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THE OUTPUT EMPLOYMENT ELASTICITY AND THE INCREASED USE OF TEMPORARY CONTRACTS: EVIDENCE FROM POLAND

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The output employment elasticity and the increased use of temporary contracts: evidence from Poland

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Abstract

The paper investigates how increased use of temporary contracts has affected employment elasticity with respect to output in Poland. Our empirical analysis covers the period of 1996-2016, with particular focus on the years 2001-2016. Several econometric tools are used to explore the relation between growth in GDP and employment. Our study shows that widespread adoption of temporary contracts contributes positively to total employment elasticity. However, what we have observed is that the share of temporary contracts has increased, but the total employment elasticity has decreased. We related this to an inverse relationship between the growth of permanent and temporary employment and the opposite trends in output elasticities of temporary and permanent employment.

Keywords:

labour demand, temporary contracts, economic growth, labour market institutions

JEL:

J21, J23, E32, J41

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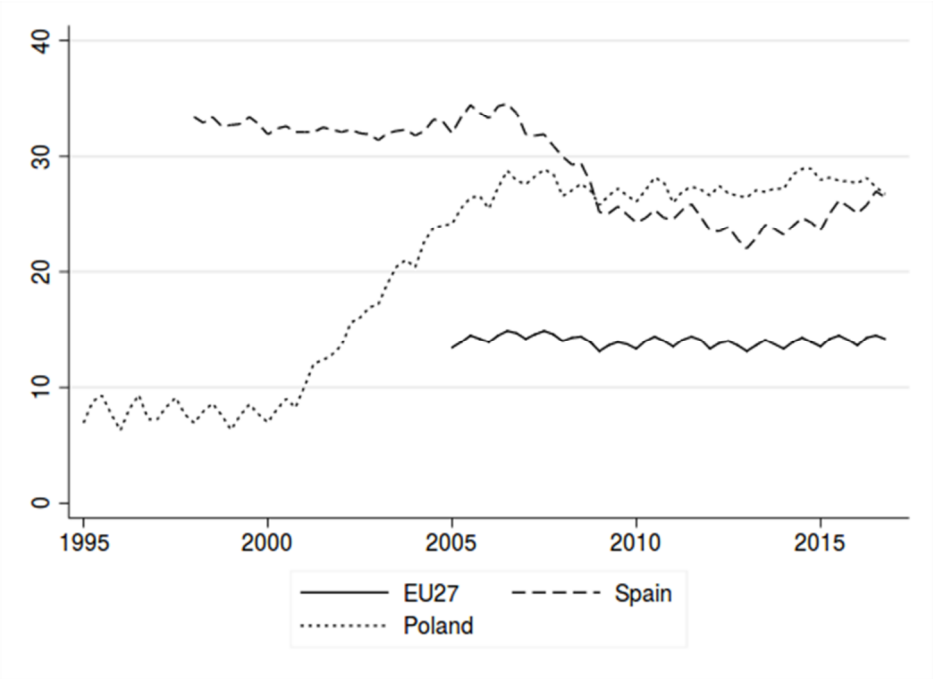
1. Introduction

Understanding the determinants of employment intensity of growth, particularly the reasons for the differences in this intensity across countries and over time, is important for policy makers. The aim of this paper is to explore whether and to what extent the increased use of temporary contracts has affected output elasticity of employment in Poland. Studying the Polish case is interesting for at least two reasons. First, Poland experienced significant changes in the employment structure at the beginning of the 21st century. Between 2001 and 2005 the share of temporary workers soared from 12% to 26% and fluctuated between 26% and 28% in the following years (see Figure 1). Thus, the share of this type of workers has reached the highest level in the EU.

Figure 1. Share of temporary workers in Poland, Spain and EU (27) (in %), 1995-2016



Note: Polish employment series are different before and after 2001.
Source: Eurostat, Polish LFS and own calculation.

Second, there seems to be a contradiction between the Polish empirical and common view on the influence of the widespread use of temporary contracts on employment responsiveness to output growth. It is well known that for employers term contracts, compared to open-ended ones, offer advantages in terms of flexibility and costs, i.e. they provide for shorter notice periods and lower severance payments. Consequently, it is expected that the high share of temporary workers plays an important role in the increase in employment responsiveness. Numerous studies have confirmed this. Especially research of the Spanish case (see e.g. Bentolila, Saint-Paul 1992, Benito, Hernado 2008, Costain, Jimeno and Thomas 2010, Bentolila, Cahuc, Dolado and Barbanchon 2012). Spain used to be the European leader in terms of the share of temporary employment. Cross-country analyses provide similar conclusions (see e.g. IMF 2010, Dixon, Lim and van Ours 2017). However, there is also evidence that the gap in employee rights between temporary ("cheap") and permanent ("expensive") workers can lead temporary jobs becoming substitutes for permanent jobs and then the increased share of temporary jobs has a negligible effect on total employment (see Garibaldi and Mauro 2002, Kahn 2010, Cahuc, Charlot and Malherbet 2013).

Little research has been carried out on the Polish case. It only partially supports the prevalent view. More precisely, the Social Diagnosis Report (2015, p. 136) confirms that temporary jobs are not as steady as permanent jobs. Over the period of 2009-2015, probability of becoming unemployed was about three times higher for temporary workforce than for permanent. An empirical attempt to explain the impact of the growing use of flexible work contracts in Poland on employment responsiveness to changes in GDP was presented by Cichocki, Gradzewicz and Tyrowicz (2015). What is interesting, their use of the impulse response function did not find evidence that the growing use of non-standard labour contracts (including fixed-term contracts) has resulted in increased employment elasticity with respect to GDP growth.

This paper extends this literature. First, based on Okun's "difference" and "gap" specifications, elasticities of employment under permanent and temporary contracts are estimated and compared. Second, the effect of change in the share of temporary employment on employment elasticity is explored. Third, stability of employment elasticity over time is investigated.

The analysis covers the period of 1996-2016, with attention paid to the years 2001-2016, when changes of the share of temporary employment in total employment were the most pronounced. Empirical analysis is based on quarterly data. Using OLS, FM-OLS, structural stability tests, rolling regressions, Granger causality test and Markow switching regression, we look at relations between GDP growth and total, permanent and temporary employment growth. Our study confirms that the widespread use of fixed-term contracts increased employment elasticity with respect to output. We also find that the high and stable share of temporary employment coincided with declining elasticity of total employment. We related this to the negative relationship between the growth of permanent and temporary employment and the opposite trends in output elasticities of temporary and permanent employment.

The paper is organized as follows. Section 2 presents the theoretical background and data. Section 3 characterizes temporary employment in Poland. Section 4 contains empirical research. Section 5 concludes the article.

2. Model and data

Based on a seminal paper by Okun (1962), we assume that output fluctuations cause firms to hire and fire workers. In other words, changes in GDP growth rate or in GDP level affect employment growth rate or employment level. The relation can be written as a "difference" version (1) or "gap" version (2):

$$\Delta e_t = \beta_0 + \beta_1 \Delta y_t + \varepsilon_t \quad (1)$$

$$(\Delta e_t - \Delta e_t^*) = \beta_0 + \beta_1 (\Delta y_t - \Delta y_t^*) + \varepsilon_t \quad (2)$$

where Δ represents change from the previous period, e is employment, y is output, e^* is long-run level employment, y^* is long-run output or potential output, t is time index, ε is error term.

In this paper, we will estimate both versions of Okun law. Equations (1) and (2) make it possible to estimate output elasticity of employment (β_1) and the "jobless growth threshold"

($-\beta_0/\beta_1$), i.e. growth which is slower than the threshold causes employment figures to fall, while faster growth causes employment rates to rise. Estimation of Equation (2) is potentially more problematic because it uses unobservable variables e^* and y^*. Different measures of long-run employment and potential output can potentially produce different results.

The coefficient (β_1) depends on the cost-of-employment adjustment. Firms try to reduce or avoid this cost and, among others, first fire or hire "cheaper" temporary workers. Therefore, we expect that output elasticity of temporary employment is higher than that of permanent employment and that the more widespread use of fixed-term contracts has increased employment elasticity in Poland.

In our paper we use quarterly data from the Polish Labour Force Survey (LFS). Employment statistics come from the LFS database revised by the National Bank of Poland (NBP) (see Saczuk, 2014) and are based on data published in *Quarterly information on the labour market* by the Central Statistical Office of Poland (CSO). Unfortunately, the definition of temporary employment is different before and after 2001. This fact hinders certain calculations, for instance, the calculation of employment growth rate. Moreover, the data on employment for quarters 1999q2 and 1999q3 is interpolated as for this period the LFS data was not collected by the CSO. Data for real GDP growth rate before 2003 is taken from *Statistical Bulletins* of the CSO, after 2002 - from *Poland macroeconomic indicators* available on the CSO website.

Estimating elasticities, we use logs of original variables as well as the logarithmic growth rates calculated as first order differences of the levels of the original variables. Therefore, the elasticities of labour which we calculated should be interpreted as a percentage change of employment growth resulting from a 1% change in GDP growth rate. To estimate the trend component, we follow the standard practice of using the Hodrick-Prescott (HP) filter.

3. Temporary employment

In this paper the term *temporary workers (employment*) refers to temporary jobs as defined in the Polish LFS. However, this term encompasses several types of contracts made according to the Polish Labour Code or the Polish Civil Code. Unfortunately, it is not possible to distinguish these contracts in LFS data. Until 2016, Labour Code contracts included various temporary job contracts: for a fixed period, for a trial period, contracts to complete a specified task and contracts used when there was a need to replace a worker who is on (mainly maternity) leave. Such contracts provide the same working conditions and social benefits as permanent contracts, e.g. sick leave, maternity leave and minimum wage. The crucial difference lies in shorter notice periods and lower severance payments. The use of civil contracts in the case of employment is restricted by Polish law, but it is a common practice to use them in this manner. The protection of employees granted by the Labour Code is not effectively enforced in such cases. The most popular forms of contracts used in this context are commission contracts and contracts of result. Workers employed under these types of arrangements are not entitled to social benefits (for instance to sick leave, maternity leave, paid vacation and severance payment), as well as to minimum wage (the last problem was partly eliminated by regulatory changes in 2016). All in all, temporary workers constitute a heterogeneous group that is less protected than permanent workers.

Tables 1 and 2 provide information on the size and structure of temporary workers. According to LFS, the number of fixed-term workers rapidly increased from 1.2 to 2.6 million between 2001 and 2005 and then increased to almost 3.3 million in 2010 and 3.6 million in 2015. This growth was partly caused by the increasing use of civil contracts. The Social Insurance Institution (SII) reports that the number of individuals paying contributions from

civil-law contracts (excluding contracts of result) increased from 220 thousand to 1 million over the period of 2001-2015. The CSO reports that civil contracts (including contracts of result) were the only source of income for 1.2 million individuals in 2015. Civil contracts account for approximately 1/3 of temporary employment. There has also been a significant increase in employment *via* temporary work agencies from 170 thousand in 2004 to 800 thousand in 2015. This group includes both workers under civil code and labour code contracts. Across sectors, it is particularly striking that over the years 2001-2005, the share of fixed-term contracts doubled in total employment, but it almost tripled in manufacturing.

Table 1. Increase in temporary employment by different form of contracts (in millions)

	2001	2005	2010	2015
Temporary employment	1.17	2.61	3.31	3.55
Persons paying contributions from civil-law contracts [a]	0.22	0.40	0.64	1.04
Workers under commission contract and contract of result[b]	.	.	1.01[c]	1.21
Hired by temporary employment agencies	.	0.21	0.43	0.80

Note: *a* - excluding contract of result, *b* - the only source of income, *c* - in 2012.
Source: MRPiPS (2016, p. 29), CSO (2016, Table 15), LFS, SII.

Table 2. Share of temporary workers in total employees by economic activity (in %)

	2001	2005	2007
Total	8.7	19.3	21.8
Agriculture; fishing	2.1	3.1	3.9
Industry	10.9	26.9	29.9
Manufacturing	10.4	28.6	31.4
Construction	17.5	32.6	34.8
Services	9.7	20.0	21.8
Services (except public administration and community services; activities of households and extra-territorial organizations)	10.9	23.8	25.7
Education; health; other service activities; activities of households; extra-territorial organizations	8.5	15.1	16.8

Source: Eurostat and own calculation.

OECD EPL indicators confirm considerable disparities in employment protection across the main types of employment (see EPL timeseries[1]). The EPL strictness index for permanent workers was 2.23 and was constant over the period of 1990-2013. In contrast, the temporary workers index was significantly lower and changed over time. In the years 1990-2002, it was equal to 0.75, then the index temporally decreased to 0.25 in 2003, and finally, after Poland's accession to the EU (2004), it rose to 1.75 and was stable in the years to follow.

Comparison changes in temporary workers share, differences in protection and labour market outcomes reveal that the increase in the popularity of term contracts resulted from the interaction of labour market institutions and adverse shocks. Figure 1 shows that the period of 1995-2016 comprises three distinctly different subperiods in terms of the share of temporary

[1] http://www.oecd.org/els/emp/oecdindicatorsofemploymentprotection.htm (access: 22.03.2017).

workers. The first (1995-2000) is the subperiod of the "low share". The second subperiod (2001-2005) captures the "growing share". The third one (2006-2016) covers the "high share". Expansion of the use fixed-term contracts coincided with weaker protection and greater difference, while the "high share" stabilization was related to more restrictive regulations and smaller difference. However, various term contracts had existed in the Polish law long before their share in total employment rose dramatically. For example, the most common civil contracts, i.e. commission contracts and contract of result, were introduced in the 1960s. Over the period of 2001-2005, there were no changes in the law that could have explained the increased use of these contracts. (In 2002, a contract of replacement was introduced, in 2003 unlimited renewal temporary contracts were allowed but this regulation was renounced the next year.) This suggests that it was interpretation and enforcement of regulation that changed, rather than the legal framework.

What is important, the rapid growth of fixed-term contracts took place when the demographic wave and the economic slowdown soared unemployment rate to almost 20%. While the share stabilization occurred after EU accession, the unemployment rate decreased more than twice. This data indicates a link between labour market outcomes and the use of temporary contracts.

The difference in protection is reflected in the costs incurred by the employer. Civil contracts have a substantially lower tax wedge. As mentioned before, employers need not pay contributions to the state pension plan, severance payments nor minimum wages. For instance, Arak, Lewandowski and Żakowiecki (2014) reported that for a minimum wage worker in 2013, the substitution of a permanent contract with a contract of result reduces contributions to the pension scheme by 17% and increases the worker's net income by 15-30%. In reality, workers with fixed-term contracts are paid less than workers with open-ended contracts. According to Gatti, Goraus and Morgandi (2014, pp. 26-28) as well OECD (2012, p. 4), temporary workers' earnings are on average about 30% lower monthly than those of permanent workers. Gatti *et al*. (2014) also reports that the wage difference decreases to 15% after controlling for differences in a number of characteristics (sex, age, education, sector, location) and that roughly 20% of temporary employees with civil contracts have earnings below the minimum wage. All in all, temporary contracts are predominantly used by employers to cut labour costs or to increase salaries of low-skilled workers. These also make such contracts attractive both to firms and to workers.

4.1 Empirical analysis

Employment growth and changes in employment structureOver the period of 1996-2016, the growth rate of employment varied over time and between different types of employment[2]. Table 3 reports quarterly average growth rates in the periods of the "low share", "growing share" and "high share". In the years 1996-2000, the total growth rate was 0.4%, while permanent employment was decreasing at a rate of -0.2%, employment under temporary contracts was rising at a rate of 0.6%. The next period covers the explosion of temporary contracts. Over the period of 2002-2005, the average growth rate of temporary workers was 22.5% per year and the number of workers under open-ended contracts was decreasing on average by -3.4% per year. Due to moving in the opposite direction, the average total rate of employment growth was relatively low at 0.8% per year. In the years 2006-2016, the average

[2] The growth in output and employment is measured as the quarter over analogical quarter in previous year (Q/Q).

growth of temporary employment decreased to 2.9%, but the growth of permanent employment increased to 1.9% resulting in the overall employment growth of 2.2% per year.

Table 3. Average quarterly growth rate in total, permanent and temporary employment (in %)

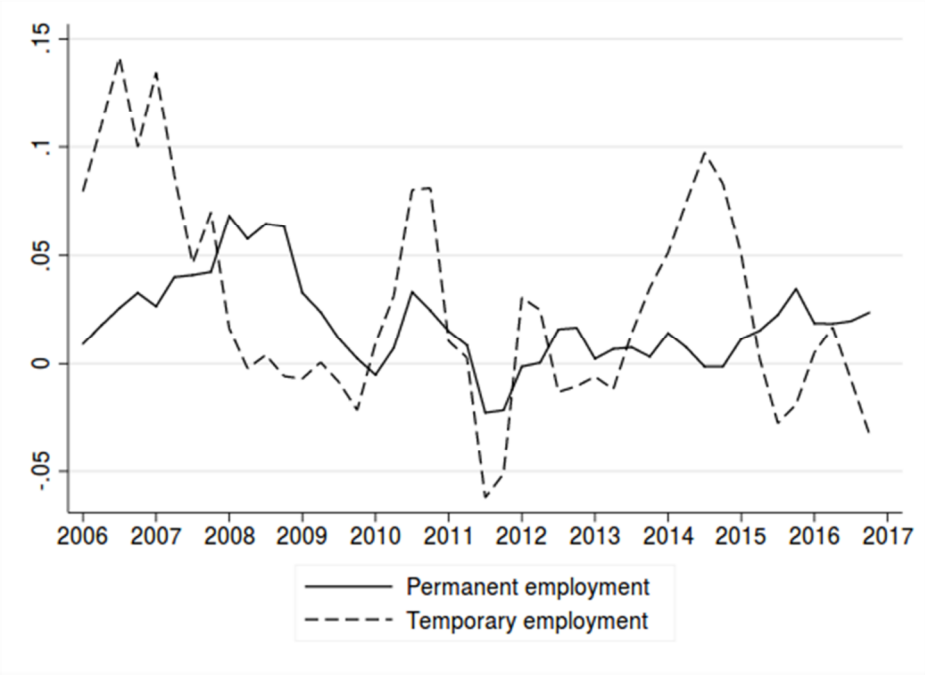
	1996-2016	1996-2000	2002-2016	2002-2005	2006-2016
Total	1.3	0.4	1.8	0.8	2.2
Permanent	.	-0.2	0.5	-3.4	1.9
Temporary	.	0.6	8.1	22.5	2.9

Source: LSF and own calculation.

The period of rising popularity of fixed-term contracts substantially changed the employment structure with respect to shares of temporary vs. permanent employment. However, the contribution of this period to total employment growth was much smaller. Between the years 2001 and 2005, the number of temporary contracts increased by about 1.45 million, whereas the number of permanent contracts declined by roughly 1.15 million. Total employment was fairly stable, with a net increase by only 300 thousand individuals. It seems that the expansion of temporary contracts was associated largely with the substitution of more expensive permanent jobs with cheaper temporary jobs and then its influence on employment size seems to have been small.

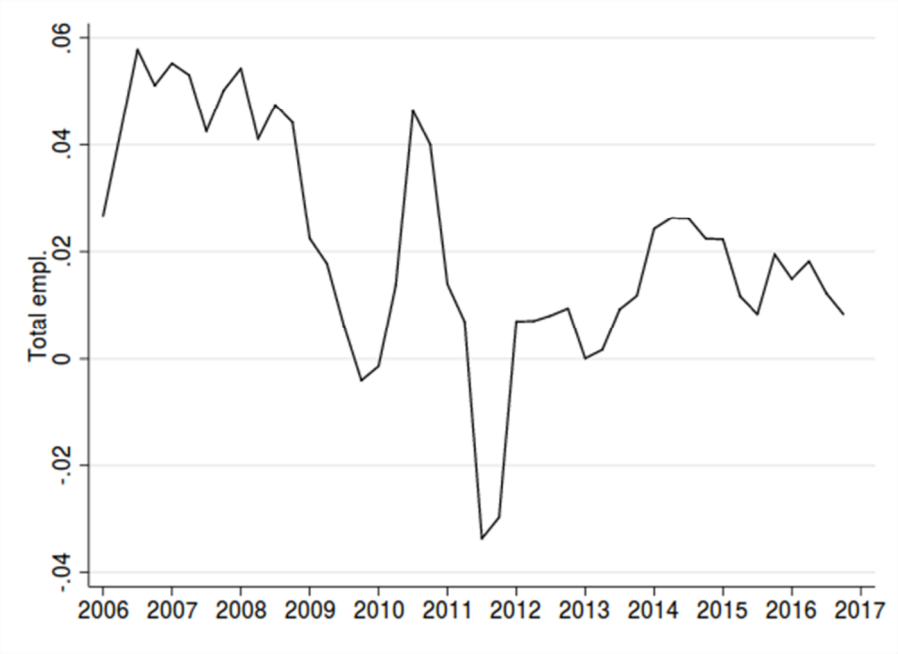
Figure 2 gives the evolution of the quarterly growth rate of temporary and permanent employment in the subperiod of 2006-2016. It shows that with regard to the period of 2009-2011, changes of the two sorts of employment were positively related, that is there was a tendency for both of them to move together. In contrast, before and after this period, we can observe inverse relations between these changes. In turn, the comparison of Figure 2 and 3 reveals that the total employment growth was more volatile in periods when the two types of employment were moving together, whereas a fall in volatility is witnessed when the two types of employment were moving in the opposite directions.

Figure 2. Permanent and temporary employment growth (in %), 2006-2016



Source: LSF and own calculation.

Figure 3. Total employment growth (in %), 2006-2016



Source: LSF and own calculation.

Spearman correlation coefficients between growth rates of temporary and permanent employment provide a similar conclusion. Table 4 presents estimated coefficients for some selected periods. The values of the coefficients confirm that there was an inverse relation between temporary and permanent employment growth, except in the years 2009-2011. The correlation is –0.80 for the period of 2006-2008, 0.64 over the period of 2009-2011 and –0.71 for the years 2012-2016. Table 4 also contains the standard deviations of the total employment growth. For the same periods as above, these standard deviations are 0.9, 2.4 and 0.8 respectively. These numbers suggest that the inverse relation between the growth of permanent and temporary employment coincided with the stable total employment growth, whereas the positive correlation between them was linked to higher volatility of the total employment growth.

Table 4. Spearman correlation between temporary and permanent employment growth and standard deviation of total employment growth in selected periods

	2006-2016	2006-2008	2009-2011	2012-2016
Correlation	0.128	-0.804***	0.608**	-0.714***
Standard deviation	2.17	0.89	2.40	0.80

Note: / ***/ ** / */ indicate statistical significance at the 1, 5, and 10 percent level.

Source: LFS and own calculation.

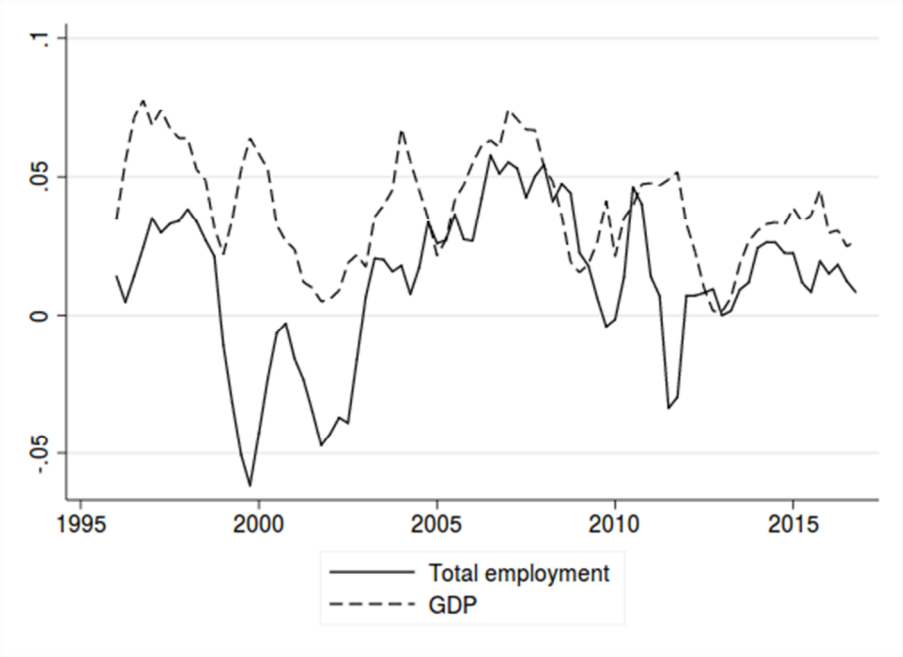
These results lead us to argue that there was (mainly) an inverse causality between the temporary and permanent employment growth rate, and that the difference in employment protection affects to a much greater extent the composition of total employment than the growth of total employment.

4.2 GDP growth and employment

Figures 4 and 5 as well as correlation matrixes 5 and 6 suggest that there is a positive relationship between changes of GDP and adjustments of employment. The Spearman

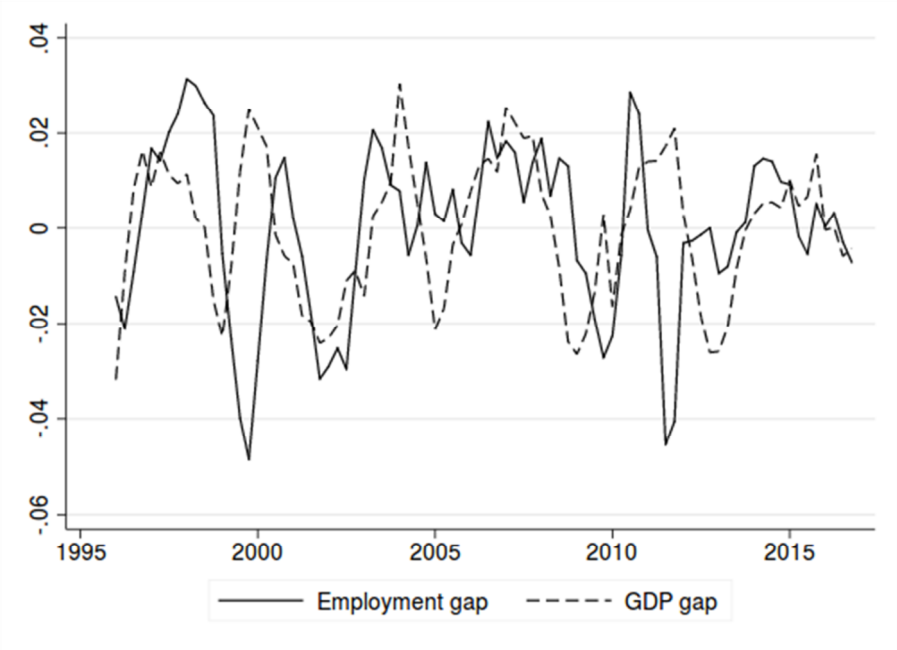
correlation coefficient between growth rates of GDP and employment is 0.47. A similar, but slightly lower, correlation can be observed for the deviations from the trend of GDP and employment. The coefficient is equal to 0.27.

Figure 4. Total employment and GDP growth (in %), 1996-2016



Source: LFS, CSO and own calculation.

Figure 5. Trend deviations in GDP and total employment (in % points), 1996-2016



Source: LFS, CSO and own calculation.

The correlations also indicate that the relationship between GPD and employment was diversified over time and across various types of employment. On the one hand, in the case of

temporary employment the correlation changed over time. During the period of "low share", the coefficient was statistically insignificant, during the period of "growing share" it was significant and negative (–0.47), whereas in the period of "high share" the coefficient was significant and positive (0.46). These results support a hypothesis that the expansion of fixed-term contracts was generally associated with the difference in labour protection and the high unemployment rate. It also seems that for the years 2006-2016, temporary employment growth was mostly driven by output growth. On the other hand, the correlation coefficients of output growth and permanent employment growth were positive, but tended to decrease over time. The difference in the correlation coefficient seems to reflect divergent trends between GDP growth and growths of temporary and permanent employment over time.

Table 5. Spearman correlation between GDP growth and total, temporary and permanent employment growth

	1996-2016	1996-2000	2002-2016	2002-2005	2006-2016
Total	0.48***	0.42*	0.54***	0.47*	0.53***
Permanent	.	0.52**	0.27**	0.51**	0.32**
Temporary	.	0.21	0.15	-0.47*	0.46***

Note: / ***/ ** / */ indicate statistical significance at the 1, 5, and 10 percent level.
Source: LSF, CSO and own calculation.

Table 6. Spearman correlation between GDP gap and total, temporary and permanent employment gap

	1996-2016	1996-2000	2002-2016	2002-2005	2006-2016
Total	0.27**	-0.14*	0.36***	0.41	0.37**
Permanent	.	.	0.16	0.31	0.10
Temporary	.	.	0.20	0.11	0.20

Note: / ***/ ** / */ indicate statistical significance at the 1, 5, and 10 percent level.
Source: LSF, CSO and own calculation.

4.3 Output elasticity of employment

In order to compute this elasticity, several econometric tools are used. The standard way to estimate these elasticities is to estimate the parameters of model (1) and (2) with the Ordinary Least Squares (OLS) method. Such estimates are the starting point of our analysis. In Table 7 we report such estimated elasticities for total employment, permanent employment and temporary employment. The results of the autocorrelation test suggest that a serious autocorrelation problem is present in these regressions. The presence of autocorrelation causes the standard OLS variance matrix estimator to be inconsistent and makes the results of standard statistical inference invalid. We use the Newey-West autocorrelation robust standard errors to account for this problem. The estimated output elasticity for the full sample of total employment at 0.56 is lower that the same estimate of permanent employment at 0.68. Both estimates are statistically significant, which contrasts with the same estimate of output elasticity of temporary employment which suggests that there is no significant relationship between GDP growth rate and the growth rate of this type of employment. These results suggest that changes in GDP significantly affect changes in employment, but this influence can mostly be observed for permanent employment.

Strong autocorrelation of the residuals can result from nonstationarity cointegration of the variables included in the regression. We used the HEGY test to check the stationarity of the quarterly growth rates of employment and GDP. The results of the testing are reported in

Table A1. For all the series, apart from the series for temporary employment, the null hypothesis of the existence of seasonal and non-seasonal unit roots are rejected at 5% significance level. In the case of the growth rate of temporary employment, a unit root at frequency zero is suggested by the results of the tests. It is well known (e.g. Granger and Newbold, 1974) that nonstationarity of the variables can seriously distort the asymptotic properties of the OLS estimator. Therefore, to check the sensitivity of our results to the assumption that all the regressors are stationary, we estimated the equations (1) also using the FM-OLS method, which is used when all the variables are I(1). The results are reported in Table A2. The estimates of the coefficient are similar to those obtained with OLS, but the only significant GDP coefficient is the one in the model for total employment.

Previous studies indicate slightly higher values of employment elasticity than 0.56. For example, Czyżewski (2002) estimated output elasticity of total employment for the years 1993-2000 at 0.7, while Ciżkowicz and Rzońca (2003) report these measures for the years 1992-2001 to be equal to 0.9. Saget (2000), in his cross-country analysis, estimates Polish output elasticity of employment for the years 1989-1999 at 0.94. Larger estimates obtained with shorter time series than the one used by us suggest that employment intensity of growth has declined in the recent years, but this can also result from methodological differences between the cited papers.

Table 7. OLS estimations equations (1)

	ΔEmployment				
	Total	Permanent	Temporary (1)	Temporary(2)	Counterfactual
ΔGDP	0.560**	0.682*	-1.066	0.216	0.505**
	(0.256)	(0.356)	(1.412)	(0.913)	(0.240)
ΔPerm. employment				-1.879***	
				(0.600)	
Constant	-0.010	-0.026	0.111	0.063*	-0.012
	(0.011)	(0.022)	(0.080)	(0.033)	(0.012)
N	84	84	84	84	84
R^2	0.161	0.138	0.037	0.367	0.134
RMSE	0.025	0.034	0.107	0.088	0.025
B-G stat.	59.327	66.321	58.428	49.620	61.667
B-G p-value	0.000	0.000	0.000	0.000	0.000
CUSUM	2.404	2.796	2.427	2.427	2.504
CUSUM 5% crit. val.	1.358	1.358	1.358	1.358	1.358

Note: B-G: Breusch-Godfrey autocorrelation test ,Newey-West standard errors in parentheses, / ***/ ** / */ indicate statistical significance at the 1, 5, and 10 percent level.
Source: LSF, CSO and own calculation.

Table 8. OLS estimations equation (2)

	Employment gap				
	Total	Permanent	Temporary(1)	Temporary(2)	Counterfactual
GDP gap	0.228***	0.211***	-0.395	-0.214*	0.345
	(0.065)	(0.074)	(0.258)	(0.125)	(0.398)
Perm. employment gap				-0.383***	
				(0.045)	
Constant	-0.000	-0.000	0.000	0.000	0.008
	(0.001)	(0.001)	(0.002)	(0.001)	(0.006)
N	84	84	84	84	84
R^2	0.036	0.027	0.008	0.051	0.036
RMSE	0.018	0.019	0.065	0.064	0.027
B-G stat.	45.442	46.091	30.431	30.554	65.027
B-G p-value	0.000	0.000	0.000	0.000	0.000
CUSUM	0.861	0.806	1.135	1.129	2.142
CUSUM 5% crit. val.	1.358	1.358	1.358	1.358	1.358

Note: B-G: Breusch-Godfrey autocorrelation test ,Newey-West standard errors in parentheses, / ***/ ** / */ indicate statistical significance at the 1, 5, and 10 percent level.
Source: LSF, CSO and own calculation

Estimates of the parameters of the regression equation (2) give conclusions similar to the conclusions above. The results of the regressions are reported in Table 8. For the years 1996-2016, the rise of GDP increases by one percentage point above the trend caused employment to rise respectively by 0.23 percentage point above the trend. Estimates of the coefficients still suggest that GDP growth has a positive effect on permanent employment only.

In order to investigate the impact of the widespread use of temporary contracts on employment elasticity, a counterfactual analysis was carried out. We constructed counterfactual quarterly rates of employment growth assuming that the employment structure was unchanged and it remained the same as in 2001. The growth rates of permanent and temporary employment are weighted by initial share and summed up to obtain the growth rate for total employment. This exercise informs us what the growth in employment would have occurred if the composition of employment over the period of 2002-2016 had been the same as in 2001. The formula used is as follows:

$$\Delta e^{A}_{2001+t} = s^{T}_{2001}\Delta e^{T}_{2001+t} + s^{P}_{2001}\Delta e^{P}_{2001+t} \quad (3)$$

where e^A , e^T and e^P are aggregate, temporary and permanent employment respectively, s^T and s^P are share of temporary and permanent employment respectively. Employment elasticities were calculated for such counterfactual time series. We conducted a regression equation (1) and (2) for the period of 1996-2016. The last columns in Table 7 and 8 report the results. The estimates of the parameters of the equation (2) are, with one exception, statistically insignificant. Counterfactual elasticity of aggregate employment over this period is 0.51. It is

noteworthy that the same coefficient for the actual numbers is larger. The difference shows the role of the composition effect and suggests that the spread of temporary contracts indeed increased the output elasticity of employment.

4.4 Relationship between permanent and temporary employment

What we consider important is the interrelationship between permanent employment and temporary employment and the channels of transmission between their dynamics and the dynamics of GDP. It seems plausible that changes in temporary employment are directly linked to changes of permanent employment. Indeed, in periods of high unemployment, higher proportion of workers who lost permanent contracts are forced into temporary employment. Such an effect can be present even if changes of the GDP growth rate have no direct impact on temporary employment. However, the analysis of the channels of transmission of the growth changes on the labour market necessitates the formulation of a simple structural model.

We started with causality testing. The Lag Augmented Vector Auto Regression (LA-VAR) methodology proposed in a paper authored by Hsiao and Wang (2007) were used. The number of lags in the VAR model was determined on the basis of BIC and augmented by one. The results of the Granger causality tests reported in Table A3 suggest that the changes of permanent employment influence the changes in temporary employment. There is also some evidence that the growth of GDP causes changes of permanent employment. It seems, however, that neither permanent nor temporary employment cause GDP growth.

The structure of the model cannot be deduced solely from the data. However, the results of Granger causality testing suggest a recursive form of the structural model. Assuming the validity of Cholesky ortogonalization of shocks, we obtain a model in which GDP growth is exogenous, permanent employment depends on GDP only and, finally, temporary employment depends both on GDP and permanent employment growth. Then we need to estimate additional equations in which temporary employment is explained not only by GDP growth but also by permanent employment growth:

$$\Delta e_t^T = \beta_0 + \beta_1 \Delta y_t + \Delta e_t^P + \varepsilon_t \tag{4}$$

$$(\Delta e_t^T - \Delta e_t^{T*}) = \beta_0 + \beta_1 (\Delta y_t - \Delta y_t^*) + (\Delta e_t^P - \Delta e_t^{P*}) + \varepsilon_t \tag{5}$$

where e^T and e^P are temporary and permanent employment respectively. Estimates of the parameters of this equation are reported in Tables 7 and 8. The estimated output elasticity of temporary employment is not significant, which suggests that temporary employment is only indirectly influenced by GDP through the changes in permanent employment growth. Implied (indirect) output elasticity of temporary employment is equal to -1.879 * 0.682= -1.281 and is close to the same elasticity estimate of -1.066 obtained from the reduced form equation.

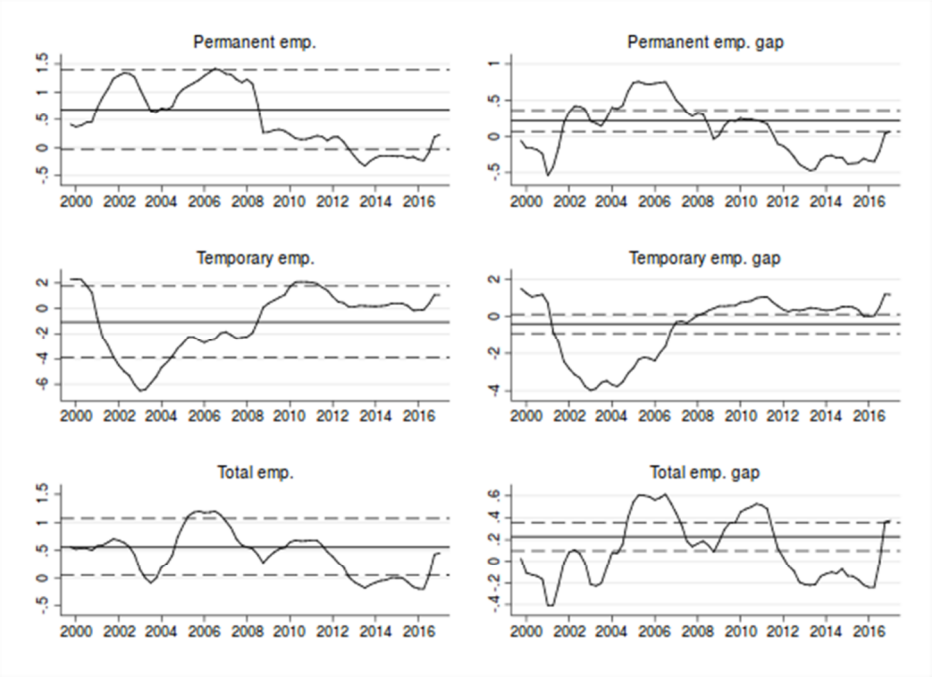
4.5 Stability of the relationship between employment and output

Next we move on to explore the issue of stability of the relationship between employment and output fluctuation for the analyzed period. For all the estimated models, the null hypothesis of stability was strongly rejected by the CUSUM test. We deal with this problem in two ways.

First, we estimate the parameters of the models of permanent and temporary employment with rolling regression. The rolling regression estimation essentially consists of the estimation of the model for all subseries of the sample (windows) with a specified number of subsequent observations. The rolling window of 20 quarters was used in our case. Interpretation of the results ought to take into account that the estimates of the parameters provided by this method change are smoothed by its construction. Figure 6 presents graphs of the estimated rolling coefficients, as well as the same coefficients calculated for the full sample (see Tables 7 and 8) and also the 95% confidence bands for rolling and full sample estimates. The rolling regression estimates of parameters outside these confidence bands for full sample estimates suggest the existence of a structural break. The graph of the rolling regression estimates represents the pattern of changes of employment elasticity.

As we can observe in Figure 6, the parameters of these models are indeed unstable. What is important, elasticities of temporary and permanent employment show the opposite movements. In the case of temporary employment, the coefficient of rolling regression is below the full sample coefficient before 2008 and above it starting from 2008. Particularly, a huge fall in elasticity of this type of employment was observable between 2000 and 2003. From 2003, elasticity started growing and the trend continued until 2012-2013. Then we observe a period of stabilization. In contrast, elasticity of permanent employment was generally above the full sample coefficient before 2008 and then we can observe a decreasing tendency until 2012-2013. Next, elasticity stabilizes. Following the discussion in Section 3, the difference in the evolutions of temporary and permanent elasticity can be construed as a change in a firm's employment strategy depending on the labour market situation. It seems plausible that over a period of high unemployment firms converted open-ended contracts into fixed-term contracts in order to reduce costs. When unemployment decreased, firms started using fixed-term contracts as the main workforce adjustment device in response to output fluctuations. In turn, stabilization of elasticities coincided with a period when employers had difficulties in finding workers due to decreasing working age populations (-3.4% between 2012 and 2016) and the unemployment rate (from 10.1% in 2012 to 5.5% in 2016). Elasticities stabilization would then reflect labour market tightness.

Figure 6. Rolling coefficients



Source: LFS, CSO and own calculation.

Total employment elasticity indicates a similar tendency as in the case of permanent employment. The rolling coefficient started declining around 2007 and then stabilized around 2012. Surprisingly, the share of temporary contracts increased, but total employment elasticity tended to decrease. This result is, on the one hand, consistent with studies which provide evidence on the instability of the relation between GDP growth and unemployment rate or employment growth rate. For instance, Daly and Hobijn (2010) Beaton (2010), Burda and Hunt (2011), Cazes, Verick and Hussami (2013). On the other hand, this result is inconsistent with the above-cited papers which analyze the influence of the share of temporary contracts on employment volatility. This inconsistency raises the question of how to explain the obtained result? What accounts for the decline of total employment elasticity? One way of answering these questions is to look at the evolution of output elasticity of temporary and permanent employment. The opposite movements of said elasticities appear to have the potential to explain this tendency. The higher share of permanent workers and declining elasticity of permanent workers can account for the decline of total employment elasticity.

The other way in which we deal with the instability of the parameters is by means of the Markow switching (MS) regression. Here we assume that two states are present in the data, both of them given by model (1), but with different parameters. The probability of remaining in the same state is given by probabilities p_{11}, p_{22} and the probabilities of changing the state - with probabilities p_{12}, p_{21}.

The estimates of the parameters of the MS regressions were obtained for separate univariate models for the permanent and temporary employment. Results of the Expectation-Maximisation (EM) procedure are reported in Table A4. Using the Bayes theorem and the estimates of the parameters, we obtain the ex-ante probabilities of the states (smoothed probabilities) which are represented by figure B1.

It is noteworthy that the close to one smoothed probability of state 1 in the model for permanent employment coincides with the close to one smoothed probability of state 1 in the model for temporary employment. The results suggest that the data consists of observations coming from two regimes. One, which was present in the years 1996-2000 and 2005-2016, was characterized by relatively higher growth elasticity of permanent employment to changes in GDP growth and with random changes of temporary employment. The second state (years 2000-2005) features lower sensitivity of permanent employment to changes of growth rates, but a strong negative relationship between the changes of permanent employment and temporary employment (substitution effect). This suggests that, indeed, the pre-accession period was unusual for the Polish labour market.

5. Conclusions

This paper investigates how, in the Polish case, the observed increased use of temporary contracts affected output elasticity of employment. Our findings confirm that a larger share of fixed-term contracts positively affects total employment responsiveness to output changes. Surprisingly, total output employment elasticity did not increase despite higher incidence of temporary contracts. One cause is that widespread adoption of temporary contracts affects to a much greater extent the employment composition than employment growth. For the most of the analyzed period, increased growth of temporary employment was associated with decreased growth in permanent employment and *vice versa*. The second cause is the opposite trends in output elasticity of temporary and permanent employment. While elasticity of temporary employment tends to be growing, elasticity of permanent employment tends be in decline. Further research is needed to explain the changes of elasticities of temporary and permanent employment.

References

Arak, P., P. Lewandowski and P. Żakowiecki (2014), „Fikcja zatrudnienia w Polsce – propozycje wyjścia z impasu", IBS Working Paper, 01/2014.

Beaton, K. (2010), *Time variation in Okun's law: a Canada and U.S. comparison*, Bank of Canada Working Paper, No. 2010-7.

Benito, A. and I. Hernado (2008), "Labour Demand, Flexible Contracts and Financial Factors: Firm-Level Evidence from Spain", *Oxford Bulletin of Economics and Statistics* 70 (3): 283–301.

Bentolila, S. and G. Bertola (1990), "How Bad is Eurosclerosis*?" Review of Economic Studies* 57 (3): 381-402.

Bentolila, S., P. Cahuc P., J.J. Dolado and T. Barbanchon (2012), "Two-Tier Labor Markets in the Great Recession: France vs. Spain"*, The Economic Journal* 122 (562): F155-F187.

Bentolila, S. and G. Saint-Paul (1992), "The macroeconomic impact of flexible labor contracts, with an application to Spain", *European Economic Review*, 36(5): 1013-1047.

Burda, M. and J. Hunt (2011), "What Explains the German Labor Market Miracle in the Great Recession?" *Brookings Papers on Economic Activity,* Spring: 273-235.

Cahuc, P, O. Charlot and F.Malherbet (2016), "Explaining the spread of temporary jobs and its impact on labor turnover", *International Economic Review*, 57(2): 533-572.

Cazes, S., S. Verick and F.A. Hussami (2013), "Why did unemployment respond so differently to the global financial crisis across countries? Insights from Okuns Law", *IZA Journal of Labor Policy* 2 (10): 2-18.

Central Statistical Office (2016), *Employment in national economy in 2015*, CSO, Warsaw 2016.

Central Statistical Office, *Quarterly information on the labour market*, CSO – various years.

Central Statistical Office, *Statistical bulletins*, CSO – various years.

Cichocki, S., M. Gradzewicz and J. Tyrowicz (2015), „Wrażliwość zatrudnienia na zmiany PKB w Polsce a elastyczność instytucji rynku pracy", *Gospodarka Narodowa* 278 (4): 96-116.

Costain, J., J.F. Jimeno and C. Thomas (2010), "Employment fluctuations in a dual labor market", Banco de España Documentos de Trabajo, No. 1013.

Daly, M. and B. Hobijn (2010), "Okun's Law and the Unemployment Surprise of 2009", FRBSF Economic Letter, March 8.

Diagnoza Społeczna 2015. Warunki i jakość życia Polaków, Rada Monitoringu Społecznego, Warszawa 2016.

Gatti, R., K. Goraus and M. Morgandi (2014), "Balancing Flexibility and Worker Protection. Understanding Labor Market Duality in Poland", The World Bank, Washington DC.

Garibalid, P. and P. Mauro (2002), "Anatomy of employment growth"*, Economic Policy* 17 (34): 67-114.

Granger, C. W. J. and P. Newbold (1974), "Spurious regressions in econometrics", *Journal of Econometrics*, 2(2): 111-120.

IMF (2010), "Unemployment dynamic during recessions and recoveries: Okun's law and beyond", *World Economic Outlook: Rebalancing Growth*, April, Chapter 3.

Hsiao, C., and S. Wang (2007), "Lag-augmented two- and three-stage least squares estimators for integrated structural dynamic models", *Econometrics Journal* 10(1): 49-81.

Kahn, L.M. (2010*),* Employment Protection Reforms, Employment and the Incidence of Temporary Jobs in Europe: 1995–2001, *Labour Economic*, 17:1-15.

MRPiPS (2016), *Informacja o działalności agencji zatrudnienia w 2015 roku*, MRPiPS, Warszawa.

OECD, (2012), "Inequality in labour income – What are its drivers and how can it be reduced?", OECD Economics Department Policy Notes, No. 8

Okun, A. M. (1962), "Potential GNP: Its Measurement and Significance", Reprinted as Cowles Foundation Paper 190. http://cowles.econ.yale.edu/P/cp/p01b/p0190.pdf

Saczuk, K. (2014), *Badanie Aktywności Ekonomicznej Ludności w Polsce w latach 1995-2010. Korekta danych*, „Materiały i Studia NBP", nr 301, NBP Warszawa.

Saget, C. (2000). "Can the Level of Employment be explained by GDP Growth in Transition Countries? (Theory versus the Quality of Data)," *Labour* 14 (4): 623-644.

Social Insurance Institution, *Statistical Yearbook of Social Insurance*, SII – various years.

Appendix A

Table A1. HEGY tests for seasonal unit roots

	Employment				
	Total	Permanent	Temporary	ΔGDP	Critical value 5%
t(0)	-2,942	-2,592	-2,206	-3,304	-2,441
t(Pi)	-7,106	-6,915	-6,229	-6,907	-2,442
F(Pi/2)	23,917	35,177	36,274	23,443	4,032
F(All_seas)	138,873	125,959	55,386	89,013	3,865
F(All)	107,019	96,044	42,848	70,153	3,723

Table A2. FMOLS estimates of equation (1)

	ΔEmployment			
	Total	Permanent	Temporary	Temporary
ΔGDP	0.739***	0.735	-0.921	0.633
	(0.285)	(0.518)	(1.540)	(0.862)
ΔPerm. employment				-2.368***
				(0.471)
Constant	-0.017	-0.028	0.109	0.048
	(0.012)	(0.023)	(0.067)	(0.037)
N	83	83	83	83
R^2	0.120	0.215	0.053	0.361
RMSE	0.026	0.034	0.182	0.111

Table A3. Granger causality tests

	chi2	*df*	*p-value*
	ΔPermanent employment		
ΔTemporary employment	.927	2	.629
ΔGDP	5.246	2	.073
ALL	6.599	4	.159
	ΔTemporary employment		
ΔPermanent employment	7.240	2	.027
ΔGDP	1.121	2	.571
ALL	10.009	4	.040
	ΔGDP		
ΔPermanent employment	1.474	2	.479
ΔTemporary employment	.509	2	.775
ΔGDP:ALL	1.537	4	.820

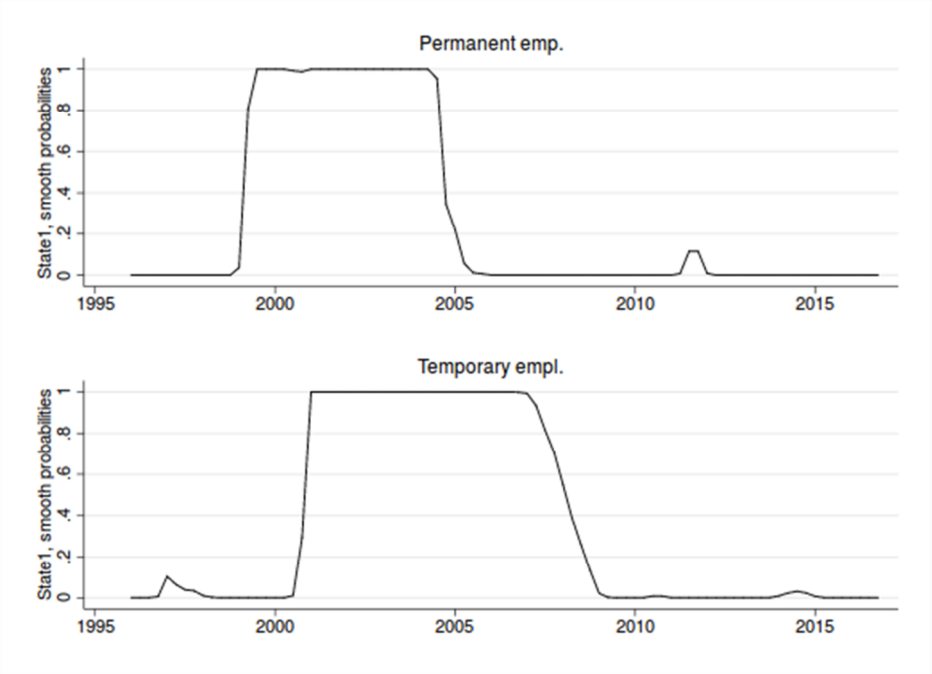
Table A4. Estimates of parameters of Markow switching model

	Employment	
	Permanent	Temporary
State1		
ΔGDP	0.708***	0.086
	(0.214)	(0.850)
ΔPermanent employment		-1.936***
		(0.435)
Constant	-0.070***	0.145***
	(0.009)	(0.043)
State2		
ΔGDP	0.342***	0.343
	(0.130)	(0.373)
ΔPermanent employment		0.284
		(0.264)
Constant	0.004	-0.008
	(0.006)	(0.016)
sigma	0.019	0.047
	(0.002)	(0.004)
p11	0.941	0.952
	(0.050)	(0.041)
p21	0.016	0.017
	(0.016)	(0.019)
N	84	84

Note: Standard error in parentheses. Wald statistic cannot be used for testing the significance of sigm, p11, p21 and then stars for these parameters were omitted.

Appendix B

Figure B1. Probability of state 1



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