YOUTH LABOUR-MARKET PERFORMANCE, INSTITUTIONS AND VET SYSTEMS – CROSS - COUNTRY ESTIMATES AND CLASSIFICATION[1]

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1. Introduction

The political, economic and social relevance of guaranteeing decent and productive employment for youth in developing and developed countries has already been recognized as one of the main issues for the new millennium (see the United Nations Millennium Declaration of 2000). The effects of youth unemployment can be particularly serious, because they occur at the beginning of the working life of a person and may have substantial scarring effects (O'Higgins, 2010; Manfredi et al. 2010; Caporale and Gil-Alana, 2014). Moreover, youth unemployment has very detrimental effects on welfare and, in the longer term, on future employment prospects and earnings (Gregg and Tominey, 2005; Mroz and Savage, 2006), on human capital accumulation (Caroleo, 2012) and on fertility rates (Jimeno and Rodriguez-Palenzuela, 2002). Nevertheless the long lasting global crisis begun in 2008 has disproportionately affected young people and exacerbated the weakness of their condition in the labour market.

Education and skills formation are generally related to the possibilities of a young worker of being employed: indeed, the observed differences in the severity of youth unemployment across countries can also depend on how the national school-to-work institutions are organized (Ryan, 2001). Young people with low levels of qualification facing higher risks of exclusion and lacking access to employment are a feature common to many economies. Unemployment rates of higher skilled people tend to be lower than those low skilled and their average employment rates are higher (Zimmermann et al., 2013). In developed countries (Quintini and Martin, 2014) the crisis has made harder the transition from school to work, especially for young people without an educational background matching the needs of the structural and technological change. Some countries have therefore created or reinforced institutions to support entry into the labour market. Yet, while the expansion of general education occurred in many countries in recent years has led to a substantial increase in overall levels of educational attainment, the quality of the education system and its linkage to the labour market have very often been questioned.[2]

This paper analyses the connections of the vocational education and training (VET) systems with youth labour-market performance in a cross-country framework. More precisely we estimate the relationship between youth unemployment (and employment) rates and the participation rates to vocational programmes at the secondary level of education (ISCED levels 2 and 3, according to the ISCED classification) through a panel

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[2] Another important phenomenon affecting young workers is the growing mismatch between the educational or skill level they belong and the level required by jobs available in the labour market. The quality and orientation (general versus vocational) of the educational program (Leuven and Oosterbeek 2011; Caroleo and Pastore, 2015) are found among the major factors explaining the cross-country variation in overeducation and its persistence.

analysis. Relying on a recently developed technique (Bonhomme and Manresa, 2012), we also propose a data-based classification of countries according to their school-to-work transition set-up.

The rest of paper has the following outline. In section 2 we review the debate on youth unemployment and school-to-work transition. Section 3 analyses the impact of the participation to vocational programmes on youth labour market performance. Section 4 proposes our empirical approach to cross-country classification of school-to-work transition systems. Some concluding remarks are provided in section 5.

2. The Youth Labour Market

2.1 Measurement problems

Youth unemployment is one of the most arduous challenges for politics and economics, not least because of the measurement issues it entails. It is not rare to experience a lack of data (Bassanini and Duval, 2006) for instance on the returns to education, or on the effectiveness and on the efficacy of an education system (a point we examine in detail in section 4), but there are also shortcomings in the conventional definition of youth unemployment.[3] In most countries the lower and the upper age limit (15-24) are likely to be inappropriate (O'Higgins, 1997). Indeed, they depend on the demographic structure of a country and on cultural, institutional and political factors. For instance, in industrialised countries, the lower age limit usually corresponds to the statutory minimum school-leaving age. Similarly the upper limit depends on how and when a young person generally reaches the economic independence and when the formal education process is finished. At any rate, within the category of youth, it is also important to make a further distinction, between teenagers (youth 15-19 years old) and young adults (20-24 years old) since the problems faced by these two groups are likely to be very different. Another source of ambiguity in the measurement of youth unemployment arises from the treatment of students. In most countries, students are considered as being outside the labour force, but in others, if they are actively seeking for a job, they are included in it.

Labour-force participation among younger people must also be carefully interpreted. Young people are particularly likely to drop out of the labour force when jobs are hard to find, whether for study, leisure, illicit activities or inertia (Ryan, 2001). Again, as explained by Ryan, inactivity can be caused by very different situations, like personal choices (leisure, foreign travel) or of other kind (military conscription, pay inequality, schooling patterns, household attributes and labour market programmes, the rise in the age of youth departure from the parental residence).

It is clear that a single indicator such as youth unemployment rate could provide only a partial picture of youth labour market problems, making it necessary to combine different indicators (Dietrich, 2014). The ILO (2011) proposes to couple the index of absolute disadvantage (the youth unemployment rate) with the index of relative disadvantage (the ratio of the youth unemployment rate to the adult unemployment rate; see also Elder, 2009; Pastore 2011;). Other indicators could be used in order to stress various aspects of the youth unemployment issue: youth unemployment as a proportion of total unemployment; youth unemployment as a

[3] As is well known ILO (1982) defines the youth unemployed as a person whose age is included into the range 15-24, without a job, but currently available for work and seeking work.

proportion of the youth population. Choudry et al. (2012a) single out employment rate as a key labour market performance indicator. They stress that it should be preferred to the unemployment rate, pointing out that population and labour force differ much more for younger cohorts than for adult workers.[4]

2.2 Causes

When analysing youth unemployment, several factors should be considered: the institutions governing the school-to-work transition (including the quality of the education system and the integration between school and work-based training), labour-market regulation (hiring and firing rules, safety nets and industrial relations systems), but also demographic and cyclical patterns (Zimmermann et al., 2013).

The demographic structure affects young employability for two reasons: it influences the size of younger cohorts determining youth labour supply (Korenman and Neumark, 1997; Shimer, 2001); and it affects the social and cultural approach of a country towards young people. It is obvious that the more young people are in the labour market, the more jobs will be needed to accommodate them. This is the so called "cohort crowding hypothesis", according to which larger youth cohorts face reduced job opportunities in the presence of imperfect substitutability between workers of different ages and wage rigidities. When the entity of younger cohorts is very high, their entry into the labour force under bad economic conditions or sluggish demand can cause the origin of longer queues, since the labour market will absorb these young people slowly and/or insufficiently ((Korenman and Neumark, 1997; Bassanini and Duval, 2006; Zimmermann et al., 2013). According to Jimeno and Rodriguez-Palenzuela (2002), demographic developments have a significant but limited impact on relative youth unemployment rates: youth workers mostly play a role of "buffer" to absorb macroeconomic shocks, through wider fluctuations in their unemployment rates: this is reflected in the very significant impact of cyclically related variables on the relative youth unemployment rates.

Indeed it has long been known that younger workers tend to be more severely affected by economic fluctuations (Clark and Summers, 1982; Verick, 2009; Manfredi et. al., 2010; Bell and Blanchflower, 2011; Bernal-Verdugo et al., 2012; O'Higgins, 2012; Choudry et al., 2012b; Zimmermann et al., 2013). This phenomenon has various reasons: a disproportionate presence of youth among temporary jobs, their high concentration in some cyclically sensitive industries, as for example construction (Manfredi et al., 2010), and the so-called LIFO principle (last-in-first-out), applied by firms in times of crisis: they prefer to fire workers hired more recently, than the ones employed for a longer time. More recently hired people tend to be younger, with higher mobility and opportunities to find a job somewhere else (this is the inclination to job shopping highlighted in Caliendo, et

[4] Martin et al. (2007) suggest an indicator of joblessness, which could account for people neither in education nor in employment, the so-called NEET. This indicator allows to analyse young people most at risk (O'Higgins, 2010; Manfredi et al., 2010; Eurofund, 2012; Drakaki et al., 2014), their social exclusion (OECD, 2008; Eurofund, 2012; Cornaglia et al., 2015) and economic losses (Eurofound 2011, 2014; ILO, 2006). According to many authors the crisis has much worsened the fate of NEET (Bell and Blanchflower, 2010; OECD, 2012; Bruno et al., 2014; Chzhen and Richardson, 2014; Eichhorst and Neder, 2014). Their number, if used jointly with the youth unemployment rate, could help in in throwing further light on cross-country differences in youth employment outcomes. As matter of fact, NEET people could be considered as a signal of the inefficiency of institutions in improving the school-to-work transition or youth employability (ILO, 2012).

al., 2011); moreover, they have less experience (Caroleo and Pastore, 2007). Bell and Blanchflower (2011) also find that the least educated young worker have been hit harder by the Great Recession.

Following the seminal papers of Nickell (1997) and Blanchard and Wolfers (2000), a wide consensus arose in the 1990s, and still remains unchallenged, that the rigidity of the labour market institutions bears major responsibility for having made European unemployment so high. These institutions cover the unemployment benefits system, the extent of active labour market policies, the wage determination system (union density, union contract coverage, degree of coordination, minimum wages), the tax wedge, the pervasiveness of employment protection legislation and the strictness of the legislation regarding the use of temporary contracts. In Jimeno and Rodriguez-Palenzuela (2002) two institutional features stand out as the most relevant for the study of youth unemployment rates: those that increase the overall cost of the standard labour contract, for instance employment protection, and those which do not make provision for some contractual flexibility for the specificities of young workers. The first ones could make younger workers less attractive than the prime age ones, because the average lower job experience tends to decrease their average productivity. The second characteristics leave youth in a relative disadvantage with respect prime age workers, if the general labour market setting is predominantly rigid.

Besides the institutions concerning schooling, training and school-to-work transition can play a key role in determining the success of the younger workers, especially during the phase of the transition from school to work (O'Higgins, 2001; Cahuc et al., 2013; Choudry et al., 2012a, Eichhorst et al., 2013; Banerji et al., 2015). The different institutional environment could explain cross-country and intertemporal variations of youth integration into employment, and institutions targeted at the activation, the employability, the skills and knowledge improvement of youth, can play a role in fighting youth unemployment, and different strategies could be implemented to contrast it.

2.3 School-to-work transition

Youth are considered a vulnerable category of workers since they are in a delicate phase of their working life, the first entry into labour forces, that is to say that are involved in the school–to–work transition (Piopiunik and Ryan, 2012), typically defined as the period between the end of compulsory schooling and the attainment of full-time and/or stable employment[5]. Several reasons justify this vulnerability. Workers at the first experience do not have the same knowledge, skills, competences that can be learnt only at work. As a result, young workers often show high turnover rates (this is the *youth experience gap* highlighted in Caroleo and Pastore 2007; Pastore 2011). Many young workers conciliate part-time job with the study and/or the searching activities for a work, frequently alternating periods in the work force with periods of inactivity, which gives rise to a not always linear transition school-to-work that entails growing precariousness and less job satisfaction (Martin et al., 2007). This situation can be worsened by other specific characteristics: gender, ethnicity,

[5] This definition can vary according to the statistical uses and to the interpretations (Raffe, 2008; Elder, 2009; Manfredi and Quintini, 2009; Elder and Matsumoto, 2010).

disability, regional disparity, the organization of the family economy (Berloffa et. al 2015), initial differences in skills and education, and rigidities on the side of institutions (school, university, training system, labour agencies as well as labour market legislation; see on this Caroleo and Pastore, 2007, 2009).

Piopiunik and Ryan (2012) propose a useful classification of the policy interventions specific for the transition school-to-work into three groups: a) active labour market programmes (ALMP; see also Martin et al., 2007; Caliendo et al., 2011) based on short-run strategies aimed at improving labour market efficiency, increasing of the labour supply, integrating unemployed workers into the labour market;[6] b) VET systems aimed at equipping people with knowledge, know-how, skills and/or competences required in particular occupations or class of occupations or trades on the labour market (Cedefop, 2008). In this case effects are expected over a longer time spectrum; c) Apprenticeship, that is a system of cooperation between firms and vocational schools in initial training (Ryan, 2011) allowing the acquisition of general and transferable skills during class-based VET, and combining structured learning on the job and actual work experience within a training company (Eichhorst et al., 2015).

Generally ALMP's are characterised by a lack of integration with the educational system, whereas in VET systems the continuity with schooling is fundamental: the competences and qualifications acquired should be made comparable to those acquired in the academic tracks to promote possibilities of transfers between the two systems (Eichhorst et al., 2015). On the other hand, the distinction between VET and apprenticeship can be ambiguous, as vocational education may have work-based components (e.g. apprenticeships, dual-system education programmes). Depending on how VET systems are organised and implemented in the institutional setting, are integrated into the formal educational path, on the place where it is carried out (at general schools, and/or at specific training centres or colleges), on the degree of specificity of the provided skills, Eichhorst et al. (2015) identify three types of VET systems: a) school-based education system, b) a dual apprenticeship system in which school-based education is combined with firm-based training, c) informal training.

Our research question finds, in particular, its motivation to the fact that, during the current recession, the best performances in terms of youth labour market outcomes have been observed in the countries where a dual apprenticeship system is prevailing, that is Germany, Austria, Denmark. More generally, it could be asked which VET systems are more conducive in the long run to a favourable youth labour market outcomes (Rodríguez-Planas et al. 2015; van Ours, 2015). Yet evidence in this field is by no means as abundant as the findings related to cycle, demographics and (to al lesser extent) overall labour-market institutions.

However, analysing the relationship between youth labour-market performance and VET systems is an undertaking potentially affected by various problems. One has to allow for various measures of performance, due to the multi-dimensionality of the problem under scrutiny. Furthermore, since schooling potentially interacts with other institutions, the issue must be analysed taking into account as wide a set of institutions as

[6] The most recent European ALMP program is the "Youth Guarantee" or "job guarantee". It is a system through which a government or local authorities and the public employment services commit to offering a young person a job, training or re-training within a certain period of being made unemployed or leaving formal education (European Youth Forum, 2012; see also Pastore, 2015).

possible. The likely endogeneity of institutions is another source of misgivings for the analysis: reverse causality may run from labour-market changes to policy changes (Bassanini and Duval, 2006). Finally, and perhaps, foremost, there is not a uniform definition across countries of VET systems, nor data are complete or available, at least for quite long time series. The lack of data and precise definitions for VET programmes could make useless the implementation of usual estimation methods. It is for this reason that we rely on a recently developed technique (Bonhomme and Manresa, 2012), in order to propose a data-based classification of countries partially based on unobservable heterogeneity.

3. Youth Labour-Market Performance, Institutions and VET Systems. Some Cross-Country Estimates.

The aim of this section is to study the impact of the labour market institutions on youth labour-market performance through a dynamic panel data model. The benchmark study on labour market institutions done by Bassanini and Duval (2006) is used as starting point, since it explores the effect of the main labour market institutions on different groups of unemployed people. Additionally to labour market institutions, we also consider variables standing for VET and other educational features. In the previous literature, education-related variables and labour market institutions are not studied jointly. Bassanini and Duval (2006) themselves only consider average years of schooling as a proxy of the education in the population.

Some are in order about Bassanini and Duval. First they only consider the employment rates, while we extend estimation to unemployment rates too. Second, they only consider workers aged 20–24: we estimate equations for male and female workers separately and also consider the more traditional definition of young people aged 15-24. Third, they do not include among the regressors the lagged dependent variable (actually Jimeno and Rodriguez–Palenzuela, 2002, do the same). But lagged dependent variables could be very useful proxies both for the persistence associated to labour market performances and the relationships between past performances and policy actions. Evidence evocative of both phenomena is found in Destefanis and Mastromatteo (2010; 2012). Hence we include a lagged dependent variable among our regressors and estimate our equation through Sys-GMM (Blundell and Bond, 1998).

The estimated equations are:

$$YUit = \beta\, YUit\text{-}1 + \Sigma\, \nu j\, Xit + \Sigma\, \chi j\ \ Sit + \Sigma\, \lambda j\, Zit\ + \varepsilon\, it \qquad (3.1)$$

$$Empit = \beta\, Empit\text{-}1 + \Sigma\, \nu j\, Xit + \Sigma\, \chi j\ \ Sit + \Sigma\, \lambda j\, Zit\ + \varepsilon\, it \qquad (3.2)$$

where *YUit* is the youth unemployment rate, *Empit* is the youth employment rate. *Xit* is a vector of variables representing specific policies and institutions - the tax wedge; employment protection legislation indicator; indicator of active labour market policies expenditures on the GDP; minimum wage; benefit duration index; union density (in the regression tables these variables are named respectively *taxWedge, epoecd, almpgdp, min_wage, abd, udnetA*). *Zit* is a vector of control variables, chosen taking guidance from previous literature: the relative cohort of youth population on total population (*relcohort*); the output gap (O*gap*). *Sit* is the vector of the education-related variables: VET programmes participation; expenditures in public education as percentage of the GDP; compulsory years of schooling; the average years of schooling. These are dubbed respectively as

Vet, educexp, compyears, educ. About the variable e*duc*, Bassanini and Duval use the relative youth education proposed by Barro and Lee (2000), captured by the difference between the number of years of education of the over 15 and the over 25 age groups. Here, we consider the revised and corrected version of this indicator, proposed by De La Fuente and Domenech (2012) (see appendix). The choice about the schooling variables is also motivated by the availability of the data: the ones that have been considered are the variables with the lower number of missing values over time and across countries, although they are very general and not clearly informative about the representativeness of the schooling systems. The recourse to the duration of the compulsory school (that is the number of years of the compulsory school, computed as the difference between the statutory minimum school-leaving age and starting legal age) can be justified as a sort of proxy of the political choices of the same countries, regarding how they want to commit the population at the compulsory education. The *Vet* variable has been chosen because it is one of the richest series of data about VET systems; moreover, the fact that it is a datum about the participation, allows to overcome the problem of no homogeneous juridical definitions across countries (about VET and apprenticeship), since the related data are collected on the basis of the ISCED classification. The reason which motivates this specific attention is due to the fact that vocational programmes should make easy the transition from school-to-work and enforce the link between schooling system and skills demanded by the labour market, as it already happens in some dual apprenticeship system.

The data used are an unbalanced panel dataset elaborated starting from the CEP – OECD Institutions Data Set (1960-2004) by Nickell (2006), which has been the main source. Data are for twenty OECD countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, Norway, New Zealand, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States, for the period 1985 – 2010. The CEP - OECD dataset has been updated until 2010 and upgraded with other (mainly education-related) variables, all from the OECD website or from the World Bank data website. Further details about the dataset are available upon request.

The evidence is illustrated in Tables A.1-A.6. Looking at the labour-market institutions, the tax wedge and the minimum wage indicators increase the youth unemployment rate, and decrease the employment rate, while active labour market policies do the opposite, as expected. Results are not consistent for the other institutions, and are not satisfactory for two education related variables: *Vet* is never significant and *educexp* always enters with the wrong sign. Measurement problems are likely to drive these results. The economic cycle also affects youth employability rather importantly, unlike the demographic cohort effects.

4. Youth Labour-Market Performance, Institutions and Vet Systems. A Data-Driven Classification

Although there may be problems in measuring it correctly, we believe that the institutions aimed to the improvement of human capital (Goergen et al, 2012) are important for youth labour-market outcomes. There is in fact an important branch of the literature focused on cross-country differences in education-related settings and school-to-work transition (Ryan 2007; Brewster et al., 2011; Tiraboschi, 2012; Piopiunik and Ryan, 2012).

This literature attempts to classify groups of countries according to institutional ex ante considerations. In this section, on the other hand, we attempt the development of a cross-country classification based on the grouped fixed effects (GFE) method developed by Bonhomme and Manresa (2012). The use of the GFE approach could be helpful in taking into account time–varying unobservables related to education-related settings, school-to-work transition and the youth labour market. In this approach regression parameters are estimated minimising a least-squares criterion with respect to all possible groupings of the cross-sectional units, relying on recent advances in the clustering literature for fast and efficient computation. Units whose time profiles of outcomes – net of the effect of covariates – are most similar are grouped together in estimation. Hence group membership is estimated from the data.

In GFE first of all one must minimise the objective function, which is quite difficult due to the piecewise-quadratic nature of the criterion. Direct minimisation is not well-suited, so the procedure develops through algorithms. There are two types of possible algorithms: a simple iterative algorithm and an alternative and more efficient algorithm. The baseline simple linear model with grouped patterns of heterogeneity takes the following form:

$$y_{it}=x'_{it}\vartheta + \alpha_{git} + v_{it}\,,\ i= 1, \ldots N,\ t= 1,\ldots T, \qquad (4.1)$$

where the covariates x'_{it} are contemporaneously uncorrelated with v_{it}, but may be arbitrarily correlated with the group-specific unobservables α_{git}. The group membership variables $g_i = \{1, ...,G\}$ are unrestricted, and will be estimated along with the other parameters of the model. The group-specific time dummies α_{git}, for $g_i = \{1, ..,G\}$, are fully unrestricted as well. As an example, all units in the first group (that is, all i such that gi = 1) share the same unrestricted time profile α_{1t}. T the number of groups G is to be set or estimated by the researcher. This model contains three kinds of parameters: the parameter vector ϑ, common across individual units; the group specific time dummies $\alpha_{git} \in A$, for all $g \in \{1,\ldots, G\}$ and all $t \in \{1,\ldots, T\}$ and the group membership variables g_i for all $i \in \{1,\ldots, N\}$. With respect the application illustrated in this article (and taking e.g. YUit), the model is:

$$YU_{it} = \vartheta\, Vet_{it} + \Sigma\, \lambda_j X_{it} + \chi\, G_{it} + \alpha_{git} + v_{it}\ i= 1, \ldots N,\ t= 1,\ldots, T \qquad (4.2)$$

where X_{it} represent the control variables as in the fixed effects model. The grouped fixed-effects estimator is defined as the solution to the following minimization problems:

$$(\theta, \alpha, \gamma) = \text{argmin}\ \Sigma\Sigma\ (YU_{it} - \vartheta\, Vet_{it} - \Sigma\, \lambda_j X_{it} - \chi\, G_{it} - \alpha_{git})^2 \qquad (4.3)$$

where the minimum is taken over all the possible groupings $\gamma = \{g_1,..., g_N\}$, of the N units into G groups, common parameters θ and group-specific time effects α. The algorithms are applied in order to do this minimization. The first algorithm iterate back and forth between group classification (computation of g_i) and estimation of the other parameters (θ and α), until numerical convergence. This iterative scheme is a clustering algorithm. In Algorithm 1, the objective function is non-increasing in the number of iterations. Numerical convergence is typically very fast. However, a drawback of Algorithm 1 is its dependence on the chosen starting values. One way to overcome this problem is to choose many random starting values, and then select the solution that yields the lowest objective.

Algorithm 2 is more efficient and it is based on the Variable Neighbourhood Search method has been pointed out as the state-of-the-art heuristic to solve the minimum sum-of-squares partitioning problem. Actually, it combines two different search technologies: a local search that guarantees the attainment of a local optimum; and a reassignment of several randomly selected units into randomly selected groups, which allows for further exploration of the objective function. This is done by means of neighbourhood jumps of increasing size, where the maximum size of the neighbourhood is chosen by the researcher. Local search allows to get around local minima that are close to each other, whereas random jumps aim at efficiently exploring the objective function while avoiding to get trapped in a valley. Algorithm 2 depends on two parameters set by the researcher: the maximum neighbourhood size and a maximum number of iterations. The algorithm may also be run using different starting parameter values, even though the choice of starting values tends to matter much less than in the case of Algorithm 1.

Several attempts have been done, with both algorithms, with different starting values and different possible number of groups. The choice of the best results is based on the Bayesian information criterion (BIC), that in this case is better when it is lower. The output of our computation is reported in Tables A.7 and A.8. For algorithm 1 the key elements are reported: the objective function output, the corresponding BIC, the number of simulation; for algorithm 2, additionally, there are the number of neighbours and the number of steps.

The computations have been done using employment and unemployment (15-24 years) rate as dependent variable. Numbers highlighted in blue are the best results. The classification output has been chosen looking at the lower value of the objective function and the BIC. Looking at the results for algorithm 1, coefficients are quite different from what we have found in the Sys-GMM estimates. From the comparison of the groups, a clear heterogeneity appears among the alternative classification methods.

From a numerical point of view, the best attempt seems to be the classification obtained through algorithm 2, using the youth unemployment rate as dependent variable, with 100 simulations, 20 steps, 20 neighbourhood. In this case, the four groups are the following. The first includes Belgium, Canada, Denmark, France, Ireland, Italy, New Zealand, United Kingdom; these are countries with heterogeneous regulation of vocational education: for almost all of them, the school-based education system is prevailing. Similar characteristics prevail in the second group – composed by Australia, Finland, Norway, Sweden, United States - although the links between school and labour market seem to be stronger, but in different ways: for instance Australia has more specific vocational and professional tracks, while the Scandinavian countries take advantage from the tradition of youth guarantee which encourages the social and economic realisation of younger people. Group 3 is composed by Austria, Germany, Japan, Netherlands, Portugal, Switzerland. In the third group there are countries all endowed with a strong VET system: Austria, Germany, Switzerland are dual system countries, similarly the Netherlands are characterized by an apprenticeship regulated as the job contract and a well-regulated educational path in the technical professional system. Japan is the most different: there, the vocational education system has been praised for reducing the need for job search by young workers, but its qualitative efficiency is questionable, since it matches jobs and school-leavers across two essentially uni-

dimensional rankings, one of school quality and pupil achievement, the other of company job rewards and reputation (Ryan, 2001). In Portugal the system is different from a dual one, but vocational education was unified in the general education path in the early 1970s, in order to prevent premature specialisation and to promote teacher-training structures correctly coordinated with the industrial, agricultural and service sectors, as an essential condition for expanding courses leading to a professional qualification. The idea was to give pupils access to higher education and, simultaneously, to give them easy access to a professional career through a network of training systems already available or about to be created. Group 4 is just one country, Spain, a particular case, since it exhibits a deeply polarized educational structure with a very high early school leaving rate on the one hand and one of the largest shares of university graduates between 25 and 34 in Europe. The access to vocational training is limited, since after compulsory education (at age 16), youths in Spain have two options: the enrollment in vocational training (*Ciclo Formativos de Grado Medio - CFGM*) or the choice of a general academic curriculum for two more years, the so called *Bachillerato*. At the tertiary education level, there is again a dual track: youths can enroll in college or vocational training of higher education (C*iclo Formativo de Grado Superior - CFGS*). The relatively marginal role of vocational training can be explained by a limited interest of employers in more formal vocational training (given the dual employment structure), but also by strong expectations of upward social mobility on behalf of young people and their families which creates strong preference in favor of academic training (Biavaschi et al., 2012).

5. Concluding Remarks

In this paper we study the effects of labour market institutions and education-related variables on youth unemployment and employment rates, in a sample of 20 OECD countries through period 1985 – 2012. We provide some GMM estimates and develop a data-driven cross country classification, grounded on an empirical model (the Grouped Fixed Effects approach) and not on ex-ante institutional analysis.

Looking at the labour-market institutions, the tax wedge and the minimum wage indicators increase the youth unemployment rate, and decrease the employment rate, while active labour market policies do the opposite, as expected. Results are not consistent for the other institutions, and are not satisfactory for two education related variables: the VET participation rate is never significant and expenditures in public education as percentage of the GDP always enter with the wrong sign. Measurement problems are likely to drive these results. Another worrying feature of our estimates is that coefficients differ across Sys-GMM and GFE.

As a preliminary comment from a policy point of view, we have found some tentative evidence that sets apart countries where a dual apprenticeship system is prevailing from other ones. More generally, it could be asked which VET systems are more conducive in the long run to a favourable youth labour market outcomes (Rodríguez-Planas et al. 2015; van Ours, 2015). Our evidence must be in this sense strengthened, arguably using more reliable measures of education-related institutions.

APPENDIX – TABLES

Table A.1

Results. Youth Unemployment Rate as Dependent Variable. Age 15-24 (variable YU) and 20-24 (variable YU2024).

VARIABLES	YU	YU	YU	YU
l1YU	0.923***	0.927***	0.926***	0.914***
	(0.0141)	(0.0140)	(0.0212)	(0.0171)
epoecd	0.220*	0.232**	-0.301	-0.358*
	(0.117)	(0.117)	(0.192)	(0.200)
taxWedge	0.00519	0.0133	0.0365*	0.0363*
	(0.0155)	(0.0143)	(0.0196)	(0.0192)
almpgdp	-0.264	-0.350	-1.326**	-1.236**
	(0.326)	(0.335)	(0.539)	(0.611)
relcohort	-0.0136	-0.00998	-0.0159	-0.0146
	(0.0119)	(0.0122)	(0.0190)	(0.0181)
Ogap	-0.275***	-0.280***	-0.259**	-0.257**
	(0.0595)	(0.0614)	(0.117)	(0.110)
minw_medw	0.679*	0.972***	3.190**	3.126**
	(0.363)	(0.372)	(1.355)	(1.377)
Abd	-0.443	-0.337	-1.094	-1.148
	(0.300)	(0.279)	(0.766)	(0.797)
udnetA	0.00959	0.0136**	0.00462	0.00731
	(0.00677)	(0.00674)	(0.00897)	(0.00966)
Vet			-0.00265	-0.00157
			(0.0128)	(0.0135)
educexp			0.846***	0.779***
			(0.242)	(0.267)
compyears			-0.155**	-0.170**
			(0.0754)	(0.0848)
educ			-0.169	-0.257**
			(0.106)	(0.121)

VARIABLES	YU2024	YU2024	YU2024	YU2024
l1YU2024	0.927***	0.929***	0.882***	0.904***
	(0.0149)	(0.0147)	(0.0256)	(0.0243)
epoecd	0.280**	0.257***	-0.249	-0.170
	(0.112)	(0.0946)	(0.153)	(0.187)
taxWedge	0.00155	0.00835	0.0366**	0.0351*
	(0.0128)	(0.0110)	(0.0178)	(0.0188)
almpgdp	-0.104	-0.150	-1.003**	-1.198**
	(0.295)	(0.293)	(0.497)	(0.471)
relcohort	-0.00315	-0.000512	-0.00485	-0.00811
	(0.00954)	(0.00955)	(0.0160)	(0.0167)
Ogap	-0.260***	-0.250***	-0.250***	-0.253***
	(0.0627)	(0.0630)	(0.0904)	(0.0913)
minw_medw	0.517	0.675**	2.565***	2.766***
	(0.336)	(0.341)	(0.805)	(0.965)
Abd	-0.310	-0.279	-0.752	-0.740
	(0.276)	(0.253)	(0.715)	(0.801)
udnetA	0.00303	0.00375	0.000480	-0.00234
	(0.00597)	(0.00548)	(0.00827)	(0.00787)
Vet			-0.00288	-0.00323
			(0.0118)	(0.0120)
educexp			0.665***	0.783***
			(0.216)	(0.237)
compyears			-0.186***	-0.156**
			(0.0666)	(0.0652)
educ			-0.290**	-0.158*
			(0.130)	(0.0918)

Table A.2

Results. Youth Unemployment Rate (Female) as Dependent Variable. Age 15-24 (variable YUf) and 20-24 (variable YU2024f)

VARIABLES	YUf	YUf	YUf	YUf
l1YUf	0.945***	0.946***	0.901***	0.912***
	(0.00830)	(0.00812)	(0.0132)	(0.0129)
epoecd	0.269**	0.263**	-0.212	-0.176
	(0.118)	(0.113)	(0.231)	(0.265)
taxWedge	-0.000881	0.00536	0.0410**	0.0407**
	(0.0109)	(0.00998)	(0.0171)	(0.0190)
almpgdp	-0.228	-0.280	-1.491**	-1.618**
	(0.256)	(0.269)	(0.742)	(0.635)
relcohort	-0.0103	-0.00782	-0.00158	-0.00263
	(0.00851)	(0.00883)	(0.0163)	(0.0166)
ogap	-0.216***	-0.213***	-0.114	-0.112
	(0.0543)	(0.0555)	(0.0937)	(0.0954)
minw_medw	0.412	0.599**	2.112*	2.233*
	(0.284)	(0.275)	(1.106)	(1.160)
abd	-0.424*	-0.377*	-1.651*	-1.668*
	(0.246)	(0.225)	(0.986)	(0.997)
udnetA	0.00982*	0.0116**	0.00478	0.00269
	(0.00528)	(0.00529)	(0.00802)	(0.00869)
Vet			0.00166	0.000915
			(0.0129)	(0.0127)
educexp			0.771**	0.841***
			(0.300)	(0.293)
compyears			-0.101	-0.0876
			(0.0836)	(0.0757)
educ			-0.301**	-0.218*
			(0.138)	(0.118)

VARIABLES	YU2024f	YU2024f	YU2024f	YU2024f
l1YU2024f	0.950***	0.951***	0.854***	0.889***
	(0.00887)	(0.00915)	(0.0257)	(0.0175)
epoecd	0.268**	0.257**	0.0415	0.154
	(0.116)	(0.112)	(0.219)	(0.281)
taxWedge	-0.00562	6.02e-05	0.0424***	0.0402*
	(0.0118)	(0.0104)	(0.0164)	(0.0217)
almpgdp	-0.0926	-0.133	-0.908*	-1.322**
	(0.244)	(0.250)	(0.528)	(0.554)
relcohort	-0.00196	0.000347	0.0192	0.0152
	(0.00829)	(0.00871)	(0.0170)	(0.0158)
ogap	-0.306***	-0.303***	-0.163**	-0.153**
	(0.0634)	(0.0642)	(0.0665)	(0.0724)
minw_medw	0.224	0.380	1.187**	1.526*
	(0.259)	(0.251)	(0.538)	(0.807)
abd	-0.255	-0.221	-0.716	-0.745
	(0.228)	(0.216)	(0.495)	(0.643)
udnetA	0.00302	0.00415	0.00112	-0.00336
	(0.00486)	(0.00460)	(0.00884)	(0.00987)
Vet			-0.00658	-0.00929
			(0.0110)	(0.0113)
educexp			0.443**	0.642***
			(0.176)	(0.230)
compyears			-0.174**	-0.121
			(0.0881)	(0.0895)
educ			-0.422***	-0.186**
			(0.147)	(0.0753)

Results. Youth Unemployment Rate (Male) as Dependent Variable. Age 15-24 (variable YUm) and 20-24 (variable YU2024m)

VARIABLES	YUm	YUm	YUm	YUm
l1YUm	0.907***	0.915***	0.919***	0.930***
	(0.0181)	(0.0175)	(0.0294)	(0.0311)
epoecd	0.156*	0.145*	-0.329*	-0.266
	(0.0936)	(0.0804)	(0.171)	(0.185)
taxWedge	0.0105	0.0225	0.0288	0.0301
	(0.0180)	(0.0165)	(0.0223)	(0.0219)
almpgdp	-0.325	-0.427	-1.150**	-1.295**
	(0.405)	(0.401)	(0.579)	(0.516)
relcohort	-0.0150	-0.00980	-0.0276	-0.0292
	(0.0130)	(0.0130)	(0.0182)	(0.0194)
ogap	-0.276***	-0.266***	-0.373***	-0.373***
	(0.0728)	(0.0752)	(0.119)	(0.118)
minw_medw	0.867**	1.211***	3.666***	3.797***
	(0.420)	(0.426)	(1.176)	(1.272)
abd	-0.455	-0.349	-0.560	-0.598
	(0.329)	(0.293)	(0.832)	(0.901)
udnetA	0.00987	0.0131*	0.0114	0.00886
	(0.00828)	(0.00745)	(0.0122)	(0.0114)
Vet			-0.00525	-0.00586
			(0.0162)	(0.0163)
educexp			0.756***	0.847***
			(0.267)	(0.255)
compyears			-0.176*	-0.156*
			(0.0985)	(0.0941)
educ			-0.242	-0.160
			(0.156)	(0.124)

VARIABLES	YU2024m	YU2024m	YU2024m	YU2024m
l1YU2024m	0.901***	0.906***	0.886***	0.906***
	(0.0216)	(0.0212)	(0.0422)	(0.0386)
epoecd	0.219**	0.191**	-0.335*	-0.245
	(0.109)	(0.0840)	(0.191)	(0.198)
taxWedge	0.00853	0.0190	0.0343	0.0341
	(0.0171)	(0.0151)	(0.0233)	(0.0225)
almpgdp	-0.0963	-0.175	-0.877*	-1.083**
	(0.393)	(0.375)	(0.528)	(0.496)
relcohort	-0.00545	-0.00115	-0.0188	-0.0221
	(0.0125)	(0.0123)	(0.0201)	(0.0209)
ogap	-0.308***	-0.292***	-0.400***	-0.403***
	(0.0728)	(0.0725)	(0.110)	(0.109)
minw_medw	0.697*	0.958**	3.476***	3.679***
	(0.423)	(0.440)	(1.033)	(1.175)
abd	-0.358	-0.296	-0.269	-0.293
	(0.336)	(0.302)	(0.888)	(0.971)
udnetA	0.00267	0.00419	0.00296	6.02e-05
	(0.00778)	(0.00673)	(0.0118)	(0.0110)
Vet			-0.00474	-0.00506
			(0.0151)	(0.0152)
educexp			0.724***	0.855***
			(0.271)	(0.264)
compyears			-0.261***	-0.227**
			(0.0996)	(0.0956)
educ			-0.242	-0.125
			(0.162)	(0.118)

Results. Youth Employment Rate as Dependent Variable. Age 15-24 (variable Emp) and 20-24 (variable Emp2024)

VARIABLES	Emp	Emp	Emp	Emp
l1Emp	0.992***	0.996***	0.991***	1.009***
	(0.0138)	(0.00429)	(0.0122)	(0.0105)
epoecd	-0.297	-0.296*	0.128	0.260
	(0.201)	(0.174)	(0.184)	(0.177)
taxWedge	0.0137	0.0178	-0.0113	0.0172
	(0.0159)	(0.0149)	(0.0107)	(0.0144)
almpgdp	0.237	0.205	0.983**	0.523
	(0.385)	(0.405)	(0.425)	(0.645)
relcohort	-0.00607	-0.00504	-0.0172	-0.0107
	(0.0105)	(0.00926)	(0.0193)	(0.0130)
Ogap	0.357***	0.361***	0.265***	0.267***
	(0.0739)	(0.0733)	(0.0764)	(0.0788)
minw_medw	0.197	0.272	-1.616*	-1.113
	(0.440)	(0.364)	(0.889)	(0.999)
Abd	-0.0287	-0.0543	-0.243	-0.643
	(0.249)	(0.250)	(0.773)	(0.840)
udnetA	-0.00379	-0.00391	0.00417	0.00385
	(0.00628)	(0.00709)	(0.00912)	(0.00657)
Vet			-0.00345	-0.00917
			(0.00863)	(0.0106)
educexp			-0.607**	-0.514
			(0.301)	(0.315)
compyears			0.260***	0.265***
			(0.0719)	(0.0742)
Educ			0.136*	0.218***
			(0.0796)	(0.0727)

VARIABLES	Emp2024	Emp2024	Emp2024	Emp2024
l1Emp2024	0.980***	0.997***	0.971***	0.957***
	(0.0168)	(0.00387)	(0.0122)	(0.00959)
epoecd	-0.352**	-0.275**	0.404***	0.369***
	(0.157)	(0.122)	(0.131)	(0.139)
taxWedge	0.0120	0.0224*	-0.0209	-0.0353***
	(0.0141)	(0.0116)	(0.0145)	(0.00995)
almpgdp	-0.0199	-0.134	0.507	0.790**
	(0.351)	(0.295)	(0.517)	(0.367)
relcohort	-0.0142*	-0.0145*	-0.0120	-0.0166
	(0.00818)	(0.00763)	(0.00789)	(0.0115)
Ogap	0.354***	0.339***	0.332***	0.324***
	(0.0828)	(0.0774)	(0.0747)	(0.0722)
minw_medw	-0.0576	0.241	-1.681***	-1.876***
	(0.511)	(0.402)	(0.635)	(0.662)
Abd	0.0388	-0.000636	0.184	0.499
	(0.267)	(0.221)	(0.680)	(0.590)
udnetA	0.00125	0.00435	0.0111*	0.0106
	(0.00558)	(0.00477)	(0.00566)	(0.00647)
Vet			-0.0117	-0.0106
			(0.00987)	(0.00865)
educexp			-0.583**	-0.645***
			(0.242)	(0.224)
compyears			0.330***	0.319***
			(0.0677)	(0.0628)
Educ			0.315***	0.336***
			(0.0869)	(0.0814)

Table A.5

Results. Youth Employment Rate as Dependent Variable (Female). Age 15-24 (variable EmpF) and 20-24 (variable Emp2024F)

VARIABLES	EmpF	EmpF	EmpF	EmpF
l1EmpF	0.998***	0.999***	0.980***	0.973***
	(0.0118)	(0.00414)	(0.0121)	(0.0115)
Epoecd	-0.249	-0.232	0.301*	0.250
	(0.216)	(0.178)	(0.156)	(0.179)
taxWedge	0.0119	0.0120	-0.0317*	-0.0435***
	(0.0130)	(0.0132)	(0.0171)	(0.00839)
almpgdp	0.0920	0.0846	0.941	1.247***
	(0.343)	(0.372)	(0.670)	(0.433)
relcohort	-0.00771	-0.00775	-0.0293**	-0.0323**
	(0.00982)	(0.00891)	(0.0133)	(0.0159)
Ogap	0.305***	0.299***	0.134**	0.127**
	(0.0602)	(0.0599)	(0.0621)	(0.0604)
minw_medw	0.381	0.413	-1.186	-1.489**
	(0.415)	(0.352)	(0.837)	(0.695)
Abd	0.155	0.161	0.619	0.922
	(0.247)	(0.244)	(0.902)	(0.742)
udnetA	-0.00320	-0.00249	0.00520	0.00460
	(0.00531)	(0.00593)	(0.0101)	(0.0102)
Vet			-0.00550	-0.00566
			(0.0102)	(0.00897)
educexp			-0.488*	-0.552**
			(0.292)	(0.268)
compyears			0.277***	0.272***
			(0.0667)	(0.0729)
Educ			0.249***	0.240***
			(0.0865)	(0.0829)

VARIABLES	Emp2024F	Emp2024F	Emp2024F	Emp2024F
l1Emp2024F	0.994***	0.999***	0.919***	0.920***
	(0.0132)	(0.00427)	(0.0161)	(0.0135)
Epoecd	-0.229	-0.191	0.495***	0.498***
	(0.186)	(0.165)	(0.169)	(0.169)
taxWedge	0.0153	0.0172	-0.0877***	-0.0852***
	(0.0160)	(0.0142)	(0.0136)	(0.00975)
almpgdp	-0.317	-0.351	0.998*	0.976**
	(0.337)	(0.307)	(0.526)	(0.472)
relcohort	-0.0142	-0.0149	-0.0285***	-0.0288***
	(0.0103)	(0.0105)	(0.0101)	(0.00997)
Ogap	0.328***	0.322***	0.167***	0.163***
	(0.0704)	(0.0700)	(0.0532)	(0.0526)
minw_medw	0.320	0.428	-1.474***	-1.401**
	(0.470)	(0.438)	(0.567)	(0.591)
Abd	0.312	0.323	1.105*	1.086**
	(0.256)	(0.230)	(0.604)	(0.552)
udnetA	0.00149	0.00351	0.00634	0.00640
	(0.00571)	(0.00489)	(0.00899)	(0.00892)
Vet			0.00127	0.00102
			(0.0122)	(0.0116)
educexp			-0.465**	-0.443**
			(0.215)	(0.198)
compyears			0.299***	0.297***
			(0.0664)	(0.0549)
Educ			0.563***	0.573***
			(0.100)	(0.101)

Table A.6

Results. Youth Employment Rate as Dependent Variable (Male). Age 15-24 (variable EmpM) and 20-24 (variable Emp2024M)

VARIABLES	EmpM	EmpM	EmpM	EmpM
l1EmpM	0.988***	0.994***	1.017***	0.990***
	(0.0148)	(0.00394)	(0.0191)	(0.0160)
Epoecd	-0.316*	-0.280*	0.0512	-0.102
	(0.189)	(0.168)	(0.201)	(0.199)
taxWedge	0.00892	0.0128	0.0455**	0.00825
	(0.0156)	(0.0139)	(0.0205)	(0.0200)
almpgdp	0.324	0.285	0.520	1.066***
	(0.404)	(0.421)	(0.658)	(0.377)
relcohort	-0.00220	-0.00111	0.00426	-0.00653
	(0.0108)	(0.00864)	(0.0158)	(0.0244)
Ogap	0.329***	0.321***	0.402***	0.403***
	(0.0671)	(0.0647)	(0.0977)	(0.0934)
minw_medw	0.0262	0.179	-1.345	-2.073**
	(0.465)	(0.369)	(1.068)	(0.953)
Abd	0.0571	0.0319	-1.136	-0.553
	(0.272)	(0.268)	(0.887)	(0.834)
udnetA	-0.00543	-0.00377	-0.00843	-0.0102
	(0.00651)	(0.00745)	(0.00962)	(0.00850)
Vet			-0.0114	-0.00469
			(0.0116)	(0.00868)
Educexp			-0.525*	-0.597*
			(0.316)	(0.327)
compyears			0.238*	0.257**
			(0.123)	(0.125)
educ			0.228**	0.130
			(0.0889)	(0.0884)

VARIABLES	Emp2024M	Emp2024M	Emp2024M	Emp2024M
l1Emp2024M	0.964***	0.993***	0.981***	0.959***
	(0.0221)	(0.00418)	(0.0272)	(0.0165)
Epoecd	-0.403***	-0.301***	0.225	0.179
	(0.130)	(0.0883)	(0.189)	(0.197)
taxWedge	0.00650	0.0235**	0.0123	-0.00824
	(0.0157)	(0.0108)	(0.0227)	(0.0157)
almpgdp	0.0765	-0.0513	0.427	0.711*
	(0.425)	(0.339)	(0.593)	(0.375)
relcohort	-0.0102	-0.00980*	-0.000863	-0.00728
	(0.00831)	(0.00562)	(0.0127)	(0.0186)
Ogap	0.389***	0.366***	0.555***	0.545***
	(0.0869)	(0.0794)	(0.111)	(0.111)
minw_medw	-0.386	0.0327	-2.268**	-2.478**
	(0.546)	(0.412)	(1.104)	(1.046)
Abd	0.0262	-0.119	-0.790	-0.385
	(0.301)	(0.247)	(1.102)	(0.907)
udnetA	0.00266	0.00625	0.00517	0.00509
	(0.00690)	(0.00598)	(0.00737)	(0.00823)
Vet			-0.0154	-0.0125
			(0.0131)	(0.0130)
Educexp			-0.652**	-0.703**
			(0.287)	(0.274)
compyears			0.372***	0.369***
			(0.0958)	(0.0948)
educ			0.288***	0.295***
			(0.110)	(0.106)

Tables A.7 – Results Algorithm 1.

Table **A.7**a - Empit as dependent variable.

$Empit = \vartheta\ Vet_{it} + \Sigma\ \lambda\ j\ Xit + \chi\ Git + \alpha\ git + vit$ $i = 1, \ldots N$					
N observations	**Objective function**	**BIC**	**AIC**	**N simulations**	**N groups**
351	4672.34	2460.67	2398.89	10	2
351	3753.60	2481.90	2416.26	100	2
351	3708.63	2489.11	2423.48	1000	2
351	3708.63	2489.11	2423.48	10000	2
351	4202.29	2377.32	2442.95	10	3
351	3392.05	2421.21	2359.44	100	3
351	2851.96	2392.04	2326.40	1000	3
351	2505.74	2362.53	2296.89	10000	3
351	2743.93	2399.92	2334.29	10	4
351	2584.18	2422.80	2364.89	100	4
351	2293.22	2341.64	2287.58	1000	4
351	2049.08	2221.25	2159.47	10000	4

Table A.7b - YUit as dependent variable.

$YUit = \vartheta\ Vet_{it} + \Sigma\ \lambda\ j\ Xit + \chi\ Git + \alpha\ git + vit$ $i = 1, \ldots N$					
N observations	**Objective function**	**BIC**	**AIC**	**N simulations**	**N groups**
351	3229.54	2311.57	2245.94	10	2
351	3107.67	2206.89	2145.12	100	2
351	3107.67	2206.89	2145.12	1000	2
351	3000.40	2058.89	1993.26	10000	2
351	2681.32	2175.53	2113.76	10	3
351	2643.82	2188.78	2130.87	100	3
351	2287.57	2177.02	2119.11	1000	3
351	2083.59	2161.19	2099.42	10000	3
351	2209.55	2137.84	2079.93	10	4
351	1962.02	2156.59	2098.68	100	4
351	1725.00	2144.11	2090.06	1000	4
351	1696.06	2154.67	2096.76	10000	4

Table A.7c - Coefficients and classification based on algorithm 1, dependent variables Emp and YU.

	Emp - Algorithm 1 Coefficients
Vet	*0.108894*
epoecd	-0.8608
taxWedge	1.178031
almpgdp	-3.16E-01
relcohort	3.48E-01
educ	-3.72E-02
minw_medw	-0.3629
Abd	0.259509
udnetA	-0.9113
Ogap	-0.7833

Group 1	Canada, Netherlands, Spain, United States
Group 2	Portugal
Group 3	Australia, Austria, Germany, Japan, Sweden, Switzerland, United Kingdom
Group 4	Belgium, Denmark, Finland, France, Ireland, Italy, Norway, New Zealand

	YU - Algorithm 1 Coefficients
Vet	*-0.57233*
epoecd	0.232355
taxWedge	9.96E-02
almpgdp	2.81827
relcohort	-0.18851
educ	1.792023
minw_medw	-0.10499
Abd	1.037122
udnetA	0.38113
Ogap	-0.15347

Group 1	Canada, Sweden, United States
Group 2	New Zealand, Spain
Group 3	Australia, Austria, Belgium, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Switzerland, United Kingdom
Group 4	Denmark

Tables A.8 – Results Algorithm 2.

T able A.8a YUR as dependent variable

$YURit = \vartheta\ lrelWbit + \Sigma\ l\ j\ Xit + \chi\ Git + \alpha\ git + vit\ i= 1, \ldots N$							
N observations	**Objective function**	**BIC**	**AIC**	**N simulations**	**N Neighbour**	**N steps**	**N groups**
351	3000.40	2058.89	1993.26	10	10	10	2
351	3000.40	2058.89	1993.26	100	10	100	2
351	3000.40	2058.89	1993.26	100	20	10	2
351	3000.40	2058.89	1993.26	100	20	20	2
351	3000.40	2058.89	1993.26	1000	20	20	2
351	2040.59	2010.904	1945.27	10	10	10	3
351	2040.59	2010.904	1945.27	100	10	10	3
351	2030.71	2236.892	2171.26	100	20	20	3
351	2040.59	2010.904	1945.27	100	10	20	3
351	2024.08	2236.892	2171.26	100	20	20	3
351	1435.49	1904.536	1842.76	10	10	10	4
351	1428.24	1904.536	1842.76	100	10	10	4
351	1428.24	1904.536	1842.76	100	20	10	4
351	1428.24	1904.536	1842.76	100	20	20	4

Table A.8b coefficients and classification based on algorithm 2, dependent variable YUR.

Yur - Algorithm 2	
Coefficients	
Vet	*0.509157*
Epoecd	-3.09619
TaxWedge	0.688521
almpgdp	0.511905
relcohort	0.672852
educ	0.436186
minw_medw	4.544986
Abd	-6.81169
udnetA	0.154683
Ogap	-0.30052
Group 1	Belgium, Canada, Denmark, France, Ireland, Italy, New Zealand, United Kingdom
Group 2	Australia, Finland, Norway, Sweden, United States
Group 3	Austria, Germany, Japan, Netherlands, Portugal, Switzerland
Group 4	Spain

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