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Tax Wedges, Unemployment Benefits and Labour Market Outcomes in the New EU Members

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Abstract There has been a widely accepted belief that certain labor market institutions, including high taxation and generous benefits, can lead to low employment and/or high unemployment. To what extent do such priors about tax wedges and unemployment benefits apply to the new members of the EU? Principal Component Analysis (PCA) suggests the new members share similar characteristics to each other and should be grouped separately from the rest of Europe. There are statistically significant differences in the medians of unemployment benefits and the labor market outcomes of the less productive workers, but insignificant differences in prime-age outcomes and tax wedges. Within the new members, our non-parametric analysis finds tax wedges and the duration of benefits (not the replacement ratio) are associated with poor labor market outcomes, but the evidence is weak.

Keywords Labour market institutions, principal component analysis
JEL classification J21, J48, J68, P27

1. Introduction

The extent to which labour market institutions can account for differences in labor market performance has been cause for long-running debate.[1] In terms of Freeman's (2005, p. 137) analysis of the "Case against labor institutions", it appears that the aggregate evidence is too weak to convict, but that strong priors drive the judgment passed by many studies. However, there is enough empirical evidence to advance high taxes and improperly designed unemployment benefits systems as lead suspects for detrimental effects on labor market outcomes.[2] Were the institutional suspects lined up against a wall, taxes and benefits would be picked by many witnesses.

The case is complicated by evidence suggesting complicity between taxes, benefits and other aspects of labor market institutions.[3] This leads to arguments that good labor

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[1] Nickell and Layard (1999) is a seminal work in this field. More recent work assigning a role to institutional features includes Bassanini and Duval (2006), which has been incorporated in the OECD Employment Outlook (OECD 2006), and Nickel, Nunziata and Ochel (2005). A more skeptical view is offered in Allard and Lindert (2006), and Baker, Glyn Howell and Schmitt (2005).

[2] On balance, empirical studies are more likely to find significant effects for these variables than others. Baker, Glyn, Howell and Schmitt (2005) suggest findings for taxes and or benefits are the most robust, although they argue the evidence is weak overall.

[3] For example, interaction effects are found in Daveri and Tabellini (2000), and European Commission (2004).

market outcomes can be achieved with more than one combination of labor market policies. For example, the approach in Nordic countries is very different to that of the Anglo-Saxon economies.

Excluding Cyprus and Malta, the European Union has 10 new members as of 2007, which we will refer to as Central and Eastern European (CEE) countries or the CEE10.[4] While these countries share many features associated with their status as converging economies, their joining the EU prompts the question of whether, in terms of labor market institutions and outcomes, they should be classified separately in their own group, or whether they fall neatly into one of the existing "Old Europe" categories. Another pertinent question to address is to what extent any priors on the link between labor market institutions and outcomes would apply to the CEE countries. For example, is the view that high taxes and generous benefits can be detrimental to labor market outcomes in some settings more justified or less justified in the CEE countries? Bearing in mind that all the relevant variables are in a state of flux, we use snapshots of the data to begin to answer this question in three ways.

First, we use data to classify European countries in four groups defined by labor market outcomes in 2001–2005 and policy/environment variables in 2005. Section 2 employs principal component analysis (PCA), which is used to summarize a number of variables into easily-interpretable summary statistics. The exercise provides a cross-sectional snapshot of the data without any consideration of evolution over time or of potential relationships. Our results suggest the new members are relatively similar to each other and should be classified separately as a group. In particular, the CEE10 appear to experience relatively bad labor market outcomes but do not have conditions accused of being bad for labor outcomes. This simple observation suggests that, even with strong priors that institutions are to blame, it would be wrong to tell CEE countries to make their tax/benefit systems "better like the rest of Europe".

Second, we turn our attention to specific labor market, tax and benefit variables in Section 3. Much research compares the values for an individual country to the OECD, EU15 or broader European average, but does not indicate whether this is a characteristic of that country or of most new members. Furthermore, work which compares averages of the old and new members to conclude one variable is higher than the other does not take account of the variation within each group, in particular outliers that could move the mean.[5]

To address this gap in the literature, we use Mann-Whitney statistics to test the hypothesis that the CEE10 and EU15 countries come from the same distribution against the alternative that EU15 values are higher. This non-parametric two-sample test works in small samples, is robust to outliers, and makes few distributional assumptions. Using 2001–2005 averages, the tests show outcomes for the less educated and youth are significantly worse in the CEE10, but that outcomes for prime-age employment are not. Using 2005 data, the benefits system is significantly less generous, but tax wedges are not significantly different. From this observation, one would not be able to claim

[4] This follows the labelling in Schiff, Egoume-Bossogo, Ihara, Konuki and Krajnyak (2006). Vork, Leetma, Paulus and Anspal (2006) refer to the "New Member States" (NMS).

[5] Examples include Vork et al. (2006), and Ederveen and Thissen (2004).

generous benefits and high taxes account for the relatively poor performance of the CEE countries as a whole.

Third, we turn our attention to potential relationships between specific variables *within* the CEE countries. Section 4 reviews some of the existing evidence. As we have already suggested, the evidence is not conclusive, but identifies tax wedges and unemployment benefits as potentially detrimental. In Section 5, we present non-parametric indicators of correlation between tax wedges, unemployment benefits and a variety of labor market outcomes in the new members. Our approach is complementary to the regression-based work of Vork et al. (2006). Unlike standard fixed effects estimates, our method is appropriate for small samples, is robust to outliers, and focuses on the cross-sectional relationships often hidden in the fixed effects. Our results point to a negative effect of high tax wedges on labor market outcomes. They also suggest that, while a high benefits replacement ratio is not bad for the labor market, long duration of those benefits is. Section 6 concludes.

2. Are the CEE different?

This and the next section provide a characterization of the data to examine whether the CEE countries are similar to the existing members. Good labor market outcomes do not map to a unique set of policies. For example, England and Denmark have enjoyed relatively good labor market performance despite having very different rules governing their labor markets. It can therefore be instructive to group countries according to one or more of their characteristics. One can distinguish between Anglo-Saxon, Nordic and Continental countries as in Nickell and Layard (1999). In a similar spirit, this section analyzes whether, in terms of labor market outcomes and a selection of environmental/policy variables, the CEE should be classified differently to the rest of Europe. Such classification requires a method for summarizing numerous features of the countries' economies into easily interpretable characteristics. To do this, we employ principal component analysis (PCA).

The procedure of PCA starts with the search for the linear combination of the variables that produces the maximum possible variance. This linear combination is the first (principal) component. The second component is the linear combination of the same variables having a maximum variance, subject to its being uncorrelated with the first component. In general, one can have as many components as variables, but the aim is to have the first few components explain a large portion of the total variance. The vector of coefficients (or "weights") is the eigenvector associated with the largest eigenvalue of the correlation matrix of the underlying variables. This applies to subsequent components also; that is, the k^{th} principal component comes from the k^{th} eigenvector. Deciding how many components to use depends on the purpose at hand and on a number of features of the data. It can be useful to employ rotation techniques to aid interpretation of the components. We employ the orthogonal Varimax rotation. In our application, the analysis is conducted on the actual values of the underlying variables but also on their ranks. The results are similar but we present those based on the ranks. The use of ranks is consistent with the statistical analysis based on ranked data

throughout the paper. Further discussion on the methodology of PCA can be found in Jolliffee (2002).

Table 1 presents the first two vectors formed by an analysis of six variables using data for 30 European countries. Descriptions of the data are available in the Appendix. In particular, the unemployment trap is a measure of the marginal effective tax rate faced by an individual moving from unemployment to employment, taking into account taxes and/or benefits. Our constructed benefits measure combines the length and duration of unemployment benefits. Employment, unemployment and GDP growth are averages from 2001–2005 while the other data are for 2005.

The two vectors form the basis for the two dimensions along which the countries are classified. The coefficients, sometimes referred to as factor loadings, are a measure of the degree of association between the variable and the component. Large positive numbers (with a maximum of unity) signify a strong positive correlation with the underlying component while large negative numbers (a minimum of -1) signify a strong negative correlation. All numbers with an absolute value of less than 0.3 have been omitted. The two principal components cumulatively explain 66% of the variation in the data.[6]

Table 1. Component vectors

Variable	Vector 1: Environment	Vector 2: Outcome
Tax wedge	0.32	0.53
Unemployment Benefits	0.51	
Unemployment Trap	0.58	
GDP Growth	−0.53	
Employment		−0.55
Unemployment		0.62
Cumulative variation	0.33	0.66

As shown in Vector 1, the bottom two variables, which are labor market outcomes, are not related to the first component. The other variables are related to the first component. We interpret the first component as a labor market environment component, or "environment" for short. The bottom two variables are correlated with the second component, so we can interpret the second component as labor market outcomes. This ignores the fact that the tax wedge is also related to the second component.[7] Employment and unemployment, have a Pearson correlation of -0.72. While negative as expected, it is some way short of -1. This motivates the inclusion of two separate

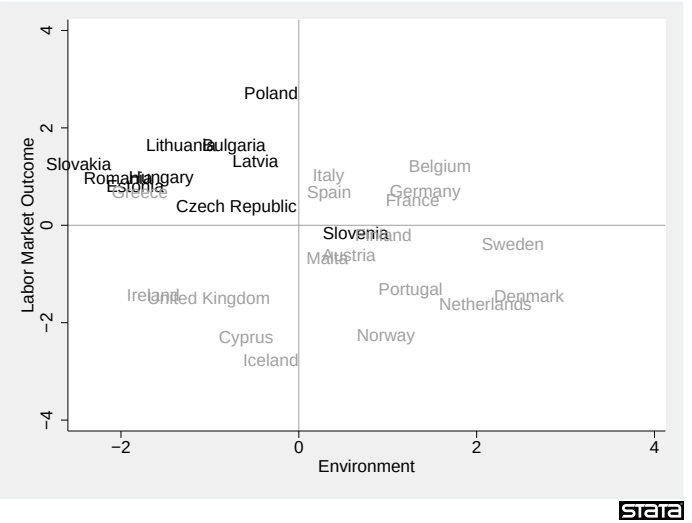
[6] This is a little bit low, but the subsequent components do not yield useful insights for this application.

[7] The tax wedge is related to both components and the second component actually captures a combination of the tax wedge and labour market outcomes. This is an issue we return to in Section 5. For now, we record that the presence of the tax wedge does not drive our key findings for this section. The main reason is that, as will be shown in Section 3, tax wedges do not differ materially between the CEE and the rest of Europe, so they are not influencing the CEE countries in a systematic way.

measures. As suggested by a referee, this is attributable to systematic variations in participation rates.

Using the prior that high taxes, a severe unemployment trap, generous benefits and weak growth can be described as conditions less conducive to good labor market outcomes, we can describe a country with these features as a "bad" environment. In terms of the policy variables, we can distinguish between laissez faire and interventionist environments. An observation with high unemployment and low employment has a "bad" labor market outcome.

Figure 1. Principal Component Analysis



Notes: Countries in black are CEE10 countries. Values are normalized to have a mean of zero. Labor market outcomes are measured on the y-axis, with countries having worse outcomes in the top half and those having better outcomes in the bottom half. The environment is measured on the x-axis. Countries having less favorable environments are on the right and those with more favorable environments are on the left.

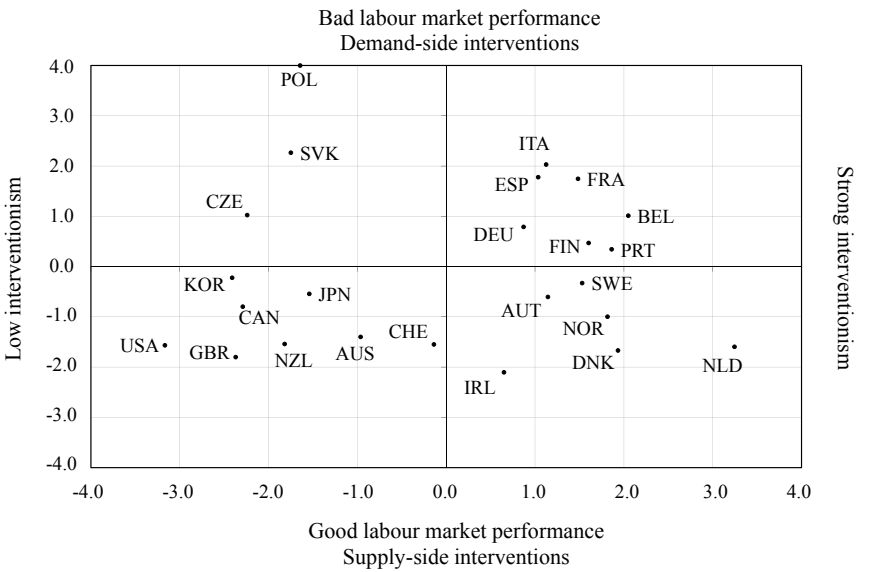
Figure 1 plots the scores of the countries, which we interpret as weighted averages of the variables in each component, using the same axes as those in Table 1. A high score for component 1 (on the right hand side of the graph) indicates countries with a "bad" environment. Similarly, a high score for component 2 (the top half) indicates countries that have worse labor market outcomes. For example, based on employment rates and unemployment rates, Poland has the worst labor market outcome of all the countries in Europe.

It is immediately striking that the top left quadrant consists almost exclusively of the CEE10 countries, which are in black. The observations in grey are other European countries. Only one CEE10 country is not in the top left quadrant, but it is close. This graph strongly suggests that we should group the CEE10 together, separately from the rest of Europe. These countries can be summarized as having relatively poor labor market outcomes without necessarily having a poor environment. We remark that this

key result, namely the grouping of the CEE countries together, is robust to the choice of specification for the PCA. In other words, the CEE are generally found clustered together in the same orthant for a wide selection of variables.[8]

A comparison with OECD (2006a, p. 204) in Figure 2 is instructive. Their y-axis is the same as ours and their x-axis captures features of labor market institutions, which can be summarized by the degree of intervention. Of the countries common to both samples, thirteen are in the same quadrant, two are not, and one is on the border. The locations within the quadrants are also similar.[9] While we have ten CEE countries, the OECD sample has three: Poland, Slovakia and the Czech Republic. These countries are the only inhabitants of the OECD bad outcome/low intervention quadrant. Our data shows they are joined by another six CEE countries (plus Greece, which is not in their sample). The only CEE country outside this quadrant is Slovenia, which is more or less in the centre of Figure 1.[10]

Figure 2. Similarities and differences in policies, institutions and labor market performance across OECD countries



Source: OECD (2006a, p. 204), accessed directly at http://dx.doi.org/10.1787/323044064232.

The OECD findings and the results here suggest the classification given in Table 2. The left column represents countries with a "good" environment, the right column cap-

[8] We present this specification precisely because of the convenient interpretation it offers, despite the presence of the tax wedge in the second component.

[9] Furthermore, their findings also suggest the tax wedge is related to both components.

[10] The location of Malta and Cyprus also justifies a separate treatment of these new members of the EU, as done by other studies, like Vork, Leetma, Paulus and Anspal (2006).

tures those with a "bad" environment, the top row contains those with "bad" outcomes and the bottom row has countries with "good" outcomes. The classification is consistent with other groupings of countries (eg. Nickell and Layard 1999; Daveri and Tabellini 2000). Here, we add a fourth distinct group, namely the CEE10 countries, albeit with a slightly narrower range of variables.[11]

Table 2. Summary classification of labor market institutions and outcomes

Central and Eastern European	Continental/ Mediterranean
Anglo-Saxon	Nordic

3. Which variables are different?

This section continues to examine potential differences between the old and new members by checking for their statistical significance. In the PCA in Section 2, we used aggregate variables — for example overall employment rates — but in this section we disaggregate somewhat — for example breaking down employment rates into those for youth, of prime-age and the less-educated.

Table 3 compares specific aspects of labor market outcomes between the CEE10 and EU15 based on averages from 2001-2005.[12] Appendix 1 contains the data definitions and sources. The table shows the medians and arithmetic means for the CEE10 and the EU15 as well as their ratios. The second last row uses the Mann and Whitney (1947) test[13] to test the null hypothesis that EU15 countries are drawn from the same distribution as CEE10 countries, against the alternative that EU15 countries have bigger values. Conditional on a country being part of the EU15, the last row shows the estimated probability its observed value will be higher than that of a CEE10 country.

For the 15–64 age group, employment rates are on average six percentage points higher in the EU15. The difference is statistically significant at the 1% level and the probability that the true EU15 median is higher is 0.81. For the same age group, we

[11] A slight adjustment to the vertical axis would group the CEE countries with 3 Mediterranean countries, suggesting the new members are most similar to this group of old EU members. Classifications that separate continental and Mediterranean countries can be found in the literature. For example, Sapir (2005) produces such a classification when analyzing features of European social models.

[12] The average is used to account for cyclical effects. However, for countries that are reforming fast, differences over five years can capture genuine structural changes.

[13] A Mann-Whitney test is similar to a two-sample t-test, but is designed for small samples, does not make distributional assumptions, and is robust to outliers. To perform a Mann-Whitney test, the values for CEE10 countries and for EU15 countries are combined and given rankings. The statistic is then calculated as follows: $U = M - T$, where U = test statistic, M = the maximum value that the sum of the ranks of the EU15 states could take, T = the actual sum of the ranks of the EU15 states. Thus, $U = 0$ would mean every EU15 country is higher than the highest CEE10 country. If, after comparison with tabulated critical values, U is low enough, then we can say the EU15 countries have significantly higher values than the CEE10 countries.

see that unemployment is much higher in the CEE10, the difference being statistically significant at 2%. Given employment is higher and unemployment is lower in the EU15, it is no surprise that activity levels are only moderately higher and that the difference is only significant at 6%.

Table 3. Comparison of labor market outcomes in the CEE10 and EU15 (2001–2005 averages)

		Employment %				Unemployment %		Activity %		
		Total 15–64	Prime 25–54	Youth 15–24	Low Educated	Total 15–64	Youth 15–24	Total 15–64	Prime 25–54	Youth 15–24
EU15	median	66.10	79.60	40.40	36.90	5.90	14.30	70.94	85.40	47.10
	mean	66.08	78.84	41.61	38.50	6.75	15.49	71.70	83.81	47.40
CEE10	median	59.55	76.15	27.45	20.20	10.55	20.25	68.85	86.00	36.30
	mean	59.06	75.86	26.73	22.25	11.30	23.78	66.73	84.44	35.18
Ratio	median	0.90	0.96	0.68	0.55	1.79	1.42	0.97	1.01	0.77
	mean	0.89	0.96	0.64	0.58	1.67	1.53	0.93	1.01	0.74
$P_{medians}$		0.01	0.14	0.01	0.01	0.02	0.04	0.06	0.46	0.02
$P_{EU15>CEE10}$		0.81	0.68	0.83	0.92	0.19	0.25	0.73	0.41	0.79

Notes: $P_{medians}$ denotes the probability that the medians in the CEE10 and EU15 countries are equal, given the observed data, is less than the number indicated; $P_{EU15>CEE10}$ is the probability that the observed value for a given EU15 country is higher than that of a CEE10 country.

Turning to particular categories, employment rates for prime-age workers are roughly equal and not significantly different, while employment rates for the youth and low-educated are significantly lower in the CEE10. For example, an EU15 country has an 83% chance of having a greater youth employment rate than a CEE10 country. The distinction between prime-age workers and youth extends to activity rates: the CEE have practically the same prime-age mean/median as the EU15 but have significantly lower youth participation. Youth unemployment is also worse in the converging countries.[14]

Another potential source of difference is older workers (above 55). The incentives facing older workers are affected by the pensions system, which is not the focus of this study. Nonetheless, we find that activity rates in the EU15 are higher but not significantly so.[15] Table 3 presented 2001-2005 averages. Appendix 2 presents 2005 data. The key results are the same, except that unemployment rates are no longer significantly different.

Youth and low-educated labor market outcomes are relatively bad in all countries, but this analysis suggests the problem is particularly acute in the CEE10. Relating this to the PCA of the previous section, it appears the generally worse employment outcomes summarized by total employment and unemployment are being driven by poor outcomes for the less-productive elements of the population.

[14] We do not have comparable prime age unemployment data.

[15] The mean in the EU15 is 45% while the CEE10 average is 39%. The p-value for the difference is 0.20.

Table 4. Comparison of selected policy/environment variables in the CEE10 and EU15 (2005)

		Minimum Wage Ratio	Tax wedge		Unemployment benefits*			Marginal effective tax rates (traps)*		
			Not VAT adjusted	VAT adjusted	Ben_rat	Ben_dur	Ben_9	Unemployment	Low wage Children: 0	Low wage Children: 2
EU15	median	40	39.5	50.67	65	15	62.5	80	51	75
	mean	41.78	37.96	48.15	60.21	n/a	59.43	77.12	46.88	64.15
CEE10	median	37.5	41.55	50.67	50	9	45	67	32	66
	mean	38.4	40.18	49.85	50.5	n/a	42.6	68.02	34.34	58.98
Ratio	median	0.94	1.05	1	0.77	0.6	0.72	0.84	0.63	0.88
	mean	0.92	1.06	1.04	0.84	n/a	0.72	0.88	0.73	0.92
$P_{medians}$		0.24	0.41	0.58	0.12	0.01	0.02	0.1	0.07	0.11
$P_{EU15>CEE10}$		0.66	0.4	0.43	0.69	0.88	0.81	0.7	0.72	0.69

Notes: $P_{medians}$ denotes the probability that the medians in the CEE10 and EU15 countries are equal, given the observed data, is less than the number indicated; $P_{EU15>CEE10}$ is the probability that the observed value for a given EU15 country is higher than that of a CEE10 country; * see text and data appendix for explanation of terms.

Table 4 presents 2005 data on aspects of the tax and benefits system, which are described in Appendix 1.[16] Ben_rat refers to the benefits replacement ratio, while Ben_dur gives the duration of benefits. Ben_9 combines quantity and duration by giving the ratio of benefits to wages over the first nine months. It also includes information on minimum wages, which shows they are not different. When we consider the low-wage tax wedge, we see it is about 5% higher in a CEE country. However, this difference is not statistically significant. After adjusting for (slightly) higher VAT rates in the EU15, we see the median VAT-adjusted wedge is identically equal.[17]

Figure 3 provides indications of the location and spread of the tax wedge (excluding VAT) in the EU15 and CEE10. Examination of Figure 3 shows the median is slightly higher in the CEE10, which we observed in Table 4. However, the height of the box and the distance between the maximum and minimum values indicates considerable heterogeneity within the EU15. In contrast, CEE10 wedges are relatively close together, as indicated by a relatively compressed box. In a pattern typical of many variables, within-group variation often exceeds that between groups.

The 2005 tax wedge data, ordered from highest to lowest, is shown in Table 5. The CEE are flanked from above and below by EU15 countries. For completeness, we include information on other European countries. Slovakia has the lowest tax wedge, while Lithuania and Hungary have the highest tax wedge.[18] Adjusting tax wedges

[16] The variables in this table are not as susceptible to cyclical effects, so the latest possible information is used. Also, data availability precludes construction of comparable data for the entire 2001-2005 period, especially for benefits.

[17] Standard measures of the tax wedge do not account for consumption taxes, although a theoretical case can be made for their inclusion (eg. Nickell 2004). The data appendix describes the rudimentary procedure used to adjust for consumption. Our results do not really depend on the choice of tax wedge, partly because, as shown in Table 6, VAT rates do not vary much.

[18] Out of 30 countries, Slovakia and Hungary had the biggest falls in the tax wedge between 2001 and 2005.

Table 5. Low-wage tax wedges in Europe (2005)

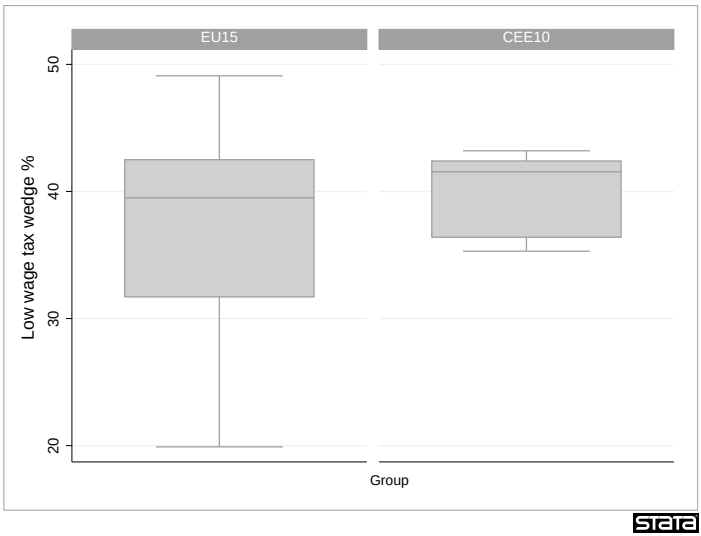
Country	Not VAT adjusted		VAT adjusted	
	%	Rank	%	Rank
Belgium	49.1	1	57.93	1
Germany	46.7	2	54.05	3
Sweden	46.5	3	57.2	2
Lithuania	43.2	4	51.86	7
Hungary	42.9	5	52.42	5
Austria	42.5	6	52.08	6
Poland	42.4	7	51.6	8
Romania	42.4	7	52.79	4
Czech Republic	42.1	9	51.34	11
Turkey	41.9	10	50.76	13
Italy	41.7	11	51.42	10
France	41.4	12	51	12
Netherlands	41.3	13	50.67	14
Latvia	41.0	14	50	16
Estonia	39.8	15	48.98	17
Finland	39.5	16	50.41	15
Denmark	39.3	17	51.44	9
Slovenia	36.4	18	47	19
Bulgaria	36.3	19	46.92	20
Spain	35.7	20	44.57	23
Slovakia	35.3	21	45.63	21
Greece	34.4	22	44.87	22
Norway	34.3	23	47.44	18
Portugal	31.7	24	43.55	24
United Kingdom	29.9	25	40.34	25
Luxemburg	29.8	26	38.96	26
Switzerland	26.7	27	31.88	29
Iceland	23.6	28	38.63	27
Ireland	19.9	29	33.8	28
Cyprus	19.1	30	29.65	30
Malta	18.7	31	31.1	31
CEE10 median	41.55		50.67	
EU15 median	39.5		50.67	
EU27 median	41		50.67	

for VAT does not significantly alter the rankings of the CEE countries, except that Lithuania does not rank as highly while Romania attains the highest percentage.

While taxes do not systematically differ between the EU15 and CEE10, many measures of benefits do. The replacement ratio of initial unemployment benefits is lower in the CEE10, but not significantly so. However, the duration[19] of benefits is significantly lower in the CEE10. Combining these measures by calculating the average replacement ratio received over the first 9 months from various forms of unemployment benefits, we conclude unemployment benefits are significantly less generous in the CEE10 than the EU15.

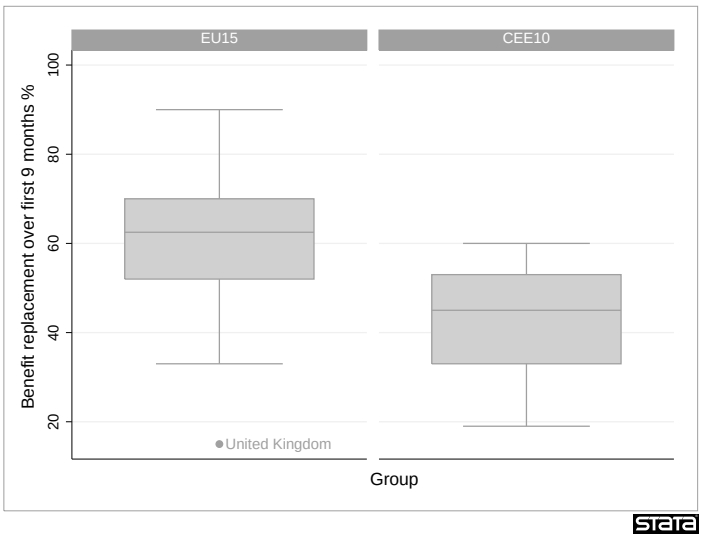
[19] Some countries have indefinite benefits. If we attach an arbitrarily high value for these, the median is a representative statistic and the Mann-Whitney test is still informative.

Figure 3. Low-wage tax wedges in Europe (2005)



Notes: The horizontal line inside the shaded box is the median. The 25^{th} and 75^{th} percentiles are denoted by the edges of the box. The horizontal lines outside the box denote the largest and smallest values in the sample, provided they are not statistical outliers.

Figure 4. Benefits in Europe (2005)



Notes: The horizontal line inside the shaded box is the median. The 25^{th} and 75^{th} percentiles are denoted by the edges of the box. The horizontal lines outside the box denote the largest and smallest values in the sample, provided they are not statistical outliers, which are labeled separately.

Figure 4 shows the CEE country with the most generous benefits (Bulgaria) is located below the EU15 median at an average ratio of 60%. The least generous country is Romania. The measures of marginal effective tax rates in the final three columns of Table 4 suggest the potential disincentives to participate in the labor market are greater in the EU15 than the CEE10. This is consistent with the finding that tax wedges are not much higher but benefits replacement is lower.

Table 6. Benefits in Europe (2005)

Country	Benefit ratio		Benefit duration		Combination	
	%	Rank	Months	Rank	%	Rank
United Kingdom	15	1	12	15	15	1
Romania	23	2	8	6	19	2
Poland	30	3	12	15	30	3
Ireland	33	4	15	19	33	4.5
Slovakia	50	8	6	3	33	4.5
Hungary	60	13.5	9	10	36	6
Estonia	45	5	9	10	43	7
Latvia	50	8	9	10	47	8.5
Czech Republic	47	6	n/a	n/a	47	8.5
Greece	50	8	9	10	50	10
Italy	70	22.5	7	4	52	11
Slovenia	70	22.5	3	1	53	12
Austria	55	10.5	infinite*	27	55	13
Lithuania	70	22.5	7.5	5	58	14
Germany	60	13.5	9	10	60	16.5
Belgium	55	10.5	infinite*	27	60	16.5
Iceland	60	13.5	60	25	60	16.5
Bulgaria	60	13.5	9	10	60	16.5
Portugal	65	17	24	23	65	20
France	65	17	15	19	65	20
Cyprus	69	19	5	2	65	20
Spain	65	17	14	17	67	22
Netherlands	70	22.5	n/a	n/a	70	24
Finland	70	22.5	23	22	70	24
Norway	70	22.5	18	21	70	24
Malta	80	27	infinite*	27	80	27
Sweden	80	27	12	15	80	27
Switzerland	80	27	15	19	80	27
Croatia	100	30	9	10	87	29
Denmark	90	29	36	24	90	30
CEE10 median	50		9		45	
EU15 median	65		15		62.5	
EU27 median	60		10.5		56.5	

Note: * Infinite durations assigned an arbitrary value of 100 for statistical work.

Table 6 presents details by listing all the countries and the benefits measures. The data are sorted by our combined measure of benefits and duration. The United Kingdom is at the top; its benefits system is much less generous than that in the rest of the EU15. Generally, new members are near the top of the table.

In summary, this section shows that the main sources of differences between the CEE10 and EU15 appear to lie in worse labor market outcomes of the less productive and in lower marginal effective tax rates, which are driven by less generous unemployment benefits. The differences are not to be found in minimum wages, tax wedges or prime-age labor market outcomes. We now turn to an analysis of potential relationships between taxes, benefits and employment outcomes within the CEE10.

4. The relationships between taxes, benefits and labour market outcomes: existing theory and evidence

Having provided snapshots of the data in the previous two sections, we proceed to examine possible relationships between taxes, benefits and employment outcomes. We discuss the theory and existing evidence on their links in this section before complementing it with our own measures of association within the CEE10 in Section 5.

4.1 Theory

The tax wedge is the difference between the cost of employment to a firm and the real take-home pay received by the worker (Blanchard 2006). The taxes potentially relevant for labor market outcomes include payroll taxes, taxes on labor income, social security contributions[20] and consumption taxes. It is intuitive to consider taxes paid by the firm as affecting labor demand and taxes paid by the worker as affecting labor supply. However, standard theoretical treatments show it is the total tax wedge that matters, not the legal incidence. By this argument, the same employment outcome occurs regardless of whether we think of the impact of the tax wedge as one on demand or supply. This result applies to labor markets in competitive equilibrium and those subject to some form of bargaining, but does not apply, for example, if many workers are subject to a binding minimum wage.[21]

Focusing on supply, tax wedges can theoretically have a positive or negative influence on labor force participation, depending on competing income and substitution effects. Textbook treatments typically regard the alternative to work as leisure, such that the income effect allows one to enjoy more leisure. In the CEE economies, the more appropriate alternative might be work outside the formal sector, be it in the black market or subsistence/household activity. If this is the case, justifying the source of an income effect is more difficult. Whether the effect of tax wedges is predominantly on employment quantities or on wages depends on the incidence of the tax, which depends on the elasticity of supply relative to demand.

[20] This depends on how much of the contributions are linked to future benefits received by the employee.

[21] Good discussions are available in Nickell (1997, 2004), Blanchard (2006), and Carlin and Soskice (2006, p. 107).

Ceteris paribus, tax wedges will have a bigger negative employment effect if labor supply is elastic, which is more likely if the income effect is small and the substitution effect is large. The previous paragraph has hinted that the income effect may be small in the CEE countries, which implies the tax wedge would have a relatively large negative effect. Furthermore, Gora, Radizwill, Sowa and Walewski (2006) show convex labor supply curves imply the labor supply curve is relatively more elastic for those towards the low end of the earnings spectrum. The presence of unemployment benefits and/or binding minimum wages can make the effective labor supply curve more elastic for low-wage workers.

Wedges can affect participation in the labor market but, holding recorded activity in the labor market constant, they can also affect the mix of employment and unemployment. In situations where wages are bargained over, higher tax wedges make the outside option – such as unemployment or work in the informal sector while registering as unemployed – more attractive. This bids up equilibrium wages. Because of the positive slope of the wage curve, higher wages imply higher official unemployment and lower employment.

Unemployment benefits affect the incentives for someone to search for work. If they subsidize costly search activities, the effect can be positive. If they encourage searchers to decrease their work effort or hold out for better paying jobs, the effect on equilibrium employment is negative.[22] In a bargaining model, generous benefits increase the value of the outside option available to workers and make workers less averse to unemployment. This strengthens their bargaining position, so they bid up the equilibrium wage at the cost of higher unemployment.

4.2 Evidence: an introduction

A consensus on the importance of labor market institutions in general does not appear to be imminent (Freeman 2005). However, the evidence for a detrimental impact is possibly strongest for tax wedges and benefits. In an influential study based on the work of Bassanini and Duval (2006), the OECD (2006a) argues high tax wedges and generous unemployment benefits have a significant negative impact on labor market outcomes. Many other studies find results consistent with significantly detrimental effects of taxes and/or benefits.[23] Nickell, Nunziata and Ochel (2005) find about two thirds of their institutional explanation for patterns in OECD labor market outcomes is accounted for by variations in the tax/benefit system.

Baker, Glyn, Howell and Schmitt (2005), while skeptical of the institutional explanation in general, conclude that the findings on taxes and benefits are more robust than other findings. However, they argue that, while the rise in tax wedges and/or benefits over time in some countries tended to coincide with worsening labor market outcomes in those countries – generating a significant estimate – this does not appear to be the case in recent times. Like Blanchard (2006), they argue that simple cross-sectional

[22] If benefits allow people to hold out for better quality matches that are less likely to result in termination of employment, the effects of benefits on equilibrium employment can be positive.

[23] These include Amable, Demmou and Gatti (2006), Nickell (1997, 2004), and Belot and van Ours (2004)

analysis shows those countries with worse employment outcomes do not necessarily have higher tax wedges and/or benefits.[24]

The lack of consensus can be partially explained by strong priors and data too weak to reject those priors (Freeman 2005). Another complicating factor is the possibility that the effect of taxes and benefits depends on broader labor market conditions, as suggested in the theoretical section above. For example, the European Commission (2004) study on the EU15 finds that the negative effect of the tax wedge on employment is greatest in those European countries with intermediate levels of trade union co-ordination, consistent with the study of Daveri and Tabellini (2000) on OECD countries. We do not investigate this feature in detail, but note trade union density is about the same in the new members as for the EU15, bargaining generally takes place at the firm level and co-ordination is low (Ederveen and Thissen 2004), which would suggest a smaller impact of tax wedges.

4.3 Evidence: the new EU member states

Ederveen and Thissen (2004) focus on four CEE countries, using panel data from OECD countries that include Poland, Slovakia, Hungary and the Czech Republic. They find statistically significant positive relationships between unemployment and the tax wedge for two specifications out of three; while the effect of benefits duration is significant and positive for one specification out of three. They show how their specifications do a poor job of explaining the variations in unemployment across their four converging countries, conclude that labor market institutions cannot account for employment variations and proceed to list broader factors that may be important. Given the restructuring taking place in the CEE countries, this is one plausible reading of their results. Another interpretation, consistent with the analysis conducted so far, is that any relationships that may apply in some parts of the OECD may not apply in others, and by extension may not apply to the CEE countries.

Vork et al. (2006) address this issue. Cross plots indicate potential differences in the magnitude of the effect of tax wedges on employment between the EU15 and eight new members of the EU, with the effect being negative for the new members but close to zero in the EU15. Cross plots of marginal effective tax rates and labor market outcomes indicate differences in the size and sign of the relationship.

For their panel of eight CEE countries over a maximum of nine years, pooled OLS regressions of overall employment on tax wedges yield a significantly negative coefficient of -0.68, so that a one percentage point fall in the wedge would lead to a 0.68% rise in employment. Fixed effects estimates are an insignificant -0.23, but are similar to those estimated by European Commission (2004) and by Vork et al. (ibid) for Europe.[25] For the EU15, the use of fixed effects does not affect the coefficient materially, but it does for the CEE countries. This is open to interpretation. On the one hand, it may be that the variables included adequately control for country specific effects in

[24] Baccaro and Rei (2005) also provides a critique.

[25] Formal regression analysis in Vork et al. rejected the equality of coefficients between the EU15 and CEE8 in most models, but this is presumably a rejection of the more stringent hypothesis that all coefficients are equal, not just the tax wedge.

the EU15 but not in the CEE8. On the other hand, it suggests much of the variation in the EU15 is of wedges over time while there has not been such variation over their sample period for the CEE countries. Thus, the fixed effects are capturing much of the static cross-sectional relationship the tax wedge coefficient could capture for the CEE countries.[26] It is therefore unclear whether tax wedges have a more detrimental effect in the CEE countries than the rest of Europe.

Vork et al. (2006) present specifications with many alternative labor market measures. The OLS coefficient for low education employment is significantly negative (-0.69) but that for youths is insignificant (-0.325). They also find a significant negative coefficient for the effect of tax wedges on *un*employment. The authors do not employ a measure of benefits but use indicators of marginal effective tax rates, which do not yield consistent signs across specification or methodology.

One possible criticism of this analysis is that it ignores much of the very important restructuring that has taken place in these economies. In a panel study based on similar data, Fabrizio (2006) partially address this criticism by decomposing the evolution of employment into industry, temporal and country effects. She finds a significant negative effect of tax wedges on the country-specific employment outcomes, with a fixed effects coefficient of –0.67.

On balance, the regression evidence does suggest a detrimental role for tax wedges, but not for benefits, in the CEE countries. We have pointed to sources of criticisms of the panel regression approach. The data available is still relatively limited and offers little variation for identification that is easily interpretable.[27] As the dataset grows in the coming years, it will include many of the recent, current and planned future reforms, yielding additional sources of variation and degrees of freedom. In the next section, we offer an approach that is simultaneously less demanding of the data currently available and complementary to panel regression research.

5. The relationships between taxes, benefits and labour market outcomes: non-parametric measures of association

This section investigates statistical relationships between benefits, taxes and labor market outcomes in the CEE10 countries. We incorporate the newest EU members, namely Romania and Bulgaria, in our sample. We focus on a single cross-section, using 2005 data for taxes and benefits and the 2001–2005 average for labor market outcomes. Data availability on benefits also motivates our use of a single cross-section.[28]

We estimate pairwise Kendall Tau correlations between the variables of interest. Kendall Tau statistics are akin to Pearson correlations but more robust to outliers, are

[26] An argument for OLS estimates has been made along these lines by Allard and Lindert (2006).

[27] See Allard and Lindert (2006) and Amable et al. (2006) on this point.

[28] While we could attempt to construct benefits measures for more time periods, genuine changes in such benefits over time could be materially affected by measurement error, which in some panel regression specifications can severely bias the results. We use 2001-2005 averages for labour market outcomes to rule out cyclical effects, although the results are not materially different for 2005 data. Arguably, any changes in taxes or benefits would be expected to have some sort of lagged effect, which could be captured in a dynamic specification.

appropriate for smaller samples and make fewer distributional assumptions.[29] Appendix 3 presents more traditional partial correlations. The exercise is less ambitious than that implicit in panel regressions. We do not have a reduced form model of how taxes and benefits affect labor market outcomes, and the results cannot by themselves imply a causal relationship between such variables. The panel on the left of Table 7 presents the Kendall Tau statistics for various employment measures. The right panel gives the odds ratio. Table 8 gives corresponding statistics for unemployment and activity. Before proceeding, bear in mind the samples sizes are small and that the test sacrifices power in favor of robust estimates.

Table 7. Measures of association: employment

	K-Tau			Odds ratio		
	ages 25–54	ages 15–24	low-educ	ages 25–54	ages 15–24	low-educ
Full wedge	−0.24	−0.24	0.02	0.61	0.61	1.05
Wedge	−0.09	−0.27	0	0.84	0.58	1.00
Ben_9	0.36	0.04	−0.04	2.12	1.09	0.91
Ben_rat	0.23	−0.05	−0.14	1.60	0.91	0.76
Ben_dur	−0.61**	−0.24	−0.06	0.24	0.61	0.89
Trap_u	0.11	0.38	0.38	1.25	2.21	2.21

Notes: ** significant at 5%. Full wedge accounts for VAT. Ben_rat is initial replacement ratio, Ben_dur is the duration of the main benefit, Ben_9 is the average replacement over the first 9 months. Trap_u is the unemployment trap.

Regarding tax wedges (with or without adjusting for VAT), the coefficients in Table 7 indicate a negative relationship between wedges and prime-age employment and between wedges and youth employment, with a coefficient of -0.24. The corresponding odds ratio of 0.61 implies the variables are substantially more likely to be discordant than concordant. The same does not hold for less educated workers.

In Table 8, there is a negative association between wedges and unemployment. We also see a negative association between wedges and activity, especially for the youth. We can interpret the negative association with activity in two ways. It can be the arithmetic combination of an association with lower employment and unemployment. Alternatively, we can interpret it as higher tax wedges discouraging workers from participating in the labor force, which can also reduce unemployment. Given the negative association with employment, the theoretical arguments are consistent with the latter interpretation.[30]

[29] The statistic is based on the number of concordant and discordant pairs of observations (a concordant pair of observations on a scatter plot would be linked by a line with a positive slope; a discordant pair by a negative slope). The statistic captures the idea that, if the number of concordant pairs exceeds the number of discordant pairs, the variables are positively related, and vice versa. After accounting for ties and standardizing the difference for sample size, we achieve the Kendall Tau "b" statistic T, where $-1 < T < +1$. A large positive number indicates a strong positive relationship, while a large negative number indicates a strong negative relationship. The odds ratio of the probability of a concordant pair to a discordant pair is then $(1+T)/(1-T)$. For example, $T = -0.25$ between two variables implies two observations are 60% as likely to be concordant as discordant. A good introduction is provided by Noether (2007) and the formal treatment is available in Kendall (1970).

[30] If participation falls (rises) because of the tax wedge, this should be associated with lower (higher) em-

Table 8. Measures of association: unemployment and activity

	K-Tau				Odds ratio			
	Unemployment		Activity		Unemployment		Activity	
	Total	ages 15–24	ages 15–24	ages 25–54	Total	ages 15–24	ages 15–24	ages 25–54
Full wedge	−0.16	−0.07	−0.31	−0.31	0.73	0.87	0.52	0.52
Wedge	−0.22	−0.13	−0.48*	−0.30	0.63	0.76	0.35	0.54
Ben_9	0.04	−0.13	−0.16	0.30	1.09	0.76	0.73	1.84
Ben_rat	−0.09	−0.28	−0.12	0.30	0.83	0.57	0.79	1.87
Ben_dur	0.18	0.06	−0.15	−0.43	1.45	1.13	0.73	0.40
Trap_u	0.02	−0.16	0.27	0.04	1.05	0.73	1.74	1.09

Notes: * significant at 10%. Full wedge accounts for VAT. Ben_rat is initial replacement ratio, Ben_dur is the duration of the main benefit, Ben_9 is the average replacement over the first 9 months. Trap_u is the unemployment trap.

Our combined measure of benefits replacement and duration, Ben_9, yields inconsistent results, which depend on the population group and labor market outcome being measured. Breaking down the benefits measure into its ratio and duration components yields interesting insights. The ratio follows a similar pattern to the combined measure, being positively related to prime-age employment and activity but negatively related for some of the less productive segments of the labor force.

However, the coefficient of benefits duration suggests a large and significantly negative relationship with prime-age employment. The odds ratio of 0.24 implies that, if country A has longer-lasting benefits than country B, then, relative to country B, country A is about four times as likely to have lower employment than higher employment. There is a negative relationship with youth employment. Table 8 also presents coefficients consistent with the view that long benefits duration can adversely affect labor market outcomes.

Recall the PCA in Section 2 found tax wedges related to both the outcome and environment components. This implies that there is a relationship between tax wedges and labor market outcomes in aggregate, one we ignored for the purposes of classifying the CEE10. Specifically, the factor loadings suggested a positive relationship between tax wedges and "bad" labor market outcomes: higher taxes are associated with worse outcomes, which is consistent with our findings in this section. Our combined benefits measure, in yielding mixed results, is also consistent with the PCA, which did not find the combined measure correlated with the second component.

In summary, it appears that, for the CEE, distinguishing benefits of long duration from those that offer a high initial replacement ratio is important. The evidence is also consistent with the view that tax wedges are discouraging labor force participation and reducing equilibrium employment, especially for youth, in the CEE. In partial answer to some of the criticisms of the panel literature, we do find at least some of the effect of wedges and benefits can be found in the cross-sectional dimension. However,

ployment and perhaps lower (higher) unemployment. We see a negative relationship with employment, activity and unemployment, which is consistent with this argument. Other theoretical explanations for a fall in unemployment after the tax wedge would simultaneously imply higher employment.

because there are few significant coefficients, the evidence is not strong. While this is partly because of a low power test, we believe that this evidence neither weakens nor strengthens the case against these labor market features for CEE10 countries.

6. Concluding comments

This study has used principal component analysis (PCA) to classify European countries according to their labor market outcomes and in terms of a labor market environment/policy component. The data suggest the new members of the European Union should be classified separately from the existing members. They tend to have worse labor market performance but an environment that is not necessarily less conducive to those outcomes. These results fit in with those of Ederveen and Thissen (2004), and Vork et al. (2006), who conclude that labor market policies and institutions are generally more flexible in the CEE countries than the rest of Europe.

In particular, we show the medians of employment and activity rates for the less productive segments of the population, namely the youth and those with less education, are statistically significantly lower in the CEE10. Indicators of prime-age outcomes are not significantly different. While the low-wage tax wedge is not statistically distinct, benefits measures are significantly less generous in the CEE10. Taken in isolation, this suggests it would be naive to assign worse labor market performance in these countries to higher taxes and/or unemployment benefits.

However, we investigate the possible relationships between taxes, benefits and employment outcomes using data for the CEE10 countries to see if they can account for variation within this group. Available empirical evidence proposes that, of all the institutional explanations for differences in labor market outcomes, tax wedges and the benefits system are leading candidates. On balance, it appears that high tax wedges and/or inappropriate benefits systems hinder the generation of desirable labor market outcomes. Consistent with panel studies of new members of the EU, our nonparametric analysis shows a negative relationship between the low-wage tax wedge and employment or activity rates, particularly for the youth. We also find that, while a high benefits ratio is not necessarily harmful, long benefits duration is associated with bad labor market outcomes.

Our work is complementary to panel studies of the CEE countries, which despite their many advantages suffer from limited degrees of freedom and insufficient sources of variation, especially after allowing for fixed effects. Future research will benefit from further sources of identification produced by additional observations and the reforms currently under way. This will provide identification over the time-dimension of data. However, the availability of good time series information on benefits remains an obstacle. The use of dynamic panel methods could also become feasible. Some of the effects of reforms may take time, so appropriately estimated dynamic specifications would be desirable.

Finally, we sound a note of caution. These countries have been through a substantial period of transition. This period is not yet over. The finding that the new EU members tend to have worse labor market performance but an environment that is not

necessarily less conducive to those outcomes would be consistent with the view that labor market institutions are of secondary importance relative to broader restructuring still taking place, regardless of the within-group evidence we have found.

Those countries that are still far from completing the process of transition arguably have worse labor market outcomes. From a methodological point of view, we have tried to take a snapshot of a set of economies that are in constant flux. The labor markets could be far from their long run equilibrium, which has two implications. First, the traditional labor-market institutions theories concern themselves with long run equilibrium employment/unemployment rates, so that they may not apply in our context. Second, a snapshot taken with future data could produce a very different picture. Thus, while a hangover from transition could account for the present dichotomy between policies and outcomes, it would be interesting to see whether it persists into the future.

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Appendix 1: Construction and sourcing of data

Benefits Benefits data are constructed for 2005. Three measures of unemployment benefits are employed. *Ben_ratio* is a measure of the initial replacement ratio of unemployment benefits relative to the average wage, net of taxes. *Ben_dur* is the duration of the initial benefit in months. Countries with infinite benefits are assigned an arbitrarily high value of 100 for use in the non-parametric analysis. *Ben_9* combines both measures and accounts for potential secondary unemployment benefits by calculating the average ratio of benefits relative to the average wage enjoyed over the first nine months. The benefits measures as constructed do not allow for supplements given for dependents and/or spouses and/or old age. We construct the measures using sources broadly similar to those detailed in Schiff et al. (2006). The main sources are the detailed descriptive data in Social Security Administration, *Social Security Programs Throughout the World: Europe 2006*, the European Commission's Labor Market Reforms database, the OECD *Taxing Wages 2004/2005* publication and individual country sources. *Taxing Wages* was used for calculating average wages and average tax rates to compile net benefits as a ratio of net wages. This was done for the average wage or average production worker wage.

GDP growth rates We use the average annual growth rates for the period 2001–5.

Labor market outcomes Data on employment (as % of population of that age), unemployment (as % of those in the labor force) and activity rates (as % of population of that age) are sourced from the *Eurostat* database using standard definitions. Youths are people aged 15–24. For our measure of low-educated employment and activity, we refer to people aged fifteen and higher with education levels up to and including lower secondary (ISCED levels 0–2). We take annual averages of quarterly data, but in some cases not all quarters are available. Using data from a single quarter and/or using data for those aged 24 and higher only does not change the results. In the body of the paper, we use averages for 2001-2005.

Low-wage tax wedge This information is compiled by the European Commission and is available at the *Eurostat* database. The indicator we use is applied takes account of all social security contributions, payroll taxes and income taxes for a single worker earning 67% of the average wage. We use 2005 values.

Low-wage tax wedge (VAT adjusted) We account for consumption taxes by adjusting the *Eurostat* wedge to account for statutory VAT rates. This adjustment does not materially affect the orderings of countries in the EU and hence does not influence any of the results. The formula used is the following: $\tau_{cons} = (\tau_{excl} + t_c)/(1 + t_c)$, where the subscripts *cons*, *excl* and *c* refer to the consumption-adjusted tax wedge, the *Eurostat* wedge and the VAT rate respectively. The VAT rates are collected by the Tax Policy Division in the IMF. We use 2005 values.

Minimum wages This is the ratio of the statutory minimum wage to the average wage for 2005. Sources include OECD minimum wage information where availa-

ble. Other observations constructed using the ILO Minimum Wages Database and the OECD's *Taxing Wages 2005/2006* publication.

Traps 2005 Marginal effective tax rates (METRs) for typical households are provided as part of the *Eurostat* Structural Indicators. The Unemployment Trap measures the METR faced by a single person moving from unemployment to a job earning 67% of the average production wage. The low wage trap measures the transition from earnings at 33% to 67% of the average production wage, and is measured for a single person and a one-earner couple with no children.

Appendix 2

Table A1. Comparison of labor market outcomes in the CEE10 and EU15 (2005)

		Employment %				Unemployment %		Activity %		
		Total 15–64	Prime 25–54	Youth 15–24	Low Educated	Total 15–64	Youth 15–24	Total 15–64	Prime 25–54	Youth 15–24
EU15	median	67.5	80.7	38.7	36.6	7.6	16.1	72.4	86.4	48.7
	mean	66.64	79.49	40.81	37.59	7.07	16.6	71.84	84.78	47.33
CEE10	median	60.15	76.85	25.25	20.56	8.1	19.3	68.65	85.8	34.3
	mean	60.19	76.97	26.09	21.38	9.8	20.92	66.82	84.42	33.04
Ratio	median	0.89	0.95	0.65	0.56	1.07	1.2	0.95	0.99	0.7
	mean	0.9	0.97	0.64	0.57	1.39	1.26	0.93	1	0.7
$P_{medians}$		0.01	0.19	0.01	0.01	0.15	0.3	0.02	1	0.01
$P_{EU15>CEE10}$		0.81	0.66	0.87	0.9	0.33	0.37	0.79	0.5	0.83

Notes: $P_{medians}$ denotes the probability that the medians in the CEE10 and EU15 countries are equal, given the observed data, is less than the number indicated; $P_{EU15>CEE10}$ is the probability that the observed value for a given EU15 country is higher than that of a CEE10 country.

Appendix 3

Table A2. Partial Correlations between labor market outcomes and policy variables

Variable	Employment						Unemployment				Activity			
	Ages 25–54		Ages 15–24		Low Education		Overall		Ages 15–24		Ages 25–54		Ages 15–24	
Wedge	0.55	0.26	0.29	0.58	0.68	0.14	−0.64	0.17	−0.62	0.19	−0.13	0.81	−0.42	0.41
Ratio	−0.82	0.05	−0.69	0.13	−0.78	0.07	0.64	0.17	0.56	0.24	−0.32	0.54	−0.46	0.35
Duration	0.18	0.73	−0.49	0.33	−0.71	0.12	0	1	−0.22	0.68	0.19	0.72	−0.70	0.12
Trap_u	0.34	0.52	0.40	0.44	0.74	0.09	−0.27	0.61	−0.20	0.70	0.01	0.99	0.22	0.67

Notes: $P_{medians}$ denotes the probability that the medians in the CEE10 and EU15 countries are equal, given the observed data, is less than the number indicated; $P_{EU15>CEE10}$ is the probability that the observed value for a given EU15 country is higher than that of a CEE10 country.