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Youth Unemployment
Determinants and Interactions with Inequality

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CHAVE MÓVEL

Dedication

I dedicate this work to the memory of my uncle and godfather Fernando, and to my son Francisco. I also want to dedicate this to my dear Vanessa, whose support over the last couple of years made this not only easier, but possible, and to my mother, Paula, the first one to actively support this enterprise.

Acknowlegments

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Secondly, I am also grateful to all the professors I met in the curricular year. They made this return to education easy, enriching my experience with their knowledge, laying the foundation for this dissertation.

Last, but not least, I would like to mention my father, who may have been the first casualty of my lack of time, and my colleagues, who made me feel welcome, and kindly helped me in several occasions.

Resumo

As taxas de desemprego jovem são significativa e consistentemente mais elevadas em comparação com as taxas de desemprego totais, atingindo valores particularmente altos em contexto de crise. O objetivo deste trabalho é aferir os determinantes do desemprego jovem em países desenvolvidos, recorrendo ao rácio entre as taxas de desemprego jovem e total, e investigar o seu impacto na desigualdade de rendimentos. Utilizando dados de 18 países da OCDE entre 1990 e 2019, os resultados das estimações demonstram que a flexibilização dos mercados de trabalho e o crescimento económico ampliam a disparidade entre as taxas de desemprego jovem e total, enquanto o nível educacional pós-secundário a reduz. Adicionalmente, este trabalho não demonstra evidências de que exista um impacto significativo do desemprego jovem na desigualdade de rendimentos.

Palavras-chave

Desemprego Jovem; Determinantes; Desigualdade de rendimentos

Abstract

Youth unemployment rates are significantly and consistently higher than total unemployment rates, hitting particularly high values in a crisis context. The aim of this work is to assess the determinants of youth unemployment in developed countries, relying on a youth to total unemployment ratio, and investigate its impact on income inequality. Using data from 18 OECD countries from 1990 to 2019, the results of the estimations indicate a widening effect of labor market flexibilization and economic growth on the gap between youth and total unemployment rates, with a narrowing effect from post-secondary educational attainment. Moreover, this work shows no evidence of a significant impact of youth unemployment on income inequality.

Keywords

Youth Unemployment; Determinants; Income Inequality

Table of contents

List of figures

List of tables

List of Acronyms

EFI	Economic Freedom Index
GDP	Gross Domestic Product
ILO	International Labor Organization
LMRI	Labor Market Regulation Index
NEET	Not in Education, Employment, or Training
OECD	Organisation for Economic Co-operation and Development
PPP	Purchasing Power Parity
UK	United Kingdom
USA	United States of America
VIF	Variance Inflation Factor

1. Introduction

When a crisis comes along, such as the current Covid-19 crisis or the Great Recession, young people are among those who pay the heaviest toll, being disproportionally affected by unemployment (ILO, 2021b; OECD, 2021). This is consistent with studies showing a higher sensitivity of the youth unemployment rate – when compared to the total unemployment rate – to business cycles (Bal-Domańska, 2022; Butkus and Seputiene, 2019; Verd, Barranco, and Bolíbar, 2019; OECD, 2008). Additionally, the disparity between youth and total unemployment rates is not restricted to recession periods, but a persistent phenomenon in developed countries (OECD, 2020; OECD, 2019; ILO, 2021b; ILO, 2017). Moreover, studies have shown that the consequences of unemployment for young people on future income are of higher magnitude, and more permanent than those of adult unemployment, representing a "scarring" effect (Ayllón, Valbuena and Plum, 2021; De Fraja, Lemos and Rockey, 2021; Mroz and Savage, 2006; Gregg and Tominey, 2005).

There are several studies empirically assessing the determinants of youth unemployment, or the impact on it of a specific factor. The flexibilization of the labor market is one of the factors frequently mentioned as contributing to youth unemployment, which leads to a higher rate of fixed-term and temporary contracts, especially among young workers (O'Reilly, Eichhorst, Gábos, Hadjivassiliou, Lain, Leschke, McGuinness, Kureková, Nazio, Ortlieb, Russell, and Villa, 2015), making them the first ones to fire when companies need to, and lower wages, which can represent a risk of future unemployment (Stewart, 2007). Liotti (2021) studied the relationship between youth unemployment and labor market regulation in 28 European countries, concluding that labor market flexibility is unlikely to help these countries reduce their youth unemployment rates. In Italy, given the specific context of the great recession, labor market regulation had a positive effect on unemployment, with a higher magnitude on youth unemployment (Liotti, 2020). In the case of high minimum wages, it is possible that they negatively influence the ease of entry in the labor market, conditioning the ability of young people to gain experience (Gorry, 2013), with labor market flexibility playing a role on how minimum wages can have an impact on youth unemployment (Neumark and Wascher, 2004). However, labor market reforms towards deregulation are also thought to help reduce total unemployment in developed countries (Nickell, Nunziata, and Ochel, 2005; Belot and Von Ours, 2000), and Breen (2005) points out that countries with more flexible labor markets seem to have lower levels of youth unemployment. The literature has also found that economic growth has a relevant impact on youth unemployment, as well as education, considering that if young people remain longer in education, they will not be unemployed, and that those

who are more educated are more likely to have a smooth school-to-work transition, reducing the risk of future unemployment (Pompei, 2021; ILO, 2017).

Our work aims to assess the determinants of youth unemployment, accounting for fluctuations that affect significantly more, or strictly young people. In all the articles mentioned above the indicator used for youth unemployment is the youth unemployment rate, with some authors using the rate of young people not engaged in education, employment, or training (NEET). We were not able to find any article where the dependent variable used is the ratio between youth and total unemployment rates, to assess the determinants of youth unemployment. Using this ratio as the dependent variable allows us to determine the factors that affect specifically youth unemployment in comparison to total unemployment, which is new in the literature. Another way this study adds to existing literature is by estimating the influence of youth unemployment on income inequality. Despite the persistent reference to the "scarring" effects of youth unemployment (Ayllón et al., 2021; De Fraja et al., 2021; Mroz and Savage, 2006; Gregg and Tominey, 2005), we have not found recent econometric studies evaluating the weight of youth unemployment on overall income inequality.

We find that the ratio between youth and total unemployment rates deteriorates with the flexibilization of labor markets and economic growth. Regarding labor market regulations, those regulating fixed term contracts (*i. e.*, how permissive the legislation is with permanent tasks being associated with fixed term contracts and how many consecutive fixed term contracts are allowed before tenure) and the minimum wages of trainees and first-job employees have the most significant impact on the gap between youth and total unemployment. Additionally, we found no evidence that youth unemployment has a short-term impact on income inequality.

The present work is structured as follows. In the second chapter we present a literature review on the determinants and consequences of youth unemployment, with the latter focusing on income losses. In the third chapter we present our data and the estimation methods used. In the fourth chapter we present the results of our estimations and discuss them. The fifth chapter summarizes our findings, underlining their implication.

2. Literature review

The present chapter consists of a literature review with two sections. The first section goes downstream, observing the consequences of youth unemployment and its potential connection with income inequality, showing the importance of this issue. The second section exploits the determinants of youth unemployment according to the literature.

2.1. The "scarring" effect of youth unemployment

Someone who is unemployed at a given time is more likely to be unemployed once again in the next year, with a similar effect from low-wage employment (Stewart, 2007). Considering that one of the characteristics of working young people is the precariousness of their jobs (Liotti, 2020) and their role in the growing polarization of the labor market, where young workers are joining more low and high-skilled jobs, with the middle-skilled jobs being mostly held by prime-age workers (OECD, 2020; ILO, 2017), Stewart's (2007) conclusions are particularly worrying for young people. Also, youth unemployment results in permanent income losses, in addition to the obvious temporary ones that come directly from the loss of a job (Arulampalam, Gregg, and Gregory, 2001; De Fraga et al., 2021; Gregg and Tominey, 2005). As the first works focusing on this "scarring" effect were performed using data from the United States of America (USA), there was a concern that this effect, intensity and/or durability might be specific to the country, or perhaps less prominent in countries with stronger welfare systems (Arulampalam et al., 2001; Eliason and Storrie, 2006). This is because the more flexible labor market in the USA is expected to promote a fast re-employment of unemployed people, unlike in the European countries, where there is a stronger regulation and unemployment protection. Eliason and Storrie (2006) study this phenomenon in Sweden, a country with a robust Welfare system, obtaining results that support the idea that in a substantially different context from the USA, there are also significant long-term income losses for unemployed people, particularly for those aged 21-30, and 41-50 years old. Using data from the United Kingdom (UK), De Fraja et al. (2021) narrowed the age groups to 18-20, 21-23 and 24-26 years old, allowing for a more accurate interpretation of the results. The authors found that unemployment at ages of 18-20 years old results in a lifetime income loss of 1.2%/year for each month of unemployment, an effect that is lower when unemployment occurs at ages of 21-23 years old and seems to be temporary when it occurs from 24 to 26 years. These conclusions may imply that, by using an age interval from 21 to 30 years old, the impact of youth unemployment on future income in Sweden (Eliason and Storrie, 2006) is underestimated, since the results with narrower groups in the UK show that from 24 years old forward the "scarring" effect seems to be null or negligible (De Fraja et al., 2021). The "scarring" effect is the most covered economic consequence of youth

unemployment, among a vast array of repercussions, such as the worsening of health, well-being and job satisfaction, and the transmission of disadvantages through generations (O'Reilly et al., 2015).

Global inequality has been rising in the last decades, not only in developing countries, but also in developed ones. The growth of income and wealth inequality in developed countries has been sharper in the USA and Canada, and comparably slower in Europe, where we find the lowest inequality levels. However, even the inequality levels and trends in Europe are far from desirable (Alvaredo et al., 2018). Since youth unemployment permanently damages employment prospects and income, as detailed in the previous paragraph, there could be a relationship between youth unemployment and income inequality. First, via the manifest loss of income that comes with unemployment, potentially mitigated by unemployment benefits, then through the permanent loss of income and future unemployment spells. We were not able to find articles studying specifically the relationship between youth unemployment and income inequality, although there are contradictory conclusions about the interaction between total unemployment and income inequality. Tridico (2017) finds no significant impact of higher unemployment rates on inequality for OECD countries between 1990 and 2013, if the countries' welfare systems are able to protect unemployed people. With a different approach, but also in the OECD, Gil-Anana et al. (2009) showed that using employment growth has no impact on income inequality. Rodríguez-Pose and Telios (2009) present results that lead to a different conclusion, showing that high unemployment rates are correlated with higher income inequality levels, with the authors refering that the rise of the unemployment rate is particularly harmful for low-income groups, worsening their relative position. Additionally, Alvaredo et al. (2018) observed a decrease on the wealth owned by people aged between 20 and 29 when compared to older groups, connecting this observation with the climbing of youth unemployment rates.

2.2. What influences youth unemployment?

O'Reilly et al. (2015) address a range of factors influencing youth unemployment, including labor market flexibility and education. Regarding labor market flexibility, the authors evoke the dominant idea in the 1990s that the strictness of labor market regulations in Europe was dampening European economies' ability to create jobs, leading to policy decisions aiming to make labor markets more flexible. This led to a growth in atypical contracts, such as temporary and part-time work contracts, especially among young people, with a high share of young workers involuntarily hired with temporary contacts. Although temporary contracts may represent an opportunity for young people to

enter the labor market and then transition to more stable employment forms, studies find these contracts represent a way of substituting more protected workers with cheaper and less protected workers (Barbieri and Scherer, 2009), and the transition rates to be low and getting lower, prolonging young people's job insecurity (O'Reilly et al., 2015; Chung, Bekker, and Houwing, 2012).

Analyzing data from 28 European countries, Liotti (2022) evaluated the hypothesis that the deregulation of labor markets reduces youth unemployment, using the labor market regulation index (LMRI) (Fraser Institute, 2021) as a measure of the degree of regulation of labor markets. The relationship between youth unemployment and labor market regulation was studied both in the short run and the long run, finding no considerable evidence that the flexibilization of labor markets helps these countries reduce their youth unemployment rates, enouncing a high turnover and a detrimental effect on aggregate demand as possible explanations for the results. Extending the high turnover explanation, the loosening of labor market regulations is thought to allow companies to continuously hire and fire, reducing their costs with labor, and creating a cycle of precariousness and unemployment for young people. Liotti (2020) also studied the effect of labor market regulation on unemployment in Italian regions, in the specific context of the Great Recession, concluding that the deregulation of the labor market plays a significant role in the rise of youth and adult unemployment, with a more pronounced effect on young people.

Nickell, Nunziata, and Ochel (2005) reach different conclusions, when analyzing data from OECD countries ranging from 1960 to 1990, considering five aspects of labor market regulation: the unemployment benefit system; systems of wage determination; employment protection; labor taxes; and barriers to labor mobility. Accounting for shocks that have an impact on unemployment and on the real interest rate, their results show that, overall, the referred labor market rigidities positively correlate with the unemployment rate. Also studying data from OECD countries in a similar time horizon (1960-1995), Belot and van Ours (2000) empirically analyze the impact of labor tax rates, replacement rates, employment protection, union density and coverage on the unemployment rate, additionally assessing how the interaction between policies shaped the outcomes. The authors mention labor tax rates, replacement rates, union density, and a strong worker's bargaining position as contributing to rising unemployment rates.

Concerning the mandated minimum wage, a specific labor market regulation present in several developed countries, Gorry (2013) assesses its impact on unemployment rates in the United States of America between 2007 and 2009, considering young workers with

low education levels, concluding that the increase in the minimum wage is connected to a raise in both the youth and total unemployment rates. This was achieved with a model that accounts for experienced and inexperienced workers, assuming that young people's wages increase as they gain experience. Neumark and Wascher (2004) also present evidence suggesting that, on average, minimum wages have a disemployment effect on young people, although this effect is more pronounced in countries with flexible labor markets, and can be smoothed by employment protection laws. Liotti's (2020) results for Italy support the argument that mandated minimum wages lead to an increase in unemployment, but this interaction was not observed with youth unemployment, which could be a consequence of the previously mentioned substitution effect, with the replacement of adult workers with young workers with atypical contracts.

Atypical contracts, specifically temporary ones, and given its high incidence among young workers, play a key role enhancing young people's sensitivity to business cycles (Scarpetta, Sonnet, and Manfredi, 2010). The relationship between economic growth and the unemployment rate has been thoroughly studied in the last decades, largely confirming Okun's (1962) pioneering conclusions of a negative correlation between economic growth and the unemployment rate (Butkus and Seputiene, 2019). However, Bal-Domańska (2022) shows this relationship has a small magnitude for youth unemployment when there is economic expansion, concluding that economic fluctuations significantly affect unemployment, more than twice as much for youth. Therefore, economic downturns affect young people harder, who additionally do not benefit from economic growth as much as the adult population does, potentially widening the gap between young people and the general population. Tomić (2018) refers to this specific issue as well, explaining that if youth unemployment has a pronounced procyclical behavior, it would be expected that this would translate into a strong response when economies are growing, allowing for a recovery of the deficit between youth and adult unemployment, which is not empirically observed.

Education and skills have an immediate interaction with work, especially when it regards young workers, who frequently transition from school to work, and have their expectations often shaped by their educational background. O'Reilly et al. (2015) distinguish clearly the over-education problem from the over-skilling problem, with the main difference being that educational attainment usually represents a job entry requirement, while skills refer to all the expertise needed to perform the job. However, most of the works focusing on these subjects rely on the over-education measure because of data availability. These studies are mostly focused on the general population, although the education and skill mismatch problematic is particularly relevant for young people, as a mismatched worker

on a first job is highly likely to still be mismatched later in life (O'Reilly et al., 2015). Education on its own is an important factor for young people to avoid unemployment in a crisis scenario, with a reduced probability of being unemployed for highly educated people (Pompei and Selezneva, 2021), and vocational education potentially helping match young workers skills to those expected by the employers (Breen, 2005).

3. Data and Methodology

This chapter is organized as follows. The first section presents the model and variables, while the second section describes the data used for our estimations. The third section is an overview of the evolution of youth unemployment since 1990 in different regions. In the fourth section we perform the diagnostic tests that justify the estimation methods.

3.1. Model and variables

To assess the determinants of youth unemployment in developed countries, the following equation is estimated:

$$YUR_{i,t} = \alpha + \beta_1 EG_{i,t} + \beta_2 AW_{i,t} + \beta_3 EAR_{i,t} + \beta_4 LMRI_{i,t} + \mu_{i,t} \quad (1)$$

where $YUR_{i,t}$ is the youth to total unemployment ratio for the country i at time t, $EG_{i,t}$ the economic growth rate, $AW_{i,t}$ the average wage, $EAR_{i,t}$ the youth to total educational attainment ratio, $LMRI_{i,t}$ the labor market regulation index, and $\mu_{i,t}$ the disturbance.

As we mentioned in the previous chapter, we have not found in the literature works that empirically assess the determinants of youth unemployment using the youth to total unemployment ratio as the dependent variable. This ratio suppresses the fluctuations that happen simultaneously for youth and total unemployment, thereby capturing solely the disparities between young people and the global population. This approach allows us focusing on the relative position of young people in the labor market and capturing the aspects that are specific to the youth unemployment.

The choice of the independent variables is based on the elements referred in the Literature Review. First, the consensus around the impact of economic growth on the unemployment rate, with a smaller magnitude for youth unemployment, makes the rate of economic growth a natural candidate to be included as explanatory variable. Second, in the Literature Review we also describe the impact of educational attainment on youth unemployment. Since our dependent variable is the youth to total unemployment ratio, we also rely on the youth to total educational attainment ratio, hence representing the relative position of young people regarding educational attainment. Third, the literature review also covers the relationship between labor market regulations and youth and total unemployment, where there are divergent views on whether the correlation is negative or positive, although the literature points towards a strong connection. Fourth, the average wage has a theoretical impact on the unemployment rates, with Liotti (2020) empirically

showing a significant relationship between this variable and both youth and total unemployment.

Afterwards, to study the potential impact of youth unemployment on income inequality, we estimate the following equation:

$$Gini_{i,t} = \alpha + \beta_1 YUR_{i,t} + \beta_2 EG_{i,t} + \beta_3 FR_{i,t} + \beta_4 SPE_{i,t} + \beta_5 EFI_{i,t} + \varepsilon_{i,t} \quad (2)$$

where $Gini_{i,t}$ is the Income Gini coefficient for the country i at time t, $EG_{i,t}$ the economic growth rate, $FR_{i,t}$ the fertility rate, $SPE_{i,t}$ the social public expenditure, $EFI_{i,t}$ the economic freedom index, and $\varepsilon_{i,t}$ the disturbance.

Malerba and Spreafico (2013) enounce four major categories of factors influencing income inequality, on which we base our choice of control variables. First, the macroeconomic performance, which is measured by the economic growth. Second, structural variables capturing population characteristics, or the household structures. Since we were not able to find direct indicators for household structures, we used the fertility rate as a proxy for the average household structure. Third, public expenditure aiming for redistribution, where we use the social public expenditure as a ratio of the GDP. Fourth, institutional features associated with economic freedom, which we account for with Fraser Institute's (2021) economic freedom index (EFI).

3.2. Data

Since we are studying the determinants of youth unemployment and its effect on income inequality in developed countries, panel data from 18 OECD countries (Austria, Australia, Belgium, Canada, Denmark, Finland, France, Italy, Japan, South Korea, Netherlands, Norway, Spain, Sweden, Switzerland, Great Britain, United States of America, and New Zealand) were used in the period between 1990 and 2019. This time span was determined by data availability. Variables are used considering periods of five years resulting in a balanced panel with 108 observations from 1990 to 2015. For each five-year period, the average of the available values was considered.

Table 1. Descriptive Statistics – equation (1).

Variable	Obs.	Mean	Standard Deviation	Min.	Max.	Source
YUR	108	2.2284	0.4634	1.1810	3.3606	World Bank
EG	108	0.0162	0.0176	-0.0213	0.0991	Penn World Table version 10.0 (Feenstra, Inklaar, and Timmer, 2015)
AW	108	44914.6	8769.4	23872.0	65476.6	OECD (2022a)
EAR	108	0.4427	0.1610	0.0550	0.9194	Wittgenstein Centre for Demography and Global Human Capital (2018)
LMRI	108	6.0695	1.6611	2.8321	9.1403	Fraser Institute (2021)

The youth to total unemployment ratio (YUR) was obtained using the youth and total unemployment rates available at the World Bank, considering youth to include people with ages between 15 and 24 years old. The economic growth rates (EG) were calculated with the output-side real gross domestic product (GDP) at chained purchasing power parity (PPP) per capita available at the Penn World Table 10.0 (Feenstra, Inklaar, and Timmer, 2015). The average wages were obtained from OECD (2022a). The educational attainment ratio results from the educational attainment considering post-secondary education of population aged between 15 and 24, and the educational attainment of the total population. For the robustness check we also use the mean years of schooling ratio, using the same age interval (Wittgenstein Centre for Demography and Global Human Capital, 2018). The labor market regulation index (LMRI) consists of the labor market regulations component (area 5B) of the economic freedom index (EFI) developed by the Fraser Institute (2021). This index and its components and sub-components are presented assuming values that range from 0 (strict) to 10 (flexible).

Since the sub-components of the LMRI will be used for additional regressions, it is relevant to describe each of these six components for a better evaluation of the results presented in chapter 4:

1. The first component (LMRI1) accounts for hiring regulations and minimum wage, more specifically regulation regarding fixed term contracts.
2. The second component (LMRI2) measures the flexibility (or strictness) of hiring and firing regulations.
3. The third component (LMRI3) aims to measure the centralization of the bargaining power.

4. The fourth component (LMRI4) measures restrictions to night, holiday, and overtime work, as well as the length of the work week and the average paid annual leave.
5. The fifth component (LMRI5) measures the mandated cost of worker dismissal, considering the dismissal of a redundant worker with 10-years tenure.
6. The sixth component (LMRI6) considers different military conscription regulations, accounting for different lengths of conscription, the strictness of its enforcement, and the non-military options available.

For a detailed description of each of these components, please refer to the Economic Freedom of The World: Appendix (Fraser Institute, 2019).

For the estimation of the influence of youth unemployment on income inequality (equation 2), we use the same sample of countries. Due to data availability, we rely now on an unbalanced panel with 99 observations from the same time horizon.

Table 2. Descriptive statistics – equation (2).

Variable	Obs.	Mean	Standard Deviation	Min.	Max.	Source
Gini	103	31.7703	4.1469	22.9500	41.3320	UNU-WIDER, World Income Inequality Database (WIID)
YUR	108	2.2284	0.4634	1.1810	3.3606	World Bank
EG	108	0.0162	0.0176	-0.0213	0.0991	Penn World Table version 10.0 (Feenstra, Inklaar, and Timmer, 2015)
FR	108	1.6515	0.2417	1.0720	2.0960	OECD (2022b)
SPE	108	0.2105	0.0600	0.0270	0.3144	OECD (2022c)
EFI	108	7.8940	0.4154	6.6890	8.7571	Fraser Institute (2021)

The youth to unemployment ratio (YUR) and the economic growth rate (EG) have the same characteristics as previously described. The fertility rates are measured as a children to women ratio, proxying for the household structure (OECD, 2022b). The social public expenditure is presented as a ratio of the gross domestic product, accounting for the redistributive role of governments (OECD, 2022c). The Fraser Institute's (2021) economic freedom index (EFI) measures the degree of economic freedom, relying on five components: size of government; legal system and security of property rights; sound money; freedom to trade internationally; and regulation. For the main estimate of equation (2), we measure inequality using the Gini coefficient. In additional estimations, we replace the Gini by the Palma ratio, the S90/S10 ratio, and the Atkinson index for an inequality aversion parameter equal to $\varepsilon = 0.75$ (which corresponds to the intermediate

parameter value from the values available). The data for all these inequality measures are taken from the World Income Inequality Database (UNU-WIDER, 2021).

3.3. Youth unemployment overview

The trends of youth unemployment generally follow the ones of total unemployment, both resulting in a similar behavior throughout time. Figure 1 illustrates this for the average values within the countries included in our sample, also showing that what significantly differs between youth and total unemployment is the magnitude of the fluctuations, and the levels of unemployment, both being markedly higher for young people.

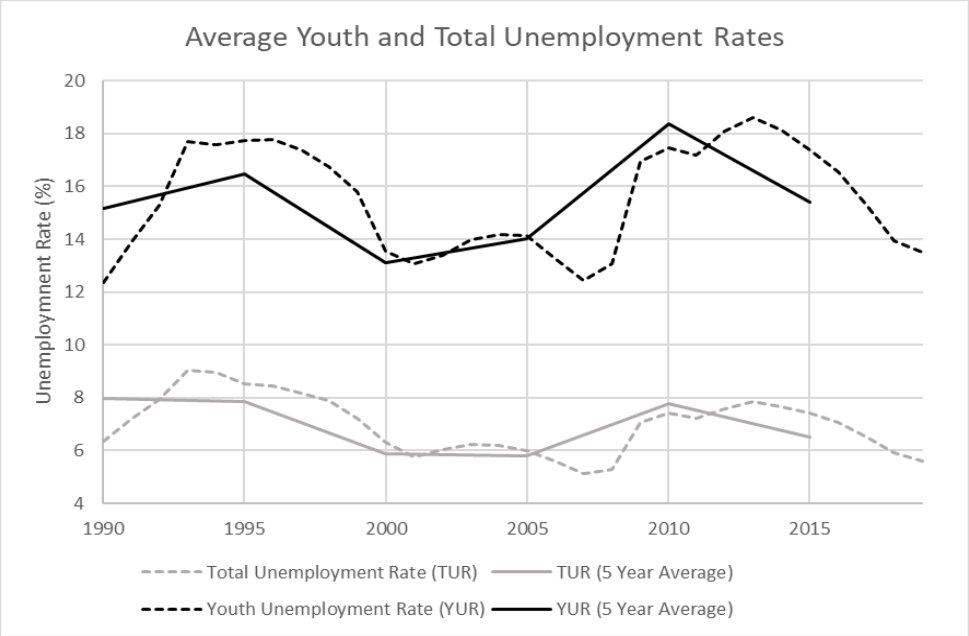

Figure 1. Average youth and total unemployment rates from 1990 to 2019. Source: World Bank

Using the youth to total unemployment ratio as the dependent variable allows us to account for the factors that strongly influence both youth and total unemployment, such as the Great Recession, which led to a general increase in unemployment. The average youth unemployment rate has seen several fluctuations in the analysed period, with fast rises from 1990 to 1993, and from 2008 to 2009, and significant reductions from 1996 to 2000, and from 2013 to 2019. The refered reductions led to two recoveries to levels similar to those registered in 1990, below 14%. The variations in the total unemployment rate have a smaller amplitude, with recoveries in the same periods as the ones for young people. Despite these reductions, the level of youth unemployment is still more than twice when compared to the level of total unemployment, and Figure 2 helps us understand how the disparity between young people and the global population rose quite steadily from 1990, when the youth to total unemployment ratio was above 2.0, to 2008, surpassing 2.5. Since then, this ratio has been declining at a slow rate, maintaining its high levels.

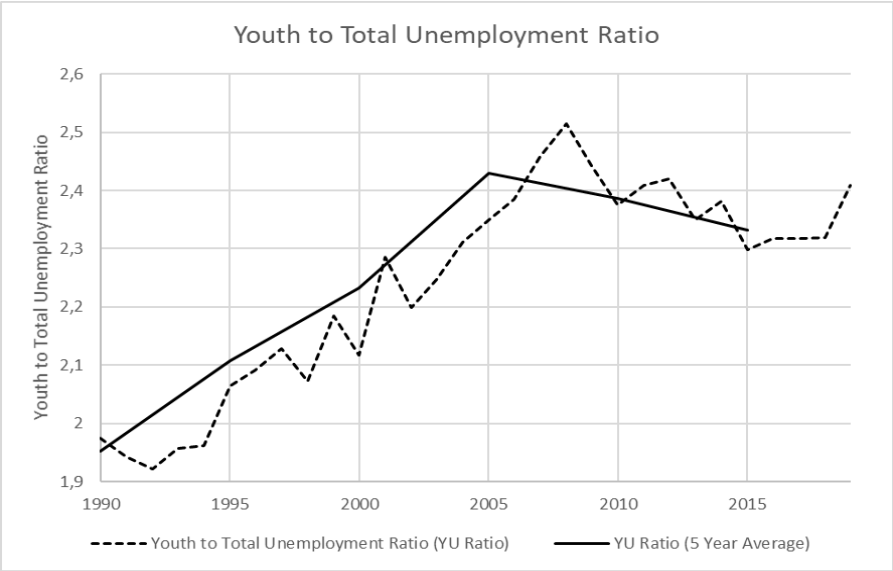

Figure 2. Youth to total unemployment ratio from 1990 to 2019. Source: World Bank

Figure 3 presents the youth to total unemployment ratios by country, with countries split by region. Within our data, with 5 year averages, Japan and South Korea are the only countries with a lower youth to total unemployment ratio in 2015 than in 1990, although the starting points and trajectories are quite different. While Japan is close to the average in 1990, South Korea has the highest ratio in the whole sample. Both countries decreased the ratio in the early 1990s, and Japan from 2005 onward, having no significant raises in the youth to total unemployment ratio between 1990 and 2015, despite the Asian financial crisis of 1997. In the European countries, Australia, New Zealand, and the United States of America, from 1990 until the Great Recession, there is a clear increasing trend in the ratio, with most of these countries stagnating or slightly recovering in the following years, regarding this indicator. Countries from Northern Europe have youth to total unemployment ratios above the average, except for Denmark, known for its flexicurity model, also associated with Finland, Norway and Sweden (Berglund *et al.*, 2010), which even considering the steady raise between 1990 and the Great Recession, without posterior recovery, maintained a level between the minimum and the average. Norway's fast raise between 1990 and 1995 may be related to the Norwegian banking crisis, making them the country with the highest ratio in 1995 and 2000. Although there are similarities in the labour markets among Northern European countries, the levels of the youth to total unemployment ratio, and its behaviour throughout the analysed time period have a wide range, nearing minimums (Denmark) and hitting maximums (Norway). The two countries from Southern Europe in our sample (Italy and Spain) have the highest youth unemployment rates, persistently above 20%, with Italy reaching 42.7% in 2014, and Spain 55.5% in 2013, in the context of the sovereign debt crisis. However, Spain has a youth to total unemployment ratio below the average in our time horizon, while Italy is

consistently close to the higher values until 2010, when it became the country with the highest ratio. Western Europe represents one third of the countries in our sample, with Austria, Switzerland and Netherlands closer to the minimum than to the average, and France close to the average. All the countries in this region have similar trends, comparable to the average trend, with the exception of Great Britain, which keeps raising its ratio, at a slower rate from 2005, switching from a position between minimum and average in 1990 to a position between the average and the maximum. Canada stands with Japan and South Korea with distinct patterns, with a fairly stable youth to unemployment ratio in the studied period. Overall, countries with a ratio below the average show few and slow decreases, despite the singular case of Japan, that presented significant reductions in the last decade.

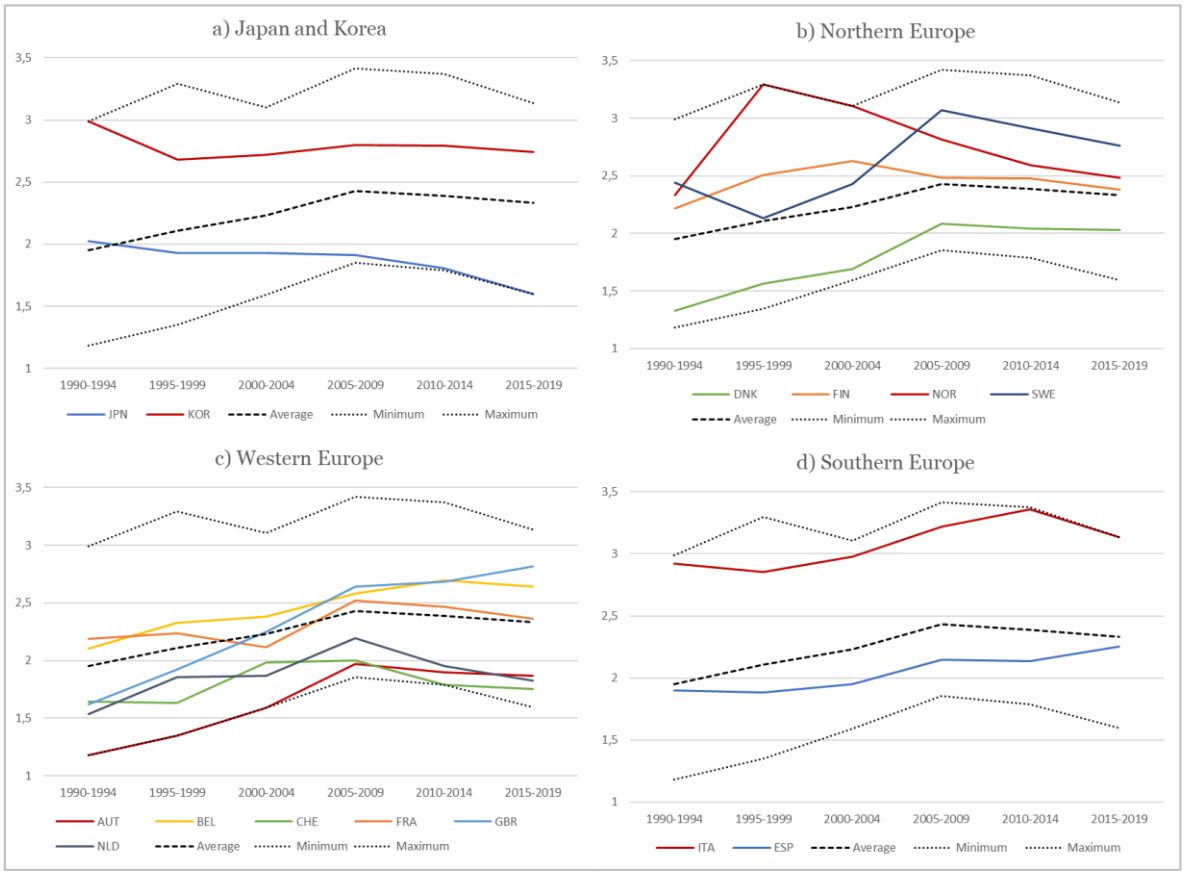

Figure 3 a) to d). Youth to total unemployment ratio from 1990 to 2019. Source: World Bank.

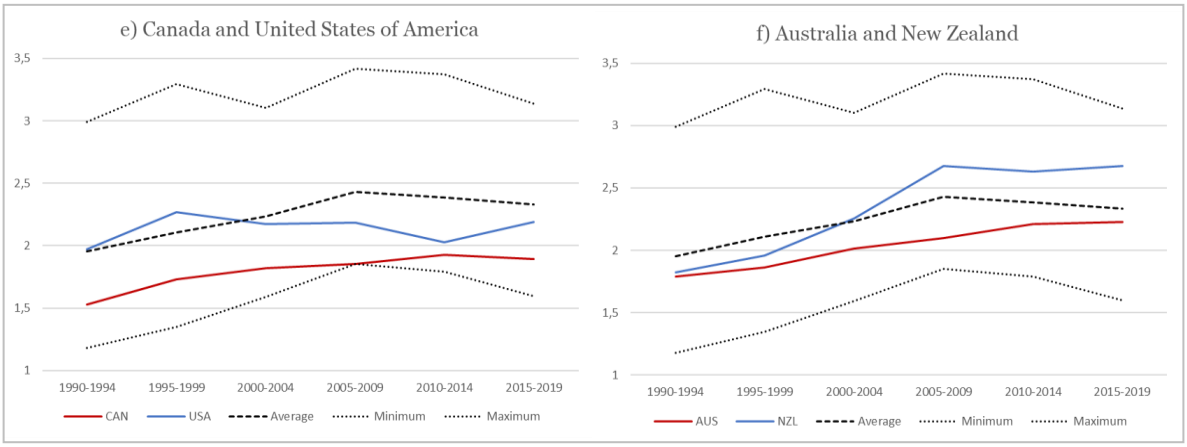

Figure 3 e) and f). Youth to total unemployment ratio from 1990 to 2019. Source: World Bank.

3.4. Methods of estimation

The three most common methods of estimation for panel data are the common constant, the fixed effects, and the random effects models. The common constant method would imply that our data set was homogeneous, and it is quite limiting, while the fixed effects model allows us to account for country-specific effects, and also time effects, if applicable. The random effects model also accounts these effects, although they are handled as random parameters, instead of fixed (Asteriou and Hall, 2011).

We used the econometric software Stata16 to run the tests and estimate the regressions we present in this work.

3.4.1. Methods of estimation: Determinants of youth unemployment

For our main data set, for the study of the determinants of youth unemployment (equation 1), the correlation matrix and variance inflation factor values allow us to conclude that there are no multicollinearilty problems.

Table 3. Correlation matrix and variance inflation factor (VIF) – equation (1).

Variables	YUR	EG	AW	EAR	LMRI
YUR	1.0000				
EG	-0.1323	1.0000			
AW	-0.0519	-0.1956	1.0000		
EAR	-0.1762	0.2743	-0.3860	1.0000	
LMRI	-0.1376	-0.1900	0.3989	-0.1459	1.0000
VIF = 1.26					

Performing the Hausman test (1978), to choose between the fixed effects and the random effects models, we reject the null hypothesis that the random effects model is consistent at a significance level of 5% (Table 4).

Since our number of time periods (T = 6) is smaller than the number of countries (N = 18), the Breusch-Pagan test will not be adequate to our panel, and we will rely on the Frees' (1995), Friedman's (1937), and Pesaran's (2004) cross-sectional dependence tests (Hoyos and Sarafidis, 2006). Pesaran's and Friedman's tests do not reject the null hypothesis of cross-sectional independence, although Frees' test rejects the same null hypothesis at a 1% significance level. Since both Pesaran's and Friedman present P-values above 90% (Table 4), we will consider this result; that is cross sectional independence.

To check our data for heteroskedasticity we ran the test developed by Baum (2000), which calculates a modified Wald statistic, testing for the null hypothesis of homoskedasticity. The null hypothesis was rejected at a significance level of 1%.

The Wooldridge test is adequate for detecting first order autocorrelation (Drukker, 2003). In our case, this test leads to the rejection of the null hypothesis of no first order autocorrelation at a significance level of 1%.

Ultimately, we ran the fixed effects model with time dummies for each period and tested for the null hypothesis that the coefficients for those time dummies are jointly equal to zero. Since the P-value is higher than 5%, we failed to reject that hypothesis, and therefore we are not going to use time dummies.

Table 4. Hausman and diagnostic tests – equation (1).

Test	Test statistic	Prob	Ho	Outcome
Hausman	$\chi^2 = 9.08^{**}$	0.0283	The random effects model is consistent	Rejected
Frees	CD-test = 1.709***	-	Cross-sectional independence	Rejected
Friedman	CD-test = 5.206	0.9971		Not rejected
Pesaran	CD-test = 0.119	0.9053		Not rejected
Modified Wald	$\chi^2 = 866.51^{***}$	0.0000	Homoskedasticity	Rejected
Wooldridge	F = 38.160***	0.0000	No first order autocorrelation	Rejected
Time dummies	F=2.03*	0.0828	The coefficients for all years are jointly equal to zero	Not rejected

Note: ***, **, and * represent statistical significance at 1%, 5%, and 10%, respectively.

Considering the results presented on Table 4, we conclude that our panel has cross-sectional independence, heterokedasticity, and first order autocorrelation, which, together with the Hausman test result and the time dummies test, leads us to the use of fixed effects with clustered standard errors (Hoechle, 2007) and no time dummies to estimate equation (1).

3.4.2. Methods of estimation: Interactions with inequality

Concerning the panel used for the analysis of the impact of youth unemployment on income inequality, the correlation matrix and variance inflation factor values allow us to conclude that there are no multicollinearilty problems.

Table 5. Correlation matrix and variance inflation factor (VIF) – equation (2).

Variables	Gini	YUR	EG	FR	SPE	EFI
Gini	1.0000					
YUR	-0.0115	1.0000				
EG	0.0185	-0.1321	1.0000			
FR	-0.0637	0.0221	-0.1496	1.0000		
SPE	-0.4864	0.1339	-0.1406	0.2033	1.0000	
EFI	0.4298	-0.2862	-0.0478	0.3275	-0.3022	1.0000
VIF = 1.24						

The Hausman test (1978) does not reject the null hypothesis, therefore we accept the random effects model as being consistent.

Since the Hausman test directs us to the random effects model, we ran the Breusch and Pagan (1980) Lagrange multiplier test for random effects, testing for the null hypothesis that the variance is equal to zero across countries. The Breusch-Pagan test rejected the null hypothesis, which shows that the random effects model is in fact appropriate for our data.

As the data set used in the estimation of equation (2) is an unbalanced panel, we rely solely on the Pesaran test, since the Frees and the Friedman tests do not account for time periods with gaps in the data. Given the reduced number of time periods in our sample, this would bias the result of the Friedman test and would not allow us to perform the Frees test (Hoyos and Sarafidis, 2006). The Pesaran test does not reject the null hypothesis of cross-sectional independence.

The Wooldridge test rejected the null hypothesis of no first order autocorrelation in our panel at a significance level of 1%.

Table 6. Hausman and diagnostic tests – equation (2).

Test	Test statistic	Prob	Ho	Outcome
Hausman	$\chi^2 = 6.79$	0.2365	The random effects model is consistent	Not rejected
Pesaran	CD-test = -1.072	0.2839	Cross-sectional independence	Not rejected
Breusch-Pagan Lagrange Multiplier	$\chi^2 = 142.74^{***}$	0.0000	Variance is equal to zero across countries	Rejected
Wooldridge	$F = 27.236^{***}$	0.0001	No first order autocorrelation	Rejected

Note: ***, **, and * represent statistical significance at 1%, 5%, and 10%, respectively.

Considering the results presented on Table 6, we conclude that our panel has cross-sectional independence, heterokedasticity, and first order autocorrelation, which, together with the Hausman test result, leads us to the use of random effects with clustered standard errors (Hoechle, 2007) to estimate equation (2).

4. Results

The present chapter is divided into two sections. In the first section we present the results of the estimations of equation (1), with additional regressions replacing the LMRI by each of its components, and robustness checks. The second section presents the results of the estimations of equation (2), considering different measures of income inequality besides the Gini coefficient.

4.1. Determinants of youth unemployment

As described in the previous chapter, to assess the determinants of youth unemployment we estimated the fixed effects model for equation (1), with clustered robust standard errors, and used the youth to total unemployment ratio as the dependent variable.

Table 7. Regression with the determinants of youth unemployment.

	(1)
EG	3.3872**
	(1.4652)
AW	6.11e-06
	(1.24e-05)
EAR	-0.8027*
	(0.4273)
LMRI	0.1163**
	(0.0413)
Constant	1.5487***
	(0.4846)
Observations	108
R^2	0.4088
No. of groups	18

Note: ***, **, and * represent statistical significance at 1%, 5%, and 10%, respectively.

The empirical results of our main regression (Table 7) show a positive impact of economic growth, average wages and labour market deregulation on youth unemployment, and a negative impact of education attainment (measured as a ratio). Of all variables, only average wages lacks statistical significance, with a high p-value (83.2%). These results show that both economic growth and labor market flexibilization increase the gap between youth and total unemployment, with a significant magnitude. An increase by 1% on economic growth would mean an increase of 0.0339 on the youth to total unemployment ratio, while an increase of 1 degree on the LMRI leads to an increase of 0.1163 on the ratio. The educational attainment ratio shows a negative correlation with the youth to total unemployment ratio, although for a significance level of 10%.

Table 8. Regressions with each of the LMRI components.

	(1)	(2)	(3)	(4)	(5)	(6)
EG	-0.5308	2.8455*	2.6108*	2.4261	1.8179	2.5230*
	(1.2292)	(1.4350)	(1.3937)	(1.9919)	(1.4975)	(1.2721)
AW	8.86e-07	2.20e-05**	2.19e-05**	9.08e-06	1.03e-05	1.96e-05*
	(1.52e-05)	(1.00e-05)	(9.67e-06)	(1.31e-05)	(4.12e-05)	(1.00e-05)
EAR	-0.6215	-0.8950	-0.9704*	-1.1783**	-0.6895	-0.5909
	(0.4187)	(0.5256)	(0.5306)	(0.4873)	(0.4943)	(0.4946)
LMRI1	0.0426**					
	(0.0193)					
LMRI2		-0.0401				
		(0.0282)				
LMRI3			0.0155			
			(0.0438)			
LMRI4				0.0484*		
				(0.0248)		
LMRI5					-0.0232	
					(0.0201)	
LMRI6						0.0315**
						(0.0145)
Const.	2.2462***	1.7714***	1.5477**	2.0061***	2.2928***	1.3689**
	(0.6269)	(0.5715)	(0.6750)	(0.6030)	(0.6011)	(0.5160)
Obs.	90	108	108	106	72	108
R^2	0.2261	0.3061	0.2938	0.4045	0.0034	0.3641
No. of groups	18	18	18	18	18	18

Note: ***, **, and * represent statistical significance at 1%, 5%, and 10%, respectively.

Since the LMRI is an index covering six components, we ran additional regressions replacing LMRI by each of these components, with the purpose of understanding which components, and therefore which categories of regulations, are most important in influencing youth to total unemployment (Table 8). We must mention the lack of observations for the component LMRI5 (mandated cost of worker dismissal), which resulted in estimates with no significance, with a R^2 of 0.34%. Hence, the results of this particular regression will not be considered relevant. Also the component LMRI1 (hiring regulations and minimum wage) has fewer observations than the other components, however they allowed for a significant result for this variable, with a R^2 of 22.61%. The only components with significant results were LMRI1, LMRI4 (hours regulations), and LMRI6 (conscription), all of these with positive coefficients, although LMRI4 is significant at 10%, while LMRI1 and LMRI6 at 5%. Generally, the results of these estimations for the economic growth, average wages and educational attainment ratio variables are consistent with those obtained in the main regression.

Our results show that hiring regulations and minimum wage (LMRI1), particularly regulations on fixed-term contracts, are the most significant regulatory aspect of the labor market in widening the gap between young people and the overall population. It is pertinent to mention that the minimum wage accounted in this component (LMRI1) corresponds to the minimum wage for trainees and first-time employees (Fraser Institute, 2019), since a great number of these will be young workers. Therefore, this component captures two characteristics of youth unemployment we addressed in the literature review

that have an impact on the stability of youth jobs and probability of being unemployed in the future: contracts that ease the firing of workers; and low wages. Military conscription and its duration (LMRI6) also shows a significant relationship with the youth to total unemployment ratio, and although this is not a labor market regulation *per se*, conscription affects distinctly young people. The positive signal indicates that countries with at least some degree of military conscription have a smaller discrepancy between young people and the total population, despite conscription keeping them either from education or the labor market. Two possible explanations may be that conscription would help young people engaging in steady military careers, or that young conscripted people acquire skills that are useful in reaching a better relative position in the labor market, while some authors consider that there is no empirical background for the use of this component (Aleksynska and Cazes, 2014). Hours regulations (LMRI4) have a less significant impact on the youth to total unemployment ratio, probably because this component measures restrictions to night or holiday work, work week length, overtime, and annual paid leave time, which have the potential to affect young people the most, but also affect adult workers.

4.1.1. Robustness check

To check the robustness of the results of our main regression (Table 7), we ran additional regressions (Table 9). First, we replaced the educational attainment ratio by the educational attainment of people aged between 15 and 24 years old (EA), and the mean years of schooling ratio (MYSR) between youth and total population, obtaining the results presented on the first two columns of Table 9. Then, we split our sample according to the real GDP *per capita* of each country in 2019, resulting in two balanced panels. The first one consists of data from 10 countries with a real GDP *per capita* of less than 50,000 dollars (2017 US$) in 2019 (Belgium, Canada, Finland, France, Italy, Japan, South Korea, Span, Great Britain, and New Zealand), and the second one includes the remaining countries (Austria, Australia, Denmark, Netherlands, Norway, Sweden, Switzerland, and United States of America), all of them with a GDP *per capita* higher than 50,000 dollars in 2019. Since this implies a significant change to the data, we ran new diagnostic tests for cross sectional dependence, heteroskedasticity, first order autocorrelation, and the Hausman test (see Appendix), leading us, in both cases, to a random effects model with clustered standard errors, resulting in the estimates presented in the third and fourth columns of Table 9.

Table 9. Robustness check regressions.

	(1)	(2)	(3)	(4)
EG	2.6828*	2.4357	3.0773**	2.6539
	(1.4776)	(1.4695)	(1.2277)	(3.2813)
AW	1.35e-05	1.08e-05	2.41e-05	-8.22e-06
	(1.18e-05)	(1.29e-05)	(1.95e-05)	(9.97e-06)
EAR			-0.4893	-0.7102
			(0.5640)	(0.8434)
LMRI	0.1329***	0.1252**	0.0692*	0.4129***
	(0.0408)	(0.0434)	(0.0418)	(0.0516)
EA	-1.1602*			
	(0.6189)			
MYSR		0.6688**		
		(0.3129)		
Const.	1.0189***	0.3397	1.1144	1.8871**
	(0.3398)	(0.5768)	(0.0418)	(0.8570)
Obs.	108	108	60	48
R^2	0.3911	0.3972	0.5012	0.4345
No. of groups	18	18	10	8

Note: ***, **, and * represent statistical significance at 1%, 5%, and 10%, respectively.

Regarding the first regression, the results are quite simillar to the ones of our main estimates (Table 7), with the economic growth and LMRI variables keeping significance and magnitude, and the educational attainment for young people also significant with a value that suggests that educational attainment on its own, *i. e.* regardless of its distance to the educational attainment of the total population, helps reduce the youth to total unemployment ratio. Regarding the second regression, the first thing that stands out is the mean years of schooling ratio variable, which is significant and has a positive coefficient. While the educational attainment and the educational attainment ratio account for those who are beyond a specified threshold (post-secondary education), the mean years schooling ratio measures the ratio between the mean years spent in school by youth and the total population, not accounting for different types or degrees of education. This shows that while post-secondary education contributes to the reduction of the disparity between youth and the total unemployment, studying for a longer time ignoring different characteristics of education may actually agravate this disparity. These estimates also show a significant value for LMRI, with a simillar result to those obtained in the previous estimations, underlining the positive impact of labor market flexibilation on the youth to total unemployment ratio.

The results for the estimations with countries separated by GDP, in general terms, are consonant with the main estimates. The educational attainment ratio lacks significance for both samples, while economic growth remains significant only for countries with lower GDP levels (third column on Table 9). The LMRI is significant for both groups, but its magnitude is considerably higher within countries with higher GDP levels (fourth column on Table 9). Since we split out original panel into two, with the GDP criterium, it is possible that the way the educational attainment ratio interacts with the youth to total

unemployment ratio has no connection with the output levels when considering developed countries, loosing significance with this data division. These results show economic growth to be strongly connected to the disparity between youth and total unemployment in countries with lower GPD levels, while countries with higher GDP levels seem to be more able to mitigate the effects of growth on young people. Labor market flexibilization positively affects the youth to total unemployment ratio in both groups of countries, with a considerable magnitude for countries with lower GDP levels, and a high coefficient for countries with higher GDP levels. For the latter, considering these estimates, a raise of 1 standard deviation (1.6332) on the LMRI, would result in a 0.6743 increase in the youth to total unemployment ratio, which is more than the total amplitude of the average ratio in the analysed time horizon (Figure 2).

Overall, this robustness check presents results that do not colide with the ones obtained in our main regression, additionally allowing for a finer analysis of the determinants of youth unemployment.

4.2. Interactions with inequality

To study the impact of youth unemployment on income inequality, we estimate the random effects model for equation (2), with clustered robust standard errors. We first consider income inequality measured by the Gini coefficient. Then, we use alternative inequality indicators, such as the Palma ratio, the S90/S10 ratio, and the Atkinson Index ($\varepsilon = 0.75$).

Table 10. Regressions for income inequality.

	Gini Coefficient	Palma Ratio	S90/S10 Ratio	Atkinson Index ($\varepsilon = 0.75$)
YUR	0.7016	0.0598	-0.5942	0.3672
	(0.8106)	(0.0520)	(1.3254)	(0.6753)
EG	-13.9012**	-0.5082	-37.4600	-13.9855*
	(6.1410)	(0.4312)	(31.4710)	(8.4979)
FR	-2.8551	-0.1622	-2.4514	-2.4530
	(1.8676)	(0.1183)	(2.3141)	(1.5468)
SPE	-12.1226*	-1.1407***	-18.2578**	-11.2222*
	(7.3680)	(0.3702)	(8.9641)	(6.6719)
EFI	1.1271	0.0467	0.6860	0.2291
	(1.04102)	(0.0655)	(0.8927)	(0.8683)
Const.	28.7997***	1.2487***	13.9582	16.7058**
	(7.4020)	(0.4510)	(9.3357)	(6.5055)
Obs.	99	96	96	96
R^2	0.2467	0.2384	0.1728	0.1927
No. of groups	18	18	18	18

Note: ***, **, and * represent statistical significance at 1%, 5%, and 10%, respectively.

The results of the estimations show that only Social Public Expenditure and Economic Growth are statistically significant, the latter when the Gini coefficient and the Atkinson index are used as dependent variables. Variable YUR – our variable of interest – is not

significant in any of the estimations, which shows that the youth to unemployment ratio does not have a relevant impact on income inequality. The fertility rate, used as a proxy for household structures, and the economic freedom index (EFI) are also insignificant. Fertility rate captures broadly the weight of children in the population, accounting for women on the denominator, however it dilutes different types of household in one single rate. The results for economic growth, despite not significant with all the income inequality indicators, from a general perspective are consistent with the literature, with a negative relationship with income inequality (Gil-Alana, Škare, and Pržiklas-Družeta, 2019). The negative relationship between social public expenditure is consistent for all the four inequality measures used, and is also consonant with the literature (Sánchez, and Pérez-Corral, 2018). The effect of economic freedom on income inequality is insignificant in all estimations, which confirms the lack of consensus in the literature (Pérez-Moreno and Angulo-Guerrero, 2016) regarding the sign and magnitude of the link between these two variables.

There are several possible reasons for the absence of statistical significance of the youth to total unemployment rate in our estimates. First, our estimations focus on short-run effects, while there may also be considerable long-run effects, which we were not able to analyze, given the number of gaps in the data for income inequality measures. Second, youth unemployment leads to temporary (or short-term), and permanent (long-term) income losses (Arulampalam *et al.*, 2001; De Fraga et al., 2021; Gregg and Tominey, 2005), yet our results provide no evidence that the disparity between youth and total unemployment explains overall income inequality fluctuations in the short-term. Third, since the effects of youth unemployment, and its disproportionally high values when compared to the total unemployment rate, may affect cohorts and not particularly age groups (O'Reilly, 2015), the most severely influenced generations carry the consequences to the future. Fourth, it is also possible that the precariousness and income losses have a stronger expression on wealth inequality, rather than income inequality, by preventing affected people from gathering wealth over the course of their lives (Alvaredo *et al.*, 2018). Finally, the gaps on income inequality data do not allow for a balanced panel with more observations, which would grant us the possibility of performing further cross-sectional dependence tests, and the use of lagged variables.

5. Conclusion

The objective of this work was to assess the determinants of youth unemployment in developed countries, relying on a youth to total unemployment ratio as the dependent variable. One of the main conclusions of the econometric analysis is that labor market flexibilization has played an important role in the widening of the gap between the unemployment rates of young people and those of global population, as variable LMRI consistently presents a significant and positive impact on the ratio over the different regressions we ran, with a stronger effect in countries with higher GDP. Specifficaly, hiring regulations and minimum wages among trainees and first-employment workers have been shown to have a particularly strong influence on youth unemployment, followed by legislation regulating night and weekend work, extra-hours, and the amount of yearly paid-leave days. Military conscription, on the other side, seems to be connected to lower youth to total unemployment rates, although this particular aspect deserves further research allowing for a better understanding of the mechanisms through which it affects youth unemployment. In addition to labor market regulation and its components, economic growth also enhances the disparity between youth and total unemployment, showing that the bennefits of economic expansion are mostly reaped by older age groups. On the other hand, post-secondary educational attainment helps young people getting a better position in the labor market, lowering the youth to total unemployment ratio.

Furthermore, we estimated the relationship between youth to total unemployment ratio and income inequality. The results showed no significant short term effects of youth unemployment on income inequality, although it is noteworthy to mention that there are significant data availability issues, that prevent us from carrying different approaches.

The use of a youth to total unemployment ratio to assess the determinants of youth unemployment is, to our best knowledge, new in the literature, and allows for a different understanding of how these determinants widen (or narrow) the gap between young people and adults. Also, the study of the impact on income inequality lays ground for future research, pinpoiting possible paths, *e. g.*, studying the long term effects of youth unemployment on income inequality, or the short term effects using a proxy for income inequality, that allow a panel with more observations. The conclusions of this work underline the importance for policy makers to account for the high sensitivity of young people to regulatory changes and business cicles, with permanent long-term consequences. It becomes clear that policies pursuing economic growth and particularly labor market flexibility are lacking balancing policies protecting young people, or are on its own detrimental for young people. Promoting higher first-job salaries, including

trainees, and more secure contracts for young people are the most important objective for developed countries to pursue, according to our results.

Appendix

Table A. Hausman and diagnostic tests for countries with GDP below 50.000$.

Test	Test statistic	Prob.	Ho	Outcome
Hausman	$\chi^2 = 2.11$	0.5498	The random effects model is consistent	Not rejected
Frees	CD-test = 1.355***	-	Cross-sectional independence	Rejected
Friedman	CD-test = 6.971	0.6401		Not rejected
Pesaran	CD-test = 0.050	0.9599		Not rejected
Breusch-Pagan Lagrange Multiplier	$\chi^2 = 57.57$***	0.0000	Variance is equal to zero across countries	Rejected
Wooldridge	F = 11.703***	0.0076	No first order autocorrelation	Rejected

Note: ***, **, and * represent statistical significance at 1%, 5%, and 10%, respectively.

Table B. Hausman and diagnostic tests for countries with GDP above 50.000$.

Test	Test statistic	Prob.	Ho	Outcome
Hausman	$\chi^2 = 2.16$	0.5398	The random effects model is consistent	Not rejected
Frees	CD-test = 0.138	-	Cross-sectional independence	Not rejected
Friedman	CD-test = 5.143	0.6425		Not rejected
Pesaran	CD-test = 0.813	0.4159		Not rejected
Breusch-Pagan Lagrange Multiplier	$\chi^2 = 28.84$***	0.0000	Variance is equal to zero across countries	Rejected
Wooldridge	F = 25.178***	0.0015	No first order autocorrelation	Rejected

Note: ***, **, and * represent statistical significance at 1%, 5%, and 10%, respectively.

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