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DO POLICIES THAT REDUCE UNEMPLOYMENT RAISE ITS VOLATILITY? EVIDENCE FROM OECD COUNTRIES

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By Alain de Serres and Fabrice Murtin

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ABSTRACT/RÉSUMÉ

Do policies that reduce unemployment raise its volatility? Evidence from OECD countries

In this paper we examine whether past labour market reforms aiming at reducing the rate of unemployment have raised its long-run volatility. Using non-linear panel data models applied to 24 OECD countries between 1985 and 2007, as well as Monte-Carlo techniques, we do not find any evidence of such policy trade-off. In contrast, we find that reduced unemployment benefit duration, more competition-inducing product market regulation and looser employment protection legislation are associated with a weaker persistence of unemployment over time, which implies a lower volatility of unemployment in the long run. More specifically, the evidence suggests that even in the case of reforms that may have raised the short-term sensitivity of unemployment to business cycles (such as with the easing of employment protection), the weaker persistence effect dominates the higher cyclical volatility, implying a net reduction in long-term volatility.

JEL codes: E24; E32; J21.
Keywords: Unemployment; unemployment persistence; labour market institutions; business cycle.

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Est-ce que les politiques qui réduisent le chômage augmentent sa volatilité ? Une analyse empirique couvrant les pays de l'OCDE.

Cette étude examine dans quelle mesure les réformes passées du marché du travail visant à réduire le taux de chômage peuvent avoir eu pour effet d'accroître sa volatilité. L'analyse empirique combinant l'estimation de modèles non-linéaires basés sur des données de panel couvrant 24 pays de l'OCDE sur la période 1985-2007 et l'application de techniques de Monte Carlo, n'a pas mis à jour d'éléments permettant d'étayer l'hypothèse d'un tel conflit (trade-off) dans l'impact des politiques publiques du marché du travail. A l'inverse, l'étude montre qu'une réduction de la durée des bénéfices d'assurance chômage, une réforme de la réglementation conduisant à une plus forte concurrence sur le marché des produits et services, ainsi qu'un assouplissement de la législation sur la protection de l'emploi entraînent une plus faible persistance du chômage, impliquant une plus faible volatilité à long terme. Même dans les cas où des réformes ont pu accroître la sensibilité du chômage aux fluctuations cycliques, l'effet de cette plus grande variance cyclique sur la volatilité à long terme est plus que compensée par la baisse de la persistance.

Classification JEL : E24 ; E32 ; J21.
Mots-clés : Chômage ; persistance du chômage ; institutions et politiques du marché du travail ; fluctuations cycliques.

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DO POLICIES THAT REDUCE UNEMPLOYMENT RAISE ITS VOLATILITY? EVIDENCE FROM OECD COUNTRIES

By Alain de Serres and Fabrice Murtin[1]

1. Introduction

1. In the course of the Great Recession, some countries have been hit by severe labour market shocks with a huge spike in unemployment. For instance, between 2007Q3 and 2010Q3, unemployment has soared from 8.3% to 20.6% in Spain, from 4.6% to 13.3% in Ireland, and from 4.7% to 9.6% in the United States. At the same time, a number of countries witnessed modest rises in unemployment despite facing similar or worse declines in GDP from peak to trough (*e.g.* Austria, Germany, Netherlands and, to a lesser extent, Japan). In that context, it is legitimate to ask whether some labour market policies and institutions that may be more conducive to low unemployment during "normal times" may leave labour markets ill-equipped to cope with deep economic recessions, and therefore more prone to entail large swings in employment along the business cycle. In short, is there any policy trade-off between the mean and volatility of unemployment?

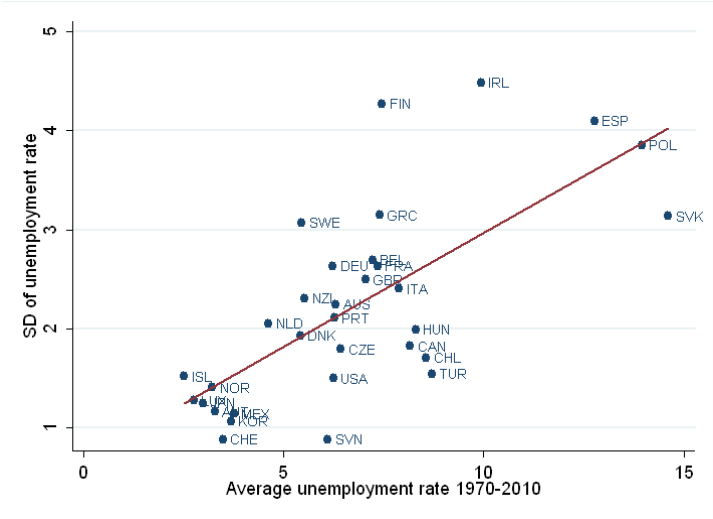
2. The empirical relationship between unemployment's level and volatility is described on Figures 1 and 2 for a sample of 24 OECD countries, spanning the period 1985-2007. As shown on Figure 1, there is a clear positive correlation between the unemployment average level and its standard deviation, which to some extent reflects a scale effect. By contrast, the correlation between the average level and the coefficient of variation of unemployment is negative, albeit not significant (Figure 2).[2] The latter negative sign suggests the possibility that some institutions, such as low employment protection for regular and/or temporary contracts, may potentially help reduce unemployment while generating a higher degree of volatility as measured by the coefficient of variation.

3. This paper analyses the effect of labour market institutions on both the level and the volatility of unemployment, investigating whether some policies that may be of benefit to employment could, on average, generate a higher degree of unemployment volatility.

[1] We would like to thank Andrea Bassanini, Romain Duval, Jørgen Elmeskov, John Martin, Giuseppe Nicoletti, Jean-Marc Robin, Stefano Scarpetta, Jean-Luc Schneider, Paul Swaim, for their valuable comments and Christine de la Maisonneuve for technical assistance as well as Irene Sinha for editorial support. The usual disclaimer applies. De Serres (corresponding author): Alain.Deserres@oecd.org; Murtin: Fabrice.Murtin@oecd.org; OECD : 2 rue André Pascal 75016 Paris.

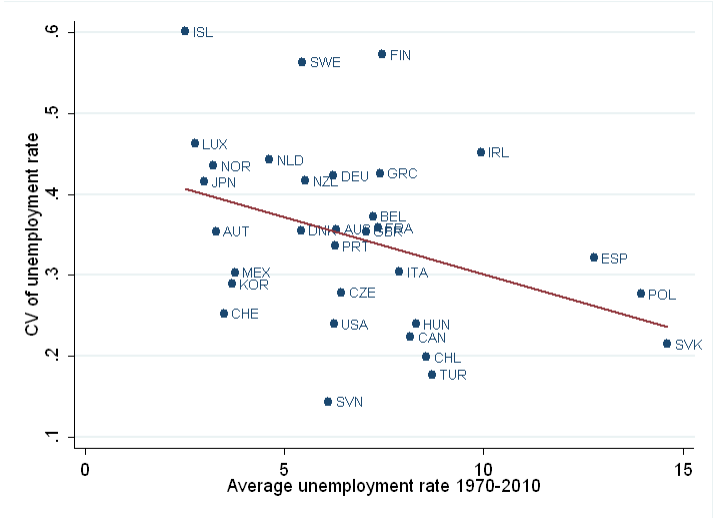
[2] Same results are obtained with cyclical unemployment as derived from HP filtering.

Figure 1 - Standard deviation and average of the unemployment rate, 1970-2010



Source: OECD Quarterly Series of Unemployment (2010) and authors' calculations.

Figure 2 - Coefficient of variation and average of the unemployment rate 1970-2010



Source: OECD Quarterly Series of Unemployment (2010) and authors' calculations.

To do so, the volatility of unemployment is split in two sub-components or proximate determinants: One is the degree of unemployment persistence across time, and the other is a measure of "cyclical volatility", defined as the elasticity of the unemployment rate to a proxy of business cycle conditions, namely the output gap. More specifically, cyclical volatility corresponds to the capacity of specific institutions to either mitigate or amplify the impact of changes in business cycle conditions on unemployment. The effects of labour market institutions and policies on the long-term level, persistence and cyclical volatility are identified separately and jointly estimated, using different mix of policy variables and econometric models to circumvent any potential misspecification.

4. In past studies, the macroeconomic aspects of unemployment have been traditionally described by a system of wage and price-setting equations popularised by Layard *et al.* (1991). This framework,

developed among others by Bruno and Sachs (1985), explains the variations in unemployment by the interaction between shocks and two types of rigidities, namely real and nominal wage rigidities. As real wages adjust imperfectly to 'warranted' wages and nominal wages do not instantaneously react to changes in prices, unemployment deviates from its steady-state equilibrium value. This general framework has been enriched by studies focusing on the institutional features that influence the speed at which wages and employment return to their equilibrium levels, such as the potential unemployment effects of unemployment insurance and employment protection systems (Nickell, 1990, 1998; Machin and Manning, 1999; OECD, 1994, 2006; Bover *et al.*, 2002; Boeri and Garibaldi, 2009; Bentolila *et al.*, 2010), fiscal policy (Elmeskov *et al.*, 1998, Daveri and Tabellini, 2000), wage bargaining institutions (Calmfors and Driffill, 1988) or product market regulation (Nicoletti and Scarpetta, 2005; Fiori *et al*., 2007; Griffith *et al.*, 2007), as well as the interaction between these institutional variables or with economic shocks (Elmeskov and MacFarlan, 1993; Blanchard and Wolfers, 2000; Bassanini and Duval, 2006, 2009).

5. Following this approach, this paper adopts a simple wage-setting/price-setting model that highlights the interaction between labour market institutions on the one hand and economic shocks or lagged unemployment on the other.[3] The paper contributes to the literature in several ways: *i)* First and most importantly, we show that there is generally no mean-volatility policy trade-off as institutions that are beneficial to employment are found to be neutral *vis-à-vis its* volatility, and vice-versa; *ii)* We find three main determinants of unemployment volatility: Longer benefit duration, as well as tighter product market regulation and employment protection for regular workers are associated with a higher persistence of unemployment over time, implying a higher volatility of steady-state unemployment; *iii)* In the case of employment protection, the overall effect on volatility is less clear cut. This is because while it raises persistence, it also dampens cyclical variations in unemployment. Even so, the persistence effect is found to dominate in terms of total unemployment volatility.

6. The paper is structured as follows. In Section 2, a simple wage-setting/price-setting model is proposed to disentangle between the effects of institutions on the level of unemployment, its degree of time persistence and its cyclical volatility. The empirical framework is then presented in Section 3 together with regression results. Section 4 examines the potential existence of any mean-volatility trade-off among labour market policies. Last section concludes.

2. Theoretical framework

7. This section proposes a theoretical foundation for our econometric model described later. It isolates the impact of institutions on the long-run level of unemployment as well as on the two sub-components of unemployment volatility, namely the degree of time persistence and cyclical volatility (short-term impact of shock).

2.1. A simple wage and price-setting model

8. The framework used to illustrate the behaviour of firms and workers operating in imperfectly competitive labour and product markets is based on the system of wage and price setting equations popularised by Layard *et al*. (1991, Chapter 8).

[3] Admittedly, this paper does not focus on unemployment turnover as in Mortensen and Pissarides (1994) or Robin (2011). Other studies (Murtin and de Serres; 2013; Murtin *et al.*, 2013) assess the relationship between unemployment flow variables and labour market institutions.

i) Price-setting equation

9. The objective of individual firms is to set prices and choose quantities of labour and capital that will maximise their revenues given the level of demand for the goods produced at the chosen price. The price-setting relationship is usually expressed as a mark-up of prices over expected wages. It is a function of labour demand, its growth rate, and price shocks (all variables are taken in logs):

$$p - w = \beta_0 + \frac{\beta_1}{\alpha}(y - \bar{y}) + \frac{\beta_2}{\alpha}\Delta(y - \bar{y}) + \varepsilon_p \quad (1)$$

where p is the level of prices, w wages, $y - \bar{y}$ a measure of labour demand and ε_p a price shock.

10. The parameter β_0 reflects the size of the mark-up in the long run and the underlying degree of competition prevailing in the market for goods and services. Prices are influenced by demand, and the long-run effect of the labour demand on the price-wage mark-up is equal to β_1 / α. The mark-up also depends on the phase of the business cycle, namely whether labour demand is widening or is winding up. This dynamic effect is captured by the change in labour demand and the parameter $\beta_2 > 0$. The magnitude of β_2 measures the sensitivity of the mark-up to economic conditions, and can be interpreted as such as the capacity of the firm to absorb any deviation from its long-run labour demand. For instance, if a lot of labour hoarding takes place as a result of large hiring and firing costs, firms' mark-up will be more sensitive to the business cycle and β_2 will be large. In turn, a high value of β_2 relative to β_1 implies a strong persistence effect and sluggish adjustments of prices relative to their fundamental level.

11. Production is characterised by a Cobb-Douglas function. As the stock of physical capital plays no role in unemployment dynamics in the simplest version of the Layard *et al.* (1991) model, it is simply ignored. Actual output and its full-employment level are respectively given by

$$\begin{cases} y = \alpha n + \varepsilon_y \\ \bar{y} = \alpha l \end{cases} \quad (2)$$

where n is employment, l the size of the labour force and ε_y a productivity shock. The log unemployment rate is defined as $u = l - n$, which implies a direct relationship between labour demand and unemployment, namely $y - \bar{y} = -\alpha u + \varepsilon_y$. Combining equations (1) and (2) yields:

$$p - w = \beta_0 - \beta_1 u - \beta_2 \Delta u + \eta_p \quad (3)$$

where $\eta_p = \beta_1 \varepsilon_y / \alpha + \beta_2 \Delta \varepsilon_y / \alpha + \varepsilon_p$ is a linear combination of productivity and price shocks.

ii) Wage-setting equation

12. Workers are generally assumed to bargain for the highest level of take-home wage while minimising the risk of being laid-off. Although there is a multitude of ways to characterise this trade-off between wage conditions and jobs security, the key factors having an influence on the bargaining strategy are the market power of employees (itself a function of the market power of their employer's firm and the degree of unionisation), the expected level of income (benefits) received outside the labour market, the probability for employees to quickly find another job if laid-off, and the pressure that the outsiders

(unemployed) can exert on insiders' (employees) wage determination. The key characteristics of the wage-setting mechanism can be illustrated using the following relationship:

$$w - p^e = \gamma_0 - \gamma_1 u - \gamma_2 \Delta u + \gamma_3 T + \gamma_4 UB + \gamma_5 WB + \eta_w \quad (4)$$

which models wage formation as a mark-up $w - p^e$ over the expected price p^e.

13. The parameter γ_1 measures the long-run elasticity of real wages to the unemployment rate. It is commonly interpreted as the degree of long-run real wage flexibility, as a higher value for this parameter drives a higher sensitivity of wages to unemployment. The parameter γ_2 captures the notion that the workers' willingness to push for higher wages depends not only on the level of unemployment but on whether the unemployment rate is rising or falling in the short term. A high value of γ_2 relative to γ_1 could, for instance, lead to a situation where falling unemployment exerts upward pressure on wages even if the level remains high.

14. Other variables are deemed to affect the wage-price mark-up independently from unemployment. The variable T is the tax wedge that represents the difference between the total labour compensation paid by the employer and the net take-home pay of employees in terms of the consumption price.[4] It is introduced to reflect the desire by employees to bargain on the basis of what matters for their well being, *i.e.* the purchasing power of after-tax income in terms of consumer goods and services. Similarly, more generous unemployment benefits UB exert an upward pressure on the reservation wage of workers, which translates into a higher wage-price mark-up. The variable WB is introduced to capture the power of unions in the wage bargaining process and their capacity to appropriate part of the rent accruing to firms operating in an environment of monopolistic competition. Finally, other sources of shifts to the wage setting function (such as wage-push shocks) are captured by η_w.

15. The formation of price expectations is based on the assumption that inflation follows a random walk,[5] namely $\Delta p = \Delta p_{-1} + \upsilon$. Price expectation is, therefore, $p^e = p_{-1} + \Delta p_{-1}$, implying that price surprises are equal to $p - p^e = \Delta p - \Delta p_{-1} = \upsilon$. Combining this equation with (4) yields:

$$w - p = \gamma_0 - \gamma_1 u - \gamma_2 \Delta u + \gamma_3 T + \gamma_4 UB + \gamma_5 WB + \eta_{w,\nu} \quad (5)$$

where $\eta_{w,\nu} = \eta_w - \nu$.

iii) Labour market equilibrium

16. The unemployment rate consistent with long-run labour market equilibrium is obtained at the point where the level of real wage in the price and wage setting function is equalised. Accordingly, the long-term equilibrium unemployment rate, or natural rate, is derived under the assumption that unemployment is constant, inflation expectations are realised and there is no shock in the economy. Algebraically, it is obtained by combining (3) and (5) to eliminate the real wage and by assuming $\Delta u = 0$. The equilibrium unemployment rate is thus given by

4 Hence, in addition to changes in payroll and labour income taxes, it also captures the effect of shifts in the relative price of consumption and production goods.

5 This ad-hoc assumption is made to preserve the analytical tractability of the model.

$$u^* = \frac{\beta_0 + \gamma_0 + \gamma_3 T + \gamma_4 UB + \gamma_5 WB}{\beta_1 + \gamma_1} \quad (6)$$

17. Dynamics of log unemployment are easily obtained after adding equations (3) and (5) and using equation (6). Denote ρ for log unemployment persistence and σ for the multiplier of economic shocks affecting unemployment, labelled as "cyclical volatility". One obtains:

$$\begin{aligned} u &= \rho u_{-1} + (1-\rho)u^* + \sigma.Z \\ \rho &= \frac{\beta_2 + \gamma_2}{\beta_1 + \gamma_1 + \beta_2 + \gamma_2} \\ \sigma &= \frac{1}{\beta_1 + \gamma_1 + \beta_2 + \gamma_2} \\ Z &= \eta_p + \eta_{w,v} = \eta_p + \eta_w - \upsilon \end{aligned} \quad (7)$$

where Z is a combination of economic shocks affecting prices, wages and labour demand.

18. As mirrored by the above specification (7), labour market institutions can have an influence on the equilibrium level of log unemployment u^*, on the degree of log unemployment persistence ρ and on the magnitude of cyclical volatility σ through their influence on each parameter β_i and γ_i. For instance, the higher the degree of long-run real wage flexibility (γ_1), the lower unemployment persistence ρ and the sensitivity to economic shocks (lower cyclical volatility σ), and therefore the volatility of unemployment.

19. The above equation also shows that unemployment can deviate more or less persistently from its natural rate depending on whether it is the *level* or the *change* in employment that has the strongest influence on the determination of real wages and mark-ups. In the extreme case where only the change matters in both price and wage setting relations (*i.e.* $\beta_1 = \gamma_1 = 0$), a situation referred to as full labour market hysteresis (Blanchard and Summers, 1986), the unemployment rate shows little or no tendency to revert towards its natural rate following a shock ($\rho = 1$).

20. Similarly, higher values for parameters β_2 or γ_2 induce a larger influence of unemployment changes (*e.g.* growing unemployment reducing prices and wages), hence more hysteresis and persistence of unemployment. As this mechanism implies an endogenous adjustment of prices and wages, it has nonetheless the virtue of smoothing the dynamics of unemployment over time, thereby lowering cyclical volatility σ. A change in parameters β_2 and γ_2 has therefore an ambiguous net effect on the overall volatility, as they impact persistence and cyclical volatility in opposite directions. This issue is examined more formally in the following section.

2.2. Defining unemployment volatility

21. Before defining the set of policies and institutions used in the analysis and describing how they may influence the key parameters, the rest of the section defines the concept of unemployment volatility that is later estimated.

22. Denote X the set of labour market institutions and $U = \exp(u)$ the rate of unemployment. Assume for simplicity that the set of demand and supply shocks captured by the output gap are normal,

independently distributed, homoskedastic random variables, and without loss of generality, that their sum forms a standard normal variable. Equation (6) suggests that, conditionally on the set of institutions but unconditionally on past realisations, the steady-state log unemployment rate is distributed as a normal variable:

$$\log U|X \to N\left(u^*(X), \frac{\sigma^2(X)}{1-\rho^2(X)}\right) \quad (8)$$

23. Using Laplace transformation yields the values of steady-state unemployment average and steady-state unemployment variance. They are given respectively by

$$\begin{aligned} E(U|X) &= \exp\left(u^*(X) + \frac{\sigma^2(X)}{2(1-\rho^2(X))}\right) \\ V(U|X) &= E(U|X)^2\left(\exp\left(\frac{\sigma^2(X)}{1-\rho^2(X)}\right) - 1\right) \end{aligned} \quad (9)$$

As a convenient approximation, the standard deviation and the coefficient of variation of the steady-state unemployment rate are respectively close to:

$$\begin{aligned} SD(U/X) &\approx E(U/X)\frac{\sigma(X)}{(1-\rho^2(X))^{1/2}} \\ CV(U/X) &\approx \frac{\sigma(X)}{(1-\rho^2(X))^{1/2}} \end{aligned} \quad (10)$$

24. These two simple equations partly explain the correlations presented in Figures 1 and 2. First, there is a scale effect that sets the standard deviation of unemployment as a given proportion of its average level. This finding largely explains the positive cross-country correlation between the average level and the standard deviation of unemployment, a simple consequence of the log-normality of the unemployment rate. By contrast, the coefficient of variation of the rate of unemployment is not affected by the average level of unemployment, and constitutes as such a convenient measure of volatility.

25. As hinted in the former section, policy reforms that for instance increase unemployment persistence ρ and reduce its cyclical volatility σ have an ambiguous effect on unemployment volatility (as defined by its coefficient of variation). An appropriate illustration is the loosening of employment protection, which may increase the adverse effect of economic shocks over the short run as it enables job destruction, while reducing unemployment persistence through enhanced job creation over the medium term (see *e.g.* Cahuc and Postel-Vinay, 2002 and Murtin *et al.*, 2011).

26. It is therefore an empirical question to determine whether: *i)* Institutions have a comparable or an opposite impact on respectively the level and the volatility of (steady-state) unemployment, defined as its coefficient of variation; *ii)* Institutions affect similarly or not the degree of unemployment persistence and its cyclical volatility. These two issues are addressed empirically in the next section.

3. The empirical framework

3.1. The set of policy determinants

27. An extended data set of labour market institutions (described in appendix) is constructed and includes: *i)* The replacement rate of unemployment benefits in the initial year of reception; *ii)* the duration of unemployment benefits, as measured by the ratio of the average replacement rate during the first five years of reception and the initial replacement rate;[6] *iii)* the volume of active labour market policies per unemployed worker normalised by a proxy of average income (GDP per worker);[7] *iv)* the economy-wide tax wedge, encompassing labour and income taxes, as well as consumer-production price differentials; *v)* wage bargaining institutions, such as union density and the difference between the administrative coverage of union agreements and union density. The latter variable, labeled as "excess coverage", tends to have low values for countries that have either decentralised (low coverage/low union density) or centralised wage bargaining systems (high coverage/high union density), and higher values for intermediate systems (high coverage/low union density). As intermediate systems of wage bargaining are thought to have a negative effect on employment compared to centralised or decentralised systems (Calmfors and Driffill, 1988), excess coverage turns out to be a good proxy for the degree of centralisation/coordination embedded in wage bargaining institutions;[8] *vi)* the OECD index of product market regulation (PMR); *vii)* the OECD indices of employment protection for regular and temporary contracts (respectively, EPR and EPT), as well as the share of workers on temporary (fixed-term) contracts in total employment.[9] The set of determinants is complemented by a proxy for business cycle conditions, namely the OECD measure of the output gap.

28. Table 1 summarises the country averages of each institution over the period. To some extent, countries can be broadly classified according to the emphasis put on protecting employment or on providing support to the unemployed through active and passive labour market policies.

> Nordic countries combine generous unemployment benefits with strong activation measures (supported by intensive job search assistance and training possibilities). Among these countries, Sweden and Finland also provide relatively strong job protection for employees on regular contract.

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6 Assume that in each country the replacement rate declines at a constant exponential rate. Then the above ratio equals within each country 144% of the half-life of the replacement rate.

7 In order to remove cyclical variations in ALMPs that result from cyclical unemployment variations, we apply a HP filter to the constructed series and use only the trend series in subsequent regressions. This procedure corrects for the endogeneity that arises from the fact that ALMP spending has traditionally been relatively insensitive to *cyclical* changes in the unemployment rate (OECD, 2009). It does not address the endogeneity problem that may arise when the variation in ALMP spending falls short of the variation in the *structural* rate of unemployment. This may be less of a problem since ALMP spending has traditionally been more responsive to changes in the structural unemployment rate. If ALMP spending nevertheless falls short of the variation in structural unemployment, this will bias the estimated impact of ALMP spending on unemployment downward.

8 As excess coverage takes continuous values and its construction does not rely on judgement, it is thought to have less measurement errors than existing indices of wage bargaining coordination.

9 As many countries do not display any formal minimum wage, it was not possible take it into account. Recent studies on the effects of the minimum wage include Draca *et al.* (2011) and Machin and Wilson (2004).

Table 1 - Labour market Institutions - descriptive statistics 1985-2007

	Panel Year of Entry	Unemployment Rate	Initial Replacement Rate	Duration of Unemployment Benefits	Active Labour Market Policies	EPR	EPT	Temporary workers	Tax Wedge	Excess Coverage	Union Density	PMR
AUS	1985	7.5	24.4	1.01	0.054	1.26	0.88	4.6	28.1	48.3	31.7	2.79
AUT	1985	3.9	37.8	0.82	0.113	2.80	1.50	7.0	41.6	54.1	40.9	3.61
BEL	1985	8.6	47.0	0.87	0.138	1.70	3.67	7.0	41.3	37.0	53.0	3.82
CAN	1985	8.6	50.0	0.33	0.055	1.25	0.25	11.9	26.3	4.3	31.4	2.59
CHE	1991	3.5	72.0	0.45	0.166	1.16	1.13	12.2	23.7	24.1	21.2	3.50
CZE	2001	7.5	18.2	0.33	0.030	3.27	0.66	9.0	37.0	2.9	22.1	2.66
DEU	1985	8.0	38.0	0.72	0.142	2.70	2.71	11.8	35.4	47.8	28.0	3.35
DNK	1986	6.3	68.8	0.79	0.277	1.65	2.10	10.4	46.2	-0.9	74.5	3.30
ESP	1985	16.5	66.6	0.54	0.051	3.10	3.52	31.1	30.0	56.7	14.6	3.62
FIN	1985	9.2	55.4	0.64	0.122	2.42	1.88	17.5	43.0	15.2	74.8	3.42
FRA	1985	10.2	59.6	0.64	0.107	2.39	3.51	11.6	41.4	78.5	9.3	4.36
GBR	1985	7.4	20.8	0.85	0.062	1.01	0.28	6.3	29.0	8.8	34.3	2.10
HUN	2001	6.5	38.5	0.33	0.061	1.92	1.02	7.2	34.4	12.3	17.7	2.94
IRL	1985	10.7	40.3	0.75	0.114	1.60	0.33	7.3	27.6	42.2	42.8	4.26
ITA	2004	7.3	55.5	0.58	0.072	1.77	1.88	12.6	39.8	46.4	33.6	2.22
JPN	1990	3.9	34.8	0.28	0.087	1.87	1.33	11.8	22.8	-4.2	22.0	2.99
KOR	2001	3.7	28.4	0.33	0.039	2.37	1.69	23.9	16.2	-0.6	10.6	3.24
NLD	1985	6.2	70.7	0.72	0.315	3.06	1.91	11.7	36.8	49.7	23.8	3.54
NOR	1985	4.1	62.4	0.61	0.188	2.25	3.24	11.5	49.7	13.9	56.1	3.49
POL	2001	17.1	33.6	0.33	0.023	2.06	1.32	21.5	33.3	20.0	20.0	2.86
PRT	1985	6.4	65.2	0.55	0.091	4.46	3.14	16.6	26.6	46.7	26.8	4.30
SVK	2001	16.3	30.0	0.33	0.019	2.36	0.59	5.1	34.3	25.9	24.1	2.63
SWE	1985	5.9	81.0	0.39	0.381	2.87	2.56	15.5	52.6	3.4	80.1	3.17
USA	1985	5.7	27.7	0.46	0.034	0.17	0.25	4.7	23.6	4.2	14.2	2.18
Average		8.0	46.9	0.57	0.11	2.14	1.72	12.1	34.2	26.5	33.6	3.21

- A majority of Continental European countries combine strict employment protection with fairly generous support to the unemployed, mainly in the form of passive measures such as high unemployment income replacement rates. Many of them have strengthened active labour market policies during the 2000s.

- English-speaking countries generally combine weak employment protection with low to moderate income support for the unemployed. These countries typically put very little emphasis on active labour market policies.

- In Central European countries (Czech Republic, Hungary, Poland, Slovak Republic) and Japan, the income support for the unemployed (passive or active) is low. Among these, employment protection is relatively strict in Czech Republic, Slovak Republic and Japan.

3.2 The expected impact of institutions on the level and volatility of unemployment

29. Each policy and institution can influence the level and/or volatility of unemployment through multiple channels, sometimes in ways that may involve complex interactions. Some of these channels are discussed below.

- *Passive and active income support for the unemployed*: While benefits in the form of higher replacement rates can push up the natural rate of unemployment through their effect on the reservation wage, the impact on persistence and volatility largely depends on the duration of benefit. In particular, a lengthy coverage period can make employees somewhat less fearful of the consequence of being laid-off and reduce the long-term sensitivity of wages to unemployment

(lower γ_1). This adverse effect of income support can at least in part be offset by active labour market programmes, in particular when unemployment benefits are conditioned on job search requirement with individual follow-up or on the enrolment in some form of vocational training scheme. It follows that spending on ALMPs can be expected to reduce both the level and persistence of unemployment.[10]

- *Wage bargaining institutions*: The degree of unionisation (as measured by union density) may either raise or lower cyclical volatility depending on whether unions push for higher real wages regardless of the unemployment level (lower γ_1) or seek to preserve current members' jobs (higher γ_2). In both cases, the result is stronger unemployment persistence.

- *Product and labour market regulation*: The direct effect of strict employment protection legislation is to raise the cost of adjusting labour for firms, leading them to absorb fluctuations in economic conditions through stronger adjustment in the mark-up rather than their workforce (higher β_2). The result is higher unemployment persistence but also lower cyclical volatility and an ambiguous effect on the level of unemployment (see *e.g.* Cahuc and Postel-Vinay, 2002). Besides, competition-reducing product market regulation may lead to a higher natural rate of unemployment through higher mark-ups (β_0). If the rent created by weak competition is partly appropriated by employees through more assertive wage bidding (lower γ_1), then stricter product market regulation is expected to raise unemployment persistence. However, the impact on cyclical volatility is not clear cut as less competition may also allow firms to hoard labour more easily (higher β_2).[11]

- *Taxation*: There is no reason *a priori* to expect the tax wedge to have any effect on unemployment persistence or cyclical volatility. As for the magnitude of its impact on the natural rate of unemployment, it will depend on the extent to which the impact of the wedge is absorbed in the short term by workers or firms, which in turn depends on the influence of other institutions. In order to capture this conditional effect, an interaction term between the tax wedge and excess coverage[12] is included in the regression reported below so as to test for the presence of a larger adverse effect of taxes on employment in countries with bargaining systems that are more prone to wage resistance by workers. Indeed, in intermediate wage bargaining systems the cost of higher payroll taxes (or social security contributions) is less likely to be passed on to employees via corresponding adjustments in wages (relative to productivity) than is the case with

10 By contributing to raise the sensitivity of wages to labour market conditions, ALMPs may also reduce cyclical volatility. However, insofar as ALMPs is mostly focused on low-skilled workers, who often stand at the margin of the labour market, the viability of their jobs is by nature more subject to economic fluctuation than other jobs and this effect on cyclical volatility may dominate.

11 Ultimately, by raising the elasticity of demand, stronger competition will likely lead to a reduction of the power of insiders and thereby contribute to increase the overall sensitivity to wages to unemployment, but to a more limited extent than if it is underpinned by labour market reform (Blanchard and Giavazzi, 2003).

12 More specifically, we introduce the tax wedge $T_{i,t}$ plus its interaction with the country-specific average of excess coverage E_i minus the OECD grand average of excess coverage E*, estimating $a.T_{i,t}+b.T_{i,t}.(E_i-E^*)$. As excess coverage is centered, the coefficient a of the tax wedge variable introduced in level represents an average effect. The coefficient b of the interaction captures a modulation effect (positive with high excess coverage, negative otherwise). The fact that excess coverage is averaged by country implies that identification stems from the time variation in the tax wedge only.

decentralised or centralised wage bargaining systems, resulting thereby in a larger adverse effect on labour demand and employment.[13]

3.3 The econometric model

30. The econometric framework is directly inspired by equation (7). We use the following log-linear model:[14]

$$\log U_{i,t} = a_i + d_t + X_{i,t}\beta + \rho(X^{\rho}_{i,t})\log U_{i,t-1} + \sigma(X^{\sigma}_{i,t})Z_{i,t} + v_{i,t} \qquad (11)$$

where U is the employment rate, X, X^{ρ} and X^{σ} three sets of labour market institutions, Z our proxy for business cycle conditions (*i.e.* the OECD output gap), a_i country fixed-effects, d_t time effects and v an idiosyncratic residual term. As made clear by equation (11), both the degree of unemployment persistence and cyclical volatility, denoted respectively $\rho(X^{\rho})$ and $\sigma(X^{\sigma})$, are conditioned by labour market institutions. Moreover, equations (6) and (11) suggest that the long-term effect of policies and institutions upon steady-state unemployment level u^* is equal to $X_{i,t}\beta/(1-\rho(X^{\rho}_{i,t}))$. It is the outcome of a level effect carried by the intercept Xβ, and of an indirect effect channeled by persistence $\rho(X^{\rho})$.

31. On a first step, we start by estimating a classical dynamic panel model where persistence ρ(.) and cyclical volatility σ(.) are constant. This estimation serves as a benchmark. In this context, it is convenient to compare the estimates obtained respectively by OLS and GMM to gauge the influence of endogeneity problems affecting institutional variables.[15]

32. Then, to account for the asymmetric effect of policies and labour market institutions on the dynamic characteristics of unemployment, we condition persistence and cyclical volatility by institutional variables, using the following functional forms:[16]

$$\rho(X^{\rho}) = \frac{\exp(\rho_0 + X^{\rho}\beta^{\rho})}{1+\exp(\rho_0 + X^{\rho}\beta^{\rho})} \qquad (12)$$
$$\sigma(X^{\sigma}) = \sigma_0 + X^{\sigma}\beta^{\sigma}$$

33. The set of institutions composing respectively X, X^{ρ} and X^{σ} is chosen as follows. First, equation (7) suggests that institutions affecting persistence also affect resilience and *vice-versa;* in other words $X^{\rho} = X^{\sigma}$. Hence, both the degree of unemployment persistence $\rho(X^{\rho})$ and the business cycle elasticity of unemployment $\sigma(X^{\sigma})$ are modeled as indices of the *same* set of labour market institutions.

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13 Similarly, Daveri and Tabellini (2000) argue that increases in labour taxes are shifted onto higher real wages in countries with strong but decentralised trade unions (*i.e.* intermediate systems), entailing a rise in unemployment and a slowdown in investment and economic growth.

14 It is consistent with the log-normality of the rate of unemployment.

15 We use Arellano and Bond (1991) DIFF-GMM estimator. As argued in Blanchard and Wolfers (2000), institutions are unlikely to be independent from unemployment's growth rate, which precludes the use of Blundell and Bond (1998) SYS-GMM estimator.

16 Several functional forms have been tested for cyclical volatility, namely an exponential, logarithmic and linear forms. The linear one displayed the best explanatory power.

34. Second, all institutions should be included in level as they necessarily appear in the intercept $(1-\rho)u^*$, which combines the three sets of parameters (β_0,α_0), (β_1,β_3) and (β_4,α_4). Conversely, some institutions may neither affect persistence nor resilience if they are channeled by parameters (β_0,α_0) but not by other parameters. Thus, the set of interacting variables is necessarily comprised within the set of variables having a direct level effect ($X^{\rho} = X^{\sigma} \subset X$).

35. In practice, some institutions are treated in *blocks* to reduce the risk of omitted variable bias, because these institutions depend on a common feature. For instance, union density and excess coverage (the difference between administrative coverage and union density) are treated in one block. Similarly, the initial replacement rate and our proxy for unemployment duration (the ratio of average and initial replacement rates) are always introduced altogether.

36. Finally, as there are risks of multi-collinearity among explanatory variables, we propose a sequential analysis in which each institution (or group of institutions) is introduced one-by-one inside functions ρ(.) and σ(.) while all institutions are included in level.[17] Then, institutions that are significant individually are introduced altogether.

3.4. Regression results

37. Table 2 presents the results, starting with the benchmark models with constant ρ and σ on Columns (1-2). Strikingly, OLS and GMM provide almost the same estimates, except for ALMPs and excess coverage that are no longer significant with GMM. Otherwise, the replacement rate of unemployment benefits, the tax wedge and its interaction with excess coverage as well as union density are found to be significant determinants of the log unemployment rate. This result somewhat alleviates the endogeneity concerns regarding these four variables. In other columns, persistence and cyclical volatility are conditioned by institutions.

38. On top of Table 2, three variables or groups of variables emerge as robust determinants of unemployment's level across the various model specifications: the replacement rate, the tax wedge and its interaction with excess coverage, excess coverage and union density. ALMPs are also always significant but this result is interpreted with caution due to specific endogeneity concerns. In the case of employment protection and product market regulation indicators, they become significant in level when they are also introduced as determinants of unemployment persistence (see Columns 5, 8 and 9).

39. In the middle of Table 2, four variables display a significant persistence effect that is consistent with priors: *i)* Consistent with the microeconomic literature (*e.g.* Card and Levine, 2000, Card *et al.*, 2007), a longer duration of unemployment benefits is associated with higher unemployment persistence; *ii)* Similarly, stricter employment protection or product market regulation are positively associated with unemployment persistence; *iii)* Conversely, a larger volume of ALMPs is associated with less persistence. Consistent with priors neither the tax wedge nor the initial unemployment income replacement rate has a significant effect on persistence. More surprisingly, this is also the case for the two variables characterising wage bargaining.

[17] A full specification of unemployment dynamics would control for any sort of interaction, not just between institutions and the two sources of volatility, but also between institutions themselves. For instance, Bassanini and Duval (2006, 2009) find a significant complementarity effect between the overall 'quality' of the institutional framework and each institution, enabling positive externalities in the implementation of 'reform packages'.

At the bottom of Table 2, ALMPs turn out to be the only robust determinant of cyclical volatility, as it is significant at the 1% confidence level. Higher spending on ALMPs leads to increased volatility, which lends support to the view that ALMP programmes raise the unemployment turnover among workers in holding cyclically-sensitive jobs and that this effect dominates other possible channels working in the opposite direction. It is worth noting that tighter employment protection is associated with lower cyclical volatility in Column (5), and that the p-value of the corresponding estimate is equal to 0.11 on Column (9).

3.5. Robustness analysis

40. This section addresses two issues: The role of temporary work and the nature of ALMPs. In Columns (1-2) of Table 3, the share of temporary workers is introduced in levels, in the persistence and in the cyclical volatility components. Compared to Table 2, the results are mostly unchanged regarding level effects as the replacement rate, the tax and the wage bargaining variables are still significant. Results are weakened regarding unemployment persistence as only ALMPs are still significant in Table 3 Column 2. Interestingly, employment protection becomes significant in the cyclical volatility part in Table 3 Column 1, and is almost significant in Column 2.

41. Second, ALMPs are decomposed in both the level and the cyclical volatility components.[18] The three sub-components (public employment services, job creation subsidies and training expenditures) are all significant and display the same sign. This comes as a good surprise as the various components of ALMPs generally display heterogeneous outcomes (see *e.g.* Gerfin and Lechner, 2002).

[18] Decomposing ALMPs in the persistence component destroys the significance of all ALMP variables, revealing multi-collinearity problems.

Table 2 - Labour market institutions and unemployment dynamics 1985-2007

Dependent variable:	**Log unemployment rate**								
Estimator:	OLS	GMM	NLS	NLS	NLS	NLS	NLS	NLS	NLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Level Effect								
Initial replacement rate	0.006***	0.006*	0.003	0.005***	0.007***	0.008***	0.007***	0.006***	0.007***
	(0.001)	(0.003)	(0.003)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
Average benefits duration	-0.132	-0.196	0.631**	-0.055	-0.144	-0.119	-0.126	-0.126	0.467*
	(0.150)	(0.213)	(0.258)	(0.094)	(0.096)	(0.095)	(0.098)	(0.096)	(0.267)
ALMPs	-0.542**	-0.301	-0.573***	-1.702***	-0.460***	-0.525***	-0.567***	-0.659***	-1.517***
	(0.242)	(0.281)	(0.139)	(0.431)	(0.131)	(0.145)	(0.140)	(0.138)	(0.502)
EPL regular contracts	0.010	0.026	0.043	0.019	0.123***	0.006	0.013	-0.004	0.105**
	(0.026)	(0.050)	(0.027)	(0.025)	(0.042)	(0.026)	(0.027)	(0.027)	(0.046)
Tax wedge	0.011***	0.011***	0.009***	0.011***	0.010***	0.023***	0.010***	0.011***	0.012**
	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)	(0.005)
Tax wedge x excess coverage	0.043***	0.025**	0.034***	0.039***	0.039***	0.046***	0.036***	0.042***	0.032***
	(0.010)	(0.012)	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)	(0.009)	(0.010)
Excess coverage	0.257**	0.048	0.212**	0.293***	0.342***	0.351***	0.647**	0.277***	0.368***
	(0.100)	(0.136)	(0.096)	(0.092)	(0.099)	(0.097)	(0.325)	(0.096)	(0.098)
Union density	0.396*	0.817**	0.269	0.508***	0.520***	0.510***	0.571**	0.476**	0.608***
	(0.209)	(0.415)	(0.188)	(0.184)	(0.193)	(0.189)	(0.280)	(0.191)	(0.190)
PMR	0.009	0.034	0.007	0.005	0.010	0.006	0.007	0.081***	0.053*
	(0.012)	(0.022)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.031)	(0.029)
	Persistence Effect (logit form)								
Constant	0.590***	0.543***	0.138	0.500***	-0.141	-0.307	0.100	-0.178	-0.860***
	(0.055)	(0.062)	(0.397)	(0.111)	(0.182)	(0.219)	(0.244)	(0.225)	(0.325)
Initial replacement rate			-0.006						
			(0.004)						
Average benefits duration			1.032***						0.761**
			(0.381)						(0.363)
ALMPs				-1.179**					-0.988*
				(0.478)					(0.599)
EPL regular contracts					0.245***				0.176*
					(0.080)				(0.090)
Tax wedge						0.023***			0.005
						(0.007)			(0.007)
Tax wedge x excess coverage						0.044***			0.007
						(0.012)			(0.012)
Excess coverage							0.547		
							(0.452)		
Union density							0.330		
							(0.361)		
PMR								0.122**	0.090*
								(0.048)	(0.047)
	Output Gap Interactions								
Constant	-0.045***	-0.046***	0.024**	0.028***	0.053***	0.045***	0.042***	0.051***	0.035***
	(0.003)	(0.005)	(0.011)	(0.004)	(0.006)	(0.010)	(0.008)	(0.009)	(0.007)
Initial replacement rate			0.0002						
			(0.0001)						
Average benefits duration			0.018						
			(0.012)						
ALMPs				0.142***					0.136***
				(0.024)					(0.024)
EPL regular contracts					-0.004*				-0.003
					(0.002)				(0.002)
Tax wedge						-0.000			
						(0.000)			
Tax wedge x excess coverage						-0.000			
						(0.000)			
Excess coverage							0.001		
							(0.014)		
Union density							0.006		
							(0.012)		
PMR								-0.002	
								(0.002)	
R^2	0.98	-	0.98	0.98	0.98	0.98	0.98	0.98	0.98
N	441	441	441	441	441	441	441	441	441

note: All regressions include country and time specific dummies

Table 3 - Labour market institutions and unemployment dynamics - further results

Dependent variable:	**Log unemployment rate**		
Estimator:	NLS	NLS	NLS
Robustness test:		**Temporary work**	**ALMPs decomposed**
	(1)	(2)	(3)
	Level Effect		
Initial replacement rate	0.006***	0.006***	0.006***
	(0.001)	(0.001)	(0.002)
Average benefits duration	0.022	-0.005	0.305
	(0.098)	(0.295)	(0.284)
ALMPs	-0.345*	-1.911***	
	(0.183)	(0.609)	
Public employment services			-2.516***
			(0.893)
Job creation subsidies			-1.317*
			(0.759)
Training and other subsidies			-1.457***
			(0.541)
EPL regular contracts	0.037	-0.010	0.097**
	(0.057)	(0.050)	(0.048)
Share of temporary workers	-0.405	-0.478	
	(0.610)	(0.540)	
Tax wedge	0.010***	0.003	0.015***
	(0.002)	(0.005)	(0.006)
Tax wedge x excess coverage	0.034***	0.039***	0.037***
	(0.009)	(0.010)	(0.012)
Excess coverage	0.237**	0.228**	0.331***
	(0.108)	(0.105)	(0.100)
Union density	0.426**	0.501**	0.597***
	(0.195)	(0.195)	(0.195)
PMR	0.017	0.064**	0.045
	(0.012)	(0.028)	(0.030)
	Persistence Effect (logit form)		
Constant	0.700***	1.211***	-0.833**
	(0.261)	(0.417)	(0.336)
Average benefits duration		-0.194	0.528
		(0.433)	(0.386)
ALMPs		-1.868**	-1.178*
		(0.753)	(0.610)
EPL regular contracts	0.014	-0.050	0.159*
	(0.110)	(0.102)	(0.094)
Share of temporary workers	-0.365	-0.354	
	(1.114)	(1.005)	
Tax wedge		-0.010	0.009
		(0.007)	(0.008)
Tax wedge x excess coverage		0.010	0.009
		(0.011)	(0.013)
PMR		0.077	0.086*
		(0.047)	(0.050)
	Output Gap Interactions		
Constant	0.045***	0.023***	0.033***
	(0.007)	(0.007)	(0.007)
ALMPs		0.167***	
		(0.028)	
Public employment services			0.190*
			(0.107)
Job creation subsidies			0.287**
			(0.115)
Training and other subsidies			0.085**
			(0.038)
EPL regular contracts	-0.005*	-0.003	-0.003
	(0.002)	(0.002)	(0.002)
Share of temporary workers	0.073*	0.067*	
	(0.039)	(0.037)	
R^2	0.98	0.98	0.98
N	417	417	441

note: All regressions include country and time specific dummies

4. Do policies that reduce unemployment raise its volatility?

42. This section addresses the main issue of interest of this paper: Are there policy trade-offs between unemployment mean and its volatility? The first sub-section describes the statistical tools used to answer to the latter question, then the results are presented.

4.1. A Monte-Carlo framework

43. One focuses on steady-state unemployment level and volatility. For a given estimated model, the following benchmark statistics can be calculated across all countries and over the whole period:[19]

$$
\begin{aligned}
U^0 &= E\left[\exp\left(\frac{a_i + d_t + X_{i,t}\beta + \sigma(X^{\sigma}_{i,t})Z_{i,t} + v_{i,t}}{1-\rho(X^{\rho}_{i,t})}\right)\right] \\
CV^0 &= \left(\frac{1}{(U^0)^2}E\left[\exp\left(2.\frac{a_i + d_t + X_{i,t}\beta + \sigma(X^{\sigma}_{i,t})Z_{i,t} + v_{i,t}}{1-\rho(X^{\rho}_{i,t})}\right)\right]-1\right)^{1/2} \\
\rho^0 &= E\left[\rho(X^{\rho}_{i,t})\right] \\
\sigma^0 &= E\left[\sigma(X^{\sigma}_{i,t})\right]
\end{aligned}
\qquad (16)
$$

The first and second terms correspond to the predicted average and the coefficient of variation of steady-state unemployment. The third and fourth terms correspond respectively to the predicted average degree of unemployment persistence and cyclical volatility. Using the observed values of institutions yields four benchmark statistics.

44. As a second step, each institution is increased by one standard deviation and the above four statistics are recalculated and compared with their benchmark values. The difference corresponds to the average impact of a policy reform on respectively unemployment average level, volatility, persistence and cyclical volatility.

45. The above calculation relies on a set of parameters' estimates drawn from the estimation of the non-linear model of Table 2 Column 9. To account for the uncertainty surrounding these estimates and to provide confidence intervals, we bootstrap each institution's coefficient by drawing from its estimated asymptotic distribution.

4.2. Results

46. Table 4 reports the average differences in average steady-state unemployment (Column 1), in its coefficient of variation (Column 2), as well as the differences in unemployment persistence (Column 3) and cyclical volatility (Column 4). The differences in these aggregate statistics admit non-trivial, asymmetric distributions across the bootstrapped coefficients. Because of this non-normality, the standard errors of those distributions do not make sense as measures of confidence and they are not reported. Instead, we calculate the fraction of models in which changes in the four aggregate statistics display the opposite sign as the one reported on Table 4. This share of inconsistent models corresponds broadly to the p-value testing the nullity of an estimate in the classical case of a standard normal variable. Asterisks denote the degree of robustness.

[19] We exclude about 1% of observations for which we obtain very high persistence coefficients and predicted stationary unemployment rates at odds with actual ones.

47. As expected, the initial replacement rate, ALMPs, the tax wedge and union density are significant determinants of the level of unemployment. For instance, one additional standard deviation in the replacement rate (18 percentage points) is associated with a 2.5 percentage point increase in the rate of steady-state unemployment.

Table 4. Change in steady-state unemployment characteristics following one standard deviation Increase in each Institution - Monte Carlo simulation

	ΔE(u|.) percentage points	Δcv(u|.) percentage points	Δρ(X)	Δσ(X)
Initial gross replacement rate	2.50 ***	1.00		
Share of inconsistent estimates	0.00	0.33		
Average benefits duration	0.60	9.30 **	0.033 **	
Share of inconsistent estimates	0.44	0.02	0.02	
Active ALMP	-1.30 *	1.40	-0.025 **	0.015 ***
Share of inconsistent estimates	0.09	0.41	0.05	0.00
EPL regular	0.40	8.80 **	0.036 **	-0.003 *
Share of inconsistent estimates	0.45	0.05	0.03	0.06
Tax wedge	2.40 *	14.20	0.008	
Share of inconsistent estimates	0.09	0.14	0.27	
Union density	2.50 ***	1.00		
Share of inconsistent estimates	0.00	0.32		
PMR	0.30	5.90 **	0.023 **	
Share of inconsistent estimates	0.47	0.03	0.03	

note: this table reports the simulated variations in the average and in the coefficient of variation of steady-state unemployment following the counter-factual increase in each institution by one standard deviation. The effects on the degree of unemployment persistence and on the cyclical volatility of unemployment are also reported. A Monte Carlo simulation is run as each model's coefficient is drawn randomly from its asymptotic normal distribution. One reports in italics the share of estimates with the opposite sign as the one reported. This statistics is broadly similar to a p-value. *** (respectively ** and *) correspond to a 1% (resp. 5% and 10%) confidence level.

48. The central finding of the paper is highlighted on Column 2, which describes the change in steady-state unemployment volatility. There is no evidence of any policy trade-off, as institutions that matter for the level of unemployment do not matter for its volatility, and vice- versa. It turns out that there are three main determinants of unemployment volatility: The duration of unemployment benefits, the level of employment protection and the strictness of product market regulation. As shown by Column 3, an increase in each of the latter indices is associated with larger unemployment persistence over time, which translates into higher steady-state unemployment volatility.

49. Moreover, two institutions have ambiguous effects on unemployment volatility. A stricter employment protection for regular contracts is related to a lower cyclical volatility of unemployment but to a higher persistence over time, and the latter effect is found to dominate in terms of total unemployment

volatility. Finally, a larger volume of ALMPs is associated with lower persistence and higher cyclical volatility, but the two effects cancel out in terms of total volatility.

5. Conclusion

50. For most countries, the crisis took place in a context of low or falling trend unemployment rates, reflecting in many cases the impact of labour market reforms undertaken since the mid-1990s. Still, the impact of the Great Recession on labour market outcomes has varied greatly across countries, reflecting in part differences in the degree of exposure to specific features of the crisis (*e.g.* aftermath of housing and financial bubble bursts), but also differences in policy settings put in place before and during the crisis. The contrasting labour market developments across OECD countries during the Great Recession have inspired the main question raised in this paper: Can policies that reduce the average level or trend unemployment also contribute to raise its long-term volatility?

51. To address this question, the paper uses the familiar wage-setting/price setting framework to illustrate how labour market policies and institutions influence steady-state unemployment and volatility. For this purpose, long-term volatility is decomposed in two sub-components, *i.e.* the short-term sensitivity of unemployment to cyclical activity (cyclical volatility) and the degree of unemployment persistence. Policies that reduce the impact of cyclical activity on unemployment may also raise its persistence, resulting in an uncertain net effect on the volatility of unemployment in the long term.

52. The econometric model derived from the analytic framework allows for testing whether the estimated impact of policies and institutions on the level, persistence and short-term cyclicality of unemployment is conformed to priors, but also statistically and economically significant. Based on the results from a non-linear reduced-form equation, the paper then uses a Monte-Carlo framework to directly assess the presence and significance of policy trade-offs between the level of unemployment and its volatility.

53. Overall, the paper does not find any robust evidence that reforms designed to lower steady-state unemployment result in higher long-term volatility. There is thus no clear evidence of policy trade-offs in that sense. First, in terms of average unemployment effects, the results are largely consistent with those obtained from previous studies, including those reported in *Reassessing the OECD Jobs Strategy* (OECD, 2006). Lower unemployment benefit replacement rates (initial year), a larger volume of ALMPs and a smaller tax wedge are all conducive to lower unemployment. More specifically, a decline of 7 percentage points in replacement rates, a reduction of 4 percentage points in the tax wedge or an increase equivalent to between 0.3 and 0.4 percentage point of GDP in the volume of spending in ALMPs would, based on the above results, lead to a reduction of around one percentage point in the trend rate of unemployment. With the exception of ALMPs, none of these variables is found to have a significant effect on either of the two components of volatility.

54. As regards the latter, the paper finds that a longer duration of unemployment benefits, tighter product market regulations and more stringent employment protection legislation (EPL) are associated with a higher persistence of unemployment over time, while higher spending on ALMPs help reduce persistence. Of these determinants, duration of benefits and product market regulation have no significant impact on cyclical volatility, hence their net effect is to raise the long-term volatility of steady-state unemployment. As for ALMPs and EPL, their effect on persistence and cyclical volatility go in opposite direction. While strict EPL tends to reduce cyclical volatility by encouraging labour hoarding, it also raises the persistence of unemployment. Conversely, more resources devoted to ALMPs help reduce the persistence but raise the sensitivity to short-term economic fluctuations. In the latter case, the two effects largely offset each other and there is thus no significant impact on long-term volatility. In the case of EPL,

the higher persistence effect dominates the reduction in cyclical volatility, resulting in a net increase in long-term volatility.

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Appendix on Data Sources

Unemployment rate unemployed workers as a share of the labour force, in %. Aggregate rates refer to the 15-64 age group.
Source: OECD, Database on Labour Force Statistics; OECD, Annual Labour Force Statistics.

Initial replacement rate: Average gross replacement rate for the first year for 3 family types (single, with dependent spouse, with spouse in work) and 2 levels of income (67% and 100% of average earnings)
Source: OECD Data-base on Benefit Entitlements and Gross Replacement Rates

Average replacement rate: Average gross replacement rate for 3 family types (single, with dependent spouse, with spouse in work) and 2 levels of income (67% and 100% of average earnings)
Source: OECD Data-base on Benefit Entitlements and Gross Replacement Rates
Average benefits duration = Average replacement rate / Initial replacement rate

Tax wedge: Tax wedge between the labour cost to the employer and the corresponding net take-home pay of the employee.

Tax wedge = 1-(1-TYH.R)*(1-SSC.R)*(PGDP/PCP)
= 1-(1-TYH/(WSSS-SSC+YOTH))*(1-SSC/WSSS)*(PGDP/PCP)
where:
TYH : Direct taxes on household income
WSSS : Compensation of employees
SSC : Social Security Contributions (excluding self-employed)
YOTH : Net self-employment and property income received by households
PGDP : GDP price deflator
PCP : Private consumption price deflator

Source: OECD, Economic Outlook No 87, May 2010 and Revenue Statistics, 2010.

PES and administration, Direct Job creation and Training measures: Public expenditure in labour market programmes.
Source: OECD, Employment Outlook 2010.

EPL regular and EPL temporary: Employment protection legislation for regular or temporary workers.
Source: OECD, Employment Outlook 2010.

Share of temporary contracts: Share of workers with temporary contracts in total employment.
Source: OECD, Employment Labour and Social Affairs Directorate Database 2010.

PMR: Product market regulation. OECD summary indicator of regulatory impediments to product market competition in seven non-manufacturing industries.
Source: Wölfl, A., I. Wanner, T. Kozluk, G. Nicoletti (2009), "Ten Years of Product Market Reform in OECD Countries: Insights from a Revised PMR Indicator", OECD Economics Department Working Papers, No. 695, OECD Paris.

Union coverage: Collective bargaining coverage rate, *i.e.* the share of workers covered by a collective agreement, in %
Source: OECD, Employment Outlook 2010

Union density: Trade union density rate, *i.e.* the share of workers affiliated to a trade union, in %
Source: OECD, Employment Outlook 2010

Excess coverage = Union coverage - Union density

Minimum wage: Ratio of minimum wage to median wage.
Source: Employment Labour and Social Affairs Directorate Database and National sources.

Output gap: OECD measure of the gap between actual and potential output as a percentage of potential output.
Source: OECD Economic Outlook No.87, May 2010

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