

Youth and the total unemployment rate: The impact of policies and institutions

M. Choudhry, E. Marelli, M. Signorelli

Abstract

This paper estimates the impact of several institutions and policies on youth and total unemployment rates for a large set of developed countries during the last three decades. The estimation technique used is a fixed effect panel analysis. Our empirical analysis shows that, in addition to economic growth, economic freedom, labour market reforms, a high share of part time employment, and active labour market policies reduce unemployment and improve labour market performance. Considering the poor condition of young people relative to older people, our results permit us to select, among the policies and reforms that reduce overall unemployment, the policies that have a comparatively high effect on youth unemployment.

JEL: J08, J48, J68

keywords: youth unemployment, institutions and policies, fixed effects panel estimation

1. Introduction

Unemployment is detrimental to society from many points of view. For example, it is a waste of resources; in many countries, the GDP could be 10-15% higher without unemployment. Unemployment causes a permanent loss of human capital, thus dampening long run growth prospects. It affects health and diminishes the well-being of society, not only for the unemployed. Unemployment causes an expansion of fiscal costs for the government (lower taxes and higher expenditures).

The youth unemployment rate is, in most countries, at least twice as high as the total unemployment rate. This phenomenon is particularly serious because youth unemployment refers to people who have freshly invested in human capital; their unemployment erodes such investments and raises the risk of being excluded from the labour market, ending in a negative status of “neither in employment or education or training”. In addition, young people were substantially and negatively affected by the recent crisis.

What are the causes of high unemployment rates in general and youth unemployment in particular? The causes are numerous, but in this paper, we focus on the impact of policies and institutions.

The emphasis on the role of policies and institutions is motivated by the outcomes of previous studies. For example, the OECD (2006, chapter 7) has shown that almost two-thirds of non-cyclical unemployment changes are explained by changes in policies and institutions. Since the OECD’s *Jobs Study* in 1994, the weak employment performance in Europe, the so-called “eurosclerosis”, is explained in terms of labour market rigidities and inappropriate policies or institutions. Since then, many things have changed in most European countries (see additionally Blanchard, 2006, and the follow-up OECD study by Brandt et al., 2005).

This paper considers a long period, ending in the worst year of the recent crisis (2009), and distinguishes between youth unemployment and its determinants and total unemployment.

Our empirical analysis shows that, in addition to economic growth, economic freedom, labour market reforms, a high share of part time employment, and active labour market policies

reduce unemployment. In contrast, a high interest rate, taxes on labour and unemployment benefits can unfavourably impact the unemployment rate. We additionally find that estimation results for youth and overall unemployment rate are different, and this difference in results is statistically significant.

The structure of the paper is as follows. In Section 2, a trend analysis for youth and total unemployment rate is presented. In Section 3, after a brief discussion of the causes of unemployment in general, there is a review of the determinants of youth unemployment. Section 4 presents our econometric investigations on the determinants of the total and the youth unemployment rate. Section 5 concludes the paper.

2. Youth unemployment: trends and comparisons

Let us consider, first, some definitions. In most countries, “youth unemployment” refers to individuals aged 15-24 years, but other ages are sometimes considered. Moreover, problems such as underemployment and informal sector employment may be more relevant for young people. Some authors (e.g., O’Higgins, 2011 and Scarpetta et al., 2010) observe that the size of the group of “youth left behind” can be proxied by the number of young people who are neither employed nor in education or training (NEET).¹

Globally, total unemployment increased during the recent crisis from 2007 to 2009 from 170 million to over 210 million. However, a trend of increasing unemployment began in the previous two decades. The phenomenon occurred in both emerging and advanced economies. In the EU, the unemployment rate in 2008 was close to 7%. In 2010-11, it rose to 10%, especially in the Euro area, a level last reached a decade earlier. The recession led to an increase in unemployment sooner in the most flexible labour markets or later in markets where rigidities or internal flexibilities were prevailing.² After normal recessions, employment returns to its pre-crisis levels after four or five months, on average, but the lags are longer in the case of financial crises.

The unemployment rate trend in high income OECD countries is presented in Table 1. The unemployment rate has increased in most countries as a consequence of financial and economic crises. The table shows that the largest increases, which occurred between 2005 and 2010, were in Spain, Ireland, Iceland, and Hungary, but even in the United States, the unemployment rate nearly doubled from 5.1% to 9.6%; an opposite trend was observed in Germany.

Arpaia and Curci (2010) produced a broad analysis of labour market adjustments in the EU-27 after the 2008-2009 recession in terms of employment, unemployment, hours worked and wages. They highlighted that young workers, who have weaker work contracts, lower qualifications and less experience than older workers, have borne the brunt of the “Great Recession”. In fact, the increase in the youth unemployment rate has been generally larger than the rise in the total rate. Verick (2009) noted that during and after severe recessions, young people have a difficult time both acquiring a job as a new entrant in the labour market and remaining employed.

That the worst impact was on young people is generally recognised, notwithstanding some exceptions³ and despite the recent study by the European Commission (2010) that indicates that the largest amount of the increase in total unemployment between 2008 and 2010 (almost one third of the total) was accounted for by the growth amongst those 25-34 years old. Although in some

¹ This group represented, on average for the OECD area, 11% of those 15-25 years old in 2007. The NEET definition was first used by OECD, that has recently (2009) introduced two new categories: poorly integrated (young people who do not find stable jobs but move between temporary employment, unemployment and inactivity) and left behind youth (young people who face long-term joblessness).

² In some countries, public support has favoured internal flexibility and labour hoarding for short-time work. This was the case for Germany, where unemployment decreased even in the crisis years. The differences between Germany and Italy are analysed by Aricò and Stein (2012).

³ In three countries, Austria, Germany and Luxembourg, youth unemployment rates fell over the period 2008 q3 – 2010 q3. The relative position of young people worsened the most in Italy, Portugal, and the New Member States. In the EU, youth unemployment rates increased, on average, by more than one third or 5.5 percentage points (see O’Higgins, 2012).

countries, the initial impact of the crisis on youth unemployment has been moderate, its long run consequences, such as loss of work experience and human capital, lower employability and reduced earnings over the entire life cycle, poorer job quality and precarious employment, are troublesome. Long-term unemployment is especially pernicious, and in the case of young people, it raises the risk of a “lost generation” (e.g., Scarpetta et al. 2010).

Table 1: The Total Unemployment Rate by Year

	1980	1985	1990	1995	2000	2005	2010
Australia	6.1	8.3	6.9	8.5	6.3	5.0	5.2
Austria		3.6	3.2	3.7	3.5	5.2	4.4
Belgium		11.3	7.3	9.3	6.6	8.4	8.3
Canada	7.5	10.6	8.1	9.5	6.8	6.8	8.0
Czech Republic				4.0	8.8	7.9	7.3
Denmark		7.8	8.3	7.0	4.5	4.8	7.4
Finland	4.7	5.1	3.1	15.3	9.7	8.4	8.4
France	6.4	10.3	9.4	11.8	10.2	8.9	9.3
Germany				8.1	7.7	11.1	7.1
Greece	4	7.8	7.0	9.1	11.1	9.9	12.5
Hungary				10.2	6.4	7.2	11.2
Iceland				4.9	2.3	2.6	7.6
Ireland		17.9	14.1	12.0	4.3	4.3	13.5
Italy	7.5	9.4	9.8	11.7	10.8	7.7	8.4
Japan	2.0	2.6	2.1	3.2	4.8	4.4	5.0
Korea, Republic of	5.2	4.0	2.5	2.1	4.4	3.7	3.7
Luxembourg		3.0	1.6	2.9	2.3	4.5	4.4
Netherlands	7.9	10.5	7.7	7.2	2.7	4.7	4.5
New Zealand			7.8	6.5	6.2	3.8	6.5
Norway	1.6	2.6	5.3	4.9	3.4	4.6	3.6
Portugal	6.7	8.6	4.7	7.2	3.9	7.6	10.8
Slovakia				13.1	18.8	16.2	14.4
Spain	11.1	21.0	16.0	22.7	13.9	9.2	20.1
Sweden	2.2	3.1	1.8	9.1	5.8	7.7	8.4
Switzerland			2.1	3.3	2.7	4.4	4.2
United Kingdom		11.3	6.8	8.6	5.5	4.6	7.8
United States	7.1	7.2	5.6	5.6	4.0	5.1	9.6

Source: ILO (2012).

Trends in the youth unemployment rate (YUR) during the period 1980-2010 in high income OECD countries are presented in Table 2. The youth unemployment rate was high and further increased in most countries in our sample. If we focus our attention on the EU, one of the most affected areas in the world, we can analyse the recent evolution of the YUR for young people in the 15-24 years age group and disentangle the peculiarities of individual countries. Higher than average figures were found in different groups of countries: (i) some Mediterranean countries (Spain, Italy, Greece) plus France and Belgium; (ii) many Nordic countries (Sweden and Finland); and (iii) some

new member states (NMS) such as Hungary and Slovakia.⁴ The pattern further deteriorated after the crisis in 2010.

Table 2: The Youth Unemployment Rate by Year

	1980	1985	1990	1995	2000	2005	2010
Australia	12.5	15.2	13.0	15.4	12.1	10.6	11.5
Austria		4.3	3.8	5.2	5.1	10.3	8.8
Belgium		23.5	14.5	21.5	15.2	21.5	22.4
Canada	12.8	16.1	12.3	14.8	12.7	12.4	14.8
Czech Republic				7.8	17.0	19.3	18.3
Denmark		11.5	11.5	9.9	6.7	8.6	13.8
Finland	8.8	9.7	8.9	27.0	20.3	18.9	20.3
France		25.7	19.8	27.1	20.6	20.3	22.5
Germany				8.2	8.4	15.2	9.7
Greece	13.8	24.2	23.3	27.9	29.5	26.0	32.9
Hungary				18.6	12.7	19.4	26.6
Iceland				11.0	4.7	7.2	16.2
Ireland		25.0	19.7	19.0	6.5	8.6	27.5
Italy	25.0	32.1	28.9	33.5	31.5	24.0	27.8
Japan	3.6	4.8	4.3	6.1	9.2	8.7	9.2
Korea, Republic of	11.5	10.0	7.0	6.3	10.8	10.2	9.8
Luxembourg		6.7	3.6	7.2	6.4	13.7	14.2
Netherlands		17.6	11.1	12.1	5.3	8.2	8.7
New Zealand			14.1	12.3	13.6	9.7	17.1
Norway	4.7	6.5	11.8	11.9	10.2	12.0	9.3
Portugal	16.4	19.0	9.6	15.7	8.6	16.1	22.3
Slovakia				24.8	37.0	29.9	33.6
Spain	25.3	43.8	30.2	40.4	25.3	19.7	41.6
Sweden	6.3	7.2	4.6	19.5	11.6	22.0	25.2
Switzerland			3.2	5.5	5.0	8.8	7.2
United Kingdom		17.8	10.1	15.3	11.7	12.2	19.1
United States	13.8	13.6	11.2	12.1	9.3	11.3	18.4

Source: ILO (2012).

After this introduction of the present situation and perspectives of the impact of the crisis, we now extend our viewpoint in line with the aim of the paper. Even before the recent crisis, youth unemployment had been increasing in many countries, both developed and emerging.⁵ Globally, young people aged between 15 and 24 years represent more than two-fifths of the total number of unemployed individuals.

Youth unemployment as a ratio of adult⁶ unemployment and its share in total unemployment in 2010 are presented in Figure 1. The share of youth unemployment in the total unemployment rate is quite high. For example, in Australia, New Zealand, Iceland, Sweden, Norway and the United

⁴ The situation was bad in other countries, as well, such as Poland and the Baltic states (not shown in the table).

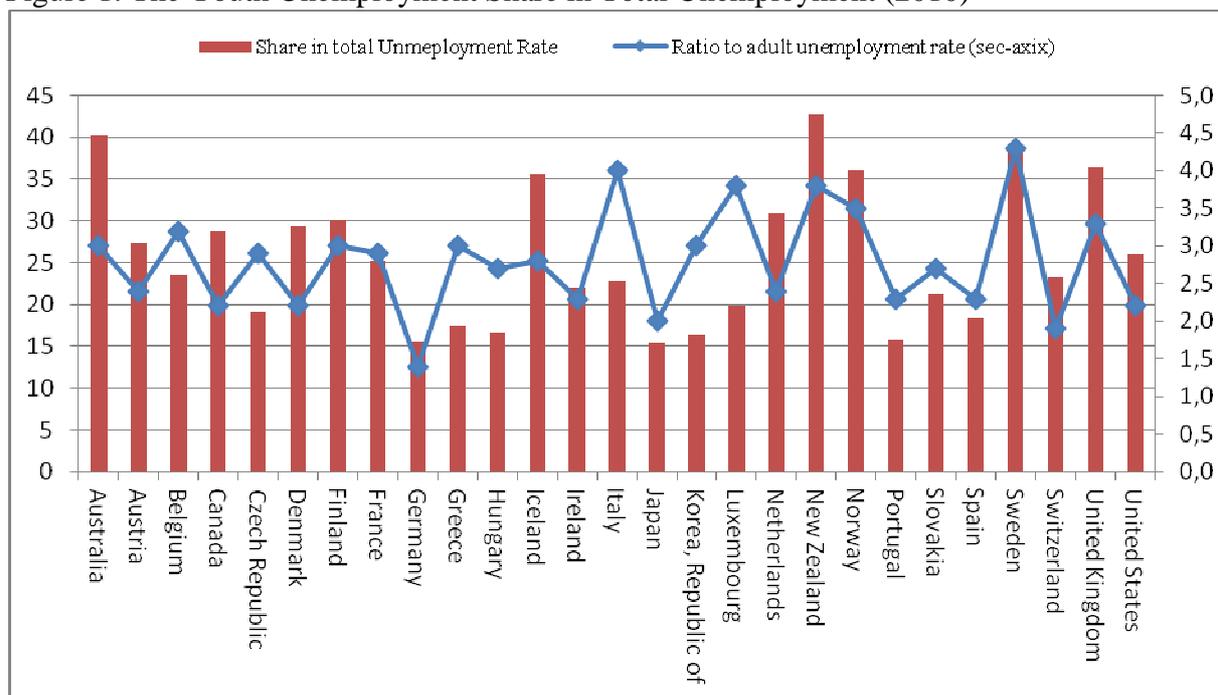
⁵ O'Higgins (2005) examines trends in the youth labour market in developing and transition countries, highlighting the considerable difficulties of integrating young people into "decent work". For transition countries, see additionally Perugini and Signorelli (2010a and 2010b).

⁶ Adult unemployment means unemployment among individuals who are 25 to 64 years of age.

Kingdom, the youth unemployment rate accounts for more than one third of total unemployment. The ratio of youth to adult unemployment rates (the right-hand axis of Figure 1) is greater than 2 in most countries, reaching top values above or close to 4 in Italy, Sweden, New Zealand, and Luxembourg.

Many studies have tried to assess the reason that the youth unemployment rate is persistently higher than the adult (or total) unemployment rate.⁷ We discuss alternative interpretations in Section 3.

Figure 1: The Youth Unemployment Share in Total Unemployment (2010)



Source: Elaborations on ILO (2012).

3. Key determinants of youth unemployment

We begin by reviewing the literature on “unemployment” in general before discussing the issues related to youth unemployment. A first group of causes include macroeconomic cyclical conditions. The key explanatory variable of unemployment (rate) changes is GDP growth; the link between the two variables is the well-known Okun’s law, which has been established in many empirical studies. However, the relationship is not stable over time and varies across countries, as confirmed by Lee (2000), who in any case concluded that the impact of growth on (un)employment is still valid. In addition, Solow (2000), arguing that much of European unemployment is due to a lack of demand, used an Okun equation. More recently, the IMF (2010) examined the role of institutions and policies in explaining changes in Okun’s law across countries and over time.⁸ Finally, Bartolucci et al. (2011) estimated a model that detects an additional impact of financial crises on unemployment beyond their effect through GDP changes; this additional impact is ascribed to the increase in systemic uncertainty.

In addition to GDP or the output gap (in alternative specifications, individual countries’ GDP growth rates are normalised for their trend growth rates), some macroeconomic variables that

⁷ See, for example, Clark and Summers (1982) and Kolev and Saget (2005).

⁸ From a methodological perspective, a dynamic version of Okun’s law is used in which the change in unemployment depends on the lagged values of the change in output, the change in unemployment itself and some control variables, including a dummy to indicate a state of recession.

are significant in explaining unemployment include productivity growth, trade openness, the terms of trade dynamics, the inflation rate and real (long-term) interest rates. While the impact of some of these variables on (un)employment is obvious, a negative effect of inflation on unemployment may be because if the actual price level exceeds the expected price level, real wages are lower than expected during the wage bargaining process, and consequently, employment increases and unemployment decreases.⁹

Regarding cyclical conditions, there are already some, albeit rare, specific investigations of the effects on unemployment of the last financial crisis and “Global Recession”; see, for example, ILO (2010), O’Higgins (2012), and Marelli et al. (2012).¹⁰ In many papers, the impact of financial crises on the youth unemployment rate is larger than the impact on the overall unemployment rate.¹¹

A second group of variables that are significant in determining unemployment and labour market performance includes either demographic or structural conditions. The demographic variables are population density, the age structure or the percentage of young (or old) people on the population, and migration flows (Pissarides and McMaster, 1990). In addition to the sectoral mix of production¹², the relevant structural conditions include the trade specialisation of countries, the links between the financial structure and real economic activities, and the degree of competitiveness, for instance, some indices of “economic freedom”.

There is a third group of variables that we call “institutional” variables, including labour taxes, unemployment benefits (amount, duration, and the replacement ratio), the degree of unionisation (union density and union coverage), the structure of collective bargaining (degree of coordination and/or centralisation), employment protection legislation (EPL), the incidence of temporary (or part-time) contracts, active labour market policies, the liberalisation of product markets, housing policies, and many others.¹³ While most empirical investigations refer to developed or OECD countries, some analyse both advanced and emerging economies.¹⁴

Different empirical studies use diverse samples (countries, periods) and employ various econometric methods; these studies exhibit different rankings and, in some cases, even different signs for the specific impact of the above variables. In some studies, static models in which institutional variables affect unemployment rates are used. In other studies, dynamic models are preferred, where institutional variables determine the change in unemployment over time. The lagged level of unemployment is often added to investigate persistent effects.¹⁵ In addition, the outcomes may differ if we explain variation in unemployment rather than employment rates because policies and institutions may affect participation rates.

As to the key results for unemployment rates, the OECD (2006, chapter 7) stresses the statistical significance of tax wedges, (unemployment) benefit systems and stringent (anti-competitive) product market regulations in explaining high unemployment rates and bad labour market performance. Hence, product market reforms can reduce unemployment rates (Fiori et al., 2007). On the contrary, there is no significant impact of the strictness of EPL, consistent with previous studies. The only certain evidence is the lower volatility of employment growth in high

⁹ See Nickell (1998), Nickell et al. (2005), and Belot and van Ours (2001).

¹⁰ While the first two studies focus specifically on youth unemployment, the third refers to the impact of the crisis on unemployment in general, but with an analysis at the regional (NUTS-2) level for the EU countries. In addition, Demidova and Signorelli (2012) investigate the determinants of youth unemployment in Russian regions for the period 2000-2009.

¹¹ With reference to previous financial crises, Choudhry et al. (2012), considering approximately 70 countries, found that the crises’ impact on youth unemployment rate is significant and robust; youth unemployment increase until five years after a financial crisis, with the largest effects in the second and third years.

¹² For example, the share of construction workers is significant in the analysis of Destefanis and Mastromatteo (2010).

¹³ Brandt et al. (2005) use a synthetic index of the intensity of the “reform policies”; they found that OECD-inspired reforms improve labour market performance with a five-year lag in terms of both the employment and unemployment rates. See, in addition, the review by Bassanini and Duval (2006).

¹⁴ These economies are from up to 97 countries (Bernal-Verdugo et al., 2012), 85 countries (Botero et al., 2004), 73 countries (Feldmann, 2009) and 100 countries (Feldmann, 2010).

¹⁵ Furthermore, some econometric analyses control for possible endogeneity and reverse causality from unemployment to labour market institutions (e.g., Bernal-Verdugo et al., 2012).

EPL countries. A similar outcome was found for the impact of union density, while the degree of coordination in collective bargaining appears to be significant (OECD, 2006).¹⁶

Not only labour market but also product market characteristics, including institutions and policies, are relevant in shaping labour market outcomes. In particular, “economic freedom” affects unemployment favourably both by improving the functioning of such markets (direct effect) and by stimulating economic growth (indirect effect). In some empirical studies, an “index of the economic freedom of the world” (EFW) has been used (Feldmann, 2010), but more particular “freedoms” have additionally been investigated: the size of the government, the rule of law and security of property rights, the liberalisation of international trade, and flexible regulations.¹⁷

Moreover, such reforms are mutually reinforcing, justifying comprehensive reform programmes rather than separate labour market reforms¹⁸, and may interact with macroeconomic conditions and shocks.¹⁹ Changes in policies and institutions, together with changes in the output gap, are estimated to explain 74% of the cross-country variance in the observed unemployment changes for the period 1982-2003 (OECD, 2006).

Not only is the impact of macroeconomic shocks amplified by the existence of certain policies and institutions, but the persistence of the shocks is increased because of long run effects on labour demand.²⁰ Alternately, active labour market programmes can reduce the negative effects generated by high unemployment benefits; expenditures on training programmes are especially effective. The key roles of active labour market policies (ALMP) and unemployment benefits in the explanations of changes in both employment and the unemployment rate are confirmed by the empirical analysis of Destefanis and Mastromatteo (2010).²¹

With regard to the specific determinants of youth unemployment, although many authors found that the “scarring” effect of unemployment on young people depends on the overall labour market conditions, such effect is significantly higher for disadvantaged youth. Hence, youth unemployment rates are more sensitive to the business cycle than adult unemployment rates. However, what are the specific reasons for the worse youth labour market performance compared to adults?

On the labour supply side, a lower level and/or different quality of youth human capital and productivity may be one reason for that bad performance. Human capital is a prominent element in the transition of young people from school to the labour market, the risk of unemployment they face, their performance at work, and the quality and stability of their position. Young people with low human capital and few skills are more exposed to long-term unemployment, unstable and low quality jobs, and perhaps social exclusion than young people with high human capital and high skills (OECD, 2005). In most countries, well-educated young adults exhibit higher employment and labour force participation rates and lower unemployment rates. In addition, they have generally been more able to reduce the negative impact of the crises than young people with less education.²²

The problem, however, is that young people, despite a generally higher education than older cohorts, often lack the other two components of human capital: generic and job-specific work experience. Educated young people need to acquire firm-specific knowledge through work for human capital secured at school to become productive (see Carmeci and Mauro, 2003). Thus, the existence of a “youth experience gap” harms the employability of young people. The characteristics

¹⁶ Other studies have found that central or coordinated wage bargaining can improve labour market performance (see Belot and van Ours, 2004). Even the tax wedge exhibits a large role on labour costs and employment when bargaining is conducted at the industry level, as in continental Europe.

¹⁷ Feldmann (2010) considered 100 industrial and developing countries for the period 1980-2008.

¹⁸ This point is additionally stressed in Bassinini and Duval (2009) because improvements in labour market performance require reforms in more than one area of the labour market.

¹⁹ See Blanchard and Wolfers (2000).

²⁰ This effect can be estimated using a dynamic model in which the previous unemployment rate is included as a regressor for explaining changes in current unemployment rates.

²¹ They consider 30 OECD countries over the period 1994-2004. According to their results, much of the overall explanatory power of labour market institutions derives from the performing-enhancing effects of ALMP.

²² Notice that a time of crisis may be a good opportunity to encourage young people to remain in, or return to, education; see Bell and Blanchflower (2010).

of the educational systems and the different processes of human capital formation have additionally been investigated. For example, countries operating a “dual apprenticeship system” improve youth labour performance.²³

The institutional framework of the labour market is related to the demand side. In addition to the impact of high taxes, high unemployment benefits (and, in some studies, high unionisation rates) are relevant in the case of youth unemployment. Specific institutional variables that have been considered include minimum wages, whose impact has however been found to be ambiguous, and the diffusion of temporary contracts (see Neumark and Wascher, 2004, and Booth et al., 2002, respectively).

Employment protection legislation has not been found significant in explaining the behaviour of total unemployment rates. However, this legislation appears more significant for young workers than older workers, but more so for employment rate specifications rather than for unemployment ones. In fact, EPL and lay-off regulations affect the distribution and duration of unemployment by affecting worker turnover more than the unemployment level (OECD, 2006). However, the magnitude of the effect is in general small even in the case of youth unemployment. In any case, empirical results range from a non-significant relationship or even positive effects of EPL²⁴ to a large (negative) impact of EPL or similar indices. For example, Bernal-Verdugo et al. (2012) found that hiring and firing regulations and hiring costs have the strongest effect on unemployment outcomes, especially for youth unemployment. The effect is significant for both OECD and non-OECD groups of countries.²⁵ Reforms strengthening “economic freedom” impact youth unemployment more than general unemployment rates (Feldmann, 2010).²⁶

The matching between labour demand and supply mainly depends on a different set of institutional variables, such as the school-to-work transition (STWT) processes. Such processes are quite heterogeneous in different countries and change over time (see Caroleo and Pastore, 2007; Quintini and Manfredi, 2009; and Ryan, 2001).

The above variables may interact with each other, worsening the youth unemployment problem. For example, cyclical conditions (recessions) may cause a greater impact on the young than other ages because of the higher diffusion of temporary contracts among the young or the strict EPL protecting adult workers.²⁷ In fact, not only are the young who are already in the labour market generally among the first to lose their jobs, especially in countries with the highest EPL on “permanent contracts”, but labour hoarding practices can further reduce the labour demand for young people; thus, the young have greater difficulties in finding another job than do other age groups.

Furthermore, the crises exacerbate structural problems affecting the transition from school to work. Because of the reduction in labour demand, school-leavers compete with more jobseekers for fewer vacancies (see Scarpetta et al., 2010). The risk of a “lost generation” highlights the need to adopt effective active and passive labour policies and adequate STWT institutions to minimise the increase in the number of young people losing effective contact with the labour market and permanently damaging their employment prospects.

²³ Brunello et al. (2007), Checchi (2006). Another possible cause of high youth unemployment and low quality employment is the mismatch between the knowledge acquired through formal education and the skills required by the labour market. For a case study of the characteristics and timing of university-to-work transitions, see Sciulli and Signorelli (2011).

²⁴ O’Higgins (2012), using data for the recent crisis period, found a beneficial influence of the EPL index on youth labour performance; that is, in countries where EPL is strong, young people are less likely to become discouraged workers or unemployed.

²⁵ They considered a large panel of countries over the period 1985-2008, thus controlling for unobserved country-specific characteristics that may affect labour market performance and assessing how the effect of labor markets institutions has evolved over time. The main explanatory variable was the EFW index. In addition, they considered the six sub-components of the composite labour market index.

²⁶ This author estimates that if Italy had enjoyed the same degree of economic freedom as the United States, its unemployment rate might have been reduced by 1.2-1.6% and its youth unemployment rate by 2.3-3.0% (a 3.5-3.9% reduction if the indirect effects via greater economic growth are taken into account).

²⁷ In the EU, just before the crisis in 2008, 41.8% of young people were in temporary employment compared to 14.4% for all employees. The incidence of youth in temporary employment has risen to 44.3% after the crisis. In many countries (for example, in Italy), practically all new employment opportunities in this period have been temporary (O’Higgins, 2012).

Finally, O'Higgins (2011 and 2012) warns that the key problem is not only that young people are more vulnerable to a crisis' effects than older adults but also that these effects are likely to be more long-lasting for the young. Long periods of unemployment erode the skills of young workers, reduce their employability, cause a permanent loss of human capital and make unemployment persistent. In other words, extended difficulties in the search for work early in the work life are likely to have long-term negative consequences for both employment prospects and wages.

4. An econometric investigation

In this section, we present an econometric analysis of our basic research question, i.e., the determinants of the youth unemployment rate (YUR) compared to the total unemployment rate (TUR) and the specific role played by policies and reforms.

4.1. Variables, data and sample

To estimate econometrically the impact of various macroeconomic, structural and institutional variables on the unemployment rate, especially the youth unemployment rate, we used a sample of high income OECD countries for the period 1980-2009. The initial number of countries included in the regressions is 26. One reason to limit our sample to high income OECD countries is the availability of reliable data on various indicators, specifically for labour market reforms and policies. A list of countries included in our analysis is presented in Table A1 in the appendix.

According to the International Labour Organisation (ILO), from which the YUR and TUR data were extracted, the unemployed comprise all persons above a specified age who, during the reference period, were (a) without work, (b) currently available for work, and (c) actively seeking work. The unemployment rate is defined as the number of unemployed in an age group divided by the labour force for that group²⁸.

We have included various explanatory variables to capture their impact on the YUR and TUR. These control variables belong to different categories, e.g., the macroeconomic situation, the demographic condition, governance and economic freedom, the labour market conditions, and policies and reforms. The choice of control variables for our econometric analysis was motivated in Section 3; in particular, we take guidance from previous literature (Booth et al., 2002; OECD, 2006; Destefanis and Mastromatteo, 2010; Feldmann, 2012). Our control variables include the lagged GDP growth rate, inflation, the real interest rate, the education level, the youth population share, the labour market reform index, the economic freedom index, active labour market policies expenditure and unemployment benefits.

Data for GDP growth, the inflation rate, the real interest rate and the population 0-14 years of age are from the World Bank Development Indicators (WDI) historical database. Data on the labour market reforms (LMR) index and the economic freedom index are from the Fraser Institute. The LMR index is our main variable for evaluating the impact of labour market reforms on the youth unemployment rate. The LMR is an un-weighted, composite index based on six measures of labour market institutions: the minimum wage, hiring regulations, firing regulations, centralised collective bargaining, the mandated cost of hiring, and the mandated cost of worker dismissal and conscription. Similarly, economic freedom is a composite measure of Economic Freedom of the World, scaled to take values between 0 (least free) and 10 (most free); the index measures the degree of economic freedom in five different dimensions.

²⁸ In the case of our YUR, the labour force of that age group (15-24 years) is used as the denominator. Similarly, when we are using the total unemployment rate as our dependent variable, the TUR is calculated as the total unemployed labour force divided by the total labour force in the age group 15-64 years.

Detailed explanations of definitions, calculations and sources of all data used in the empirical analysis are presented in Appendix Table A2. The summary statistics of the dependent and independent variables are presented in Table A3.

4.2. Model and econometric specifications

The empirical investigation of the impact of the potential determinants of the unemployment rate on the YUR is conducted for a sample of high income OECD countries for the period 1980-2009. The empirical estimation is performed with unbalanced panel data to fully utilise the available information for our variables of interest.

The baseline model for estimation is

$$YUR_{it} = LMR_{it}\beta + MEC_{it}\lambda + Z_{it}\mu + \varepsilon_{it} \quad (1)$$

where YUR_{it} represents the youth unemployment rate in country i at time t and is our dependent variable. Alternatively, YUR_{it} is replaced by TUR_{it} when we use the total unemployment rate as our dependent variable. LMR_{it} represents the labour market reforms index. LMR_{it} is an un-weighted composite index, and its value ranges from 1-10. MEC_{it} represents the macroeconomic conditions prevailing in country i at time t . Z_{it} is a vector of other control variables, and ε_{it} is the error term. We have employed a fixed effect panel estimation method to estimate our baseline model. A fixed effects model was selected on the basis of a Hausman test. The Hausman test statistic and corresponding p-value are reported in the results table.

4.3. Econometric results and discussion

We estimate equation (1) using a fixed effects panel model over the period 1980-2010 for a panel of high income OECD countries. The results from the empirical estimation are presented below in Table 3 for the YUR and in Table 4 for the TUR. We discuss the results in Table 3 and Table 4 together to capture and highlight the difference between the results for youth unemployment and the total unemployment rate.

In Tables 3 and 4, column 1 reports the results from our base model. In the base model, we evaluate the impact of the labour market reform index and lagged GDP growth rate on the youth unemployment rate. We observe that the LMR index coefficient is negative and statistically significant. The result implies that labour market reforms improve the YUR. This finding is additionally true for the total unemployment rate, shown in Table 4. Similarly, a higher GDP growth rate reduces unemployment. A comparison of the YUR and TUR results show that the favourable impacts of labour market reforms and economic growth are particularly large for young workers. Our estimates suggest that a one unit increase in the LMR index will result in a 0.98 per cent decrease in youth unemployment and an 0.83 per cent decrease in the total unemployment rate, *ceteris paribus*. In summary, according to our estimates, an improvement in the LMR index and economic growth is likely to reduce unemployment both among the total labour force and among young workers.

We then incorporate additional explanatory variables to evaluate the role of various macroeconomic, demographic, and institutional indicators in determining the total unemployment rate and the unemployment rate amongst young people. In model 1, we incorporate the inflation rate. The coefficient for the inflation rate is negative and statistically significant, implying that inflation lowers the YUR and the TUR (see model 1 in Tables 3 and Table 4). The coefficient of the LMR index remains negative and significant, implying its robustness.

In model 2, we control for the share of children in the total population. We incorporate the share of the population aged 0-14 years in the total population as a demographic variable. Our assumption is that a large share of those aged 0-14 years will have implications for the unemployment rate, specifically for young workers. The coefficient for share of children is positive for both TUR and YUR but is statistically significant only for youth unemployment rate.

In model 3, we introduce the real interest rate variable. A high real interest rate may lead to lower investment and a decline in labour demand. Our estimates suggest that a high interest rate is likely to result in a high unemployment rate; however, the coefficient is statistically significant only for the TUR. Our findings are in agreement with previous literature (Blanchard and Wolfers, 2000, Nickell et al., 2005 and Feldmann, 2010)

Table 3: Determinants of the Youth Unemployment Rate

	Base Model	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
LMR Index	-0.978**	-1.148***	-0.775***	-1.026**	-0.386	-0.793***					-0.066
	0.219	0.228	0.241	0.389	0.501	0.239					0.167
GDP Growth (-1)	-0.971***	-0.950***	-0.914***	-0.874***	-0.932***	-0.941***	-0.740***	-0.687***	-0.854***	-0.588***	-0.650***
	0.113	0.113	0.111	0.212	0.246	0.113	0.168	0.138	0.108	0.121	0.091
Inflation		-0.189**	-0.332***	-0.161	-0.342***	-0.223***	-0.392***	-0.072	-0.07	-0.531***	-0.102*
		0.074	0.08	0.125	0.128	0.075	0.12	0.135	0.063	0.181	0.054
Population aged 0-14			0.644***								
			0.161								
Real Interest Rate				0.216							
				0.157							
Education					-1.224*						
					0.654						
Part-time employment						-0.366***					
						0.108					
EFI							-3.836***				
							1.156				
ALMPEMP								-0.231***			
								0.041			
Employment tax									0.201		
									0.123		
Unemployment Benefits										2.316***	
										0.871	
Unemployment Rate (-1)											0.798***
											0.036
Constant	23.391***	24.972***	11.467***	23.133***	33.919***	28.608***	46.366***	20.037***	14.988***	15.453***	5.772***
	1.47	1.581	3.704	2.891	6.262	1.94	8.735	0.685	1.925	1.033	1.571
Hausman Test Statistic	8.37	10.23	10.29	21.62	219	13.9	9.31	11.87	14.06	38.41	109.97
P-value	0.06	0.03	0.02	0.00	0.00	0.03	0.05	0.04	0.05	0.00	0.00
Observations	321	321	321	248	114	308	326	329	328	260	319
Number of Countries	26	26	26	25	26	26	26	19	19	25	26
R-square	0.21	0.23	0.27	0.26	0.205	0.256	0.275	0.48	0.177	0.28	0.761
Significance of Model	35.97***	29.093***	26.965***	5.914***	5.425***	23.854***	17.027***	27.495***	21.903***	30.015***	178.238***

Note: Robust standard errors are reported under the coefficient value.* significant at 10 %, ** significant at 5 %, *** significant at 1 %.

The education indicator is used as explanatory variable to capture the impact of human capital (model 4). The coefficient for education is negative both for the youth and total unemployment rate but statistically significant only for the YUR. Estimates suggest that an extra year of schooling will help young workers find jobs.

Part time work opportunities can lead to declines in unemployment rate. To capture this phenomenon, we include part time employment as percentage of total employment as an explanatory variable (model 5). As expected, the high part time employment coefficient is negative and statistically significant. This result implies that part time jobs can be helpful for unemployment problem.

The Economic Freedom Index (EFI) is included in model 6 as an explanatory variable to capture its impact on labour market performance. The EFI coefficient is negative and statistically significant, as shown in model 6 in Tables 3 and 4. This result implies that more economic freedom can lead to a decline in the youth and overall unemployment rate. The EFI is a summary index of governance, legal structure, property rights, access to money, freedom to international trade and regulation of credit, and labour and business. Improvements in these dimensions can be helpful for the unemployment problem. Because labour market reforms are already included in the EFI, we exclude the LMR index variable from our regressor list. Our estimates for the EFI suggest that economic freedom substantially reduces unemployment, especially amongst young workers.

To capture the impact of labour market policies and reforms, we include expenditures on active labour market policies per unemployed individual, employment tax and unemployment benefits. The results are presented in models 7, 8 and 9 in Tables 3 and 4. The coefficient for the active labour market policy expenditures is negative and statistically significant both for the youth and overall unemployment rate. Active labour market policies appear to reduce the unemployment rate, especially among young workers. The employment tax coefficient is positive, which implies that heavy taxes on labour will lead to a high unemployment rate. However, the employment tax coefficient is statistically significant only for the TUR (see model 8 in Table 4). Moreover, our empirical estimates suggest that unemployment benefits have negative implications for labour market performance. The unemployment benefit coefficient is positive and statistically significant for both the TUR and YUR. This result implies that generous unemployment benefits have a large and significant impact on unemployment for young and adults workers²⁹.

The short term determinants of the unemployment rate are estimated by including the lagged value of the dependent variable as an explanatory variable. The estimation results are presented in model 10 of Tables 3 and 4. The LMR variable coefficient is still negative but statistically insignificant³⁰. The lagged dependent variable coefficient is highly significant, reflecting the persistent effect of unemployment. The inclusion of a lagged dependent variable may potentially lead to a multicollinearity problem. To detect the possible quasi-dependence between several explanatory variables, we calculated the variance inflation factor³¹ (VIF). The result suggests that multicollinearity is not a problem in our analysis.

In our discussion of the empirical estimation results, the impact and magnitude of the explanatory variables differ for the YUR and TUR, as highlighted in the previous discussion. To test the equality of coefficients for the YUR and TUR statistically, we employ the Wald test³². The

²⁹ For an analysis of the design of unemployment benefits (amount, duration and replacement ratio), see Corsini (2012).

³⁰ In other words, the LMR effect is not visible in the short run. Perhaps the LMR affects labour market performance with a time lag. Alternately, the very strong persistence effect of lagged dependent variable, which is additionally visible from high R square, may be another reason the effect is not visible in the short run.

³¹ In Table 3, the VIF for lagged youth unemployment rate is 3.64, for inflation 2.29, for LMR 4.01 and for lagged GDP growth 3.13. The tolerance levels are 0.28, 0.44, 0.25 and 0.32, respectively. The mean value of the VIF is 3.27. In Table 4, the VIF for the lagged total unemployment rate is 3.63, for inflation 2.21, for LMR 3.99 and lagged GDP growth 3.22. The tolerance level is 0.28, 0.45, 0.25 and 0.31, respectively. The mean value for the VIF is 3.26. The low values of the VIF suggest that multi-collinearity is not a problem in our estimations.

³² Let β_A and β_B denote two vectors of k parameters, one for group A and one for group B, with covariance matrices V_A and V_B ; then, the Wald statistic

$$(\hat{\beta}_A - \hat{\beta}_B)'(V_A + V_B)^{-1}(\hat{\beta}_A - \hat{\beta}_B),$$

results indicate that the null hypothesis has to be rejected. Thus, age-targeted policies to address the unemployment rate may be more successful than a uniform policy.

Table 4: Determinants of the Total Unemployment Rate

	Base Model	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	
LMR Index	-0.823 ***	-0.910 ***	-0.650 ***	-0.735 ***	-0.521 **	-0.649 ***						-0.092
	0.202	0.119	0.202	0.14	0.224	0.123						0.077
GDP Growth (-1)	-0.453 ***	-0.442 ***	-0.415 ***	-0.422 ***	-0.494 ***	-0.463 ***	-0.281 ***	-0.396 ***	-0.472 ***	-0.121		-0.340 ***
	0.086	0.059	0.075	0.068	0.124	0.058	0.086	0.081	0.056	0.097		0.047
Inflation		-0.098 **	-0.196 *	-0.078 *	-0.200 **	-0.104 ***	-0.206 **	-0.041	-0.072 **	-0.238		-0.027
		0.038	0.105	0.043	0.097	0.039	0.086	0.072	0.033	0.154		0.026
Population aged 0-14			0.445									
			0.279									
Real Interest Rate				0.153 ***								
				0.043								
Education					-0.676							
					0.546							
Part-time employment						-0.307 ***						
						0.056						
EFI							-2.375 ***					
							0.714					
ALMPEMP								-0.146 ***				
								0.04				
Employment tax									0.310 ***			
									0.042			
Unemployment Benefits										2.311 ***		
										0.525		
Unemployment. Rate (-1)											0.827** *	
											0.02	
Constant	13.061 ***	13.865 ***	4.529	12.162 ***	19.375 ***	17.071 ***	25.798 ***	11.190 ***	4.860 ***	5.517 ***	2.838 ***	
	1.39	0.817	5.357	1.065	5.375	0.992	5.391	0.665	0.704	0.609	0.683	
Hausman Test Statistic	5.05	270	121.35	14.76	8.07	14.47	15.9	12.9	12.26	19.19	134.33	
P-value	0.08	0	0	0.03	0.06	0.03	0.03	0	0	0	0	
Observations	344	334	334	256	119	320	339	348	355	272	332	
Number of Countries	27	27	27	26	27	27	27	20	20	26	27	
R-square	0.22	0.242	0.308	0.273	0.209	0.307	0.239	0.461	0.302	0.329	0.84	
Significance of Model	14.30 ***	32.384 ***	11.512 ***	21.219 ***	6.067 ***	32.012 ***	14.244 ***	14.571 ***	47.918 ***	35.225 ***	824.876 ***	

Note: Robust standard errors are reported under the coefficient value.* significant at 10 %, ** Significant at 5 %, *** significant at 1 %.

has a chi-squared distribution with k degrees of freedom under the null hypothesis that the estimates of β_A and β_B have the same expected value. The test statistic is 1337.36, and the p-value is 0.00. We can reject the null hypothesis of equality of the coefficients.

LMRs reduce the unemployment rate, and their coefficients are significant in most cases (in 5 out of 7 specifications in case of YUR and in 6 out of 7 specifications in case of TUR). The inclusion of various control variables does not change the sign and significance of this variable, thus reflecting the robustness of our findings. For a sensitivity analysis, we included more control variables³³ in the analysis, but our findings on the impact of LMR remain robust.

5. Conclusions

Unemployment, especially for young people, is a key problem in many developed countries³⁴. In general, total and youth unemployment depend on macroeconomic, structural, educational and labour market policies, in addition to the role played by labour market institutions and regulations.

This study investigates the determinants of the youth unemployment rates during the period 1980-2009 for a sample of high-income OECD countries. The estimation technique used is a fixed effects panel model. The empirical study highlights the differentiated impact of various determinants on total unemployment rate (TUR) and youth unemployment rate (YUR).

We find that the impact of labour market reforms (LMR) on the unemployment rate is statistically significant and robust and that LMRs are more substantial for the YUR than the TUR. The inclusion of many control variables, including lagged GDP growth, inflation, real interest rate, education level, part time employment and population age structure, does not change the sign and significance of the key explanatory variable. Moreover, our results additionally show that GDP growth, economic freedom, education, part time employment and active labour market policies reduce unemployment, especially for young people, while the proportion of young people in a population and unemployment benefits increase the YUR and TUR. Finally, employment taxes increase only the TUR.

In summary, the key findings of our econometric estimates are as follows: (i) the effect of various determinants on youth unemployment is greater than the effect on overall unemployment and (ii) the differences between the results for the youth and total unemployment rates are statistically significant. In conclusion, our findings suggest that to reduce the overall (and youth) unemployment rate, policy makers³⁵ should first stimulate economic growth. Next, policymakers should implement appropriate labour market reforms, adopt generous “active” policies for the labour market that are well integrated with the necessary “passive” labour market policies and foster economic freedom in product markets. These measures should be helpful, especially for countries with particularly high unemployment among young people.

References

- Aricò F.R. and Stein U. (2012), “Was Short-Time Work a Miracle Cure during the Great Recession? The Case of Germany and Italy”, *Comparative Economic Studies*, 3.
- Arpaia A. and Curci N. (2010), “EU Labour Market Behaviour During the Great Recession”, *European Economy*, Economic Papers, 405.
- Bartolucci F., Choudhry M., Marelli E. and Signorelli M. (2011), “Financial Crises and Labour Market: Beyond the Okun’s Law”, presented at the 16th World Congress *International*

³³ The control variables included employment share in various sectors, foreign direct investment, gross capital formation, openness and financial depth. The results are available upon request.

³⁴ The less developed economies are more affected by “working poverty” and “working vulnerability” than “unemployment”. Unemployment is difficult to define and calculate in those countries, where the distinction between the “formal” labour market and employment in the “informal” economy is frequently unclear. For a comparison across world regions based on different labour market indicators, see Brada and Signorelli (2012).

³⁵ For a recent review of policies to reduce youth unemployment, including an appraisal of measures taken in European countries after the recent crisis, see O’Higgins (2011).

- Economic Association*, Tsinghua University, Beijing, July 4-8, 2011; also at the 26th *National Conference of Labour Economics (AIEL)*, Università Cattolica del Sacro Cuore, Milan, 15-16 September 2011.
- Bassanini A. and Duval R. (2006), *Employment Patterns in OECD Countries: Reassessing the Role of Policies and Institutions*. OECD Economics Department working paper, 486.
- Bassanini A. and Duval R. (2009), “Unemployment, Institutions, and Reform Complementarities: Re-Assessing the Aggregate Evidence for OECD Countries”, *Oxford Review of Economic Policy*, 25: 40–59.
- Bell D. and Blanchflower D. (2010), *Youth unemployment: Déjà vu?*, IZA Discussion Paper no. 4705, Bonn.
- Belot, M. and Van Ours J.C. (2001), “Unemployment and Labor Market Institutions: An Empirical Analysis”, *Journal of Japanese and International Economics*, 15(4): 403-418.
- Belot, M. and Van Ours J.C. (2004), “Does the Recent Success of Some OECD Countries in Lowering their Unemployment Rates Lie in the Clever Design of their Labour Market Reforms?”, *Oxford Economic Papers*, 56, 4, 621-42.
- Bernal-Verdugo E.L., Furceri D. and Guillaume D. (2012), “Labor Market Flexibility and Unemployment: New Empirical Evidence of Static and Dynamic Effects”, *Comparative Economic Studies*, 3.
- Blanchard O. (2006), “European Unemployment: The Evolution of Facts and Ideas”, *Economic Policy*, 21(45): 5-59.
- Blanchard O. and Wolfers J. (2000), “The Role of Shocks and Institutions in the Rise of European Unemployment: The Aggregate Evidence”, *Economic Journal*, 110(462): 1–33.
- Booth A.L., Francesconi M. and Frank J. (2002), “Temporary Jobs: Stepping Stones or Dead Ends?”, *Economic Journal*, 112(480), F189-F213.
- Botero J.C., Djankov S., La Porta R., Lopez-de-Silanes F. and Shleifer A. (2004), “The Regulation of Labor”, *Quarterly Journal of Economics*, 119 (4): 1339–1382.
- Brada J.C. and Signorelli M. (2012), “Comparing Labour Market Performance: Some Stylized Facts and Key Findings”, *Comparative Economic Studies*, 3.
- Brandt N., Burniaux J.M. and Duval R. (2005), *Assessing the OECD Jobs Strategy: Past Developments and Reforms*, OECD Economics Department working paper, 429.
- Brunello G., Garibaldi P. and Wasmer (2007), *Education and Training in Europe*, Oxford University Press, New York.
- Carmeci L. and Mauro L. (2003), “Long Run Growth and Investment in Education: Does Unemployment Matter?”, *Journal of Macroeconomics*, 25, 123-137.
- Caroleo F.E. and Pastore F. (2007), “The Youth Experience Gap: Explaining Differences Across EU Countries”, *Quaderni del Dipartimento di Economia, Finanza e Statistica*, Università di Perugia, 41.
- Checchi D. (2006), *The Economics of Education*, Cambridge: Cambridge University Press.
- Choudhry M., Marelli E. and Signorelli M. (2012), “Youth Unemployment Rate and Impact of Financial Crises”, *International Journal of Manpower*, 33, 1, 76-95.
- Clark K.B. and Summers L.H. (1982), “The Dynamics of Youth Unemployment”, in R. B. Freeman and D. A. Wise (Eds.), *The Youth Labour Market Problem: its Nature, Causes and Consequences*. Chicago Press/NBER.
- Corsini L. (2012), “Unemployment Insurance Schemes, Liquidity Constraints and Re-employment: A Three Country Comparison”, *Comparative Economic Studies*, 2.
- Demidova O. and Signorelli M. (2012), “Determinants of Youth Unemployment in Russian Regions”, *Post-Communist Economies*, 2.
- Destefanis S. and Mastromatteo G. (2010), “Labour-market Performance in the OECD: Some Recent Cross-country Evidence”, *International Journal of Manpower*, 31, 7, 713-31.
- European Commission (2010), *Employment in Europe 2010*, Brussels.

- Feldmann H. (2009), “The Unemployment Effects of Labor Regulation around the World”, *Journal of Comparative Economics*, 37 (1): 76–90.
- Feldmann H. (2010), “Economic Freedom and Unemployment”, chapter 5 in: *Economic Freedom of the World*, Annual Report.
- Fiori G., Nicoletti G., Scarpetta S. and Schiantarelli F. (2007), “Employment Outcomes and the Interaction Between Product and Labor Market Deregulation: Are They Substitutes or Complements?”, *IZA Discussion Papers*, No. 2770.
- ILO (2010), *Global Employment Trends for Youth. Special Issue on the Impact of Global Economic Crisis on Youth*, International Labour Organization, Geneva, August.
- ILO (2012), *Key Indicators of the Labour Market (KILM)*, Seventh Edition, Geneva.
- IMF (2010), “Unemployment Dynamics During Recessions and Recoveries: Okun’s Law and Beyond”, Chapter 3 in *World Economic Outlook: Rebalancing Growth*, Washington.
- Kolev A. and Saget C. (2005), “Understanding Youth Labour Market Disadvantage: Evidence from South-East Europe”, *International Labour Review*, 144(2), 161-187.
- Lee J. (2000), “The Robustness of Okun’s law: Evidence from OECD Countries”, *Journal of Macroeconomics*, 22(2): 331-56.
- Marelli E., Patuelli R. and Signorelli M. (2012), “Regional Unemployment in the EU before and after the Global Crisis”, *Post-Communist Economies*, 2.
- Neumark D. and Wascher W. (2004), “Minimum Wages, Labour Market Institutions, and Youth Employment: A Cross-National Analysis”, *Industrial and Labour Relations Review*, 57(2), 223-247.
- Nickell S. (1998), “Unemployment: Questions and Some Answers”, *The Economic Journal*, 108(448): 802-816.
- Nickell S., Nunziata L. and Wolfgang O. (2005), “Unemployment in the OECD since the 1960s. What do we know?”, *Economic Journal*, 115, 500: 502-06.
- OECD (1994), *OECD Jobs Study*, Paris.
- OECD (2005), *Education at Glance*, Paris.
- OECD (2006), *Employment Outlook*, Paris.
- OECD (2009), *Employment Outlook*, Paris.
- O’Higgins N. (2005), “Trends in the Youth Labour Market in Developing and Transition Countries”, *Labor and Demography Working Paper*, 507002.
- O’Higgins N. (2011), “The Impact of the Economic and Financial Crisis and the Policy Response on Youth Employment in the European Union”, presented at the *Eaces International Workshop*, Perugia, November 10-11.
- O’Higgins N. (2012), “This Time It’s Different? Youth Labour Markets during ‘The Great Recession’ ”, *Comparative Economic Studies*, 3.
- Perugini C. and Signorelli M. (2010a), “Youth Unemployment in Transition Countries and Regions”, in Marelli E. and Singorelli M. (eds.), *Economic Growth and Structural Features of Transition*. London and New York, Palgrave-Macmillan.
- Perugini C. and Signorelli M. (2010b), “Youth Labour Market Performance in European Regions”, *Economic Change and Restructuring*, 2.
- Pissarides C.A. and McMaster I. (1990), *Regional Migration, Wages, and Unemployment: Empirical Evidence and Implications for Policy*, Oxford Economic Papers, 42, 8,12-831.
- Quintini G. and Manfredi T. (2009), “Going Separate Ways? School-to-Work Transitions in the United States and Europe”, *OECD Social, Employment and Migration Working Paper*, 90.
- Ryan P. (2001), “The School-to-Work Transition: A Cross-National Perspective”, *Journal of Economic Literature*, 39(1), 34-92.
- Scarpetta S., Sonnet A. and Manfredi T. (2010), “Rising Youth Unemployment During the Crisis: How to Prevent Negative Long-term Consequences on a Generation?”, *OECD Social, Employment and Migration Working Papers*, 6.

- Sciulli D. and Signorelli M. (2011), “University-to-Work Transitions: An Empirical Analysis on Perugia Graduates”, *European Journal of Higher Education*, 1.
- Solow R.M. (2000), ‘Unemployment in the United States and in Europe: A Contrast and the Reasons’, *CESifo Working Paper*.
- Verick S. (2009), “Who is Hit Hardest During a Financial Crisis? The Vulnerability of Young Men and Women to Unemployment in an Economic Downturn”, *IZA Discussion Papers*, 4359.

APPENDIX

Table A1: List of Countries

Australia	Greece	New Zealand
Austria	Hungary	Norway
Belgium	Iceland	Portugal
Canada	Ireland	Slovakia
Czech Republic	Italy	Spain
Denmark	Japan	Sweden
Finland	Korea, Republic of	Switzerland
France	Luxembourg	United Kingdom
Germany	Netherlands	United States

Table A2: Data description and Sources

Variable	Definition	Source
<i>Dependent Variables</i>		
Youth Unemployment Rate	Youth (15-24 years) unemployed labor force/youth labor force	Key Indicators of Labor market (KILM) 7 th Edition
Total Unemployment Rate	Total unemployed labor force/Total labor force	Key Indicators of Labor market (KILM) 7 th Edition
<i>Key Explanatory Variable</i>		
Labor Market Reforms Index	Labor Market Regulations (LMR) index as an explanatory variable. LMR is a composite index based on six measures of labor market institutions (minimum wage, hiring and firing regulations, centralized collective bargaining, mandated cost of hiring, mandated cost of worker dismissal and conscription). The LMR index is an un-weighted average of these six measures and its value varies from 1-10	Fraser Institute http://www.freetheworld.com/2011/2011/Dataset.xls
<i>Control Variables</i>		
GDP Growth	Annual GDP growth	World Development Indicator
Inflation	Annual change in the consumer price index	World Development Indicators
Real Interest Rate	The lending interest rate adjusted for inflation as measured by GDP deflator	World Development Indicators
Population aged 0-14	Share of population in age group 0 to 14 years	World Development Indicators
Economic Freedom Index	Summary index from Economic Freedom of the World, scaled to take values between 0 (least free) and 10 (most free). The index measures the degree of economic freedom in the following areas: (1) Size of government: expenditures, taxes and enterprises, (2) Legal structure and security of property rights, (3) Access to sound money (4) Freedom to trade internationally, (5) Regulation of credit, labor, and business. The summary ratings of the index are the arithmetic means of the five area ratings.	Fraser Institute http://www.freetheworld.com/2011/2011/Dataset.xls

Part time Employment	Part time employment as percentage of total employment	World Development Indicators
Education	Average years of schooling	Barro and Lee
Employment Tax	The employment tax rate is $\frac{ESS}{IE-ESS}$ With ESS equal to employers' social security contributions and IE equal to total compensation for employees. ESS is available from the OECD National Accounts detailed tables and IE from OECD Revenue Statistics	The CEP – OECD Institutions Data Set (1960-2004) http://eprints.lse.ac.uk/19789/
ALMP/UNEMP	Expenditure on Active Labour Market Policies per unemployed individual normalised on GDP per member of the labour force	The CEP – OECD Institutions Data Set (1960-2004) http://eprints.lse.ac.uk/19789/
Unemployment Benefits	Out of work income maintenance and support-Full unemployment benefits	OECD-Stats http://stats.OECD.org/index.aspx?

Table A3: Summary Statistics of Variables

Variable	Mean	Std. Dev.	Min	Max
Youth Unemployment Rate	14.460	7.463	3.200	43.800
Total Unemployment Rate	6.652	3.428	1.613	22.676
Labor Market Reforms	6.076	1.642	2.620	9.280
Population aged 0-14 year	17.989	2.679	13.322	29.675
Real Interest Rate	4.487	3.301	-10.600	12.873
Inflation	3.231	3.206	-9.629	28.303
GDP growth	2.412	2.731	-7.580	10.579
Part-time Employment	15.273	7.440	1.600	36.700
Economic Freedom Index	7.403	0.583	5.240	8.640
Unemployment Benefits	0.781	0.527	0.080	2.810
Average year of schooling	9.874	1.730	5.533	13.190
Employment Tax Rate	14.836	8.448	0.000	30.000
ALMP/UNEMP	16.468	15.082	1.570	103.560