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The macroeconomic impact of structural policies on labour market outcomes in OECD countries: A reassessment

Peter Gal,

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By Peter Gal and Adam Theising

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ABSTRACT/RÉSUMÉ

The macroeconomic impact of policies on labour market outcomes in OECD countries: a reassessment

This paper presents a first set of updates and extensions of the large body of existing evidence about the aggregate labour market impact of structural policies, in the context of enhancing the OECD's supply-side framework for the quantification of reform packages. In line with previous findings, elements of the tax benefit system, activation policies and wage setting institutions are found to be robust policy determinants of the aggregate employment and unemployment rates. Looking beyond the overall employment impact, outcomes for vulnerable groups such as the low educated, the youth and the elderly tend to be more affected by certain structural policies, including specific measures targeted at them. Finally, more competition-friendly product market regulations are also found to impact aggregate employment rates positively and significantly, although less robustly.

JEL codes: E24; J08
Keywords: Labour market policies, employment, unemployment, labour force participation

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L'impact macroéconomique des politiques structurelles sur le marché du travail dans les pays de l'OCDE : une mise à jour

Cette étude vise à mettre à jour et compléter les résultats de la littérature existante concernant l'impact des politiques structurelles sur le marché du travail, et ceci dans le contexte de l'amélioration du cadre de modélisation pour la quantification de l'impact des réformes sur l'offre globale. Conformément aux résultats des études antérieures, nous trouvons que les éléments du système de prélèvements et de transferts fiscal, les politiques d'activation et les modes de détermination des salaires sont des déterminants robustes du taux d'emploi et du taux de chômage. Au-delà de l'impact global sur l'emploi, les résultats pour les groupes vulnérables tels que les travailleurs peu qualifiés, les jeunes et les travailleurs âgés ont tendance à être plus touchées par certaines politiques structurelles, y compris des mesures spécifiques ciblées sur eux. Enfin, nous trouvons aussi qu'une réglementation des marchés de produits moins restrictive pour la concurrence encourage le taux d'emploi de manière significative, bien que de façon moins robuste.

Codes JEL: E24; J08
Mots clefs: politiques du marché du travail, emploi, chômage, participation au marché du travail

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THE MACROECONOMIC IMPACT OF POLICIES ON LABOUR MARKET OUTCOMES IN OECD COUNTRIES: A RE-ASSESSMENT

By Peter Gal and Adam Theising[1]

1. Introduction

1. This paper is a first step of an updated assessment of the quantitative impact of policies and institutions on the employment rate for a panel of OECD economies. It reports interim results of an ongoing work, which is part of a broader objective to inform policymakers about the impact of potential policy reforms on growth. There are two main differences from the long list of existing OECD studies in the area.

2. First, the paper aims to broaden the set of policy channels included in the analysis and assess their impact on labour market outcomes, including under the constraint of unchanged overall fiscal balance. It takes stock of and categorizes a wide range of labour market policies and institutional indicators so as to gauge the feasibility of including them in the analysis. They include traditionally used indicators, covering three broad areas: *(i)* the tax-benefit system and activation policies, *(ii)* wage-setting institutions and *(iii)* regulations of labour and product markets. Importantly, these policy effects are estimated by controlling for the overall stance of fiscal policy. This serves two purposes. First, it ensures that the changes can indeed be interpreted as structural, excluding an effect coming from a fiscal stimulus. Second, it also makes sure that the effects are estimated under long-run sustainability of the budget. These considerations are particularly important for policies that can have potentially large implications on fiscal expenditures and revenues, such as spending on active labour market policies or the level of labour taxes.

3. Second, the paper also goes beyond earlier studies in looking at whether some segments of the population are more affected by certain reforms than others. This serves the basis for a broader, more inclusive assessment of policies. In turn, this also provides a richer predictive framework for assessing the effects of policies on aggregate employment. It finds that the impact of policies varies by skills – measured by educational attainment – and by demographic groups – i.e. women, men, youth, prime-age, elderly. Demographic groups have already been carefully studied, though nearly ten years ago (Bassanini and Duval, 2006) with only partial updates (OECD, 2012, Thévenon, 2013). In addition to revisiting these findings, the analysis also carefully compares the size of the effects across these segments. Moreover, educational attainment levels can broadly serve as a proxy for skill and wage levels; this dimension is gaining particular importance amid growing concerns about the role of technology and automation on the employment prospects of less skilled workers.

[1] OECD Working Papers should not be reported as representing the official views of the OECD or of its member countries. The opinions expressed and arguments employed are those of the author(s). The authors are, respectively, Economist and Consultant (formerly) in the Structural Policies Surveillance Division of the Economics Department at the OECD. The authors gratefully acknowledge useful comments and suggestions by Economics Department and Employment, Labour and Social Affairs staff: Philip Bagnoli, Sebastian Barnes, Andrea Bassanini, Orsetta Causa, Federico Cingano, Alain de Serres, Oliver Denk, Balázs Égert, Jean-Marc Fournier, Alexander Hijzen, Sebastien Königs, Catherine L. Mann, Giuseppe Nicoletti, Jean-Luc Schneider and David Turner and participants at the OECD/ECO Brownbag Seminar Series. They also thank Hervé Boulhol, Agnès Cavaciuti, Maria Chiara Cavalleri, Sebastien Martin and Alessandro Saia for sharing data as well as Caroline Abettan for technical assistance.

4. The main findings of this paper are as follows:

- Among tax-benefit and activation policies, lower unemployment benefit replacement rates, increased spending on active labour market policies (ALMP), lower labour tax wedges all tend to boost employment, either by decreasing structural unemployment rates or by increasing participation rates or a combination of both. These findings broadly confirm existing results but based on an updated dataset and on a somewhat different methodology, and are shown to be robust to a large array of sensitivity checks.
- Among wage-setting institutions, the excess coverage of wage agreements, its interaction with the tax wedge and the level of minimum wage tend to affect employment rates negatively.
- Among product and labour market regulations, only the former shows significant negative effects on the aggregate employment rate, while the heterogeneous impact of EPL on various segments of the population makes aggregate effects highly dependent on the composition of the working age population by skills and demographic groups (see also 5c below).
- When assessing the effect of typically observed reforms over the last decades in OECD countries, all of these policies yield gains that are similar in magnitude. When considering more ambitious reforms that aim to reduce the gaps vis-à-vis better performing countries, wage setting institutions seem to have the largest potential to lift employment.
- Some of the policy effects show significant and intuitive heterogeneities across segments of the population:
  - Higher unemployment benefit replacement rates affect most negatively the employment of the elderly and the low educated;
  - ALMP spending has positive effects for each segments of the population, mostly so for the youth;
  - Stricter employment protection legislation tends to decrease female employment rates, although this result is not robust to the exclusion of family policies. Effects on men are ambiguous. It also has opposing effects on the low educated (lowering employment) and on the highly educated (increasing employment). These opposing effects across groups of the population help to explain why it is difficult to find robust aggregate effects;
  - Raising the legal retirement age increases labour force participation for the elderly;
  - More spending on in-kind family benefits such as childcare and longer maternity leaves increase employment rates of the working-age female population.
- Furthermore, a more detailed analysis of the policy channels reveal the following findings:
  - Average benefit replacement rates exert their main effect through the initial replacement rates;
  - Spending on job training seems to be the most important driver of the various types of ALMPs.

5. As mentioned above, this work is part of a broader project to inform policymakers about the impact of potential policy reforms on growth. The paper's contribution to such a framework is to give a first set of updated and more detailed results of the supply side effects of policy changes through labour markets. Given this perspective, a number of considerations are taken to limit the scope of the study.

6. First, a systematic overview of potential interaction effects among policies will be left for future work. That would allow for incorporating a second layer of country specificities, beyond the disaggregate

approach adopted in this paper (Nicoletti and Scarpetta, 2005; Fiori et al., 2012). Second, although micro-level, programme-evaluation type studies seeking exogenous variation are better suited to establish the causal impacts of specific policy steps, they face more difficulties in establishing macroeconomic and long-run effects. Such approaches, widely used to assess the causal impact of reforms in a single policy area by relying on within-country variation (e.g. across sectors as in Rajan and Zingales, 1998), cannot be applied as they do not incorporate the *overall, macroeconomic* impact of policy changes. Finally, the paper will not attempt to cover *job and earnings quality* aspects. Nonetheless, recent OECD work presenting cross country evidence in three broad aspects of job quality – the level and distribution of earnings, labour market security, and the quality of the work environment – indicates that the best performers in terms of traditional labour market outcomes usually tend to have also the best characteristics in terms of job quality (OECD, 2014).

7. Beyond these methodological considerations, data limitations also put a constraint on what degree of detail can be incorporated in the context of cross-country panel analysis. The determinants of *hours worked* is potentially important given large cross-country differences. However, due to constraints on the availability of internationally comparable data for a wide range of countries, it is left for future work, potentially involving fewer countries (see existing evidence by Causa, 2008). The *job flow approach* to labour markets involving gross flows (hirings, separations) and search frictions (job vacancies) could also be pursued only on a more limited sample, as long time series of job flows for a broad set of OECD countries are not yet available.

8. The structure of the paper is as follows. The next section will summarise the most relevant existing evidence. Section 3 will discuss the empirical approach, followed by data availability considerations and variable selection in Section 4. Section 5 will present the results.

2. Selective literature overview

9. This section attempts to give a very brief and selective review of a long stream of the empirical macroeconomic literature that considers the impacts of structural policies on traditional labour market outcomes. Sector-level and micro-economic studies are intentionally left out as they raise further considerations (micro vs. aggregate elasticities, external validity, etc.) worthy of a separate detailed discussion.

10. From the late 1990s, the availability of higher-quality time-series data on institutional measures brought a wave of cross-country panel studies on structural drivers of labour market outcomes. These include the unemployment benefit and the tax system, spending on active labour market policies, employment protection and wage setting institutions (Scarpetta, 1996; Blanchard and Wolfers, 2000; Bertola et al, 2002; Nickell et al, 2005). These papers established empirical results linked to theoretical findings, showing that changes in a country's institutional structure can play a large role in its labour market outcomes. Results focused primarily on the notion of (search) frictions generated by labour market rigidities, which are in turn are affected by policy settings. Fairly robust findings on the impacts of active labour market policies, unemployment benefit policies, tax wedges, wage coordination and union density solidified these policy measures as standards in the literature. Ranging discussions on the varied measured effects of employment protection legislation has made it another key variable of interest. These earlier papers also analysed interaction effects between policies with other policies or institutions.

Table 1: Summary of selected literature using cross-country panel regressions for OECD countries

Study	Country coverage	Time period	Dependent variable(s)	Determinants examined	Brief summary of findings
Blanchard and Wolfers, 2000	20 industrial countries	1960-1995	Unemployment rate	Unemployment benefits and duration, ALMP, EPL, tax wedge, union density, bargaining coordination, shocks	Interactions between macroeconomic shocks and economic institutions can largely account for the heterogeneous movements of unemployment across countries.
Bertola et al, 2002	17 OECD countries	1960-1996	Employment and unemployment rates (by population subgroup)	Union density, collective bargaining coverage, coordination, EPL, unemployment benefits and duration (year 1, year 5, older workers), labour tax, pension and disability replacement rate, accrual rate, retirement age.	Countries with stronger union wage-setting tend to lead to lower employment for young and older workers, higher unemployment for females, and high employment for prime-age males.
Jaumotte, 2003	17 OECD countries	1985-1999	Female participation rate	Tax for 2nd earner, public childcare spending, paid leave, family benefits, EPL, PMR	Paid leave and public childcare spending have a positive impact on total and full time female participation rates; higher relative taxes on second earners seem to disincentive female labour market participation.
Duval, 2004	22 OECD countries	1967-1999	Older workers' participation rate	Implicit tax on continued work, standard retirement age, prime-age unemployment rate	Implicit tax of continued work, legal retirement age are important determinants of the retirement decision, but general, demand-driven labour market conditions also seem to have an influential role.
Nickell et al, 2005	20 industrial countries	1960-1995	Unemployment rate	EPL, Unemployment benefits and duration, union density, coordination, employment tax rate, owner occupation rate, many interactions	A large share of unemployment movements can be explained by changes in labour market institutions. Interactions between them and macroeconomic shocks do not provide significant additional insight.
Bassanini and Duval, 2006	21 OECD countries	1982-2003	Employment and unemployment rates (by population subgroup)	Unemployment benefits and duration, tax wedge, union density, EPL, PMR, corporatism, labour tax, consumption tax, minimum wage, ALMPs and components, home ownership, part-time tax incentives, 2nd earner taxes, family cash benefits, leave weeks, public childcare spending, implicit tax on continued work, standard retirement age,	Institutions, policies, and coordination are all shown to play a significant role in determining (un)employment effects, both directly and via effects on labour market participation; interaction effects between policies, institutions, and macroeconomic conditions are shown to play an important role
Orlandi, 2012	13 OECD countries	1985-2009	Unemployment rate	Unemployment benefits and duration, labour tax wedge, union density, ALMPs, training, TFP growth, interest rate, construction empl. Share	The policy variables and institutions which are common to the literature hold up well when the sample includes the early years of the financial crisis; demand shocks play a significant role in explaining structural unemployment trends.
de Serres and Murtin, 2013	24 OECD countries	1985-2007	Unemployment rate	Unemployment benefits and duration, ALMPs and components, EPL, tax wedge, tax wedge*excess coverage, union density, PMR	Higher ALMP spending and lower tax wedge, initial replacement rates and union density contribute to lower levels of unemployment. Less stringent EPL and PMR and shorter unemployment benefit duration are associated with less persistence and lower volatility.
Thévenon, 2013	18 OECD countries	1980-2007	Female participation and employment rates	Spending on leave/birth grants, spending on family benefits and childcare, maternity leave, tax rate on 2nd earner, EPL, employment in services/public sector, part-time employment rate, education, unemployment rate, birth rate	The most important policy drivers of increased female participation are childcare services, maternity leave and tax policies, with important heterogeneities depending on the characteristics of the overall welfare regime.

11. A number of papers used similar methodological approaches to examine policies impacting more specific subgroups of the populations. OECD studies have considered the drivers of female labour market outcomes, and found that policy addressing paid maternity leave, public childcare spending, taxes on second earners and family benefits all play a significant role in determining female participation (Jaumotte, 2003; Thévenon, 2013). Similar work has demonstrated that minimum wage policy provides some explanation of youth and female employment outcomes, especially in countries with deregulated labour markets (Neumark and Wascher, 2004; Addison and Ozturk, 2012). Other related papers have emphasised evidence that retirement age and incentives to continuing work near retirement significantly impact the labour market decisions of older employees (Blöndal and Scarpetta, 1999; Duval, 2004).

12. In a major, seminal OECD work conducted in the context of the Reassessed Jobs Strategy (OECD, 2006), Bassanini and Duval (2006, 2009) undertook a thorough array of econometric estimations and reproduced or updated many of the literature's key findings on the role of policies and institutions. While the results generated were largely consistent with previous works, a number of relevant methodological techniques were displayed in their work on the determinants of employment and unemployment rates.[2] Furthermore, their extension of a dynamic framework for unemployment rate estimations allowed for the disentangling of amplification and persistence effects. This served as a precursor to more recent OECD papers regarding the impact of structural policies on labour market resilience, unemployment volatility and persistence as well as job flows (OECD, 2012; de Serres and Murtin, 2013). Finally, work by the European Commission (Orlandi, 2012) showed that the results presented by Bassanini and Duval (2006) are broadly robust to the inclusion of the early years of the recent financial crisis, as well as to including additional control variables for housing market booms and productivity developments.

3. Empirical approach

13. Following the literature, the policy determinants of labour market outcomes are explored by regressing the employment rate on a set of policies as explanatory variables. It is, by definition, a function of the unemployment rate (*UR*) and the labour force participation rate (*PR*):

$$ER = (1 - UR)PR,$$

14. where *ER = employment / population, UR = unemployment / active population* and *PR = active population / population.* However, the effect of policies on the employment rate is not a simple function of the effects on the unemployment and participation rates. Some policies may affect primarily the employed part of the active population, thus creating opposing movements in *UR* – through its denominator – and *PR* – through its numerator. But policies can also affect the pool of unemployed, resulting in *additional* changes in *UR* and hence, *ER.* Put differently, when affected by the same policies, the unemployment rate and labour force participation rate cannot be combined mechanically to obtain overall employment effects, as there may be issues of "double counting".

15. Furthermore, there are movements in and out of the unemployed to the inactives, especially after policy changes with long lasting effects. This can make the difference between unemployment and inactives less clear cut. Bearing in mind these considerations and that the paper's ultimate interest is in employment effects over the long run, the results will focus primarily on employment rates and less on unemployment and participation rate effects, although the baseline results will be presented for each of these outcomes.

[2] In particular, the use of a Seemingly Unrelated Regression framework to jointly estimate the effects of policies on employment rates of different subgroups (prime-age males, part-time and full-time females, youth, and older workers) implied some degree of simultaneous dependence between these outcome variables

16. Next, separate estimations are run by various segments of the labour market. To capture differential effects of policies across skill levels of the population, estimates are also obtained by three educational attainment levels (primary, secondary and tertiary education). Moreover, to allow for differences across demographic groups and in order to test the effect of specific policies targeted at some of them (pensions, family benefits), 4 distinct segments are investigated: youth (ages 15-24), prime age women and men (aged 25-54) and the elderly (aged 55-64), following previous works at the OECD (Bassanini and Duval, 2006). Depending on the composition of the population along these groups, a country can face weaker or stronger effects from the same type of policy change. For instance, a policy change that mainly affects lower educated segments of the population will show a smaller relative response in its employment rate in a country with a large fraction of highly educated individuals.

3.1. Long-run effects

17. As the primary goal is to capture the effects of observed *differences* in policy settings over the long run, rather than comparing countries with different *levels* of policies, by default, country fixed effects are included in the estimates. Therefore, identification comes strictly from within-country time-series variation. Another important advantage of the presence of country fixed effects is that they control for unobserved time-invariant factors such as broad institutional features, social preferences, etc. Their omission would cause a bias if they are also correlated with the policies. Lastly, year fixed effects are also included to control for labour market and policy developments that are common to all countries in the sample (e.g. deliberalisation periods. The presence of both country and year fixed effects can be thought of as a generalised *difference-in-differences* approach, where the policy impacts are identified by comparing (un)employment and participation before and after changes in policies, weighted by the extent of the change.

18. The regressions including policies and control variables ($X^i_{c,t}$) as potential determinants of labour market outcomes ($Y_{c,t}$) have the following form:

$$\boldsymbol{Y_{c,t}} = \sum_{\boldsymbol{i}} \boldsymbol{\beta^i X^i_{c,t}} + \boldsymbol{D_c} + \boldsymbol{D_t} + \boldsymbol{\varepsilon_{c,t}}, \tag{1}$$

where β^i captures the impact of policies, c and t stand for country and time, D_c and D_t denote country and time fixed effects, and $\varepsilon_{c,t}$ is the error term. [3] Equation (1) is estimated in the baseline case using dynamic OLS (or DOLS, see Stock and Watson, 1993; Mark and Sul, 2003). This approach is primarily developed to obtain consistent estimates of the long-run part of an error correction model (ECM), where one or more of the variables can be non-stationary.[4] It includes leading and lagging first-differenced terms of the explanatory variables among the regressors to control for remaining autocorrelation in the residuals:

[3] Note that the inclusion of country fixed effects D_c transforms each variable to its deviation from the country-specific mean. Put differently, it implements a *within* transformation, making the identification of the policy impacts relying only on within-country time series patterns and not on cross-country level differences. This estimation method is also called the least squares dummy variable approach (LSDV).

[4] Panel unit root tests indicate that the null hypothesis of non-stationarity of the series cannot be rejected for some variables and some countries. Admittedly, the dependent variables are bounded between zero and one and thus cannot be non-stationary in a strict, theoretical sense. However, in the observed time span, they can show clear trends, such as in the case of upward trending female participation rates. Note that the ECM specification can also be used for stationary variables.

$$\boldsymbol{Y_{c,t}} = \sum_{\boldsymbol{i}} \boldsymbol{\beta^i X^i_{c,t}} + \sum_{\boldsymbol{i}} \sum_{\boldsymbol{s=-1}}^{\boldsymbol{1}} \boldsymbol{\gamma^{i,s} \Delta X^i_{c,t+s}} + \boldsymbol{D_c} + \boldsymbol{D_t} + \boldsymbol{\varepsilon_{c,t}}, \quad (2)$$

The intuition behind this estimator is that by controlling for first differences, it captures all short-run, temporary changes in the coefficients of those terms ($\gamma^{i,s}$-s), leaving only long-run, persistent changes to be identified by the coefficients of the level terms (β^i-s). As robustness checks for the estimation method, ordinary least squares (OLS) as well as DOLS including 2 lags will be used (See Appendix D).

19. Furthermore, it is important to control for factors that may affect cyclical behaviour when trying to obtain medium-to long run policy effects. To that end, the output gap is always included among the regressors.[5,6] The output gap is meant to capture the influence of all types of transitory – typically demand side – macroeconomic shocks. Public sector employment is also added to capture changes in government demand for labour. Moreover, many of the policies investigated in this paper have implications on government finances. A favourable reduction in the tax wedge, for instance, has to be financed over the long run in order to keep the budget sustainable. It is thus important to ensure that the estimated effects are identified from *structural* changes in the sense that they leave the overall fiscal stance finances unaffected. This is achieved by including the primary government balance as an additional control. Finally, bearing in mind the systematic increase in human capital over the last decades in most OECD countries, the average level of educational attainment is also included as a control. It may capture differential trends in labour markets across countries and population subgroups and can also serve to indicate the role of education in shaping labour market outcomes.

20. The endogenous response of policy settings to changes in labour market outcomes is mitigated somewhat by the inclusion of the output gap, although it does not entirely solve it. For example, in the aftermath of the recent financial crisis, many countries broadened their social safety nets and scaled up labour market supporting policies to alleviate the social costs of layoffs and to keep unemployed workers attached to labour markets (OECD, 2012). If the increase in the unemployment rate is unusually high and is accompanied by an unusually strong policy response, then the output gap may not capture this effect. This could potentially cause a bias in the estimates, away from zero: for policies with a positive (negative) impact this results in an upward (downward) bias. Excluding the crisis years can give some indication of biases arising from such phenomena, as that period was arguably characterised by stronger than usual changes in both labour market outcomes and policies (See Section 5.2).

3.2. Short-run effects and adjustment

21. The main focus of the analysis in the current stage is the long-run impact of policies. However, potentially both the long- and the short-run effects of policy changes are of eventual interest. Hence, for illustrative purposes, the short-run impacts are also estimated and *presented*.

[5] To retain the largest cross-country and time coverage while using a uniform methodology, the output gap in the baseline case is calculated as the percentage difference of real GDP from its slowly-moving trend given by the Hodrick-Prescott (HP) filter (using a smoothing parameter of 6.25, as recommended by Ravn and Uhlig (2002) for annual data. Results are robust to using deviations of actual output from a production function based potential output. The source of the production function approach based output gap series is the OECD Analytical Data Base of the Economics Department of the OECD.

[6] An alternative way of looking at structural labour market outcomes is to use the concept of the non-accelerating inflation rate of unemployment (NAIRU). Constructing NAIRUs, however, can be done in various ways, depending on the underlying assumptions and the techniques used for their estimation. Importantly, some of them are becoming more and more fragile over time due to ongoing structural changes in the relationship between inflation and the labour markets (Rusticelli, 2014). The simpler approach chosen here is thus considered more robust to measurement difficulties, and also makes results more comparable with the majority of the existing literature.

This is done within an error-correction mechanism (ECM) framework (Engle and Granger 1987; Hamilton, 1994). A one-step ECM involves a joint estimation of the long-run (β^i) and the short-run (α^i) relationship between policies, control variables and labour market outcomes, as well as the speed of adjustment (ρ) to the long-run relationship:

$$\boldsymbol{\Delta Y_{c,t} = \rho \underbrace{\left(Y_{c,t-1} - \sum_i \beta^i X^i_{c,t-1}\right)}_{\text{Deviation from long-run relationship}} + \sum_i \alpha^i \Delta X^i_{c,t} + D_c + D_t + \varepsilon_{c,t},} \tag{3}$$

where Δ is the first-difference operator ($\Delta X = X - X_{t-1}$) and $\varepsilon_{c,t}$ is the error term.[7] Negative and significant estimates of the adjustment parameter ρ indicate that the error correction mechanism is present. Whenever the outcome variable $Y_{c,t}$ exceeds its long-run equilibrium value implied by the determinants $X^i_{c,t}$-s, this will decrease the growth rate of the outcome variable in the next period, helping to close the deviation from the long-run value.

22. The ECM described in equation (3) in its one-step form includes a lagged dependent variable $Y_{c,t-1}$ among the regressors. Estimating such a setup using ordinary least squares with country fixed effects can lead to a bias (away from zero) in the estimate of the speed of adjustment parameter, ρ, especially when the panels are relatively short (Hurwicz, 1950; Nickell, 1981). For this reason, alternative, 2-step ECM approaches are also used. For those, equation (1) is essentially treated as the first step. Then the second step involves a similar form to equation (3) but using the error term $\hat{\eta}_{ct}$ obtained from estimating equation (2) (or equation (1) as a robustness check):

$$\boldsymbol{\Delta Y_{c,t} = \rho \hat{\varepsilon}_{c,t-1} + \sum_i \alpha^i \Delta X^i_{c,t} + D_c + D_t + \eta_{c,t},} \tag{4}$$

4. Data and the choice of explanatory factors

4.1. Data availability and coverage

23. The employment, unemployment and labour force participation rates are collected at the aggregate level – for the working age population spanning age 15 to 64 – and by distinct groups of the population. These groups include (i) demographics, i.e. age breakdowns for both genders, using existing OECD sources, and (ii) skill levels, measured by educational attainment. These are available from Eurostat only for European countries and had to be augmented with national sources to broaden the country coverage and include Australia, Canada, Korea, New Zealand and the United States.[8]

24. An extensive data collection and investigation was carried out to collect explanatory variables, spanning a wide range of factors that may affect labour market outcomes either directly or indirectly.

[7] Note that when using OLS to estimate equation (3), the regression is run in the following form:

$$\boldsymbol{\Delta Y_{c,t} = \rho Y_{c,t-1} + \sum_i \delta^i X^i_{c,t-1} + \sum_i \alpha^i \Delta X^i_{c,t} + D_c + D_t + \varepsilon_{c,t}.} \tag{3'}$$

The long run coefficient estimates are then obtained as follows:

$$\hat{\beta}^i = -\hat{\delta}^i / \hat{\rho}.$$

Standard errors for the long-run coefficients are obtained using a first-order approximation of the variance-covariance matrix, the so-called Delta method, which is built into standard econometric packages (see Gould, 1996).

[8] Note that the joint breakdown by education *and* gender*age is available for a reasonably long enough time series only for the more developed (15) long-time European Union member countries.

These potential explanatory variables are in turn classified along two dimensions: their content and their time coverage (Table 2).

25. In terms of their content, two broad groups of indicators are distinguished: (I) policies and institutions, and (II) control variables which are beyond the direct reach of policies but may still be influenced by them. Within the first broad group, it is useful to separate three subcategories: (1) institutions and legal infrastructure (rule of law, state of corruption, etc.), (2) framework conditions and regulations (product market regulation, wage setting institutions) (3) specific policies related to labour markets (unemployment benefit system, ALMPs, etc.).

26. The second group of variables (II) serve as additional controls. They are further divided into two subcategories: (1) determinants that can be assumed fairly exogenous from the perspective of labour market policies (population growth and its age structure, geography, social norms and values) and (2) further factors and outcomes shaped by policies that are not directly related to labour markets but may strongly affect them (cyclical measures of economic activity, competitiveness, openness, industrial structure and size of the economy, human capital, etc.)

27. Along the time coverage dimension, it is useful to separate three types of variables. Some of them (column A) have been measured regularly, once every one to three years, for a relatively long period of time (e.g. unemployment benefit replacement rates, active labour market policies, tax wedge). Other areas (column B) are updated less frequently – in many cases due to their strong persistence and the costliness of data collection (e.g. product market regulations) – or are not available for a long enough period to be used in a time-series context. Yet another set of indicators (column C) are available only once, either because they only recently have been measured on a systematic cross-country basis (housing market and immigration policies) or because they change only slightly, very slowly or infrequently (e.g. judicial system).[9]

28. Unfortunately, many these indicators are not available for each OECD country, and certainly not for non-OECD countries. Even on the subset of the most data-rich (generally the most developed) OECD countries, there are some potentially important indicators that are missing.[10] Hence there is a choice to be made: either the indicator is included in the analysis at the cost of reducing country-coverage, or the area covered by the indicator is ignored. In addition, only a subset of OECD member countries (typically the early members, around 20-25) tend to have relatively long series (more than 20 years) available. Finally, some key details of policies tend to be available only for shorter periods than the overall policy stance. Examples include the incentives on continuing work near retirement, detailed ALMP components, and certain aspects of the family benefit system.[11] In light of these considerations, the next subsection discusses the set of policy areas that are retained in the analysis.

[9] Inevitably, such a taxonomy involves a degree of judgment and the classification of some factors may be subject to debate. For instance, some variables that can be treated as fairly exogenous for labour market policy may still be related over the long run (e.g. population and health developments). In addition, some indicators are available for a longer time series and/or at higher frequencies for a subset of countries only (see details in Appendices C and D). In that case, the classification is based on the data-rich OECD members (around 20-25 countries) as it is usually those countries that have a longer time series coverage.

[10] To mention a few examples, government employment is missing for Ireland, unemployment benefits are missing for Slovenia. On top of it, less developed or more recent OECD members tend to have many policies missing (Mexico, Turkey, Chile, etc.).

[11] Whenever possible, efforts have been made to construct longer time-series by merging existing series and interpolating for missing years. The prime example of that approach is gross replacement rates for unemployment benefits. For that variable, a longer series – available for 1961-2005 – is prolonged by using a new series (available for 2001-2011) and adjusting for any differences in the levels for the jointly available years on a country-by-country basis. Appendix C explains the details for similar cases.

Table 2: Taxonomy of potential explanatory variables for structural labour market outcomes

Category/type by content		Time coverage: (A) Measured frequently and over a long period	(B) Measured less frequently or available only for a short period	(C) Available only once or nearly constant
I. Policies and institutions	I/1. Institutions and legal infrastructure		• Governance (rule of law, state of corruption) • Judicial system (independence)	• Democratic institutions • Judicial system (efficiency, predictability)
	I/2. Framework conditions and regulations	• EPL (components on regular and temporary contracts and collective dismissals) • ETCR (PMR component on regulation of network industries) • Wage coordination and bargaining • Union density • Excess coverage of wage bargaining	• PMR (components, notably barriers to entrepreneurship and trade, state control)	• Competition law and policy (CLP) • Bankruptcy cost • Housing regulation (transaction costs, tax relief on debt financing, rent control and subsidy) • Immigration integration index
	I/3. Specific policies related to labour markets (e.g. taxation, benefits and activation)	• Unemployment benefit system (average replacement rates, initial replacement rates, duration) • Spending on ALMPs (subcomponents such as training, public employment service, startup incentives, etc.) • Tax wedge (single; family and 2nd earner; aggregate measure) • Retirement age (legal, effective) • Pension replacement rate • Maternity leave period • Minimum wage (as % of median wage) • Public spending on childcare	• Spending on ALMPs (detailed subcomponents such as apprenticeship support, recruitment incentives, rehabilitation) • Implicit tax on continued work near retirement	
II. Additional control variables	II/1. Predetermined, exogenous factors	• Population growth • Age structure of population		• Geography (distance, coastal areas) • Urban density • Climate • Resource endowments • Religion • Social values and norms (degree of trust, attitude towards gender issues, technology, work)
	II/2. Further factors (may also be affected by policies)	• Cyclical controls (output gap, government employment) • Competitiveness (real wages, productivity, exchange rate misalignments) • Openness • Industrial structure (mining, construction, manufacturing) • Size of the economy • Spending on education	• Human capital (years of schooling, PISA scores) • Health factors (life expectancy at birth, at old age)	• Human capital (adult skills – PIAAC scores)

Table 3: The available set of countries and years

OECD countries	Years		
	(1)	(2)	(3)
	Labour market outcomes available		
		All policies and control variables available	
			Years retained by the dynamic OLS estimator*
Australia	1966-2013	1996-2011	1998-2010
Austria	1994-2013	1994-2010	1996-2009
Belgium	1983-2013	1985-2011	1987-2010
Canada	1976-2013	1985-2011	1987-2010
Chile	1996-2013	-	-
Czech Republic	1993-2013	2001-2009	2003-2008
Denmark	1983-2013	1986-2010	1988-2009
Estonia	1990-2013	-	-
Finland	1963-2013	1985-2011	1987-2010
France	1983-2013	1994-2010	1996-2009
Germany	1970-2013	1985-2011	1987-2010
Greece	1983-2013	1995-2010	1997-2009
Hungary	1992-2013	2001-2008	2003-2007
Iceland	1991-2013	-	-
Ireland	1961-2013	-	-
Israel	1985-2013	-	-
Italy	1970-2013	2004-2011	2006-2010
Japan	1968-2013	1990-2011	1992-2010
Korea	1980-2013	2002-2006	2004-2005
Luxembourg	1983-2013	2008-2008	-
Mexico	1991-2013	-	-
Netherlands	1971-2013	1985-2011	1987-2010
New Zealand	1986-2013	1990-2005	1992-2004
Norway	1972-2013	1985-2011	1987-2010
Poland	1992-2013	2001-2010	2003-2009
Portugal	1974-2013	1985-2010	1987-2009
Slovak Republic	1994-2013	2001-2011	2003-2010
Slovenia	2002-2013	-	-
Spain	1972-2013	1985-2010	1987-2009
Sweden	1963-2013	1985-2011	1987-2010
Switzerland	1991-2013	1991-2010	1993-2009
Turkey	1988-2013	-	-
United Kingdom	1984-2013	1985-2010	1987-2009
United States	1960-2013	1985-2011	1987-2010
Total	**1960-2013**	**1985-2011**	**1987-2010**
Number of countries	**34**	**26**	**25**

Note: policies and controls variables refer to those that are included in Table 8. The employment rate refers to the working age population (aged between 15 and 64 years old).
* The dynamic OLS estimator uses two lags and one leading elements for each explanatory variables, hence reducing the length of the time series.

4.2. The choice of explanatory variables

29. The choice of policy areas included in the analysis builds on renewed efforts for collecting and reviewing policy and institutional indicators, while trying to maintain reasonable country and year coverage (at least around 20 countries and 20 years). The majority of labour market policy indicators that cover the most relevant policy areas – the tax-benefit system, activation policies, wage setting institutions and labour and product regulation and – have been routinely included in the voluminous existing work done at the OECD and outside. The core set of indicators covering these areas appear recurrently when analysing overall labour market performance (Bassanini and Duval, 2006; OECD, 2012; De Serres and Murtin, 2013, etc.). Some detailed aspects of these policies appear only in selected, targeted analyses on specific groups of the population – e.g. the part of the tax-benefit system that affects second earners (Jaumotte, 2003; Thévenon, 2013). Additional policies appear as determinants of specific subgroups, such as family benefit policies or the pension system (Duval, 2004).

30. Beyond data availability considerations, there is a conceptual difficulty of incorporating all of the details of all policies in a fully consistent framework: it would involve estimating regressions which contain all these determinants at the same time. However, this is infeasible, as it would yield unstable results due to the large number of explanatory factors which tend to become strongly correlated given the relatively limited sample size (at the order of 300-500 observations). Put differently, there is not enough observed variation in policies so as to precisely disentangle the effect of each of them. Hence adding too many explanatory factors at the same time can produce spurious results or results that are also sensitive to small changes in the model specification and the sample.

31. Therefore, as a starting point, a handful of those variables are included that cover the most important broad policy areas and that are most commonly discussed in the literature (see also Table 4 and for sources and details, Appendices C and D):

- **Tax-benefit system and activation policies:**
  - **Average unemployment gross benefit replacement rates** across wage levels, family statuses and benefit durations, reflecting the combined effect of initial replacement rates and benefit duration. **Net initial replacement rates** and **benefit duration** are also considered in the extensions. By raising the reservation wage of employees, they have the potential to increase unemployment;
  - **Spending on active labour market policies (ALMPs)**. They are expressed as the trend of spending per unemployed as a percentage of GDP/capita, following De Serres and Murtin (2013), in order to take out cyclical and automatic changes due to increases in unemployment. Specific spending types (**public employment service and administration**, **training**) are also considered as an extension. By helping jobseekers finding vacancies, ALMPs have the potential to decrease unemployment and increase participation;
  - **Labour tax wedge**. It includes social contributions as well as income taxes. The baseline measure uses the statutory tax wedge prevailing at the average wage for a couple with 2 children and a single earner at 100% of the average wage. As robustness checks, (i) the tax wage pertaining to unmarried, earners without children and (ii) government revenue statistics on collected taxes (ex-post measure) are also used. By increasing the labour cost and reducing net wages, the tax wedge may lower both labour supply and demand and therefore increase unemployment;

- **Wage-setting institutions**

  - The existence and size of **minimum wages** (as a % of the median wage). Its impact is ambiguous, as it may raise incentives to remain in the active labour force and could encourage job search for low-wage earners. On the other hand, it passes on increased costs to employers, thereby potentially lowering demand for – especially low-skilled – workers and hence raising unemployment;

  - **Excess coverage of wage bargaining,** which equals the difference between the coverage of wage bargaining agreement and the share of covered workers who are represented by unions. Wage bargaining coverage – especially if larger than union coverage – can lead to rigid adjustment in wages and may be detrimental for employment (De Serres and Murtin, 2013). Strong coordination in wage bargaining may induce the bargaining parties to internalise the potential negative employment effects of higher wage demands (Bassanini and Duval, 2006; Elmeskov et al., 1998). The excess coverage is also included in interaction with the tax wedge, following Murtin, De Serres and Hijzen, (2014).[12] It captures the idea that tax wedge increases are more likely to have a larger employment impact in cases where the wage bargaining system lead workers to resist more strongly reductions in post-tax real wages, leaving the increase in the tax wedge to be largely absorbed by firms.[13]

- **Labour and product market regulation**

  - **Employment protection legislation (EPL) related to regular (open-ended) contracts**. **Regulation of temporary workers** is also considered as an extension. It captures the economic costs of laying off workers. In the short run, strict EPL may help preserving jobs but in the long run may discourage hiring by making layoffs more costly;

  - **Energy, transport and communication regulation (ETCR)** that captures the strictness of anti-competitive measures in 7 network industries. By helping young and growing firms and allowing for easier experimentation with innovative business models, a more competition friendly regulatory stance is expected to raise the overall employment rate over the long run. However, in the short run or for some segments of the labour force, it can also have detrimental employment effects.

- **Policies affecting specific segments of the workforce**

  - **Legal retirement age**, it is an obvious determining factor of the participation rate of the elderly age groups;[14]

[12] The excess coverage is used in a time-invariant form in the interaction, also demeaned across countries to preserve a correct interpretation of the tax wedge at the average level of excess coverage. Furthermore, the tax wedge is demeaned over time and within each country in the interaction term, so that the interpretation of the stand-alone excess coverage term is the average effect across countries.

[13] The measure for wage bargaining coordination from ICTWSS takes a scale between 0 and 5 and shows a very erratic pattern that is difficult to explain and fit into the current framework. For this reason, it is omitted from the analysis.

[14] The incentives affecting the retirement decision should ideally be more fully captured by including a variable for the change in net pension wealth from an additional year in the labour force - i.e., the implicit tax on continuing work. However, due to data limitations, this is not feasible when the analysis requires long time series and aims to include more recent years. An alternative variable would be the effective retirement age, but that is calculated based on the

- **Government spending on childcare benefits (cash and in-kind)**, they have the potential to affect mainly female participation rates as it changes their incentives for staying in or re-entering the labour market.

- **Length of maternity leave (in weeks)**

- **Control variables**

  - **Output gap** to capture cyclical fluctuations;

  - **Government employment** to capture government demand for employment;

  - **Fiscal stance (measured by the primary balance of the government budget)** to make sure that the estimated effect of the reforms can indeed be interpreted as structural effects and not from their nature as a fiscal stimulus. As robustness, cyclically adjusted and underlying variants are also used.

  - **Education level** to capture the different trends across countries in educational attainment, which can potentially shape labour force participation;

Table 4: Policy and institutional variables included in the analysis

Tax-benefit system and activation policies • Unemployment benefit replacement rates (gross, average across durations, family statuses and income levels) • Spending on active labour market policies (per unemployed, as % of GDP) • Labour tax wedge (couple with a single earner and 2 children)	**Wage-setting institutions** • Minimum wages (as % of median) • Excess coverage of wage bargaining (difference between bargaining coverage and union coverage)
Labour market regulation • Employment protection legislation (EPL, regular contracts)	
Policies affecting specific groups • Legal retirement age • Disability spending (per GDP, %) • Government spending on family benefits (cash and in-kind, per GDP, %) • Length of maternity leave (weeks)	**Control variables** • Output gap (difference from HP-trend) • Public sector employment (as % of population) • Educational attainment (adjusted years of schooling) • Primary balance of government (as % of GDP)

Note: For details on the time-varying policies, see the text and Appendices C and D.

32. The effects may also depend on the overall policy settings and other characteristics of countries, as well as on concomitant changes which lead to reform complementarities (Bassanini and Duval, 2006; 2009). In particular, appropriate wage setting institutions that help more flexible wage adjustments may

observed exit rates to retirement. Thus it already reflects the decisions of those affected and not only the policy setting.

mitigate the negative impact of certain policies. Moreover, for specific subgroups of the population, further policies may be more important than the ones listed above. Heterogeneous effects by groups of the population are investigated below in great detail, but reform complementarities or policy effects depending on country-specificities (i.e. wage setting and other institutions) are left for future work.

4.3. Stylised facts and descriptive statistics

33. Employment and participation rates vary substantially across countries (Figure 1). These differences tend to be persistent: compare for instance the employment rate of Switzerland (around 80%) with that of Chile (60-65%). In addition, labour force participation rates sometimes show strong upward trends – for instance in Spain, Ireland, the Netherlands – which resulted in higher employment rates during the 2000s. Further, fluctuations in the unemployment rate can bring substantial changes in the employment rate, contributing to sizable employment shortfalls (see e.g. Estonia, Greece, Poland and Spain). Some of these changes are cyclical and revert relatively quickly, while others seem more persistent. Thus it is important to take account of short-run and long-run impacts of policies and control variables, inherent in the ECM framework applied here.

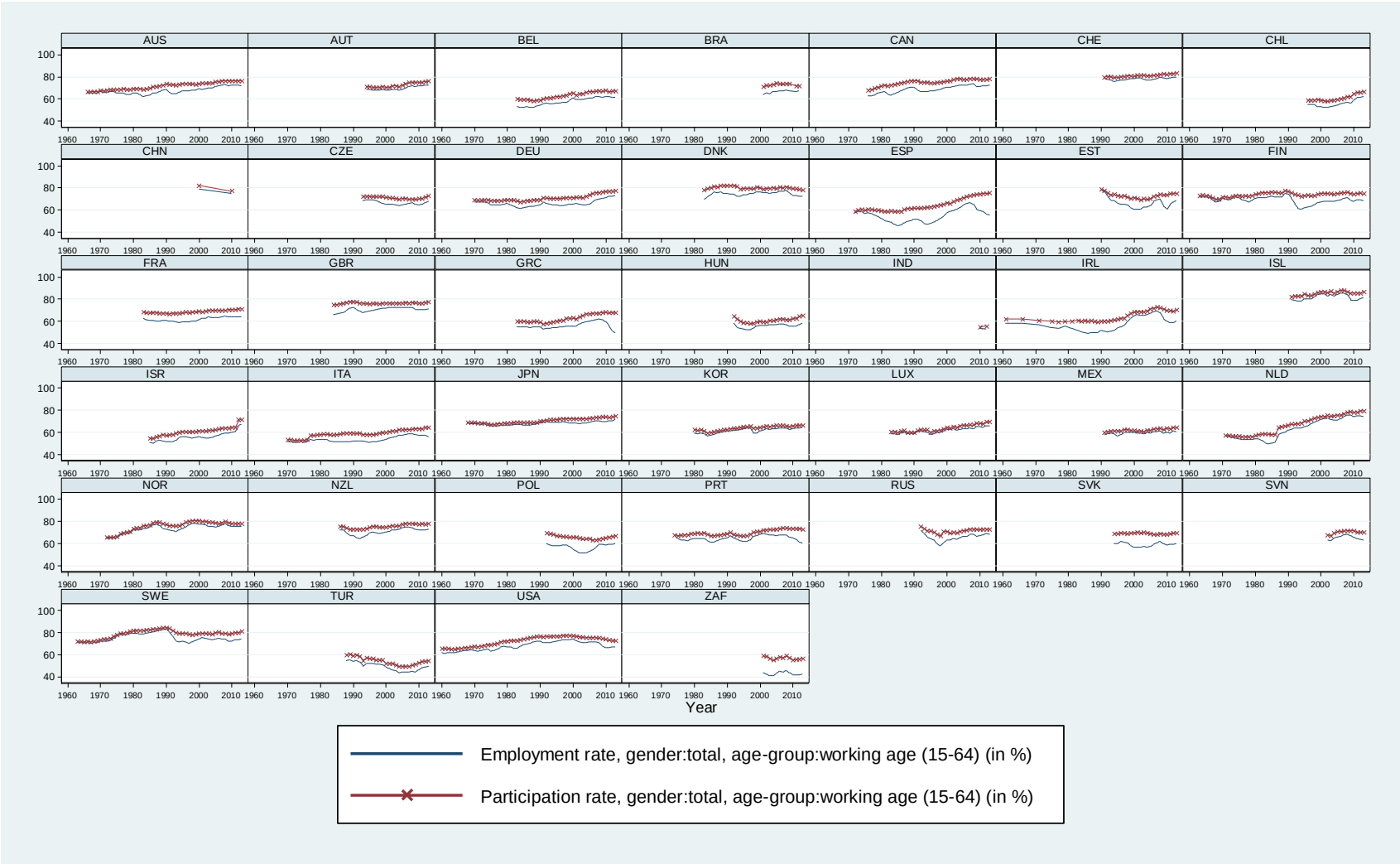
34. It is worth noting that on average across OECD countries, the composition of the population has been steadily shifting towards higher skill levels (Figure 2). The share of tertiary educated is increasing at the expense of primary educated, and in the latest available year (typically 2013), they both stand around 27.5 % of the working age population. At the same time, the share of the secondary educated segment remains relatively unchanged around 45%.

35. Descriptive statistics show some interesting differences in the standard deviations of the variables (Table 5, columns on standard deviations).[15] First, labour market outcomes vary much less for prime-age males than for other groups. Second, the labour force with the lowest educational attainment levels shows the highest variation. Third, the majority of these differences come from cross-country variances, although the patterns are also present, to a smaller extent, for within country variation (last column). Fourth, within country disparities in general tend to be much smaller, both for labour market outcomes as well as for policy variables. This implies that a substantial part of the variation is explained by country-fixed effects, which are difficult to interpret in economic terms. It is therefore important to explore the potential of institutional variables or other country characteristics to explain the large cross-country differences.[16] These findings are also illustrated visually with country-by-country time series patterns (Appendices A and B).

[15] Limiting the observations to the baseline estimation sample yields qualitatively similar conclusions.

[16] This issue will be studied in great detail in future work, potentially involving the use of principal component analysis to compress the information available in a large amount of country characteristics and institutions.

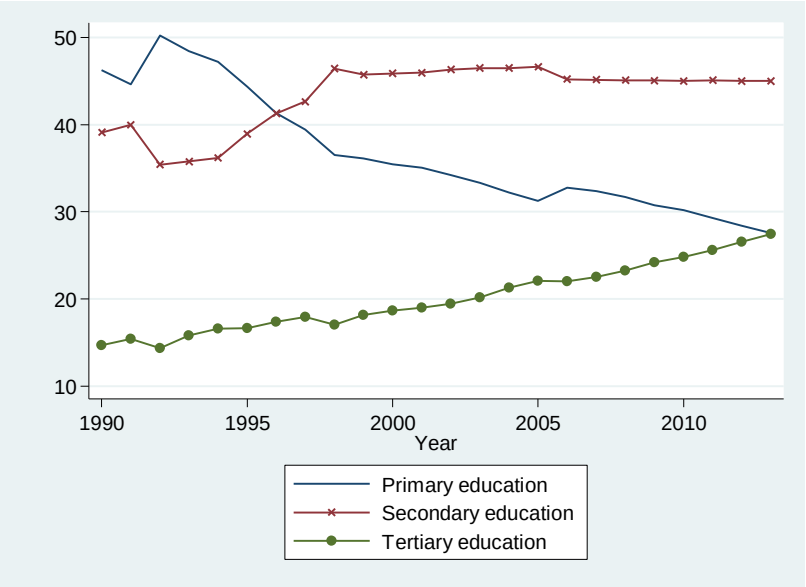
Figure 1: Employment and labour force participation for OECD and BRIICS countries



Source: OECD Labour Force Survey database

Figure 2: The composition of the population across skill levels

*Average across OECD countries**



Source: OECD calculations based on Eurostat and national sources. For details, see Appendix C.
* Where the series are available.

Table 5: Descriptive statistics of labour market outcomes and selected policy variables

	Variable description		Number of observations	Number of countries	Mean	Min	Max	Standard deviation	Within-country st.dev.
Labour market outcome variables	Employment rate	Working age population	1,126	34	64.6	44.1	85.7	8.1	3.5
		Youth	1,108	34	45.0	11.9	74.3	14.1	6.5
		Prime age female	1,039	34	64.1	24.4	89.6	14.0	7.9
		Prime age male	1,039	34	87.7	70.4	97.0	4.8	3.0
		Elderly	1,084	34	47.9	16.7	87.2	13.8	5.7
		Low skill	599	30	47.8	13.3	81.7	12.2	3.1
		Medium skill	599	30	69.6	43.0	87.1	7.8	2.9
		High skill	599	30	83.4	68.2	93.5	4.1	2.2
	Unemployment rate	Working age population	1,126	34	7.2	0.6	27.5	4.0	2.8
	Labour force participation rate	Working age population	1,126	34	69.5	49.6	87.9	7.5	3.4
Selected policy indicators	**Tax benefit system and activation**								
	UE benefit repl. rates (average, gross)		1,155	29	24.4	0.0	65.2	13.9	9.3
	UE benefit repl. rates (initial, net)		528	32	70.2	44.0	91.4	9.5	3.6
	UE benefit duration		528	32	88.6	50.0	107.4	12.7	3.2
	ALMP		726	32	22.0	0.4	169.2	20.8	11.8
	ALMP (public empl. services)		656	32	3.4	0.0	24.1	3.1	1.9
	ALMP (training)		685	32	4.3	0.0	37.6	4.7	3.1
	Tax wedge (couple, single earner, 2 children)		981	34	27.4	-24.2	53.9	11.9	5.1
	Tax wedge (nat. accounts)		983	30	28.9	3.4	50.6	9.4	3.5
	Wage setting institutions								
	Excess coverage		1,111	33	25.6	-18.0	84.5	23.6	7.9
	Minimum wage		785	24	48.9	9.7	96.4	12.3	7.6
	Labour and product market regulations								
	EPL (regular)		802	34	2.2	0.3	5.0	0.8	0.2
	EPL (temporary)		802	34	1.9	0.3	5.3	1.4	0.6
	ETCR		1,320	34	4.1	0.8	6.0	1.5	1.3
	Policies aimed at specific demographic groups								
	Legal retirement age		1,648	34	62.6	45.0	70.0	3.8	1.4
	Family benefits in cash (% of GDP)		953	34	1.3	0.0	3.7	0.7	0.3
	Family benefits in kind (% of GDP)		953	34	0.6	0.0	2.5	0.6	0.3
	Maternity leave weeks		1,320	30	15	0	52	9	5

Note: The time period varies by variable, but mostly from the middle of the 1980s till 2011, and the country coverage is generally the OECD. For details and data sources, see Appendix C. The number of observations reflects the raw available series, before data adjustments described in Appendix C. Limiting the observations to the baseline estimation sample yields qualitatively similar conclusions. Within-country standard deviation is calculated as the standard deviation of the series that are obtained by de-meaning them by each country.

36. Simple correlation coefficients provide an initial assessment of the relationships between policies, institutions, and the labour market outcomes. Pairwise correlations show sizeable and intuitive relationships between the employment rate and most explanatory variables (ALMPs, tax wedge, minimum wage, excess coverage, EPL, ETCR, retirement age and family benefits, see Table 6). Most of these patterns hold regardless of whether country and time fixed effects are purged from the data.

Table 6: Pairwise correlations between the employment rate and the policy variables

Policy Variables	No transformations	Purged from country fixed effects	Purged from country and year fixed effects
UE benefit repl. rates (average, gross)	0.192***	0.108*	0.003
UE benefit repl. rates (initial, net)	0.295***	-0.026	0.057
UE benefit duration	0.421***	0.193***	0.146***
ALMP	0.440***	0.302***	0.405***
ALMP (public empl. services)	0.425***	0.409***	0.396***
ALMP (training)	0.457***	0.238***	0.316***
Tax wedge (couple, single earner, 2 children)	-0.338***	-0.261***	-0.219***
Tax wedge (nat. accounts)	-0.161***	-0.296***	-0.251***
Tax wedge (nat. accounts)	0.120***	0.05	-0.224***
EPL (regular)	-0.335***	-0.331***	-0.270***
EPL (temporary)	-0.385***	0.051	-0.221***
Excess coverage	-0.232***	-0.085*	0.031
Minimum wage	-0.463***	-0.147***	0.029
ETCR	-0.388***	-0.440***	-0.096**
Legal retirement age	0.432***	0.066*	-0.028
Family benefits in cash (% of GDP)	0.218***	0.031	0.05
Family benefits in kind (% of GDP)	0.500***	0.426***	0.224***
Maternity leave weeks	-0.154***	0.125***	-0.038

Note: Pairwise correlations using the widest available set of observations for each policy. For further details and data sources, see Appendix C and D. Notation for significance levels: *** p<0.01, ** p<0.05, * p<0.1.

37. Regarding the issue of dependence among the explanatory factors, there is evidence for potentially strong multicollinearity if no country fixed effects were included (Table 7, panel A). This is unsurprising since certain labour market policies tend to "go together", reflecting the institutional arrangement of the country. The strongest relationships are observed between wage setting institutions and the tax-benefit system, as well as between ALMPs and unemployment benefits. However, after purging from country and year fixed effects – as is done in the regressions – very few pairs display worrying levels of correlation (Table 7, panel b). This suggests that multicollinearity is not a first order concern for the set of specifications involving this limited set of explanatory variables.

Table 7: Pairwise correlations across selected policy variables

Panel a: Using total variation

	UE benefit repl.rate	ALMP	Tax wedge	Minimum wage	Excess coverage	EPL
ALMP	0.485***	1				
Tax wedge	0.165**	0.198***	1			
Minimum wage	0.280***	0.267***	0.260***	1		
Excess coverage	0.426***	0.053	0.470***	0.404***	1	
EPL	0.275***	0.178***	0.366***	0.151***	0.570***	1
ETCR	-0.013	0.065	0.104**	0.133***	0.101	0.337***

Panel b: Using within-country, country-specific variation*

	UE benefit repl.rate	ALMP	Tax wedge	Minimum wage	Excess coverage	EPL
ALMP	-0.051	1				
Tax wedge	-0.06	0.021	1			
Minimum wage	-0.160**	-0.043	-0.066	1		
Excess coverage	0.266***	-0.109	-0.041	-0.136*	1	
EPL	-0.035	0.046	-0.057	-0.029	-0.193**	1
ETCR	-0.209***	0.108**	0.061	-0.005	-0.219***	0.362***

Note: *In panel b, all variables are purged of country and year fixed effects. Absolute values larger than 0.4 are highlighted. Standard errors in parentheses (** p<0.05, * p<0.1). For further details and data sources, see Appendix C and D.

5. Estimation results

5.1. Baseline results for aggregate labour market outcomes

38. The baseline results indicate that the tax-benefit system and spending on activation policies have a robust relationship with aggregate labour market outcomes. In particular, higher unemployment benefit replacement rates and tax wedges tend to reduce employment rates, while more spending on ALMP tends to have the inverse effect (Table 8). These results – the signs, the significance as well as the magnitudes – are robust to including wage setting institutions as well as labour (EPL) and product market (ETCR) regulations among the regressors. Importantly, these significant findings are obtained when keeping the primary government balance constant as a fraction of GDP.

39. Among wage setting institutions, higher excess coverage of wage bargaining, its interaction with the tax wedge and higher minimum wage tend to lead to lower employment rates, in line with previous findings for the unemployment rate (De Serres and Murtin, 2012). Interestingly though, the effect occurs through labour force participation and less so through unemployment. This may suggest that in the long run, these institutions can affect the decisions to stay attached with the labour market and exert job search effort.

40. Finally, more stringent labour and product market regulations (EPL and ETCR, respectively) tend to hold back employment in the long run, although the relationship is not significant between EPL and the employment rate, but is present significantly only through the unemployment rate. This reflects the

uncertainty on the overall, long-run effects of EPL that is present in the literature (see Figure 3 and more discussion in Section 5.3). Regarding ETCR, it has also been difficult to find consistent aggregate effects in the literature, and indeed it does not survive some of the robustness checks below. In any case, both of them can be thought of as serving as an important control variable to the other policy variables, helping to better identify their impact. In addition, the uncertain average impact may hide heterogeneous effects, depending on country characteristics such as other policy settings, industrial, demographic or skill composition. In particular, the role of demographics and skills will be looked at in more detail below.

41. Among the control variables, the output gap is significant with the expected signs for unemployment and employment rates, reflecting the strong cyclical nature of these variables. Higher educational attainment is associated with lower unemployment rates and higher employment rates. The government employment rate is either insignificant or positively related to overall participation and employment rates (columns 3 and 5). The size and the significance of the estimated coefficients imply a partial (around 0.4-0.6) or near complete (insignificant estimates) crowding out of private employment, in line with the finding in Bassanini and Duval (2006). Finally, higher primary balance is associated with better employment outcomes.[17]

42. As discussed in Section 4, more policy variables can be included only at a cost of losing observations. This is reflected by the decreasing number of observations in Table 8. Reassuringly, the baseline set of policies have very similar magnitudes and preserve significance when reduced to sample that is the common one across all variable sets (Appendix Table D-1). Moreover, when standard OLS is used instead of Dynamic OLS, the above findings tend to hold as well (with the exception of ETCR) and also when Dynamic OLS uses 2 leads and lags (Appendix Tables D-2 and D-3).

[17] The underlying reasons for this relationship are not the main focus of this paper, but hypotheses involve (*i*) long run positive confidence effects, (*ii*) an unobserved factor driving both employment rates and budgets to better positions (omitted variable bias) or (*iii*) cyclical variation in employment rates affecting the budget (reverse causality), for instance via more revenues from labour taxes. However, the fact that the output gap is included as a control, on top of using dynamic OLS – which is designed to capture long-run effects – makes hypothesis (*iii*) less likely.

Table 8: Baseline results

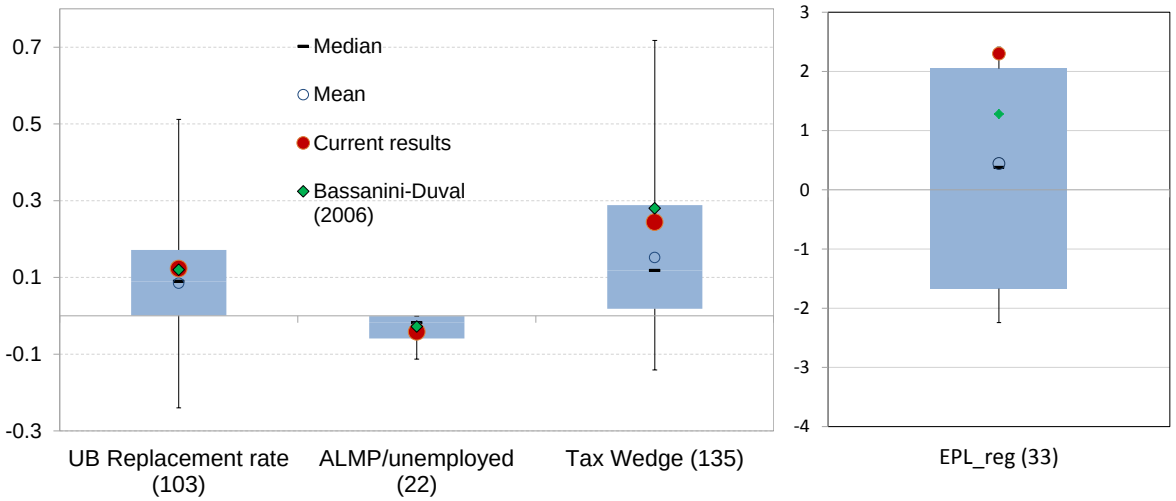
Dependent variables	Employment rate			Unemployment rate			Labour force participation		
Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Tax-benefit and activation policies									
UE benefit repl. rate	-0.210**	-0.165**	-0.177**	0.104**	0.099**	0.123**	-0.146**	-0.099**	-0.097**
	(0.042)	(0.033)	(0.034)	(0.026)	(0.027)	(0.029)	(0.038)	(0.027)	(0.028)
ALMP	0.070**	0.072**	0.057**	-0.057**	-0.054**	-0.042**	0.027*	0.033**	0.024**
	(0.015)	(0.012)	(0.014)	(0.010)	(0.011)	(0.012)	(0.014)	(0.011)	(0.012)
Tax wedge	-0.231**	-0.203**	-0.194**	0.267**	0.283**	0.244**	-0.056	-0.013	-0.027
	(0.058)	(0.066)	(0.066)	(0.049)	(0.059)	(0.057)	(0.047)	(0.056)	(0.055)
Wage setting institutions									
Excess coverage		-0.064**	-0.107**		0.028	0.094**		-0.050*	-0.055*
		(0.031)	(0.036)		(0.033)	(0.038)		(0.026)	(0.028)
Excess coverage × tax wedge		-0.897**	-0.763**		0.070	-0.057		-0.912**	-0.850**
		(0.255)	(0.242)		(0.235)	(0.220)		(0.211)	(0.203)
Minimum wage		-0.336**	-0.275**		-0.042	-0.091		-0.398**	-0.361**
		(0.069)	(0.072)		(0.053)	(0.057)		(0.057)	(0.058)
Labour and product market regulations									
EPL			-0.716			2.304**			0.479
			(1.128)			(1.033)			(0.728)
ETCR			-1.127**			0.594			-0.789**
			(0.435)			(0.368)			(0.355)
Control variables									
Education	1.900**	1.546**	0.713	-0.631**	-0.567*	0.333	1.809**	1.464**	1.130**
	(0.373)	(0.360)	(0.471)	(0.314)	(0.314)	(0.349)	(0.271)	(0.248)	(0.351)
Output gap	0.969**	0.885**	0.905**	-1.121**	-1.079**	-1.266**	0.212	0.138	0.049
	(0.204)	(0.182)	(0.188)	(0.161)	(0.162)	(0.150)	(0.183)	(0.160)	(0.169)
Govt employment	0.427**	0.124	0.305	-0.007	-0.072	-0.069	0.499**	0.108	0.291*
	(0.213)	(0.179)	(0.202)	(0.156)	(0.154)	(0.162)	(0.186)	(0.145)	(0.167)
Govt primary balance	0.265**	0.312**	0.352**	-0.303**	-0.328**	-0.364**	0.043	0.078**	0.098**
	(0.050)	(0.049)	(0.056)	(0.041)	(0.045)	(0.048)	(0.042)	(0.038)	(0.043)
Adjusted R-squared	.951	.961	.964	.863	.87	.888	.947	.964	.965
Country / year fixed effects	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes
No. of observations / countries	446 / 26	431 / 26	422 / 25	446 / 26	431 / 26	422 / 25	446 / 26	431 / 26	422 / 25
Years	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010

Note: Estimation results obtained by using Dynamic OLS and heteroskedasticity and autocorrelation robust (Newey-West) standard errors (in parentheses; ** p<0.05, * p<0.1).The dependent variables refer to the working age population (aged 15-64). See the exact definition of the explanatory variables in Table 4 and in Appendix C and the set of included countries in Table 3.

43. Reviewing a large body of existing evidence highlights that the estimated magnitude of these policies varies considerably across studies (Figure 3). The current estimates for the unemployment rate – as presented in Table 8 – are in the ballpark of the existing ones and not very far from Bassanini and Duval (2006) for the case of tax-benefit system and activation policies.[18] The lack of robustness for EPL effects is clearly conveyed by many coefficient estimates that take either positive or negative (and significant) values. This has been attributed to the fact that the enforcement of the legislation and its specific effect is highly dependent on country and time-specific conditions (Bertola et al. 1999).

Figure 3: The effect of policies on the unemployment rate – comparing new estimates with existing results

*Percentage point change in the unemployment rate in response to a unit increase in policies**



Note: Current results refer to the baseline dynamic OLS estimates presented in Table 8 column 6. Mean and median values are calculated over the whole range of existing estimates (counts are indicated for each policy in parentheses). The bars cover the range of all existing estimates except the top and bottom 10%. Only significant estimates are retained.
* Units for the policies on the left panel are based on percentage points and on the right panel based on the EPL indicator index (ranging between 0 and 6, larger being more restrictive).

Source: OECD calculations based on a large number of reviewed studies.

[18] The comparison with the literature is carried out for the policy effects on the unemployment rate as labour force participation and employment rate results are less widely available.

Table 9: Comparing the gains in employment rates across reform areas

Measured in percentage points

Policy areas	*(i)* Size of a "typical reform" *	*(ii)* Effect of a "typical reform" *	Effect of moving towards better performing countries	
			(iii) from worst stance to OECD average	*(iv)* from OECD average to best stance
Unemployment benefit replacement rates	-2.7	0.5	2.6	3.2
ALMP spending	6.7	0.4	0.9	1.8
Tax wedge	-2.6	0.5	2.4	2.7
Excess coverage of wage bargaining	-3.1	0.3	4.2	3.1
ETCR[(1)]	-0.7	0.8	0.8	0.7
Total		**2.5**	**11.0**	**11.5**

Note: This table uses the baseline estimations in Table 8, column 3. For further details and data sources, see Table 4 and Appendix C and D.
* Size of a typical reform is measured by taking average over such medium-run (5 year) policy changes that impact the outcome variable in a positive direction (in percentage points), observed over the sample period and countries covered by the estimation.

1. Size of a typical reform measured in a scale between 0 and 6 (larger being more stringent)

44. Quantitatively, Table 10 compares the effect of changing policies into an "employment-friendly" direction by a typical amount (measured by the average of medium-run (5-year) beneficial policy changes, shown in column *i*). This comparison reveals that most policy areas tended to yield similarly-sized positive effects, in the range of 0.3-0.5 percentage point employment rate increases (column *ii*). Decreasing ETCR tended to have the largest positive effects (0.8). When considering substantially more ambitious reform steps – which aim to eliminate cross-country differences in policy settings (columns *iii* and *iv*) –, reforming the wage bargaining process (by reducing excess coverage) appears to have most potential for lifting employment. This can also reflect the fact that this policy area shows the largest cross-country differences, thus there is more room for large beneficial changes than in the case of other areas.

5.2. Robustness tests

Robustness to excluding the recent financial crisis

45. As an initial robustness check of the baseline results, estimates are performed with time coverage limited to before 2007, excluding the recent financial crisis (Table 10). For each of the labour market outcomes, the signs and magnitudes of coefficients are in line with those from the full time sample, and differences in size are not statistically significant.[19] Thus, potential concerns about the strong policy response during the crisis systematically driving the results seem minor. Moreover, this robustness result suggests that there is either too little post-crisis period captured in the sample so as to draw new lessons on structural policies, or it is simply difficult to detect them using aggregate data and the relatively broad-brush indicators used here.

[19] An exception is the indicator capture product market regulation (ETCR) – not significant in the pre-crisis sample –, which is worth further investigation.

Table 10: Sensitivity of baseline results – excluding the recent financial crisis

Dependent variables	Employment rate			Unemployment rate			Labour force participation rate		
Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Tax-benefit and activation policies									
UE benefit repl. rate	-0.177**	-0.130**	-0.151**	0.068**	0.061*	0.081**	-0.147**	-0.100**	-0.109**
	(0.042)	(0.039)	(0.040)	(0.030)	(0.033)	(0.035)	(0.037)	(0.032)	(0.034)
ALMP	0.074**	0.074**	0.062**	-0.056**	-0.054**	-0.043**	0.031**	0.033**	0.027**
	(0.015)	(0.012)	(0.014)	(0.011)	(0.012)	(0.014)	(0.014)	(0.012)	(0.012)
Tax wedge	-0.260**	-0.217**	-0.217**	0.277**	0.267**	0.233**	-0.076	-0.033	-0.055
	(0.069)	(0.075)	(0.076)	(0.048)	(0.059)	(0.062)	(0.055)	(0.062)	(0.060)
Wage setting institutions									
Excess coverage		-0.077**	-0.095**		0.048	0.098**		-0.051**	-0.041
		(0.038)	(0.047)		(0.039)	(0.046)		(0.026)	(0.029)
Excess coverage × tax wedge		-0.924**	-0.825**		0.308	0.147		-0.788**	-0.778**
		(0.268)	(0.255)		(0.228)	(0.219)		(0.210)	(0.211)
Minimum wage		-0.333**	-0.294**		-0.022	-0.067		-0.393**	-0.376**
		(0.085)	(0.084)		(0.058)	(0.062)		(0.069)	(0.067)
Labour and product market regulations									
EPL			0.002			2.499**			1.433**
			(1.231)			(1.175)			(0.699)
ETCR			-0.759			0.641			-0.406
			(0.514)			(0.454)			(0.416)
Control variables									
Education	1.462**	1.041**	0.421	-0.676	-0.488	0.478	1.313**	0.986**	0.910**
	(0.446)	(0.350)	(0.507)	(0.429)	(0.381)	(0.434)	(0.260)	(0.202)	(0.348)
Output gap	1.040**	0.895**	0.982**	-1.061**	-1.025**	-1.278**	0.324*	0.187	0.134
	(0.238)	(0.207)	(0.211)	(0.195)	(0.191)	(0.183)	(0.193)	(0.172)	(0.178)
Gov't employment	0.484**	0.161	0.296	-0.057	-0.068	-0.057	0.515**	0.148	0.297*
	(0.223)	(0.182)	(0.204)	(0.193)	(0.182)	(0.204)	(0.170)	(0.137)	(0.159)
Gov't primary balance	0.309**	0.378**	0.412**	-0.333**	-0.372**	-0.377**	0.077	0.126**	0.159**
	(0.063)	(0.065)	(0.071)	(0.049)	(0.059)	(0.060)	(0.050)	(0.046)	(0.050)
Adjusted R-squared	.957	.967	.97	.896	.899	.918	.956	.97	.972
Country / year fixed effects	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes
No. of observations / countries	353 / 26	348 / 25	344 / 25	353 / 26	348 / 25	344 / 25	353 / 26	348 / 25	344 / 25
Years	1987-2006	1987-2006	1987-2006	1987-2006	1987-2006	1987-2006	1987-2006	1987-2006	1987-2006

Note: Estimation results obtained by using Dynamic OLS and heteroskedasticity and autocorrelation robust (Newey-West) standard errors (in parentheses; ** p<0.05, * p<0.1).The dependent variables refer to the working age population (aged 15-64). See the exact definition of the explanatory variables in Table 4 and in Appendix C and D, and the set of included countries in Table 3.

Robustness to alternative fiscal stance and output gap controls

46. Many of the policies investigated here have implications on government finances. A favourable reduction in the tax wedge, for instance, has to be financed over the long run in order to keep the budget sustainable. It is thus important to check whether the effects are robust to controlling for various public spending measures. Table 11 shows that almost all policy effects remain significant and retain a similar magnitude, irrespective of which fiscal stance measure is used (columns 1-3). When allowing the budget to be more or less expansionary as structural policies change – i.e. when not including any fiscal stance control – the results also stay significant except for a few cases (excess coverage and ETCR). The estimated effect for the tax wedge is somewhat larger in absolute value when the fiscal stance is kept constant (although the differences are not significant). This could indicate that when tax reductions are carried out in a way that they are budget neutral – i.e. there is no need for future budgetary corrections –, then the macroeconomic, long run beneficial effects can be at least as good as when allowing for an expansionary stance.

47. In the baseline case, to maximise country and time coverage, an HP-filtered output is used to proxy for an output gap to control for cyclical fluctuations. When using a production function based output gap, the results remain robust, with nearly identical point estimates to the case when the baseline output gap is used (column 5).

Table 11: Robustness of employment rate effects to alternative fiscal stance and output gap measures

Dependent variable: employment rate of the working age population	**Output gap measure:**	Output gap based on HP-filter (baseline)				Production function based output gap
	Fiscal stance measure:	Primary balance (baseline)	Cyclically adjusted primary balance	Underlying primary balance	No fiscal stance included	Primary balance (baseline)
Explanatory variables		(1)	(2)	(3)	(4)	(5)
Tax-benefit and activation policies						
UE benefit repl. rate		-0.177**	-0.111**	-0.117**	-0.152**	-0.155**
		(0.034)	(0.034)	(0.035)	(0.040)	(0.033)
ALMP		0.057**	0.064**	0.053**	0.064**	0.059**
		(0.014)	(0.014)	(0.015)	(0.015)	(0.014)
Tax wedge		-0.194**	-0.199**	-0.190**	-0.165**	-0.229**
		(0.066)	(0.072)	(0.073)	(0.077)	(0.070)
Wage setting institutions						
Excess coverage		-0.107**	-0.064*	-0.067*	-0.035	-0.078**
		(0.036)	(0.037)	(0.040)	(0.046)	(0.036)
Excess coverage × tax wedge		-0.763**	-0.439*	-0.389	-0.731**	-1.026**
		(0.242)	(0.233)	(0.263)	(0.288)	(0.232)
Minimum wage		-0.275**	-0.278**	-0.288**	-0.332**	-0.255**
		(0.072)	(0.061)	(0.063)	(0.080)	(0.066)
Labour and product market regulations						
EPL		-0.716	1.756	1.823	-0.743	1.614
		(1.128)	(1.338)	(1.307)	(1.397)	(1.358)
ETCR		-1.127**	-0.825**	-0.963**	-0.330	-0.865**
		(0.435)	(0.398)	(0.445)	(0.494)	(0.405)
Control variables						
Education		0.713	2.232**	2.202**	1.424**	1.972**
		(0.471)	(0.708)	(0.709)	(0.575)	(0.679)
Output gap		0.905**	1.252**	1.278**	1.020**	
		(0.188)	(0.204)	(0.214)	(0.216)	
Output gap (prod.fn. based)						0.349**
						(0.088)
Gov't employment		0.305	0.301	0.378*	0.286	0.067
		(0.202)	(0.203)	(0.228)	(0.224)	(0.194)
Gov't primary balance		0.352**				0.283**
		(0.056)				(0.051)
Gov't primary balance (cycl.adj.)			0.434**			
			(0.067)			
Gov't primary balance (underlying)				0.478**		
				(0.075)		
Adjusted R-squared		.964	.968	.969	.954	.967
Country / year fixed effects		Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes
No. of observations / countries		422 / 25	399 / 24	394 / 24	423 / 25	416 / 25
Years		1987-2010	1987-2010	1987-2010	1987-2010	1987-2010

Note: Estimation results obtained by using Dynamic OLS and heteroskedasticity and autocorrelation robust (Newey-West) standard errors (in parentheses; ** p<0.05, * p<0.1).The dependent variables refer to the working age population (aged 15-64). See the exact definition of the explanatory variables in Table 4 and in Appendix C and D, and the set of included countries in Table 3.

Robustness to alternative tax wedge measures

48. The baseline measure for the tax wedge focuses on statutory rates but only for a well-defined, limited segment of the population: couples with a single earner with 2 children, at 100% of the average wage. Although this can be seen as a relatively typical segment, it may be that the tax wedge pertaining to other segments – i.e. singles, 2nd earners, higher wage earners – would lead to different aggregate effects. As a robustness check, the tax wedge pertaining to single earners at the average wage without children is used, yielding very similar results to the baseline case for most policy variables (columns 1and 2 in Table 12). Employment effects are only slightly stronger for the tax wedge itself, coming from a more pronounced unemployment effect (columns 4 and 5).

49. Since tax wedge series for many other segments are not available to be included in the analysis[20], government revenue statistics and national accounts are used to recover the overall, aggregate "ex-post" tax wedge. Such a measure is probably more prone to endogeneity concerns, as lower employment automatically leads to lower labour taxes. However, opposing effects can also arise if employment increases after tax cuts typically occur in the lower wage segments and labour taxes are progressive. Current regressions suggest that the second mechanism is stronger: the findings imply almost twice as large an effect as in the baseline case for employment rates (column 3 in Table 12), which is driven by larger unemployment as well as participation effects (columns 6 and 9).

Robustness to changing the country coverage

50. Coefficient estimates may be disproportionately affected by variations in explanatory factors that are present in only a small number of countries. To investigate whether such effects strongly influence the aggregate results, results are also presented from estimations that leave out one country after the other from the sample ("jackknifing").[21] The resultant point estimates (and their statistical significance) are shown in Figure 4.

51. The negative impact of an increase in benefit replacement rates on the aggregate employment rate remains significant no matter which country is removed. ALMP spending and the tax wedge seem also robust to excluding any of the countries – except the Netherlands and Sweden, respectively. Furthermore, the size of the effects increases substantially when Sweden and Germany are removed, respectively. Regarding wage setting institutions, the negative employment effects of excess coverage of wage bargaining seem to be driven by Germany, Spain and New Zealand. The lack of robustness of these variables to changing the country sample may indicate the presence of heterogeneities in the policy effects, depending on country characteristics and other policy or institutional settings. These issues are to be examined in more detail in future work.

52. Overall, these results highlight that it is difficult to pin down a single estimate value based simply on an average effect that is assumed to be homogeneous across countries. They also reinforce the need for a more granular approach or one that allows for policy effects conditional on country characteristics. This further motivates the next section, which looks beyond aggregate effects, and allows for country-specific overall effects.

[20] Time series start mostly only around 2000.

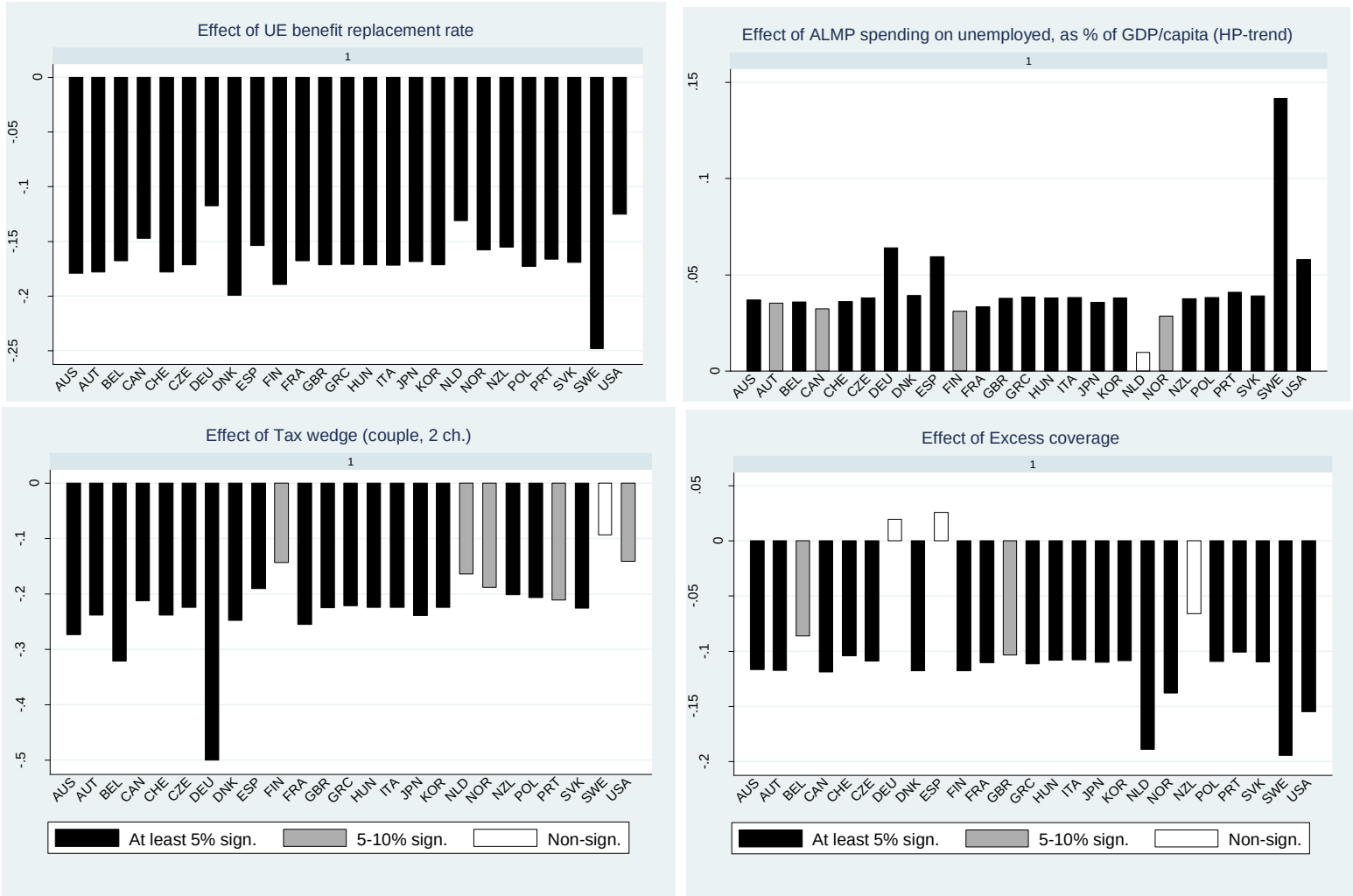
[21] If there are *n* countries in a dataset, then the same regression will be performed *n* times on differing samples of *n-1* countries.

Table 12: Robustness to alternative tax wedge measures

Dependent variables	Employment rate			Unemployment rate			Labour force participation rate		
Tax wedge measures	Couple, 2 children, single earner (baseline)	Single, no child	Aggregate, based on national accounts	Couple, 2 children, single earner (baseline)	Single, no child	Aggregate, based on national accounts	Couple, 2 children, single earner (baseline)	Single, no child	Aggregate, based on national accounts
Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Tax-benefit and activation policies									
UE benefit repl. rate	-0.177**	-0.164**	-0.123**	0.123**	0.112**	0.086**	-0.097**	-0.092**	-0.067**
	(0.034)	(0.033)	(0.034)	(0.029)	(0.026)	(0.028)	(0.028)	(0.027)	(0.027)
ALMP	0.057**	0.066**	0.038**	-0.042**	-0.056**	-0.031**	0.024**	0.024*	0.013
	(0.014)	(0.014)	(0.014)	(0.012)	(0.011)	(0.012)	(0.012)	(0.012)	(0.013)
Tax wedge (couple, 2 children)	-0.194**			0.244**			-0.027		
	(0.066)			(0.057)			(0.055)		
Tax wedge (single, no child)		-0.227**			0.326**			0.003	
		(0.069)			(0.055)			(0.061)	
Tax wedge (aggregate, nat.acc.)			-0.476**			0.319**			-0.278**
			(0.084)			(0.080)			(0.063)
Wage setting institutions									
Excess coverage	-0.107**	-0.115**	-0.112**	0.094**	0.108**	0.113**	-0.055*	-0.054*	-0.047
	(0.036)	(0.034)	(0.034)	(0.038)	(0.037)	(0.040)	(0.028)	(0.028)	(0.030)
Excess coverage × tax wedge	-0.763**	-0.744**	-0.534**	-0.057	0.017	-0.390**	-0.850**	-0.765**	-0.849**
	(0.242)	(0.235)	(0.206)	(0.220)	(0.201)	(0.177)	(0.203)	(0.209)	(0.183)
Minimum wage	-0.275**	-0.325**	-0.210**	-0.091	-0.038	-0.086*	-0.361**	-0.377**	-0.287**
	(0.072)	(0.067)	(0.054)	(0.057)	(0.048)	(0.049)	(0.058)	(0.054)	(0.043)
Labour and product market regulations									
EPL	-0.716	-0.863	-0.947	2.304**	2.425**	2.703**	0.479	0.402	0.519
	(1.128)	(1.049)	(0.964)	(1.033)	(1.008)	(0.985)	(0.728)	(0.693)	(0.656)
ETCR	-1.127**	-0.872**	-1.012**	0.594	0.151	0.592	-0.789**	-0.854**	-0.668**
	(0.435)	(0.425)	(0.395)	(0.368)	(0.342)	(0.363)	(0.355)	(0.353)	(0.337)
Control variables									
Education	0.713	1.156**	0.901**	0.333	-0.297	0.344	1.130**	1.124**	1.342**
	(0.471)	(0.450)	(0.396)	(0.349)	(0.314)	(0.335)	(0.351)	(0.356)	(0.322)
Output gap	0.905**	0.901**	0.906**	-1.266**	-1.302**	-1.337**	0.049	0.022	0.004
	(0.188)	(0.184)	(0.173)	(0.150)	(0.146)	(0.155)	(0.169)	(0.166)	(0.161)
Gov't employment	0.305	0.095	0.543**	-0.069	0.226	-0.195	0.291*	0.287*	0.455**
	(0.202)	(0.200)	(0.199)	(0.162)	(0.159)	(0.162)	(0.167)	(0.167)	(0.175)
Gov't primary balance	0.352**	0.282**	0.306**	-0.364**	-0.271**	-0.328**	0.098**	0.093**	0.075*
	(0.056)	(0.056)	(0.052)	(0.048)	(0.046)	(0.047)	(0.043)	(0.044)	(0.040)
Adjusted R-squared	.964	.965	.97	.888	.892	.888	.965	.966	.969
Country / year fixed effects	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes
No. of observations / countries	422 / 25	422 / 25	421 / 25	422 / 25	422 / 25	421 / 25	422 / 25	422 / 25	421 / 25
Years	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010

Note: Estimation results obtained by using Dynamic OLS and heteroskedasticity and autocorrelation robust (Newey-West) standard errors (in parentheses; ** p<0.05, * p<0.1).The dependent variables refer to the working age population (aged 15-64). See the exact definition of the explanatory variables in Table 4 and in Appendix C and D, and the set of included countries in Table 3.

Figure 4: Robustness of employment effects to omitting one country at a time from the sample (selected policy variables)



Note: Estimation results obtained by using Dynamic OLS and heteroskedasticity and autocorrelation robust (Newey-West) standard errors. The dependent variables refer to the working age population (aged 15-64). The baseline specification with the full set of variables is used (Table 8, column 3). See the exact definition of the explanatory variables in Table 4 and in Appendix C and D.

5.3. Detailed results by policies and labour market groups

53. To investigate the potential heterogeneity of policy effects by skill levels and demographic groups, this section presents results along the education, age and gender dimensions. Furthermore, additional drivers of labour force participation for certain segments of the population are incorporated: policies helping families (the amount of spending on family benefits and the length of maternity leaves) and the pension system.[22]

Policy effects vary by skill levels

54. Results by skill levels show interesting and intuitive patterns (Table 17).[23] First, unemployment benefits tend to affect most strongly the low-educated segment (columns 1-3), while those with tertiary education are not significantly impacted (col. 7-9). The employment rates of secondary educated show weak (col. 6) or insignificant effects (col. 4-5). This is consistent with the idea that the unemployment benefits serve as a binding reservation wage only for the lower skilled segment, as the higher skilled one usually earns well above it.

55. The tax wedge has the strongest negative effect at the medium skilled part of the population, while showing no significant effects for the rest. This is in line with the fact that the tax wedge is measured at the average wage, which intuitively has the highest overlap with the middle segment of the skill distribution. Finally, higher spending on ALMPs does not yield significant positive estimates, most likely due to the shorter availability of the education breakdowns of employment rates than the aggregate ones. Another possible reason is that ALMPs can be expensive and hence need to be accompanied with large adjustments in other expenditures or revenues in order to keep the budget unchanged. This phenomenon can also explain the negative effect found for the high educated segment.

56. Among wage setting institutions, the excess coverage exerts a significantly negative effect on the employment rates for all education levels. It has the smallest impact on the highest educated segments, where the interaction with the tax wedge turns positive. The impact of the minimum wage is not robust across specifications. Finally, strict EPL hurts most the employment prospects of the low skilled, and raises the employment rate of the highly educated. The opposing impacts of EPL by education levels may serve as an explanation of why it has been difficult to find a robust effect of it at the aggregate level. Finally, product market regulations hold back only the medium skilled, to the extent that is roughly consistent with the aggregate effect found in Table 8 and the typical share of the medium skilled in the total population.

57. Overall, these results indicate that most traditional policies aimed at boosting employment have much larger effects at the segment of the population with lower skill levels. On the one hand, this might raise concerns regarding the future effectiveness of these policies on lifting aggregate employment, since the share of tertiary educated is constantly increasing while the ratio of low educated is declining. On the other hand, as the share of highly educated population is rising, employment rates can also be expected to increase, making the reliance on these policies less necessary, and perhaps other policy areas could gain more importance.

[22] Note that at this stage their analysis is only exploratory, and more refined measures could be applied in future work. Examples include separate pension age limits by gender, and relating it to children to mitigate their endogeneity (Thévenon, 2013).

[23] Since the employment rate series by education breakdowns are substantially shorter than the series used in the previous sections (Table 5), it may be harder to obtain significant estimates due to the lower number of observations.

Table 13: Heterogeneous policy effects by education / skill levels

Dependent variable: employment rate by education levels	**Education levels**								
	Low (primary)			**Medium (secondary)**			**High (tertiary)**		
Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Tax-benefit and activation policies									
UE benefit repl. rate	-0.105**	-0.113**	-0.160**	-0.022	-0.026	-0.087**	-0.065	-0.023	-0.030
	(0.049)	(0.051)	(0.053)	(0.042)	(0.052)	(0.041)	(0.042)	(0.039)	(0.036)
ALMP	-0.011	0.023	-0.001	-0.017	0.025	-0.029	-0.050**	-0.042**	-0.044*
	(0.035)	(0.033)	(0.031)	(0.029)	(0.032)	(0.027)	(0.022)	(0.021)	(0.023)
Tax wedge	-0.190**	-0.136	-0.021	-0.301**	-0.326**	-0.274**	-0.019	-0.005	-0.054
	(0.082)	(0.086)	(0.083)	(0.086)	(0.100)	(0.096)	(0.069)	(0.075)	(0.077)
Wage setting institutions									
Excess coverage		-0.148**	-0.242**		-0.090	-0.233**		-0.145**	-0.103*
		(0.052)	(0.064)		(0.067)	(0.073)		(0.046)	(0.054)
Excess coverage × tax wedge		-0.351	-0.512		-0.199	0.348		1.354**	1.217**
		(0.444)	(0.475)		(0.500)	(0.537)		(0.448)	(0.454)
Minimum wage		-0.200**	-0.124		-0.138*	-0.025		-0.161**	-0.117
		(0.094)	(0.098)		(0.073)	(0.072)		(0.074)	(0.071)
Labour and product market regulations									
EPL			-5.223**			-4.673**			2.643*
			(1.168)			(1.304)			(1.404)
ETCR			0.345			-2.214**			-0.387
			(0.716)			(0.635)			(0.521)
Control variables									
Education	0.117	0.099	-0.670	4.203**	4.227**	1.923**	2.289**	2.980**	2.939**
	(0.539)	(0.530)	(0.681)	(0.638)	(0.714)	(0.718)	(0.422)	(0.524)	(0.550)
Output gap	0.723**	0.817**	0.958**	1.013**	0.880**	0.813**	0.495*	0.450*	0.317
	(0.281)	(0.256)	(0.261)	(0.327)	(0.308)	(0.301)	(0.265)	(0.250)	(0.235)
Gov't employment	1.814**	1.570**	1.332**	1.855**	1.544**	1.763**	0.888**	1.035**	1.066**
	(0.333)	(0.353)	(0.339)	(0.336)	(0.350)	(0.349)	(0.273)	(0.248)	(0.245)
Gov't primary balance	0.163*	0.274**	0.196**	0.364**	0.517**	0.502**	0.204**	0.432**	0.467**
	(0.089)	(0.100)	(0.098)	(0.095)	(0.122)	(0.105)	(0.067)	(0.077)	(0.079)
Adjusted R-squared	.976	.979	.981	.951	.956	.964	.85	.873	.886
Country / year fixed effects	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes
No. of observations / countries	349 / 25	334 / 25	327 / 24	349 / 25	334 / 25	327 / 24	349 / 25	334 / 25	327 / 24
Years	1990-2010	1990-2010	1990-2010	1990-2010	1990-2010	1990-2010	1990-2010	1990-2010	1990-2010

Note: Estimation results obtained by using Dynamic OLS and heteroskedasticity and autocorrelation robust (Newey-West) standard errors (in parentheses; ** p<0.05, * p<0.1).The dependent variables refer to the working age population (aged 15-64). See the exact definition of the explanatory variables in Table 4 and in Appendix C and D, and the set of included countries in Table 3. Squared cells indicate that the estimated effect for the group with the given skill level is significantly different (at least at 10% level) from the effect estimated for those at low skill levels. The p-values for of these differences are obtained from stacking all groups together and using group-interactions. This applies only to the full models (columns 6 and 9).

Policy effects vary by demographic groups

58. Results by four distinct demographic groups (prime age women and men, the youth and the elderly) confirm the conventional wisdom that most policies exert a larger effect on groups that are less strongly attached to the labour market (Table 14). Accordingly, the employment rates of older people – close to retirement – react significantly more strongly to unemployment benefits than prime age men. This difference could be explained by unemployment benefits acting as a path to early retirement, thus leading to an exit from the labour force (Blöndal and Scarpetta, 1999; Gruber and Wise, 2004). Second, active labour market policies seem to benefit all segments, with the youth standing out as significantly more affected than prime age men. This supports the notion that active labour market policies targeted to marginal groups can be particularly effective and indeed have their intended effects (Escudero, 2014).Third, the tax wedge has a significantly weaker impact on women employment rates, which can be driven by the fact that they tend to be the 2nd earners and the baseline tax measure refers to couples with a single earner.

59. Regarding wage setting institutions (excess coverage of wage bargaining and the minimum wage), women and the youth stand out as the groups that are significantly affected. At the same time, the effects on prime age men and the elderly are not significant. Stronger employment protection raises the employment rates of older people, and it is not significant for the other groups. This is possibly due to the fact that the firing-reduction effect of EPL clearly dominates for this group. On the other hand, more competition friendly product market regulations impact the employment rates of women positively, and leaving the others unaffected. This might indicate that deregulations in the network industries – which are captured by the ETCR indicator used here – had positive effects mainly on occupations that women enter in larger proportions, either through direct or indirect effects (i.e. through sectors that use the output of ETCR industries).

60. Considering specific policies targeting specific demographic groups (Table 15), family benefits provided in kind as well as longer maternity leaves raise the employment rate of prime age women. In-kind benefits include direct financing and subsidising of providers of childcare and early education facilities. As such, they have a potential to help parents returning to work. Similarly, maternity leave weeks, when set at the right levels, can encourage child bearing for working mothers. On the other hand, family benefits provided in cash (e.g. child allowances) yield no significant effects. It may be that the positive income effects they bring outweigh the incentives they create for having a job next to raising children. The legal retirement age lifts the employment rate of the elderly by a statistically and economically significant margin: 1 extra year leads to 0.8 percentage point higher employment rate for those between 55 and 64 years old. Finally, higher tax wedges pertaining to singles affect youth employment rate very strongly and negatively.[24]

[24] For women, the squared terms of maternity leave length – implying a decreasing returns to additional weeks – were found not to be significant when added to the set of regressors in Table 15. For the elderly, the effective retirement age was investigated but did not yield significant results. For youth, the EPL for temporary workers, or the absolute difference between temporary and permanent worker regulations were included but yielded insignificant results.

Table 14: Heterogeneous policy effects by demographic groups

Dependent variable: employment rate by demographic groups	**Demographic groups**											
	Prime age women (25-54)			**Prime age men (25-54)**			**Youth (15-24)**			**Elderly (55-64)**		
Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Tax-benefit and activation policies												
UE benefit repl. rate	-0.288**	-0.189**	-0.220**	-0.128**	-0.131**	-0.147**	-0.303**	-0.240**	-0.245**	-0.343**	-0.364**	-0.318**
	(0.065)	(0.042)	(0.044)	(0.027)	(0.029)	(0.030)	(0.078)	(0.069)	(0.072)	(0.062)	(0.064)	(0.064)
ALMP	0.098**	0.105**	0.076**	0.043**	0.046**	0.047**	0.111**	0.124**	0.125**	0.059**	0.056**	0.070**
	(0.025)	(0.020)	(0.021)	(0.010)	(0.010)	(0.011)	(0.028)	(0.026)	(0.027)	(0.018)	(0.018)	(0.020)
Tax wedge	-0.159*	-0.027	-0.016	-0.291**	-0.297**	-0.274**	-0.115	-0.170*	-0.148	-0.328**	-0.293**	-0.306**
	(0.092)	(0.104)	(0.105)	(0.043)	(0.048)	(0.047)	(0.087)	(0.098)	(0.097)	(0.068)	(0.088)	(0.087)
Wage setting institutions												
Excess coverage		-0.089*	-0.197**		0.038	0.025		0.037	0.039		-0.080	0.041
		(0.050)	(0.054)		(0.028)	(0.032)		(0.052)	(0.064)		(0.068)	(0.072)
Excess coverage × tax wedge		-1.170**	-0.808**		0.133	0.079		-0.949*	-1.041*		0.709**	0.345
		(0.391)	(0.384)		(0.184)	(0.182)		(0.556)	(0.571)		(0.327)	(0.330)
Minimum wage		-0.734**	-0.621**		0.037	0.043		-0.306**	-0.312**		-0.095	-0.120
		(0.105)	(0.108)		(0.045)	(0.047)		(0.142)	(0.151)		(0.107)	(0.111)
Labour and product market regulations												
EPL			-2.403			-0.569			-0.122			2.660**
			(1.645)			(0.827)			(1.498)			(1.206)
ETCR			-2.059**			0.232			0.176			0.729
			(0.689)			(0.352)			(0.760)			(0.630)
Control variables												
Education	3.694**	3.233**	1.572**	0.570**	0.718**	0.582*	-0.085	-0.082	-0.151	0.109	0.106	1.158*
	(0.568)	(0.498)	(0.623)	(0.251)	(0.251)	(0.345)	(0.475)	(0.506)	(0.764)	(0.397)	(0.447)	(0.655)
Output gap	0.472	0.300	0.336	0.997**	0.934**	1.037**	1.156**	1.093**	1.160**	0.729**	0.668**	0.439
	(0.338)	(0.301)	(0.292)	(0.152)	(0.150)	(0.140)	(0.315)	(0.304)	(0.315)	(0.312)	(0.293)	(0.287)
Govt employment	0.456	-0.161	0.093	-0.158	-0.111	-0.204	0.403	0.115	0.073	-0.525**	-0.539**	-0.407
	(0.337)	(0.265)	(0.278)	(0.160)	(0.164)	(0.180)	(0.351)	(0.355)	(0.361)	(0.265)	(0.268)	(0.270)
Govt primary balance	0.102	0.161**	0.254**	0.328**	0.326**	0.335**	0.693**	0.648**	0.643**	0.339**	0.425**	0.321**
	(0.074)	(0.072)	(0.073)	(0.039)	(0.042)	(0.046)	(0.089)	(0.094)	(0.109)	(0.071)	(0.084)	(0.087)
Adjusted R-squared	0.932	.951	.955	.894	.899	.907	.968	.97	.97	.97	.974	.976
Country / year fixed effects	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes
No. of observations / countries	444 / 26	429 / 26	420 / 25	444 / 26	429 / 26	420 / 25	446 / 26	431 / 26	422 / 25	446 / 26	431 / 26	422 / 25
Years	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010

Note: Estimation results obtained by using Dynamic OLS and heteroskedasticity and autocorrelation robust (Newey-West) standard errors (in parentheses; ** p<0.05, * p<0.1). The dependent variables refer to employment rates by different demographic groups (age intervals indicated in parentheses). See the exact definition of the explanatory variables in Table 4 and in Appendix C and D, and the set of included countries in Table 3. Squared cells indicate that the estimated effect for the demographic group is significantly different (at least at 10% level) from the effect estimated for prime age men (applied only to the full models (columns 3, 9 and 12). The p-values for of these differences are obtained from stacking all groups together and using group-interactions.

Table 15: Specific policies affecting specific demographic groups

Dependent variable: employment rate by demographic groups	**Demographic groups**			
	Prime age women (25-54)		**Elderly (55-64)**	**Youth (15-24)**
Explanatory variables	(1)	(2)	(3)	(4)
Tax-benefit and activation policies				
UE benefit repl. rate	-0.206**	-0.203**	-0.343**	-0.183**
	(0.048)	(0.051)	(0.066)	(0.062)
ALMP	0.059**	0.100**	0.063**	0.147**
	(0.023)	(0.035)	(0.020)	(0.021)
Tax wedge	-0.056	0.020	-0.260**	
	(0.100)	(0.098)	(0.087)	
Wage setting institutions				
Excess coverage	-0.157**	-0.173**	0.105	0.072
	(0.052)	(0.055)	(0.068)	(0.051)
Excess coverage × tax wedge	-0.969**	-0.916**	0.623*	-3.627**
	(0.407)	(0.397)	(0.334)	(0.501)
Minimum wage	-0.423**	-0.407**	-0.093	-0.311**
	(0.110)	(0.115)	(0.113)	(0.100)
Labour and product market regulations				
EPL	-2.705*	-2.725*	1.710	1.599
	(1.490)	(1.437)	(1.311)	(1.227)
ETCR	-1.833**	-1.472**	0.630	1.032
	(0.669)	(0.712)	(0.622)	(0.639)
Specific policies targeting specific demographic groups				
Family benefits in cash (% of GDP)	-0.963	-0.967		
	(1.128)	(1.088)		
Family benefits in kind (% of GDP)	4.643**	4.698**		
	(1.149)	(1.180)		
Number of weeks of maternity leave		0.265**		
		(0.130)		
Legal age for pensions (total)			0.851**	
			(0.361)	
Tax wedge (single, no ch.)				-0.866**
				(0.110)
Control variables				
Education, output gap, gov't employment and primary balance	Yes	Yes	Yes	Yes
Adjusted R-squared	.959	.96	.977	.978
Country / year fixed effects	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes
No. of observations / countries	420 / 25	420 / 25	422 / 25	422 / 25
Years	1987-2010	1987-2010	1987-2010	1987-2010

Note: Estimation results obtained by using Dynamic OLS and heteroskedasticity and autocorrelation robust (Newey-West) standard errors (in parentheses; ** p<0.05, * p<0.1).The dependent variables refer to employment rates by different demographic groups (age intervals indicated in parentheses). See the exact definition of the explanatory variables in Table 4 and in C and D, and the set of included countries in Table 3.

5.4. The role of a broader range of institutions and policy areas

61. In addition to the baseline set of policies discussed thus far, more details of those policies are also investigated:

- In particular, looking deeper into average unemployment benefit replacement rates, it appears that the main effect occurs through differences in the net initial replacement rates, and benefit duration has no additional significant effect (Table 16, col. 2). However, these components are available only for a smaller (shorter) sample, which causes ALMP spending and the tax wedge to become insignificant (see col. 1).

- The structure of ALMP spending is investigated by using the two largest components that are not strongly correlated with each other[25]: public employment services and training (col. 3). The latter shows strong positive and significant effects – twice as large as the overall ALMP – while spending on public employment services does not appear significant, although it is not far from it.

- EPL of temporary contracts, when added to the baseline set of results containing the EPL of permanent contracts, is not significant (col. 4).

62. These results do not substitute for a more detailed analysis of each of the policy areas and as such should not be taken as conveying definitive policy conclusions. Yet they highlight the difficulties of obtaining robust and clean results on the details of policies when incorporating them together with other policy areas.

[25] Their pairwise correlations, after purging them from country and year fixed effects, do not exceed 0.5.

Table 16: Extending results for the aggregate employment rate with more details of policies

Dependent variable: employment rate	Baseline	Details on UE benefits	Details on ALMPs	Details on EPL
Explanatory variables	(1)	(2)	(3)	(4)
Tax-benefit and activation policies				
UE benefit repl. rate (average)	-0.177**		-0.149**	-0.176**
	(0.034)		(0.034)	(0.034)
Unemployment benefit initial net replacement rate		-0.166**		
		(0.059)		
Unemployment benefit duration		0.001		
		(0.061)		
ALMP - Overall	0.057**	0.010		0.055**
	(0.014)	(0.020)		(0.015)
ALMP - Public employment service			0.119	
			(0.128)	
ALMP - Training			0.121*	
			(0.071)	
Tax wedge	-0.194**	-0.048	-0.202**	-0.192**
	(0.066)	(0.078)	(0.087)	(0.068)
Wage setting institutions				
Excess coverage	-0.107**	-0.283**	-0.157**	-0.111**
	(0.036)	(0.053)	(0.040)	(0.037)
Excess coverage × tax wedge	-0.763**	-0.537*	-1.009**	-0.763**
	(0.242)	(0.287)	(0.289)	(0.241)
Minimum wage	-0.275**	-0.088	-0.205**	-0.277**
	(0.072)	(0.084)	(0.076)	(0.076)
Labour and product market regulations				
EPL of permanent contracts	-0.716	-2.260**	-0.628	-0.754
	(1.128)	(1.122)	(1.197)	(1.132)
EPL of temporary contracts				0.078
				(0.357)
ETCR	-1.127**	-0.649	-1.200**	-1.199**
	(0.435)	(0.424)	(0.512)	(0.473)
Control variables				
Education	0.713	0.394	0.290	0.679
	(0.471)	(0.467)	(0.436)	(0.472)
Output gap	0.905**	0.717**	0.890**	0.925**
	(0.188)	(0.203)	(0.216)	(0.190)
Gov't employment	0.305	0.972**	0.544**	0.291
	(0.202)	(0.360)	(0.202)	(0.204)
Gov't primary balance	0.352**	0.230**	0.476**	0.356**
	(0.056)	(0.075)	(0.084)	(0.063)
Adjusted R-squared	.964	.97	.963	.964
Country / year fixed effects	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes
No. of observations / countries	422 / 25	350 / 25	393 / 24	422 / 25
Years	1987-2010	1987-2009	1987-2009	1987-2010

Note: Estimation results obtained by using Dynamic OLS and heteroskedasticity and autocorrelation robust (Newey-West) standard errors (in parentheses; ** p<0.05, * p<0.1).The dependent variables refer to the working age population (aged 15-64). See the exact definition of the explanatory variables in Table 4 and in Appendix C and D, and the set of included countries in Table 3.

5.5. Adjustment towards the long-run effects: an illustration

63. Although the current focus is primarily on the long-run effects of policies, the short-run estimates and the speed of adjustment coefficients are also presented for illustrative purposes (Table 17). The negative and significant speed of adjustment parameter (ρ) indicates that the error correction mechanism is present and its size is very similar across the two different estimation methods (2-step Dynamic OLS and one-step ECM). The size of the estimated speed of convergence (around -0.25) implies

that a percentage point deviation from the equilibrium long run employment rate leads to about a quarter percentage point reduction in that gap in the next period.

64. Considering the short-run effects of policies, ALMPs are found to have a significant and robust effect that is even higher a bit than the long run effect. The tax wedge also has a significant – although small – short-run effect, but only in the baseline 2-step ECM case. More stringent EPL seems to have a positive temporary effect, which can be explained by the fact that it makes firing more costly and this can dominate the hiring-reduction effect in the short run. Opposing effects of EPL in the short and the long run has also been found in Boeri and Jimeno (2005) and Marinescu (2009). Other policies do not show significant short-run effects, implying that they exert most of their influence at the aggregate level on horizons longer than a year.

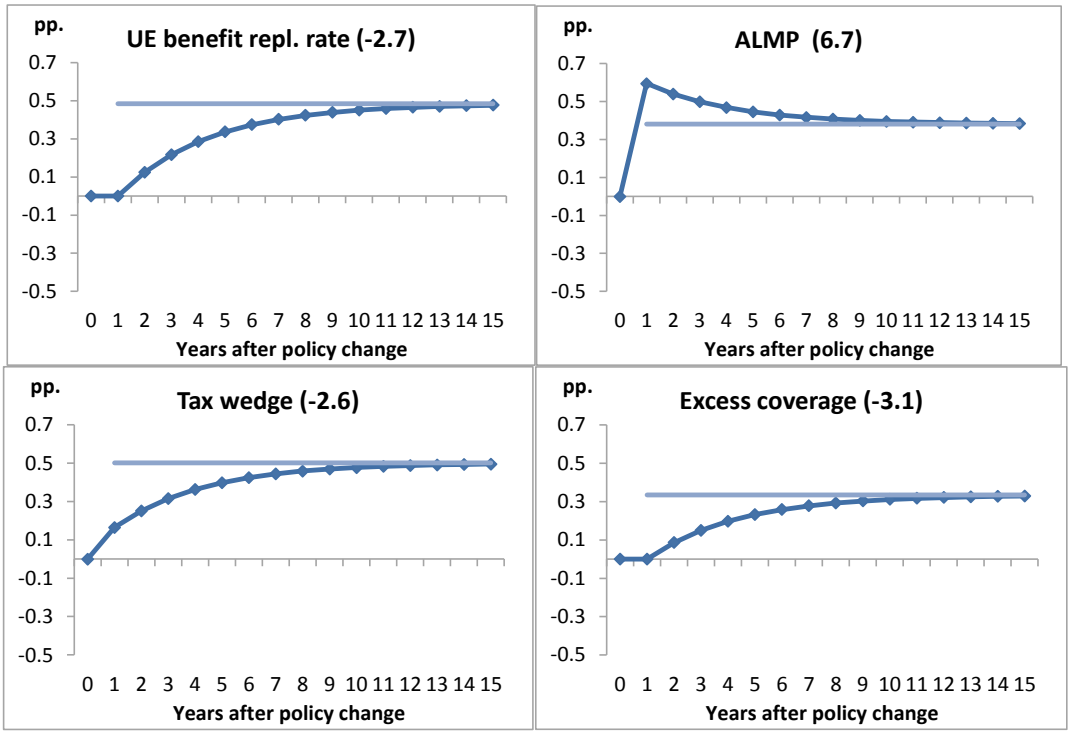
Table 17: The speed of adjustment towards the long-run relationship and the short-run effects on the employment rate

Dependent variable: Annual change in employment rate	2-step ECM using Dynamic OLS	1-step ECM, unrestricted sample	1-step ECM, same sample as 2-step
Explanatory variables	(1)	(2)	(3)
Deviation from long-run relationship (*t* -1)	-0.257**	-0.194**	-0.229**
	(0.034)	(0.020)	(0.034)
Tax-benefit and activation policies			
UE benefit repl. rate	0.023	0.027	0.018
	(0.022)	(0.023)	(0.022)
ALMP	0.069**	0.069**	0.065**
	(0.013)	(0.018)	(0.021)
Tax wedge	-0.064**	-0.036	-0.037
	(0.026)	(0.032)	(0.034)
Wage setting institutions			
Excess coverage	0.019	0.030	0.025
	(0.021)	(0.023)	(0.030)
Excess coverage × tax wedge	-0.075	-0.093	-0.055
	(0.118)	(0.111)	(0.115)
Minimum wage	-0.028	-0.020	-0.011
	(0.044)	(0.044)	(0.058)
Labour and product market regulations			
EPL	1.260**	1.066**	1.027**
	(0.329)	(0.486)	(0.458)
ETCR	-0.201	-0.110	-0.091
	(0.219)	(0.169)	(0.176)
Control variables			
Education	-0.502	0.063	0.070
	(0.897)	(1.310)	(1.304)
Output gap	0.339**	0.402**	0.394**
	(0.040)	(0.049)	(0.045)
Gov't employment	0.373**	0.321	0.366*
	(0.186)	(0.217)	(0.216)
Gov't primary balance	0.068**	0.077**	0.086**
	(0.021)	(0.039)	(0.041)
Adjusted R-squared	0.632	.65	0.688
Country / year fixed effects	Yes / Yes	Yes / Yes	Yes / Yes
No. of observations / countries	422 / 25	469 / 25	422 / 25
Years	1987-2010	1986-2011	1987-2010

Note: Estimates of short- run coefficients using lagged residuals from the long-run estimates (col. 1) or a one-step procedure (col. 2 and 3, see Section 2.3). The dependent variable refers to the working age population (aged 15-64). Heteroskedasticity and autocorrelation robust (Newey-West) standard errors for col. 1 and cluster robust standard errors for col. 2 and 3 in parentheses (** p<0.05, * p<0.1). See the exact definition of the variables in Appendix C and D.

65. To illustrate the relative magnitude of the short-run and long-run effects, Figure 5 shows the time-path of the impact of policies on the employment rate. The size of the policy change is chosen so as to proxy for the typical medium-term reform, measured by taking average over such medium-run (5 year) policy changes that impact the outcome variable in a positive direction. This comparison directly builds on the static effects presented in Table 9, but also gives some indication on the size and direction of the short-run effects. It illustrates visually the results summarised in Table 17: unemployment benefits and the excess coverage do not have short run effects, while ALMP reacts very quickly, and the tax wedge also starts to have an immediate effect, although much smaller than the long run one.

Figure 5: The estimated reaction of the employment rate after a typical reform *



Note: Size of a typical reform is measured by taking average over such medium-run (5 year) policy changes that impact the outcome variable in a positive direction (in percentage points, as a one-time permanent change, see in parentheses). The coefficients used to calculate the effects come from Table 8, col. 3 (long run) and from Table 17, col. 1 for the adjustment and the short-run effects, and the size of the reforms from Table 9. The employment rate effects are also shown in percentage points (pp.).

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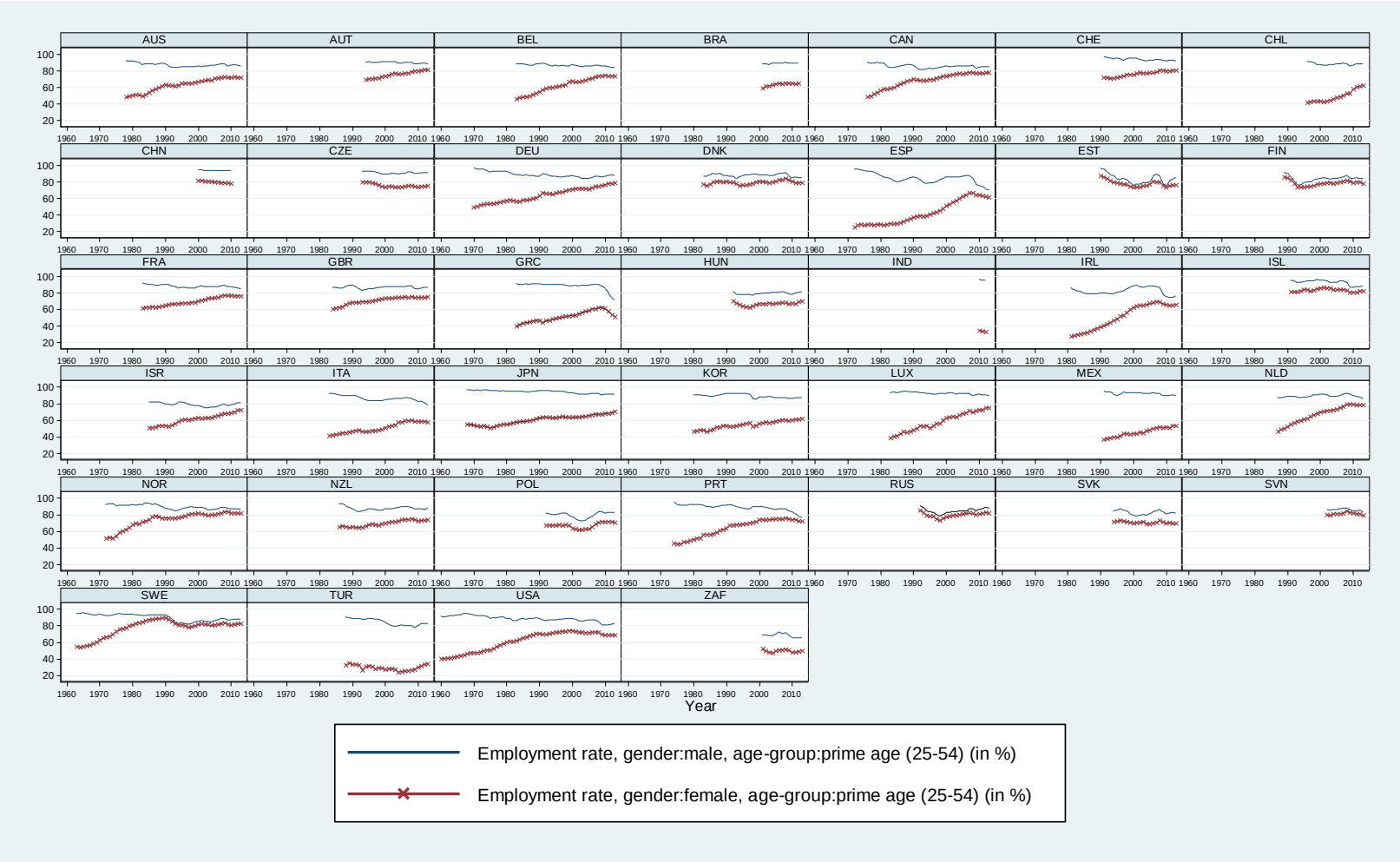
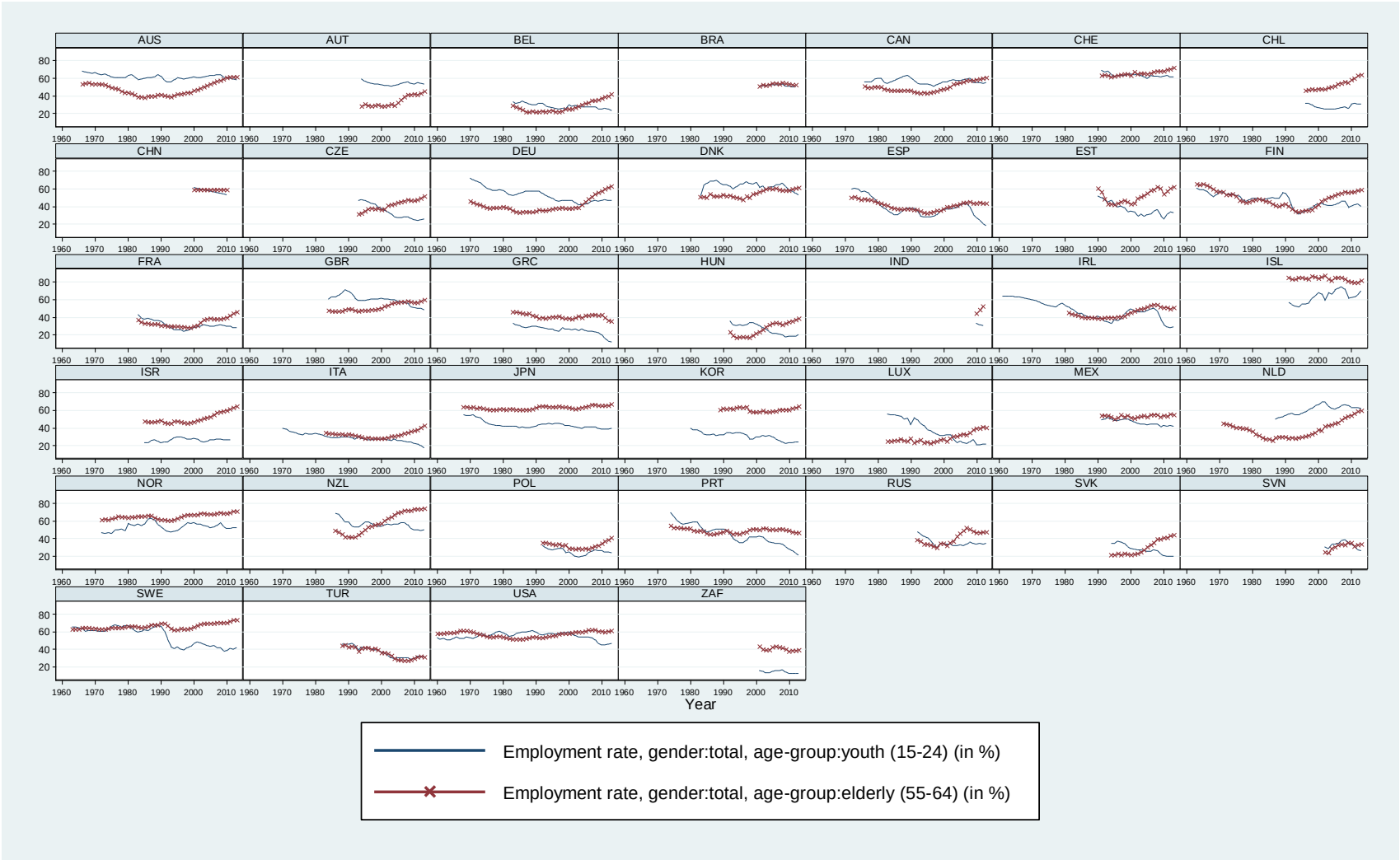
Appendix A: Country-by-country time series of labour market outcomes

Figure A-1: Employment rates for prime age women and men for OECD and BRIICS countries



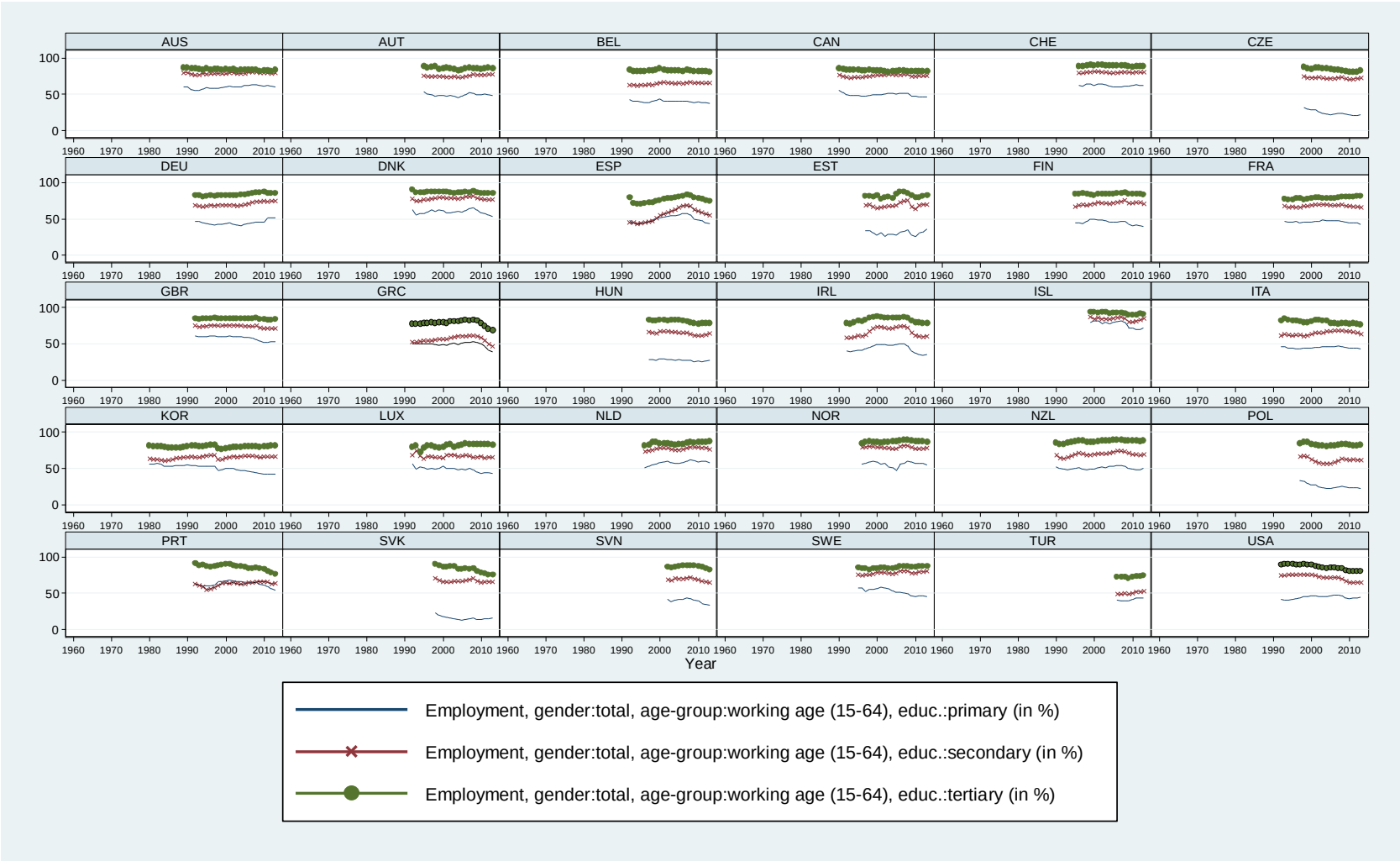
Source: *OECD Labour Force Survey database*.

Figure A-2: Employment rates for the youth and the elderly for OECD and BRIICS countries



Source: *OECD Labour Force Survey database*.

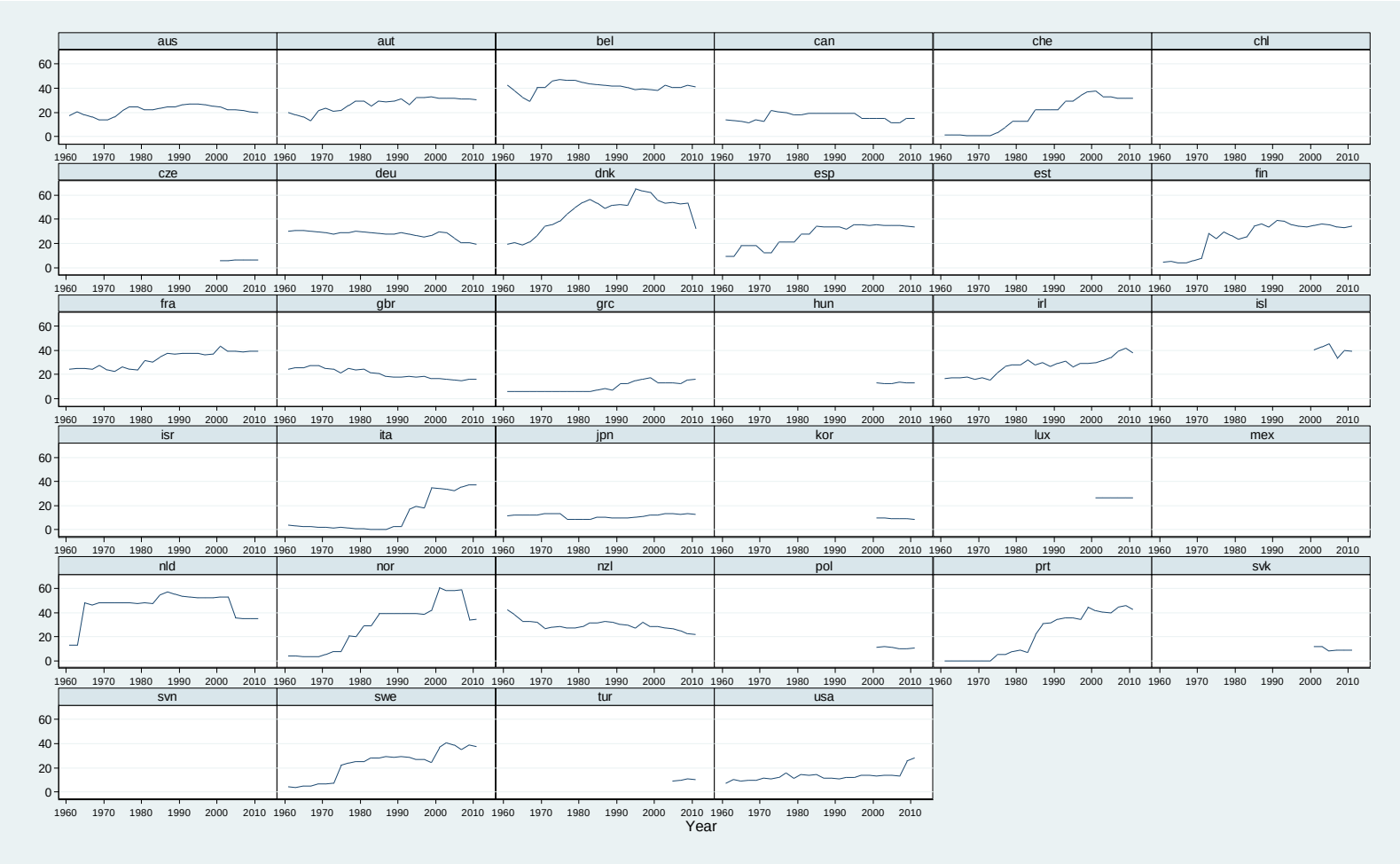
Figure A-3: Employment rates by educational attainment level for OECD countries



Source: ILO and national databases. For details see the Appendix on Data sources.

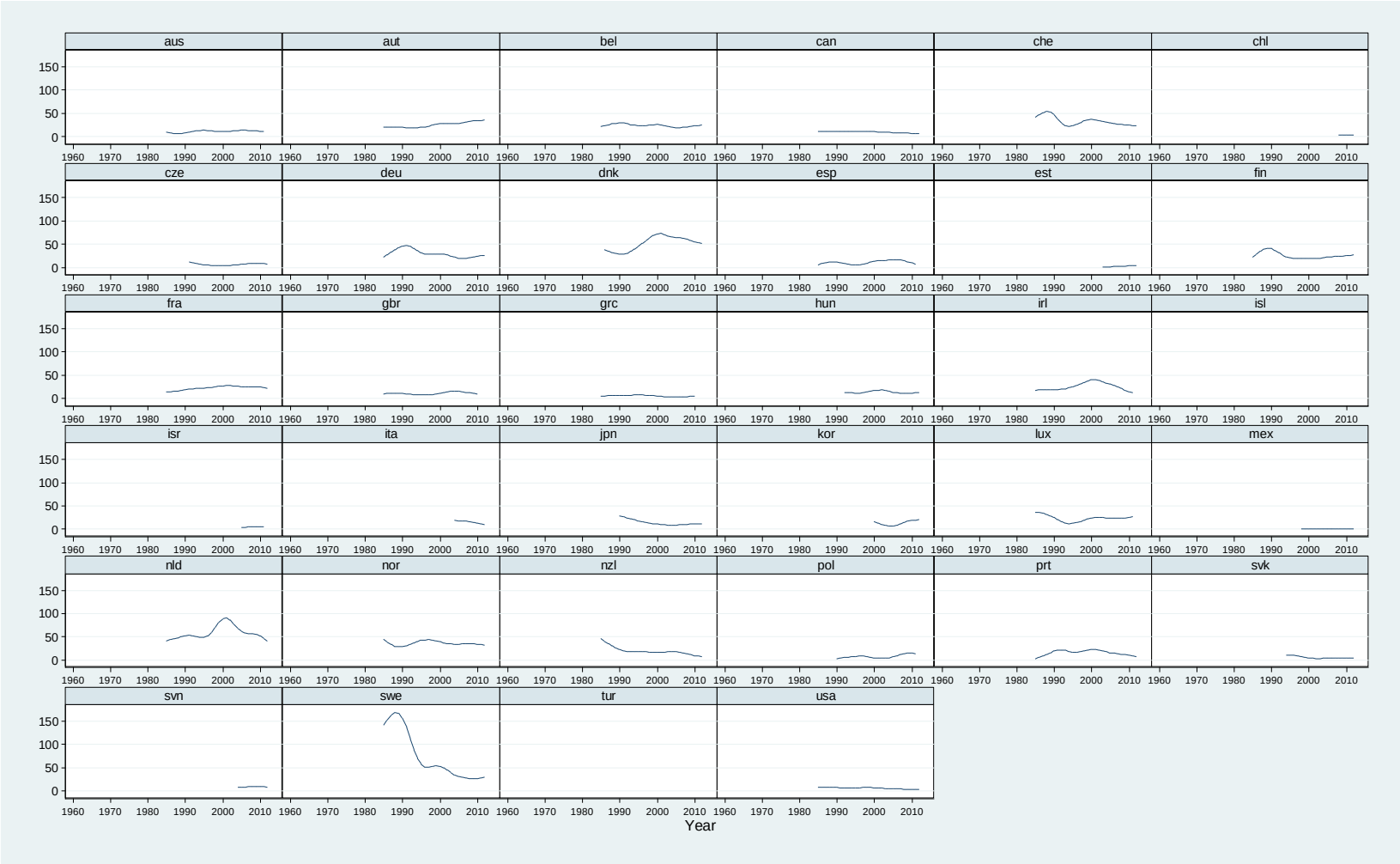
Appendix B: Country-by-country time series of labour market policies

Figure B-1: Gross unemployment benefit replacement rates (average across durations, salary levels and family statuses)



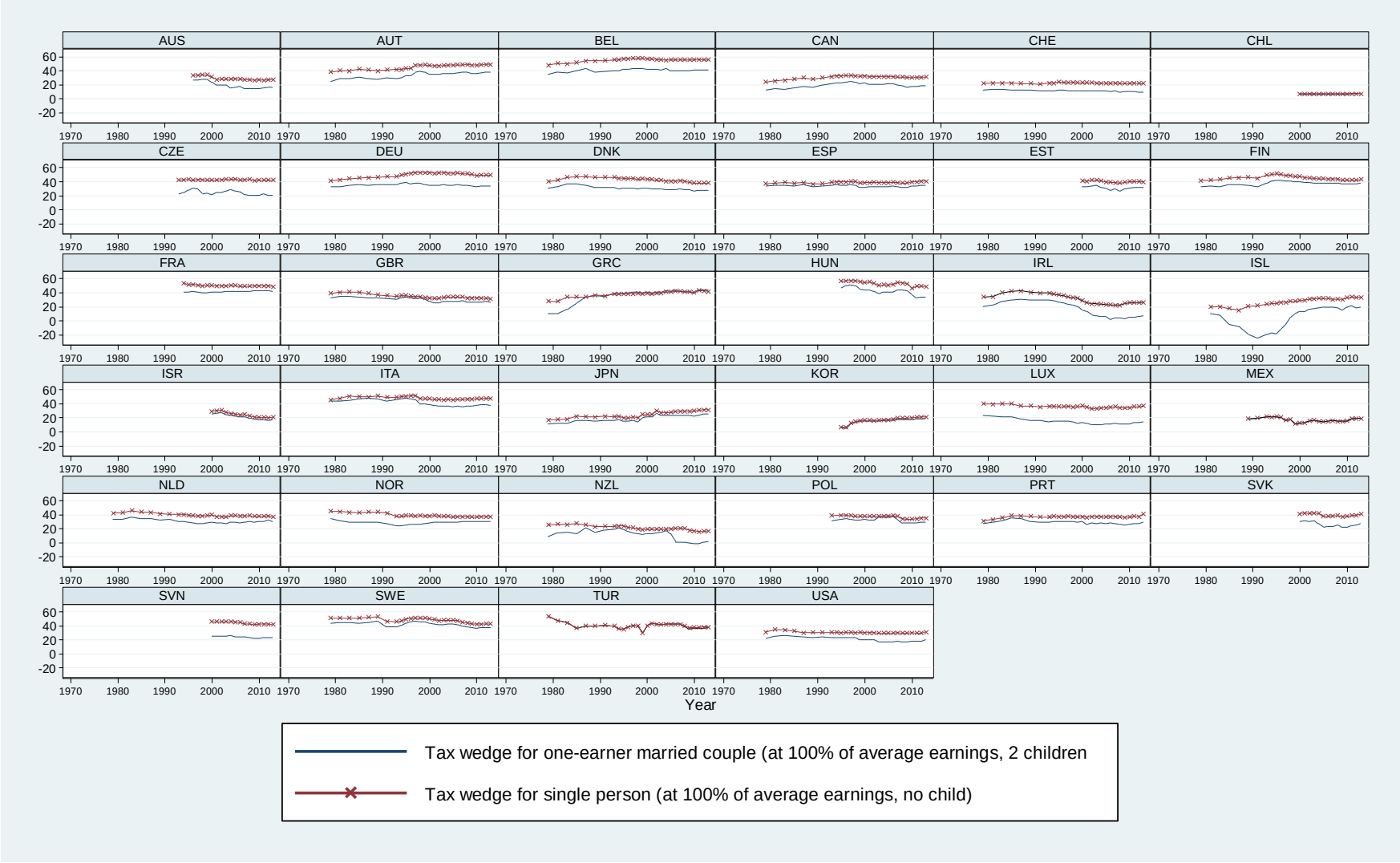
Source: *OECD Benefits and Wages database*. See further adjustments in Appendix C.

Figure B-2: ALMP spending per unemployed, % GDP/capita (HP-trend)



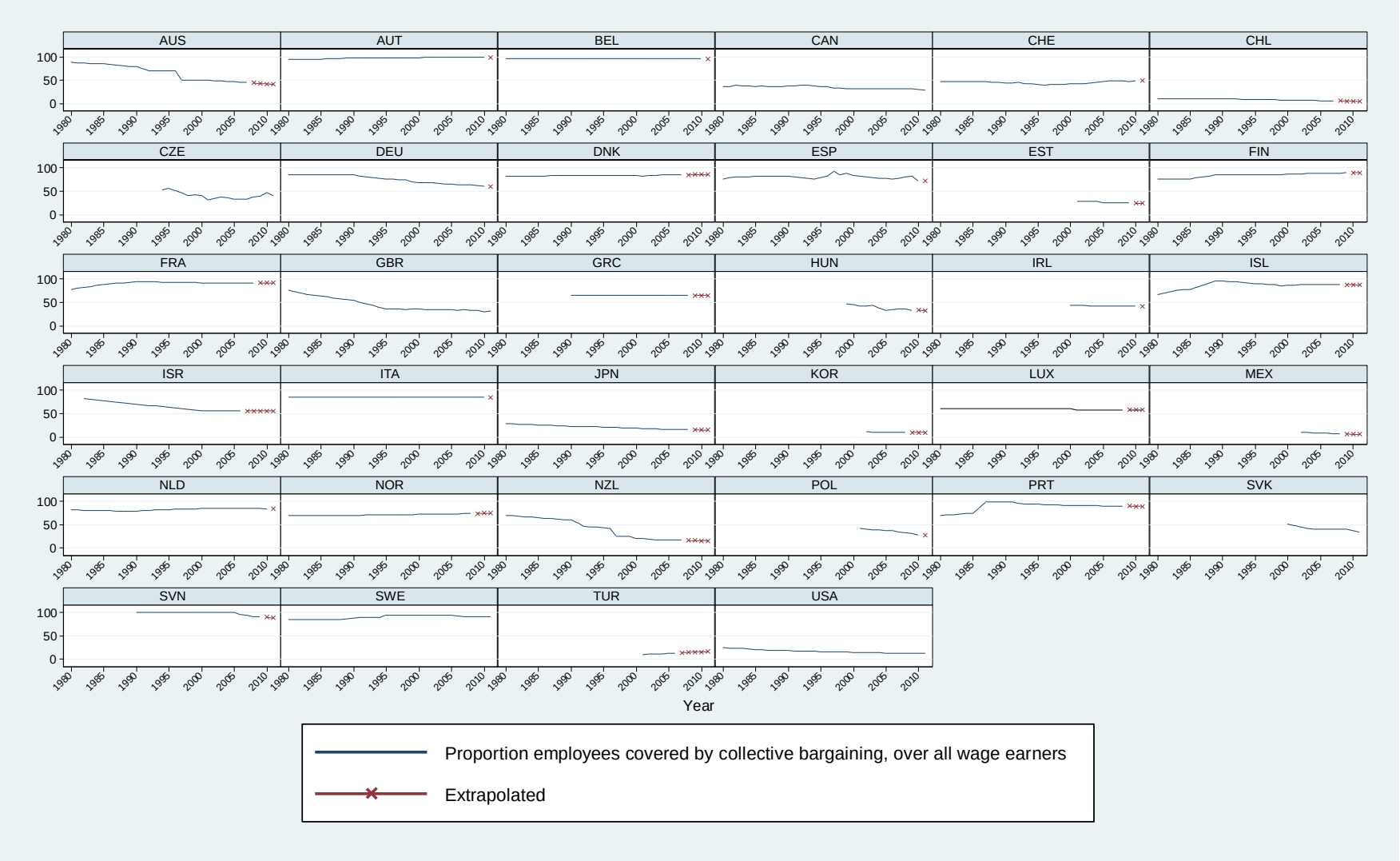
Source: *OECD Labour Market Programs database*.

Figure B-3: Statutory tax wedges for two segments of the population



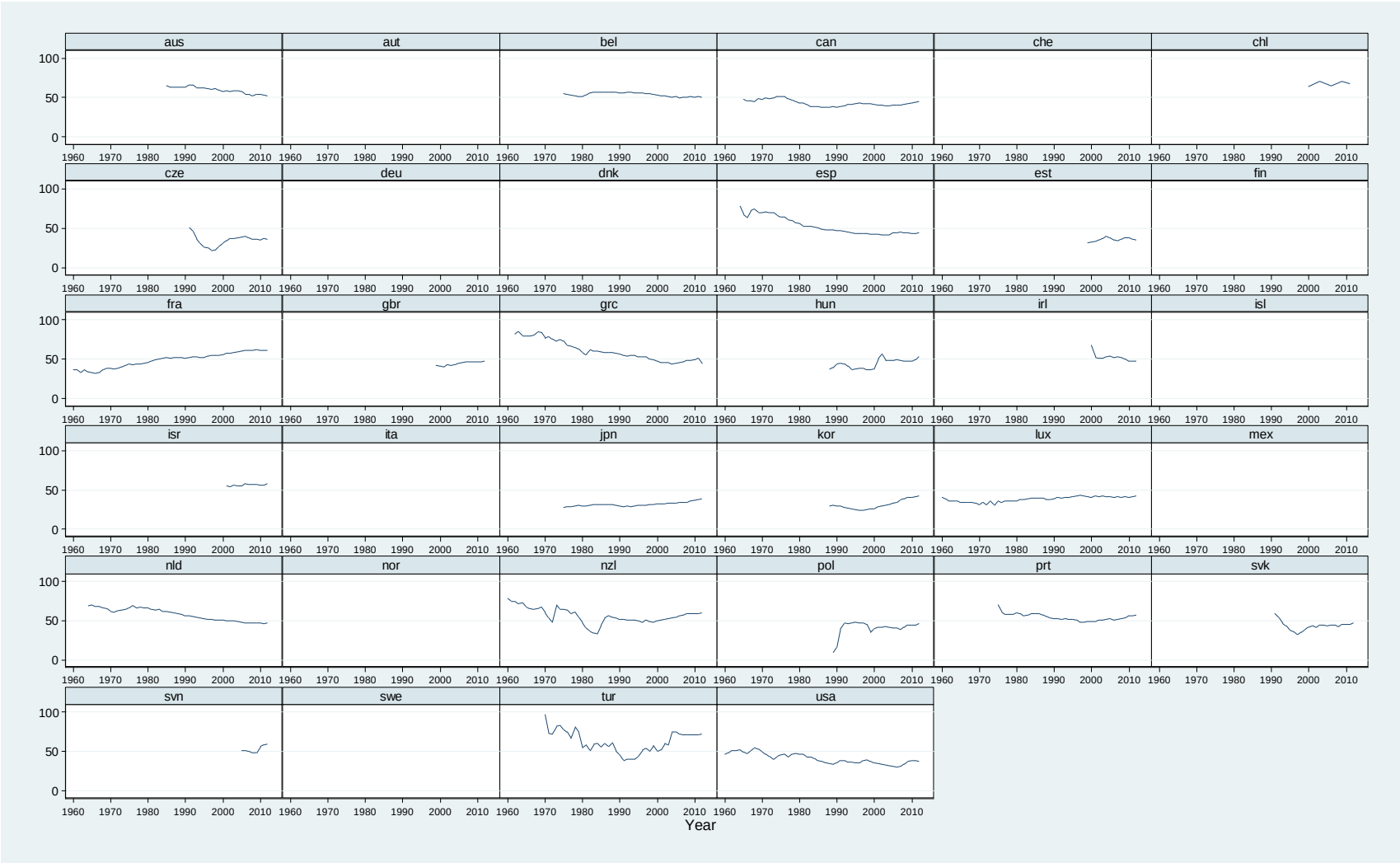
Source: *OECD Taxing Wages database*. Linearly interpolated for the period when series are available only every other year (1979-1993).

Figure B-4: Excess coverage of wage bargaining over union membership



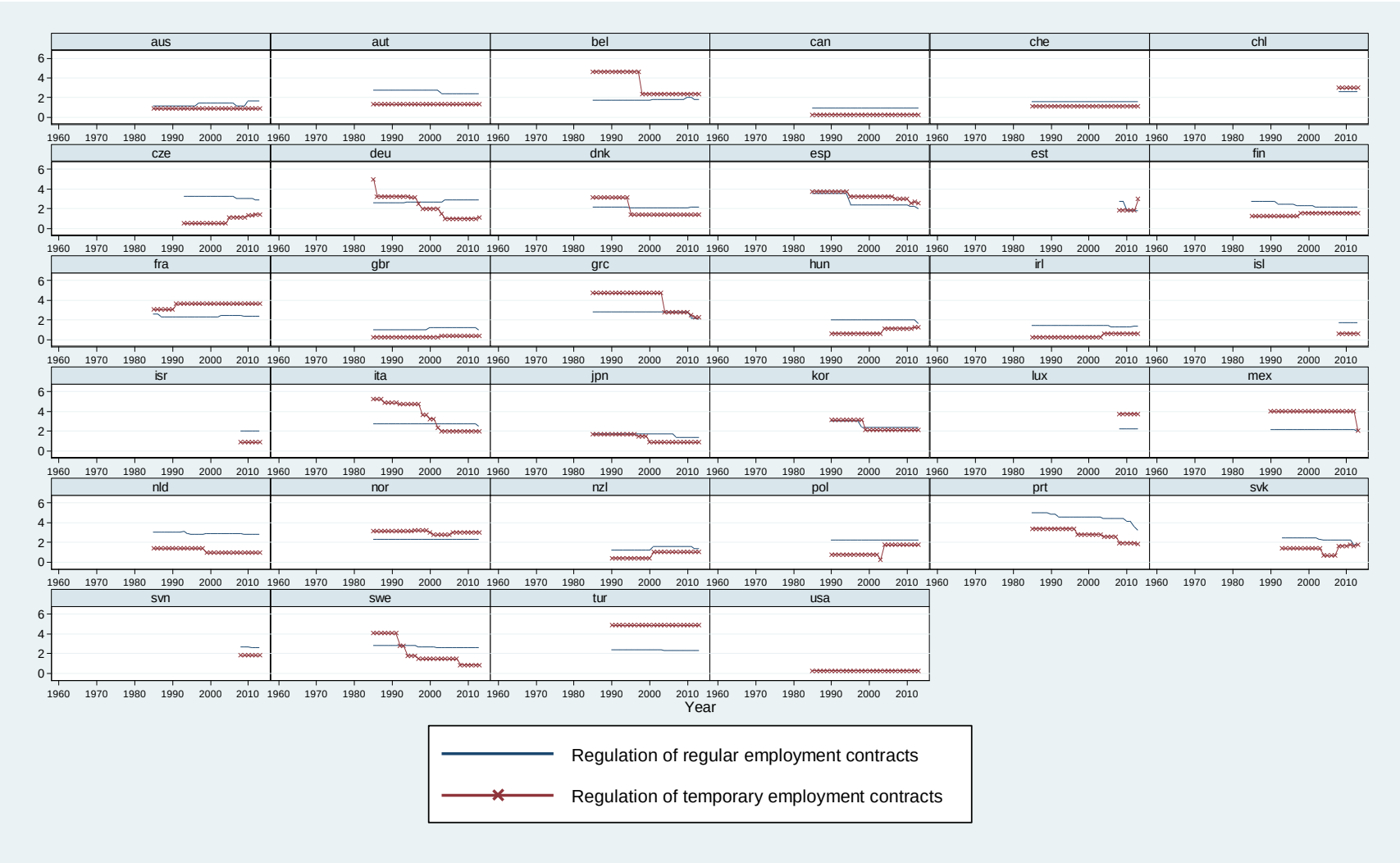
Source: ICTWSS and OECD calculations, see Appendix C for details.

Figure B-5: National hourly minimum wage (measured as % of median wage)



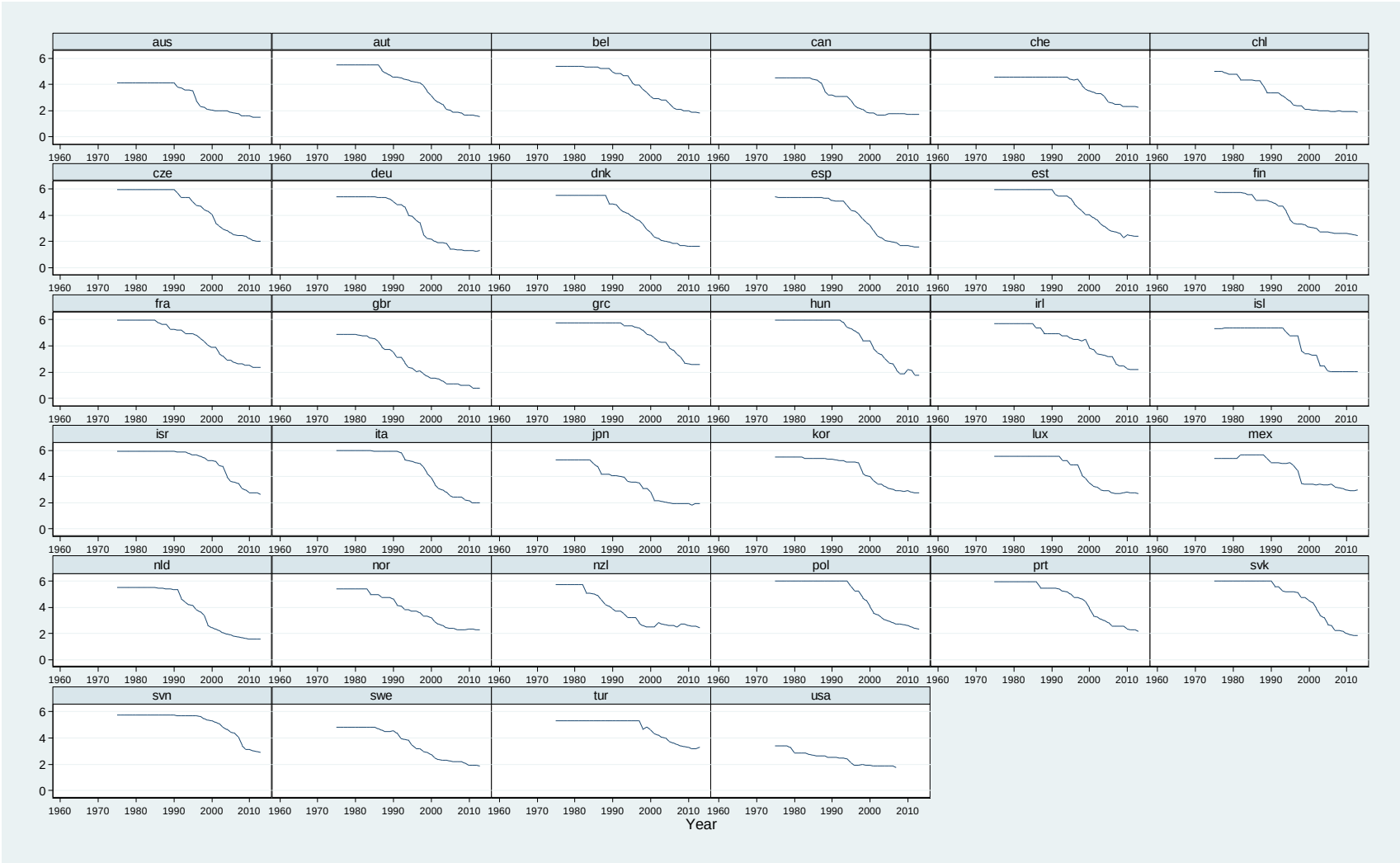
Source: *OECD Labour Force Statistics database*.

Figure B-6: Employment protection legislation index (0-6, 6 being strictest)



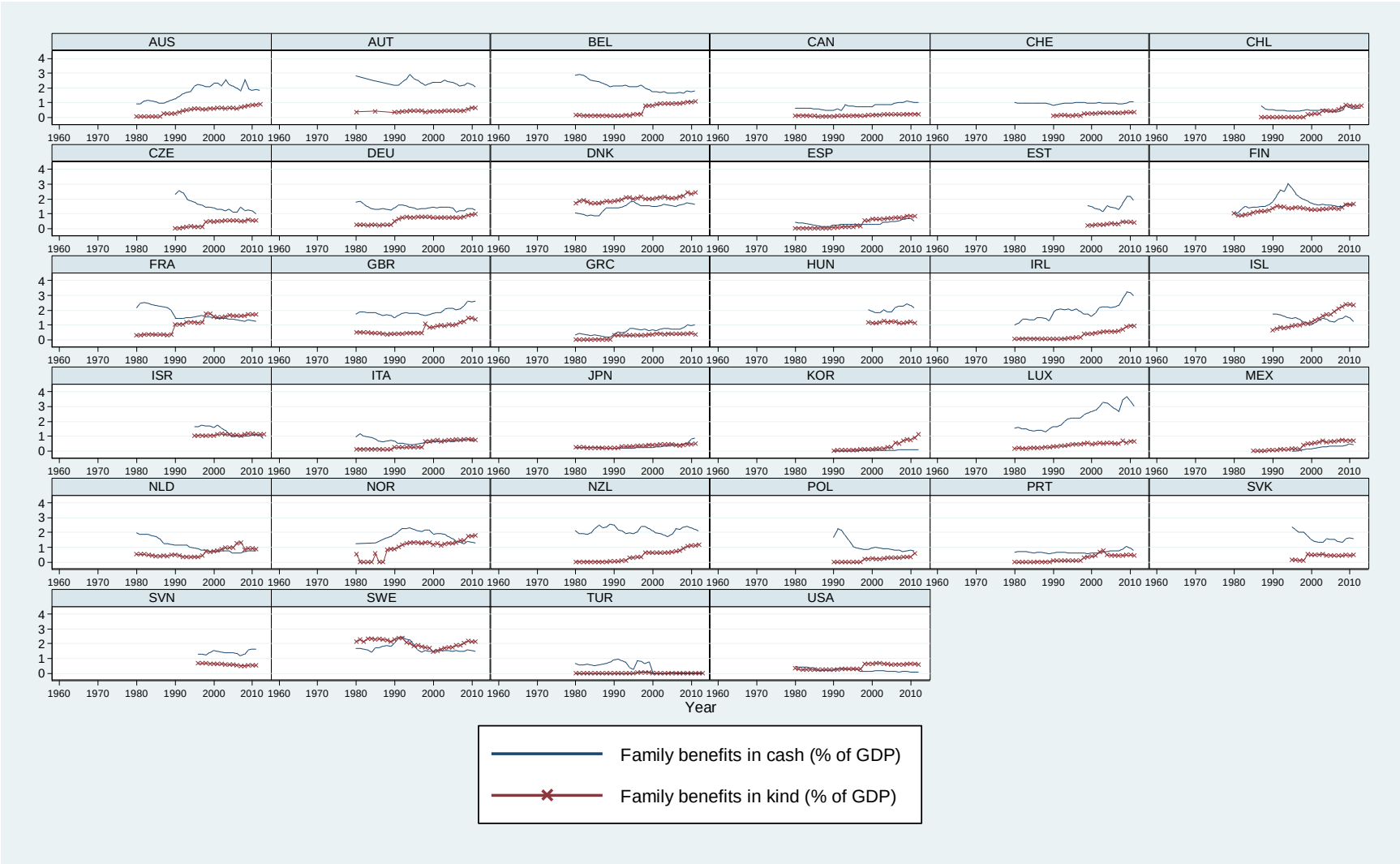
Source: *OECD Employment Protection database*.

Figure B-7: ETCR index (0-6, 6 being strictest)



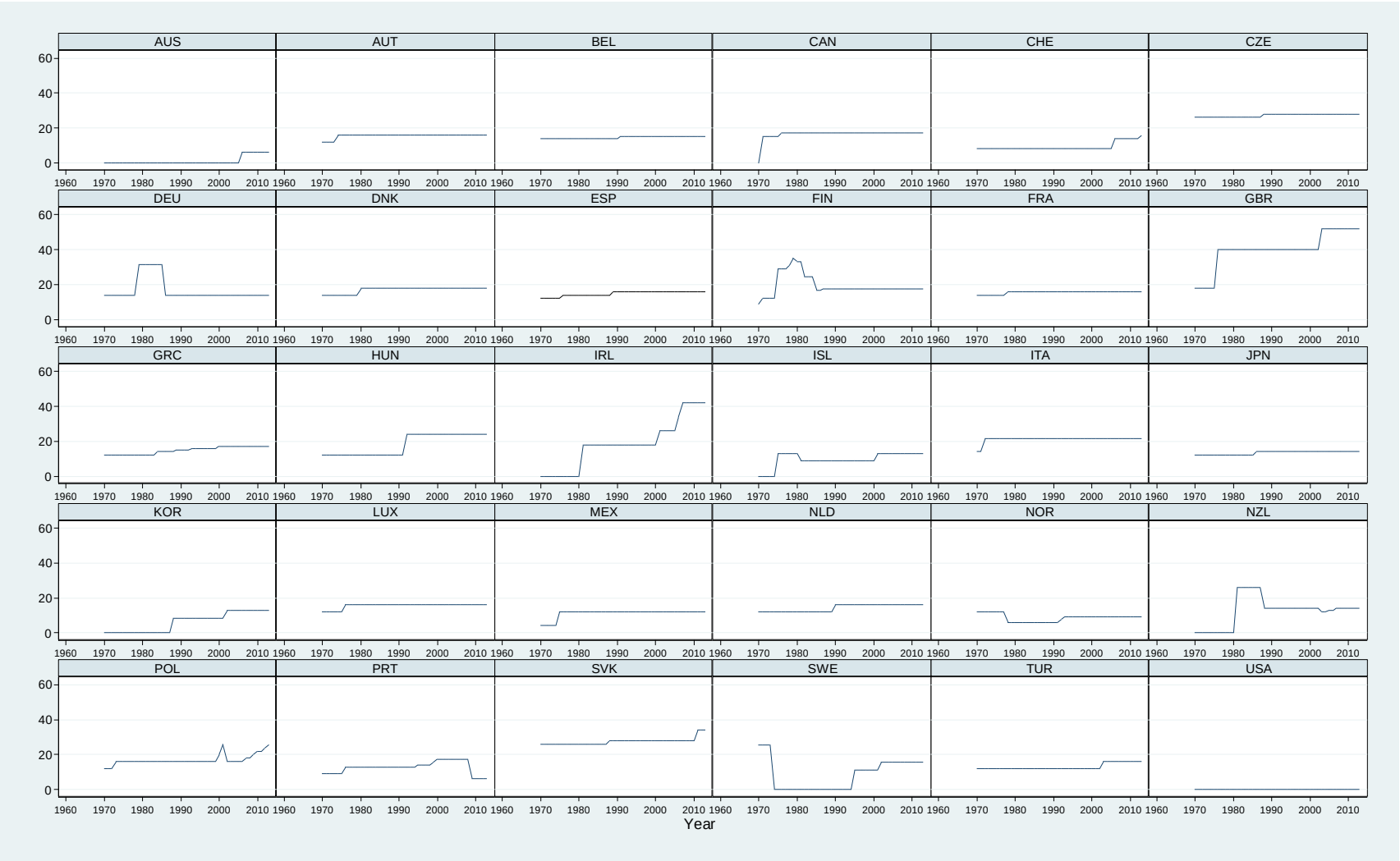
Source: *OECD Market Regulation database*.

Figure B-8: Family benefit spending in cash and in kind



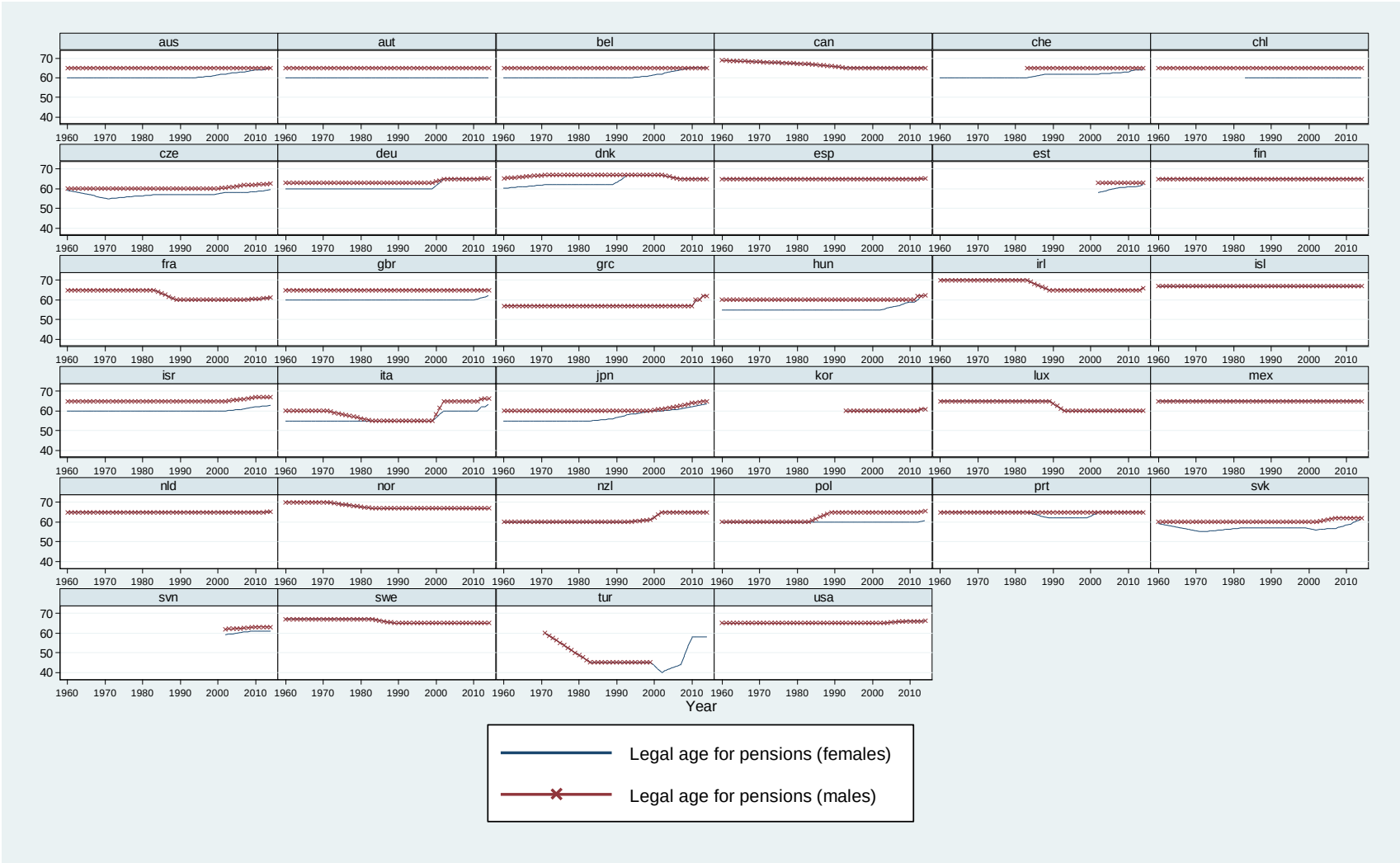
Source: *OECD Family database*.

Figure B-9: Maternity leave weeks



Source: *OECD Family database*.

Figure B-10: Legal pensionable age (in years)



Source: *OECD Economic Outlook* (May 2014).

Appendix C: Variable definitions and sources

Employment, unemployment and labour force participation

1. By gender and age: Primary source is the OECD Labour Force Survey (LFS) database. To produce aggregate (working-age population) series, a simple summation of 5 year age groups was performed across all the age groups between 15 and 65. Note that if for a certain country or year, at least one subcomponent was missing, the aggregation was not carried out in order to ensure comparability across countries and over time. Observations for two countries were adjusted. For Germany, the dynamics observed for West Germany are applied to the series on unified Germany back in time before 1991. For Israel, participation and employment has been dropped after 2011 for age groups smaller than 25 due to an implausible upward level shift.

2. By education level: For EU countries, the data comes from Eurostat/ILO. As these series only exist for European countries, comparable data for Australia, Canada, Korea, New Zealand and the United States was compiled from national sources.

- For Australia, the data comes from Education and Work surveys published by the Australian Bureau of Statistics. Observations for which education level is unknown were removed for the data. Between 1989 and 2000, individuals "Still at school" were considered as having "without non-school" qualifications.

- Korean data comes from the Korean Statistical Information Service (KOSIS).

- Canadian data comes from the Labour Force Survey of Statistics, Canada. Observations for the 65+ age group were removed.

- Data for New Zealand comes from Statistics NZ. Quarterly data was averaged into yearly values. 'Post school' and 'school qualification' were aggregated into a middle (ed3_4) level, and compiled into the relevant rates.

- Data for the United States was garnered from the US Bureau of Labor Statistics. Series IDs available on request. Monthly data averaged into yearly values and education sorted by International Standard Classification of Education (ISCED) standards.

Unemployment benefit replacement rates:

3. Gross unemployment benefit replacement rates chain more recent series (available for 2001-2011) on the old series (available for 1961-2005), both from OECD sources. Gross replacement rates (GRR) express gross unemployment benefit levels as a percentage of previous gross earnings. They are unweighted averages across two earnings levels (average earnings and two-thirds of this level), three household types (single, dependent spouse and spouse in work) and three durations of unemployment (the first year, the second and third years, and the fourth and fifth years of unemployment). As the series are biannual, linear interpolation was also performed. Initial replacement rates, net replacement rates and benefit duration are sourced from de Serres and Murtin (2013).

ALMP and its components:

4. The more detailed ALMP subcomponent series were taken from OECD sources. In order to align these series with those from de Serres and Murtin (2013), a transformation was used. These new series were adjusted as ALMP (subcomponent) spending per unemployed person as a % of GDP/capita. This was done by dividing the current "spending as % of GDP" by the unemployment-to-population ratio. The

cyclical components have been removed by HP filtering, using a smoothing parameter of 6.25 (Ravn and Uhlig, 2002).

Tax wedges:

5. Three measures of tax wedge were considered. First, statutory tax wedges for different household types were constructed from the Center for Tax Policy (CTPA) historical datasets. The baseline measure is the one that applies at 100% of the average wage for couples with a single earner and 2 children. As an alternative measure, the tax wedge for a single earner without a child is also investigated. As these series were available only every other year for 1979-1993, liner interpolation was performed. Second, an "ex-post", aggregate measure calculated from OECD national accounts and tax revenues was generated, which is based on the ratio of labour costs collected by the government over labour costs that are accrued to employees.

Excess coverage:

6. The excess coverage of wage bargaining over union membership is calculated as the difference between the adjusted coverage series from ICTWSS and union density. Beforehand, the adjusted coverage series are linearly interpolated as the series are not available each year, and in some cases 2-4 years are not observed. Towards the end of the sample, a linear extrapolation is applied using the last five observations, to obtain one or two additional years. Results for excess coverage are robust to excluding the extrapolated observations.

Minimum wage:

7. Minimum wage is measured as a percent of the median wage. Only nationwide, statutory minimum wages are captured by this measure. In the regressions, it is measured in deviation from the mean across all countries and years where it is present, and it takes a value of zero when a minimum wage does not exist. The regression also includes a dummy for the presence of the minimum wage. It is mostly collinear with country fixed effects, except in the very few cases when a statutory nationwide minimum wage was introduced during the estimation sample.

Legal retirement age:

8. Data sourced from OECD Outlook (May 2014), and it is simply the average of the female and male pension ages. Missing years are filled by linear interpolation.

Output Gap:

9. Two output gap measures were constructed. First, a deviation from the Hodrick-Prescott trend was generated from annual, forecasted data from the 95th *Economic Outlook* (GDPV_EO95). The forecasted years are retained in the filtering in order to eliminate the end-point sensitivity of the HP-filter. Second, the deviation of actual output from the production function implied potential output is used. The source of potential output is the Analytical Database of the OECD (ADB).

Government or public sector employment:

10. It is defined as the ratio of public sector employment to the working age population, as in Bassanini and Duval (2006) and Thévenon (2013). Public sector employment is sourced from the OECD/ADB.

Fiscal stance:

11. The baseline measure is defined as the primary balance of the government budget as % of GDP, as calculated in OECD/ADB. As alternative measures, the cyclically adjusted and the underlying primary balances are used, as calculated for the *Economic Outlook* 95 database of the OECD.

Appendix D: Additional estimation results

Table D-1: Baseline results – using the same sample across specifications

Dependent variables	Employment rate			Unemployment rate			Labour force participation		
Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Tax-benefit and activation policies									
UE benefit repl. rate	-0.216**	-0.163**	-0.177**	0.096**	0.103**	0.123**	-0.157**	-0.094**	-0.097**
	(0.043)	(0.033)	(0.034)	(0.026)	(0.027)	(0.029)	(0.039)	(0.027)	(0.028)
ALMP	0.067**	0.072**	0.057**	-0.056**	-0.055**	-0.042**	0.026*	0.033**	0.024**
	(0.015)	(0.012)	(0.014)	(0.010)	(0.011)	(0.012)	(0.014)	(0.011)	(0.012)
Tax wedge	-0.242**	-0.203**	-0.194**	0.285**	0.278**	0.244**	-0.054	-0.017	-0.027
	(0.060)	(0.066)	(0.066)	(0.048)	(0.059)	(0.057)	(0.049)	(0.056)	(0.055)
Wage setting institutions									
Excess coverage		-0.061*	-0.107**		0.035	0.094**		-0.042	-0.055*
		(0.032)	(0.036)		(0.035)	(0.038)		(0.026)	(0.028)
Excess coverage × tax wedge		-0.912**	-0.763**		0.059	-0.057		-0.936**	-0.850**
		(0.255)	(0.242)		(0.236)	(0.220)		(0.214)	(0.203)
Minimum wage		-0.335**	-0.275**		-0.032	-0.091		-0.390**	-0.361**
		(0.071)	(0.072)		(0.053)	(0.057)		(0.059)	(0.058)
Labour and product market regulations									
EPL			-0.716			2.304**			0.479
			(1.128)			(1.033)			(0.728)
ETCR			-1.127**			0.594			-0.789**
			(0.435)			(0.368)			(0.355)
Control variables									
Education	1.886**	1.557**	0.713	-0.669**	-0.540*	0.333	1.761**	1.497**	1.130**
	(0.381)	(0.365)	(0.471)	(0.320)	(0.320)	(0.349)	(0.266)	(0.251)	(0.351)
Output gap	0.944**	0.880**	0.905**	-1.102**	-1.099**	-1.266**	0.189	0.117	0.049
	(0.214)	(0.187)	(0.188)	(0.167)	(0.167)	(0.150)	(0.188)	(0.163)	(0.169)
Gov't employment	0.510**	0.136	0.305	-0.067	-0.048	-0.069	0.535**	0.138	0.291*
	(0.219)	(0.185)	(0.202)	(0.159)	(0.157)	(0.162)	(0.186)	(0.149)	(0.167)
Gov't primary balance	0.259**	0.309**	0.352**	-0.303**	-0.337**	-0.364**	0.038	0.068*	0.098**
	(0.051)	(0.051)	(0.056)	(0.039)	(0.047)	(0.048)	(0.042)	(0.039)	(0.043)
Adjusted R-squared	.951	.961	.964	.869	.87	.888	.947	.964	.965
Country / year fixed effects	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes
No. of observations / countries	422 / 25	422 / 25	422 / 25	422 / 25	422 / 25	422 / 25	422 / 25	422 / 25	422 / 25
Years	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010	1987-2010

Note: Estimation results obtained by using Dynamic OLS and heteroskedasticity and autocorrelation robust (Newey-West) standard errors (in parentheses; ** p<0.05, * p<0.1).The dependent variables refer to the working age population (aged 15-64). See the exact definition of the explanatory variables in Table 4 and in Appendix C, and the set of included countries in Table 3.

Table D-2: Estimating the baseline specifications using standard OLS

Dependent variables	Employment rate			Unemployment rate			Labour force participation		
Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Tax-benefit and activation policies									
UE benefit repl. rate	-0.162**	-0.127**	-0.125**	0.076**	0.077**	0.080**	-0.117**	-0.076**	-0.072**
	(0.045)	(0.033)	(0.033)	(0.021)	(0.021)	(0.021)	(0.038)	(0.026)	(0.026)
ALMP	0.089**	0.088**	0.083**	-0.071**	-0.065**	-0.064**	0.038**	0.041**	0.036**
	(0.014)	(0.013)	(0.013)	(0.009)	(0.009)	(0.010)	(0.012)	(0.010)	(0.011)
Tax wedge	-0.251**	-0.240**	-0.237**	0.285**	0.320**	0.308**	-0.063*	-0.026	-0.030
	(0.050)	(0.061)	(0.062)	(0.046)	(0.054)	(0.055)	(0.035)	(0.042)	(0.042)
Wage setting institutions									
Excess coverage		-0.060**	-0.077**		0.026	0.047*		-0.050**	-0.056**
		(0.030)	(0.031)		(0.025)	(0.027)		(0.024)	(0.025)
Excess coverage × tax wedge		-0.782**	-0.700**		0.115	0.056		-0.769**	-0.712**
		(0.270)	(0.275)		(0.215)	(0.216)		(0.208)	(0.211)
Minimum wage		-0.331**	-0.337**		-0.007	0.002		-0.373**	-0.370**
		(0.075)	(0.079)		(0.050)	(0.052)		(0.058)	(0.061)
Labour and product market regulations									
EPL			-0.137			0.945			0.237
			(0.963)			(0.931)			(0.586)
ETCR			-0.382			0.014			-0.423
			(0.349)			(0.274)			(0.278)
Control variables									
Education	1.792**	1.581**	1.337**	-0.621**	-0.598**	-0.393	1.716**	1.488**	1.331**
	(0.367)	(0.336)	(0.393)	(0.290)	(0.284)	(0.292)	(0.259)	(0.220)	(0.270)
Output gap	0.457**	0.430**	0.438**	-0.469**	-0.448**	-0.474**	0.138	0.121	0.113
	(0.113)	(0.112)	(0.114)	(0.086)	(0.086)	(0.087)	(0.094)	(0.087)	(0.089)
Gov't employment	0.178	-0.010	0.028	0.254*	0.162	0.213	0.419**	0.133	0.209
	(0.207)	(0.205)	(0.219)	(0.138)	(0.140)	(0.146)	(0.180)	(0.161)	(0.174)
Gov't primary balance	0.155**	0.154**	0.168**	-0.229**	-0.250**	-0.258**	-0.017	-0.030	-0.020
	(0.046)	(0.047)	(0.049)	(0.038)	(0.038)	(0.040)	(0.036)	(0.034)	(0.035)
Adjusted R-squared	0.927	.939	.94	.832	.844	.847	0.929	.949	.949
Country / year fixed effects	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes
No. of observations / countries	521 / 26	506 / 26	495 / 26	521 / 26	506 / 26	495 / 26	521 / 26	506 / 26	495 / 26
Years	1985-2011	1985-2011	1985-2011	1985-2011	1985-2011	1985-2011	1985-2011	1985-2011	1985-2011

Note: Estimation results obtained by using *standard* OLS and and heteroskedasticity and autocorrelation robust (Newey-West) standard errors (in parentheses; ** p<0.05, * p<0.1). The dependent variables refer to the working age population (aged 15-64). For further details and data sources, see Appendix C.

Table D-3: Estimating the baseline specifications using Dynamic OLS with 2 leads and lags

Dependent variables	Employment rate			Unemployment rate			Labour force participation		
Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Tax-benefit and activation policies									
UE benefit repl. rate	-0.208**	-0.165**	-0.201**	0.100**	0.104**	0.151**	-0.146**	-0.094**	-0.103**
	(0.050)	(0.043)	(0.042)	(0.032)	(0.034)	(0.036)	(0.048)	(0.037)	(0.039)
ALMP	0.069**	0.073**	0.050**	-0.067**	-0.066**	-0.044**	0.019	0.025*	0.015
	(0.019)	(0.014)	(0.016)	(0.014)	(0.014)	(0.015)	(0.020)	(0.015)	(0.016)
Tax wedge	-0.206**	-0.182**	-0.151**	0.250**	0.250**	0.177**	-0.041	-0.013	-0.026
	(0.069)	(0.077)	(0.076)	(0.055)	(0.068)	(0.067)	(0.062)	(0.075)	(0.074)
Wage setting institutions									
Excess coverage		-0.064*	-0.154**		0.016	0.146**		-0.058*	-0.070**
		(0.033)	(0.039)		(0.034)	(0.044)		(0.030)	(0.035)
Excess coverage × tax wedge		-1.138**	-0.821**		0.140	-0.153		-1.122**	-0.995**
		(0.317)	(0.291)		(0.300)	(0.277)		(0.275)	(0.260)
Minimum wage		-0.295**	-0.217**		-0.107*	-0.162**		-0.403**	-0.355**
		(0.079)	(0.079)		(0.060)	(0.065)		(0.073)	(0.073)
Labour and product market regulations									
EPL			-1.361			3.523**			0.656
			(1.031)			(0.865)			(0.777)
ETCR			-1.729**			1.178**			-0.993**
			(0.530)			(0.440)			(0.479)
Control variables									
Education	1.997**	1.575**	0.207	-0.732**	-0.676**	0.891**	1.839**	1.413**	0.970**
	(0.432)	(0.421)	(0.531)	(0.358)	(0.338)	(0.414)	(0.317)	(0.314)	(0.458)
Output gap	1.391**	1.356**	1.323**	-1.771**	-1.594**	-1.890**	0.214	0.278	0.073
	(0.323)	(0.315)	(0.324)	(0.265)	(0.296)	(0.243)	(0.293)	(0.277)	(0.301)
Gov't employment	0.494**	0.131	0.345	-0.081	-0.177	-0.086	0.516**	0.035	0.300
	(0.237)	(0.210)	(0.227)	(0.186)	(0.190)	(0.193)	(0.211)	(0.181)	(0.216)
Gov't primary balance	0.278**	0.352**	0.423**	-0.317**	-0.332**	-0.392**	0.047	0.118**	0.152**
	(0.054)	(0.058)	(0.066)	(0.045)	(0.056)	(0.055)	(0.048)	(0.045)	(0.055)
Adjusted R-squared	.951	.961	.964	.863	.87	.888	.947	.964	.965
Country / year fixed effects	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes
No. of observations / countries	395 / 26	380 / 25	373 / 24	395 / 26	380 / 25	373 / 24	395 / 26	380 / 25	373 / 24
Years	1988-2009	1988-2009	1988-2009	1988-2009	1988-2009	1988-2009	1988-2009	1988-2009	1988-2009

Note: Estimation results obtained by using *dynamic* OLS with 2 leads and lags and and heteroskedasticity and autocorrelation robust (Newey-West) standard errors (in parentheses; ** p<0.05, * p<0.1). The dependent variables refer to the working age population (aged 15-64). For further details and data sources, see Appendix C.