesses lead to a higher demand for individuals with digital knowledge and result in internal training programs (UNESCO, 2018).
- Integrate technology into education and training.
 - *Education system:* The United Kingdom introduced programming lessons for children from age 5 and above to provide the students with a solid foundation for digital technology. Sweden integrated digital education into compulsory subjects such as Biology and Physics. Denmark integrated the use of ICT into student's examination, while Norway monitored and took stock of students' digital skills through a national digital skills evaluation test. Recognizing the importance of teachers, many EU countries and Hong Kong SAR developed an ICT training framework for teachers that allow them to upgrade their teaching methods. Finally, Singapore developed the ICT Master Plans for Education, including (1) equipping schools with warranted infrastructure; (2) training teachers to use technology and incorporate the knowledge into teaching methods; and (3) incorporating digital technology into curricula at all levels of education.
 - *Adult training:* In addition to boosting digital competency for students, upgrading adults' digital skills and promoting digital inclusion are equally important. Denmark has prioritized training in digital skills for employees in their labor market policy.

Luxembourg offered one-on-one and group training sessions at affordable prices to low-income individuals and elderly. Sweden, New Zealand, and Singapore's governments cooperated closely with industries and businesses to identify present and future needs in digital skills and develop policies to promote training in required digital competencies.

4.3 Labor market matching efficiency: the role of PES

Labor market matching efficiency in EU generally declined after the GFC and improved slightly in recent years. Most EU countries experienced declines in their matching efficiency immediately after the financial crisis (Figure A1 in Appendix B). However, the recovery process in the post-crisis period differed across countries. For example, after deteriorating during the GFC, the matching efficiency improved to the pre-crisis level in the Czech Republic and Estonia. On the other hand, the matching efficiency in Bulgaria, Greece, Ireland, Lithuania, Romania, the United Kingdom, Spain, and Slovenia continued to decline.

Strengthening the role of PES could enhance matching efficiency. Improving labor market matching efficiency requires policies beyond those aimed at stimulating aggregate demand, since it relates to structural factors, including institutional inefficiencies, which dissuade job seekers from accepting a job (Bova et al., 2016). PES play an important role in contributing to a well-functioning labor market, as they facilitate the process of matching the jobseekers and employers. Based on the EU's peer-to-peer review and G20 case studies, successful programs offered by PES that bring about sustainable employment for the LTU include the following factors:



- *Targeted and personalized programs that combine several interventions:* Initial profiling is an effective tool to categorize jobseekers before designing other interventions. Germany has developed a comprehensive skills assessment profiling tool, so-called “Kodiak,” and linked the profiles to regional labor market vacancies. It consists of a self-assessment questionnaire, aptitude test, interview to assess achievement motivation, assessment of social and communication skills required in selected occupations, and technical standards for the analysis of personal skills. Denmark’s approaches for interventions depend on matching groups categorized by the Employability Profiling Toolbox. Beyond ini-

tial profiling, labor market interventions for the LTU generally require a step-by-step approach, starting from strengthening basic skills and coaching, followed by workplace-oriented training, vocational training, and job search assistance. Austria, Belgium, Portugal, and the United Kingdom encourage employers to offer internships to the LTU by providing allowances for those registered with PES.

- *Strong institutional cooperation:* PES work with multiple stakeholders, including municipalities, youth and family services, other social services, and employers. Matching efficiency can be increased by strengthening cooperation on data and information exchange. One of the key recommendations by the European Commission is the establishment of a single point of contact, which is a reference point for the long-term unemployed to provide them with individualized, tailored, guidance and simplified access to employment and support services (European Commission, 2016). In addition, cooperation can be in the form of outsourcing services to PES' partners that specialize in implementing measures in specific groups such as minorities and youth. For example, in France, PES work closely with the local agencies specialized for youth to train and integrate young people who lack qualifications in the labor market. Similarly, in Poland, one of the PES partners provides labor market services to young people <25 years of age, who dropped out of school.
- *Post-employment support services:* Once the long-term unemployed persons find jobs, it is important to ensure that they stay employed. To this end, Bulgaria and Germany started a program aimed at sustaining integration of these individuals by providing them with follow-up support for a period of 6 months after placement. The support consists of a range of services, for instance, working on family and job compatibility issues, pre-employment training organized in cooperation with the employer, and prevention and resolution of risks in the initial phase of the employment). Based on a controlled experiment evaluation, retention rates significantly improved for the treatment group (European Commission, 2014).⁷

5 Conclusions

This paper finds that LTU is associated with macroeconomic conditions and labor market characteristics, using annual data of 25 European countries over the period 2000–2018. We find that LTU is persistent and countercyclical. High LTU is also associated with elevated skill mismatches, high share of NEET, and declining labor market matching efficiency. We also find that the matching efficiency in Europe has declined relative to the pre-GFC level.

ALMPs play an important role in alleviating LTU but the effectiveness varies across programs. In our full multivariate analysis, we find that ALMPs have a significant impact on LTU, while unemployment benefits do not. Among different programs of ALMPs, we find that, in line with the existing literature, training programs and startup incentives are effective tools to alleviate LTU.

Measures to reduce the incidence of LTU include ensuring adequate spending on effective ALMPs, addressing skill mismatches, and promoting labor market matching efficiency.

⁷ A simple regression analysis shows that higher matching efficiency is associated with lower registered unemployed persons in public employment services.

- *Ensuring adequate spending on effective ALMPs*: The average EU spending on ALMPs has declined compared with the pre-GFC levels. Ensuring adequate spending on ALMPs for several countries would help to tackle the LTU. In addition, successful ALMPs typically combine different types of activation policies (such as training and wage subsidies).
- *Addressing digital skill gaps*: Technological advancement and digitalization lead to a growing demand for digital skills. The COVID-19 pandemic and its aftermath further stress the importance of acquiring digital skills. Most EU countries continue to experience skill shortages in this aspect. To promote digital skill proficiency, countries should implement policies fostering digital skills, including by investing in digital infrastructure, promoting digitalization of businesses, and integrating digital-skill development into school curriculum and training programs.
- *Promoting labor market matching efficiency*: One of the key instruments to improve the job matching efficiency, particularly for the disadvantaged and the long-term unemployed, is to strengthen the role of PES. This includes promoting policy coordination among key stakeholders, offering tailored programs for the LTU, and conducting post-monitoring program after the job placement.
- *Addressing non-economic-related impacts of LTU*: While our study focuses on an economic aspect of LTU, it is also important to consider a broader impact of LTU. As mentioned earlier, apart from economic loss, LTU also has negative consequences on individuals' mental health outcomes and life satisfaction. Policies interventions to alleviate the impact of LTU on these aspects should also be considered. For example, Moore et al. (2017) find that "job-club" interventions can reduce depressive symptoms in emotional distressed LTU. In this context, the government should ensure adequate public and subsidized health services, including online counseling and online support groups.

Declarations**Availability of data and materials**

The data and materials are available upon request.

Competing interests

None.

Funding

None.

Authors' contributions

HM and NS collected the data and conducted the empirical analysis. HM and NS drafted the manuscript. All authors read and approved the final manuscript.

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Appendix A. Data

A.1. Descriptive statistics

Variable	Number of observations	Mean	Standard Deviation	Min	Max
Incidence of LTU	494	0.425	0.132	0.095	0.763
GDP growth rate	589	0.051	0.066	-0.304	0.349
Inflation rate	583	0.026	0.033	-0.017	0.457
NEET	557	14.649	5.455	4.100	32.500
Skill mismatch	520	14.518	8.084	0.772	43.126
Matching efficiency	280	0.680	0.528	0.159	4.615
Tax wedge	504	37.532	7.358	11.900	51.400
LMP	446	0.371	0.289	0.033	2.129
Training	450	0.048	0.052	0.000	0.315
Employment incentives	448	0.036	0.040	0.000	0.219
Supported employment and rehabilitation	367	0.037	0.066	0.000	0.493
Direct job creation	382	0.024	0.039	0.000	0.328
Start-up incentives	405	0.004	0.006	0.000	0.035
Unemployment benefits	456	0.263	0.211	0.021	1.283

LMP, labor market policies; LTU, long-term unemployment; NEET, not in employment, education, or training.

Appendix B. Measuring labor market matching efficiency

We estimate labor market matching efficiency based on the matching function approach.⁸ Matching efficiency is the productivity of the process for matching jobseekers to available jobs, such that, job finding is the output, whereas vacant jobs and active jobseekers are the inputs.

The process of matching job seekers with employers is assumed to be captured by the Cobb-Douglas matching function:

$$m_t = \mu_t u_t^\alpha v_t^{1-\alpha}, \quad (1)$$

where m_t is the number of new matches at time t , μ_t denotes matching efficiency, u_t is the number of unemployed, v_t is the number of vacancies, and α is the matching elasticity with respect to unemployed workers.

As the job finding rate f_t is the ratio of new hires to the stock of unemployed workers, we have

$$f_t = \mu_t \theta_t^{1-\alpha}, \quad (2)$$

where $\theta \equiv v/u$ is labor market tightness. For a given labor market tightness, matching efficiency determines the job finding rate; that is, the more efficient is the matching process, the higher rate at which job seekers can find new jobs at a given labor market tightness.

⁸ We estimate matching efficiency based on the standard search and matching model developed by Mortensen and Pissarides (1994), Veracierto (2011), and Shimer (2012). Other studies (Börsch-Supan, 1991; Wall and Zoega, 2002; Valletta, 2005; Bonthuis et al., 2013) determine a degree of matching efficiency through a shift in the Beveridge curve, which dictates a negative relationship between vacancies to the number of unemployed. In particular, an inward shift in the Beveridge curve depicts a higher degree of job matching efficiency because given numbers of vacancies constant, number of unemployed is lower as the unemployed is finding the jobs and fill in vacancies faster, and vice versa.

The labor force is normalized to one. The evolution of unemployed workers is given by

$$u_{t+1} = s_t(1 - u_t) + (1 - f_t)u_t, \quad (3)$$

where s_t is the separation rate. Thus, the number of unemployed workers at time $t + 1$ is given by the number of unemployed workers who cannot find jobs at time t plus employed workers who lose jobs at time t .

In the steady state, Eq. (3) can be rewritten as

$$\mu_t = s_t(1 - u_t) / (u_t \theta_t^{1-\alpha}).$$

Thus, we can compute the matching efficiency after estimating parameter α with the unemployment rate, separation rate, and labor market tightness.

The elasticity of matching function with respect to unemployment can be estimated from

$$\ln f_t = \ln \mu_t + (1 - \alpha) \ln \theta_t + \varepsilon_t.$$

B.1 Data and results

We obtain quarterly data of the unemployment rate, unemployment, and job vacancy rate of 23 EU countries from Eurostat.⁹ The choice of countries depends mainly on data availability. The sample period varies across countries and spans the longest timeframe for which data is available. As for job finding and separation rates, following Elsby et al. (2009) and Shimer (2012), we construct these series by using data on the short-term unemployment and total unemployment.¹⁰ The short-term unemployment is measured by workers who have been unemployed for <3 months.

Table A1 reports the sample averages of job finding and separation rates and estimates matching elasticities with respect to unemployment. The job finding rates range from 11.9% in Greece to 57.5% in Finland. The separation rates range from 1.4% in Slovakia to 5.2% in Spain. As for the matching elasticity with respect to unemployment, most estimated values lie in the plausible range of 0.5–0.7, which is reported by Petrongolo and Pissarides (2001).

⁹ Sample countries are Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Germany, Spain, Estonia, Finland, United Kingdom, Greece, Croatia, Hungary, Ireland, Latvia, Lithuania, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden.

¹⁰ In this paper, the job finding rate is defined as the rate of transition from unemployment to employment. Similarly, the separation rate is defined as the rate of transition from employment to unemployment.

Table A1 Worker flow rates and matching elasticities

Country	Sample period	Job finding rate	Separation rate	Elasticity of matching function α
Belgium	2010Q1-2019Q1	29.9	2.2	0.87
Bulgaria	2005Q1-2019Q1	17.4	1.5	0.59
Cyprus	2005Q1-2019Q1	34	2.8	0.75
Czech Republic	2008Q1-2019Q1	28.3	1.4	0.82
Denmark	2010Q1-2019Q1	51.2	3.3	0.76
Germany	2006Q1-2019Q1	30.6	1.6	0.79
Spain	2001Q1-2019Q1	35.4	5.2	0.3
Estonia	2008Q3-2019Q1	38.8	3.4	0.52
Finland	2003Q1-2019Q1	57.5	5.1	0.8
United Kingdom	2001Q2-2019Q1	48	2.9	0.54
Greece	2009Q1-2019Q1	11.9	2.5	0.73
Croatia	2012Q1-2019Q1	19.4	2.4	0.32
Hungary	2006Q1-2019Q1	24	1.8	0.61
Ireland	2008Q1-2019Q2	24.9	2.4	0.59
Latvia	2005Q1-2019Q1	27.2	3.1	0.59
Lithuania	2004Q1-2019Q1	29.3	2.8	0.67
Norway	2009Q1-2019Q1	51.6	2	0.72
Poland	2007Q1-2019Q1	30.3	2.3	0.72
Portugal	2001Q1-2019Q1	23	2.5	0.64
Romania	2009Q4-2019Q1	27	1.8	0.64
Slovakia	2004Q1-2019Q1	12.4	1.4	0.6
Slovenia	2008Q1-2019Q1	22.9	1.8	0.57
Sweden	2009Q1-2019Q1	51.8	4.3	0.95

Figure A1 Evolution of matching efficiency in Europe.

