THE IMPACT OF COMPENSATION PAYMENTS ON EMPLOYMENT, IN REGIONAL STRUCTURES

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Abstract

Compensation payments are considered active labour market policies designed to increase efficiency, to mitigate unemployment and to sustaining employment. We tested this hypothesis for the period 1993-2013, in territorial structures (42 counties) through a dynamic panel model (confirmed by Granger causality tests – Toda-Yamamoto version), and by means of error correction model. We found that the dynamics of regional employment are positively related to expenditure incurred for active policies and there are negatively correlated with the ratio between the unemployment average indemnity (and support allowance) and the average net nominal monthly salary earnings. But, the connexion between employment and compensation payments converges extremely slowly for a long-term stable relationship.

Keywords: *employment, compensation payment, dynamic panel models, causality tests, error correction model.*

1. Introduction

This paper offers a presentation of econometric models for analysing the impact of economic policy measures on the dynamics of employment, on territorial structures (NUTS-3) level.

In details, we analyse the impact of expenditure incurred for active policies to stimulate the increase of employment on the dynamics of employment, during 1993 – 2013.

As a methodology, we used a dynamic panel data model and an error correction model (ECM) – built in the general frame of vector autoregressive (VAR) analysis.

2. The data

We used the data from national statistics, like:

- for the data concerning *expenditures for unemployed social protection* the source is National Institute of Statistics, TEMPO Online, table SOM102A - Annual expenditures to unemployed social protection by expenditure categories, macroregions, development regions and counties (thousand RON);
- for *unemployment* the source is National Institute of Statistics, TEMPO Online, table SOM101A – Registrated unemployed by categories of unemployed, gender, macroregions, development regions and counties, at the end of the month (number of persons);
- for *civil economically active population* the source is National Institute for Statistics, TEMPO Online, table FOM103A – Civil economically active population by activity of national economy at level of CANE Rev.1 section, gender, macro regions, development regions and counties: 1992-2008 and FOM103D – Civil economically active population by activity of national economy at level of CANE Rev.2 section, gender, macro regions, development regions and counties: 2008-2013, thousand persons;
- for *the average net nominal monthly salary earnings* – National Institute for Statistics, TEMPO Online, table FOM106A – Average net nominal monthly salary earnings by economic activities at level of CANE Rev.1 section, categories of employees, macro regions, development regions and counties, 1990-2008) and FOM106E – Average net nominal monthly salary earnings by economic activities at level of CANE Rev.2 section, sex, macro regions, development regions and counties: 2008-2013, RON;
- for *gross domestic product*, by macro-regions, development regions and counties – National Institute for Statistics, TEMPO Online, table CON103C – GDP by macro regions, development regions and countries, calculated according CANE Rev.1, for 1995 - 2008) and CON103I – GDP by macro regions, development regions and countries (ESA 2010), calculated according CANE Rev.2, for 2000-2012, millions of RON.

We are evaluated the econometric characteristic of these time series. To be exact, we tested for stationarity (Im, Pesaran and Shin unit root test for panel date series). The results are presented in the following table:

Im, Pesaran and Shin Unit Root Test
Null Hypothesis: Unit root
Probability of null hypothesis

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	ocup	d(ocup)	cha /gdp	cms /csn	gdp, %
BH	0.000	0.010	0.242	0.098	0.018
BN	0.229	0.001	0.081	0.136	0.035
CJ	0.627	0.006	0.147	0.012	0.002
MM	0.986	0.000	0.000	0.690	0.007
SM	0.329	0.008	0.112	0.015	0.094
SJ	0.325	0.000	0.341	0.134	0.005
AB	0.278	0.011	0.366	0.603	0.026
BV	0.421	0.015	0.226	0.911	0.002
CV	0.016	0.000	0.003	0.025	0.004
HR	0.897	0.009	0.025	0.008	0.009
MS	0.256	0.000	0.786	0.030	0.007
SB	0.756	0.002	0.020	0.034	0.033
BC	0.510	0.008	0.022	0.003	0.009
BT	0.546	0.022	0.056	0.147	0.016
IS	0.337	0.001	0.000	0.014	0.070
NT	0.124	0.006	0.008	0.010	0.109
SV	0.238	0.000	0.005	0.139	0.005
VS	0.439	0.000	0.017	0.016	0.014
BR	0.402	0.000	0.017	0.059	0.012
BZ	0.410	0.000	0.000	0.025	0.020
CT	0.505	0.015	0.097	0.038	0.000
GL	0.733	0.005	0.551	0.074	0.011
TL	0.164	0.002	0.371	0.054	0.039
VR	0.509	0.001	0.186	0.100	0.048
AG	0.733	0.002	0.197	0.205	0.026
CL	0.689	0.001	0.000	0.272	0.035
DB	0.025	0.001	0.009	0.008	0.019
GR	0.543	0.015	0.000	0.039	0.038
IL	0.940	0.008	0.095	0.136	0.071
PH	0.542	0.355	0.002	0.753	0.189
TR	0.865	0.007	0.243	0.020	0.019
IF	0.464	0.191	0.000	0.006	0.433
B	0.315	0.008	0.034	0.083	0.118
DJ	0.371	0.002	0.234	0.215	0.006
GJ	0.187	0.011	0.024	0.051	0.002
MH	0.156	0.000	0.121	0.359	0.007
OT	0.519	0.001	0.002	0.098	0.016
VL	0.369	0.000	0.010	0.001	0.003
AR	0.394	0.002	0.022	0.061	0.001
CS	0.039	0.000	0.002	0.477	0.001
HD	0.367	0.083	0.008	0.098	0.018
TM	0.519	0.013	0.004	0.022	0.002

The above results are generated by the software EViews-8.

Legend:

OCUP = employment (thousand persons);

GDP = gross domestic product (millions of RON);

CHS = unemployment indemnity (and support allowance, until 2006), thousand RON;

CHA = CPSS – CHS, expenditure for active labour market policies to stimulate the increase of employment (thousand RON), where:

CPSS = expenditures for unemployed social protection (thousand RON);
CSN = average net nominal monthly salary earnings (RON);
CMS = CHS/SOM, i.e., average unemployment indemnity (and support allowance), thousand RON/person, where:
SOM = unemployment (number of persons).

The above table shows the following characteristics of series:

Series	Nature of series:
OCUP	I(1)
$\frac{CHA}{GDP}$	I(0)
$\frac{CHS/SOM}{CSN/1000}$	I(0)
@pc(GDP)	I(0)

So, the series concerning civil employment is integrated of first order, denoted I(1), and the other are stationary, symbolized I(0).

3. Causality relationship between employment and active labour market policies

We analyze the causality relationship between dynamics of employment (OCUP) and expenditure incurred for active policies to stimulate the increase of employment (CHA), as share to gross domestic product (GDP), namely, $\frac{CHA}{GDP}$. The Granger Causality Test is applied on a model with two control variables: the first control variable is the ratio between the unemployment average indemnity (and support allowance – until 2006), CHS/SOM, toward average net nominal monthly salary earnings, CSN, namely, $\frac{CHS/SOM}{CSN/1000}$, and the second control variable is the percentage change in GDP, namely, @PC(GDP). The results are presented in the following table:

VAR Granger Causality/Block Exogeneity Wald Tests

Sample: 1993 2015
Included observations: 630
Dependent variable: d(OCUP)

Excluded	Chi-sq	df	Prob.
$\frac{CHA}{GDP}$	26.78092	2	0.0000
$\frac{CHS/SOM}{CSN/1000}$	7.404576	2	0.0247
@PC(GDP)	9.317361	2	0.0095
All	50.82695	6	0.0000

The above results are generated by the software EViews-8.

If we reject the hypothesis that expenditure for active labour market policies to stimulate the increase of employment (CHA), as share to GDP, $\frac{CHA}{GDP}$, does not Granger Cause the dynamics of employment, then the error is insignificant (less than 0.01%). Therefore, we reject the hypothesis of non-causality (as defined by Granger). Further, we reject both the hypothesis that the ratio between the unemployment average indemnity (and support allowance), CHS/SOM, toward average net nominal monthly salary earnings, CSN, namely $\frac{CHS/SOM}{CSN/1000}$, does not Granger Cause the dynamics of employment and the same relationship between the GDP growth and the dynamics of employment.

It is interesting that the relationships between dynamics of employment and the evolution of expenditure for active labour market policies to stimulate the increase of employment are not reciprocal interactions. In the next table, we can observe that if we reject the hypothesis that dynamics of employment does not Granger Cause the expenditure for active policies to stimulate the increase of employment (CHA), as share to GDP, $\frac{CHA}{GDP}$, then the error is about 78.6% (see table below), much higher than standard significance level (5%).

Also, the available data do not signal the existence of a causality relationship between expenditure for active policies to stimulate the increase of employment, as share to GDP, $\frac{CHA}{GDP}$, and the ratio between the unemployment average indemnity (and support allowance), toward average net nominal monthly salary earnings, $\frac{CHS/SOM}{CSN/1000}$. If we reject the hypothesis of non-causality between these two variables, then the error is larger than 30% (see table below).

Dependent variable: $\frac{CHA}{GDP}$

Excluded	Chi-sq	df	Prob.
d(OCUP)	0.4809	2	0.7863
$\frac{CHS/SOM}{CSN/1000}$	2.3779	2	0.3045
@PC(GDP)	169.16	2	0.0000
All	236.69	6	0.0000

The above results are generated by the software EViews-8.

Like in employment case, we do not reject the hypothesis that GDP dynamics is Granger cause on expenditure for active labour market policies to stimulate the increase of employment.

4. Vector Error Correction Model

Granger causality test assesses only the possibility of a link between two variables, without estimating direction and intensity of such a link. We evaluate further the possibility that between the dynamics of employment and expenditure for active policies to stimulate the increase of employment to be a long-term stable connection. Econometric test whether these series are cointegrated.

4.1. Tests for cointegration

Because the series are relatively short (1993 – 2013), for increased confidence, we use two panel cointegration tests: *Kao (Engel-Granger based) Residual Cointegration Test* and *Fisher (combined Johansen) Panel Cointegration Test*. The EViews-8 results are presented below.

Kao Residual Cointegration Test

Series: d(OCUP), $\frac{CHA}{GDP}$, $\frac{CHS/SOM}{CSN/1000}$, @PC(GDP)

Sample: 1993 2015

Included observations: 966

Null Hypothesis: No cointegration

Trend assumption: No deterministic trend

User-specified lag length: 1

Newey-West automatic bandwidth selection and Bartlett kernel

ADF	t-Statistic	Prob.
	-3.491228	0.0002
Residual variance	301.6127	
HAC variance	106.2654	

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(RESID)

Method: Least Squares

Sample (adjusted): 1998 2012

Included observations: 630 after adjustments

Variable	Coef	Std. Error	t-St.	Prob
RES_{-1}	-0.85	0.0511	-16.7	0.00
$D(RESD_{-1})$	-0.24	0.0336	-7.1	0.00
R-sq.	0.60	MDV		-0.36
Adj.R-sq.	0.60	S.D. DV		17.51
SER	11.1	AIC		7.648
SSR	76819	SIC		7.662
LLh	-2407	HQC		7.654
DW stat	2.09			

According to *Kao (Engel-Granger based) Residual Cointegration Test, rejecting the Null Hypothesis* (no cointegration) involves an error of 0.02%, below the standard 5%. Accordingly, we reject the null hypothesis: we do not have econometric arguments to accept the hypothesis that the series are not cointegrated.

We present also the EViews-8 results for *Fisher (combined Johansen) Panel Cointegration Test* with no deterministic trend in the data, and no intercept or trend in the cointegrating equation:

Johansen Fisher Panel Cointegration Test

Series: d(OCUP), $\frac{CHA}{GDP}$, $\frac{CHS/SOM}{CSN/1000}$, @PC(GDP)

Sample: 1993 2015

Included observations: 966

Trend assumption: No deterministic trend

Lags interval (in first differences): 1 1

Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)

	Fisher Stat			
Hypothesized No. of CE(s)	trace test	Prob.	max-eigen test	Prob.
None	1051.	0.00	762.4	0.00
At most 1	505.3	0.00	354.2	0.00
At most 2	256.8	0.00	202.6	0.00
At most 3	173.4	0.00	173.4	0.00

Probabilities are computed using asymptotic Chi-square distribution.

Individual cross section results

	Trace	Prob.	Max-Eign	Prob.
Hypothesis of no cointegration				
AB	56.406	0.000	26.970	0.020
AG	56.362	0.000	26.480	0.024
AR	80.931	0.000	38.168	0.000
B	62.208	0.000	32.898	0.003
BC	67.159	0.000	27.398	0.017
BH	90.797	0.000	38.968	0.000
BN	65.794	0.000	39.492	0.000
BR	99.082	0.000	77.596	0.000
BT	88.096	0.000	46.099	0.000

	Trace	Prob.	Max-Eign	Prob.
Hypothesis of no cointegration				
BV	63.898	0.000	36.014	0.000
BZ	73.876	0.000	31.224	0.004
CJ	91.145	0.000	51.769	0.000
CL	46.149	0.011	23.361	0.063
CS	125.100	0.000	86.681	0.000
CT	87.419	0.000	53.907	0.000
CV	94.344	0.000	49.253	0.000
DB	72.216	0.000	28.207	0.013
DJ	44.806	0.015	27.711	0.015
GJ	141.306	0.000	78.256	0.000
GL	54.067	0.001	24.893	0.039
GR	56.031	0.000	42.379	0.000
HD	96.898	0.000	64.974	0.000
HR	62.641	0.000	44.608	0.000
IF	33.911	0.185	15.493	0.465
IL	67.488	0.000	46.910	0.000
IS	62.347	0.000	33.836	0.001
MH	64.081	0.000	34.971	0.001
MM	91.822	0.000	56.949	0.000
MS	77.680	0.000	45.551	0.000
NT	77.154	0.000	42.409	0.000
OT	74.638	0.000	41.880	0.000
PH	74.782	0.000	34.150	0.001
SB	80.580	0.000	31.844	0.003
SJ	84.773	0.000	34.074	0.001
SM	48.808	0.005	26.109	0.026
SV	77.227	0.000	59.356	0.000
TL	87.922	0.000	48.547	0.000
TM	93.412	0.000	54.362	0.000
TR	54.431	0.001	33.903	0.001
VL	63.688	0.000	33.354	0.002
VR	71.855	0.000	36.420	0.000
VS	83.113	0.000	51.666	0.000

MacKinnon-Haug-Michelis (1999) p-values

In above table, in the first column, there are the 42 Romanian counties. In order to reduce the publishing space, we have not presented the final three tables of Johansen test (hypothesis of at most 1, 2 and 3 cointegration relationship).

The *Fisher (combined Johansen) Panel Cointegration Test* reject the null hypothesis: no cointegration relationship between the variables, both in panel (as common relationship – first above table of test) and in individual cross section (all the 42 counties – the second above table).

4.2. The model

Given the results of cointegration tests, we build a Vector Error Correction (VEC) model.

$$d^2(OCUP_{it}) = \beta[d(OCUP_{i,t-1}) + a_1 d\left(\frac{CHA_{t-1}}{GDP_{t-1}}\right) + a_2 \frac{CHS_{t-1}/SOM_{t-1}}{CSN_{t-1}/1000} + a_3@PC(GDP_{t-1})] +$$

$$+ b_1 d^2(OCUP_{i,t-1}) + b_2 d^2(OCUP_{i,t-2}) + b_3 d\left(\frac{CHA_{i,t-1}}{GDP_{i,t-1}}\right) + b_4 d\left(\frac{CHA_{i,t-2}}{GDP_{i,t-2}}\right) +$$

$$+ b_5 d\left(\frac{CHS_{i,t-1}/SOM_{i,t-1}}{CSN_{i,t-1}/1000}\right) + b_6 d\left(\frac{CHS_{i,t-2}/SOM_{i,t-2}}{CSN_{i,t-2}/1000}\right) + b_7 d[@PC(GDP_{i,t-1})] +$$

$$+ b_8 d[@PC(GDP_{i,t-2})] + e_{it}.$$

where

$d^2(X) = (1 – L)^2X_t$, and L is lag operator: $L(X_t) = X_t – X_{t-1}$;

$@PC(X_t) = [(X_t – X_{t-1})/X_t]\cdot 100$, one-period percentage change (%);

$OCUP_{it}$ = employment, in county *i*, year *t*, thousand persons;

SOM_{it} = unemployment, in county *i*, year *t*, persons;

GDP_{it} = gross domestic product, in county *i*, year *t*, millions RON;

CHS_{it} = unemployment indemnity (and Support allowance, until 2006), in county *i*, year *t*, thousand RON;

CHA_{it} = expenditure for active policies to stimulate the increase of employment in county *i*, year *t*, thousand RON;

CSN_{it} = average net nominal monthly salary earnings, in county *i*, year *t*, RON

If $\beta < 0$ is econometrically significant, then the model evolves towards a long-term equilibrium relationship:

$$d(OCUP_{i,t-1}) + a_1 d\left(\frac{CHA_{t-1}}{GDP_{t-1}}\right) + a_2 \frac{CHS_{t-1}/SOM_{t-1}}{CSN_{t-1}/1000} + a_3@PC(GDP_{t-1}) = 0$$

In other words, the long-term equilibrium relationship is:

$$d(OCUP_{i,t-1}) = -a_1 d\left(\frac{CHA_{t-1}}{GDP_{t-1}}\right) - a_2 \frac{CHS_{t-1}/SOM_{t-1}}{CSN_{t-1}/1000} - a_3@PC(GDP_{t-1})$$

For the above model, we selected VAR process with lag = 2 by using VAR Lag Order Selection

Criteria from EViews-8, with lag – max = 15, as follow:

Lag	LR	AIC	SC	HQ
1	NA	12.82	13.28	13.00
2	102*	11.85	12.8*	12.2*
3	23.47	11.91	13.30	12.47
4	11.24	12.12	13.98	12.87
5	15.22	12.27	14.58	13.20
6	25.14	12.23	15.01	13.35
7	25.23	12.16	15.40	13.46
8	13.53	12.28	15.98	13.77
9	18.64	12.27	16.44	13.95
10	25.12	12.08	16.71	13.94
11	9.92	12.22	17.31	14.26
12	19.77	12.05	17.60	14.28
13	24.12	11.67	17.69	14.09
14	15.31	11.51	17.99	14.11
15	13.63	11.3*	18.27	14.11

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

In above table, excepting AIC (inconclusive, lag = 15 is not acceptable), all other criterions indicate the lag = 2.

5. Results and conclusions

The EViews-8 results of the model are as follows:

Vector Error Correction Estimates
Sample (adjusted): 1999 2012
Included observations: 588 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
$d(OCUP_{t-1})$	1.000000
$\frac{CHA_{t-1}}{PIB_{t-1}}$	-5402.507
	(418.872)
	[-12.8977]
$\frac{CHS_{t-1}/SOM_{t-1}}{CSN_{t-1}/1000}$	5086.404
	(929.370)
	[5.47296]
$@PC(GDP_{t-1})$	-639.8350
	(79.3631)
	[-8.06212]

Error Correction:	d(OCUP, 2)
CointEq1	-8.77E-05
	(1.7E-05)
	[-5.28629]
$d(OCUP_{t-1}, 2)$	-0.811589
	(0.03887)
	[-20.8806]
$d(OCUP_{t-2}, 2)$	-0.242868
	(0.03767)
	[-6.44668]
$d\left(\frac{CHA_{t-1}}{GDP_{t-1}}\right)$	-0.422639
	(0.16466)
	[-2.56677]
$d\left(\frac{CHA_{t-2}}{GDP_{t-2}}\right)$	-0.066607
	(0.12012)
	[-0.55451]
$d\left(\frac{CHS_{t-1}/SOM_{t-1}}{CSN_{t-1}/1000}\right)$	-0.633559
	(0.79649)
	[-0.79544]
$d\left(\frac{CHS_{t-2}/SOM_{t-2}}{CSN_{t-2}/1000}\right)$	1.409310
	(0.78894)
	[1.78634]
$d(@PC(GDP_{t-1}))$	0.163798
	(0.03099)
	[5.28494]
$d(@PC(GDP_{t-2}))$	0.114653
	(0.02377)
	[4.82356]
R-squared	0.513782
Adj. R-squared	0.507064
Sum sq. resids	90555.31
S.E. equation	12.50598
F-statistic	76.47807
Log likelihood	-2315.211
Akaike AIC	7.905478
Schwarz SC	7.972469
Mean dependent	0.596088
S.D. dependent	17.81240

Determ.res.cov. (dof adj.)	34388
Determinant resid.cov.	32330
Log likelihood	-6390.2
AIC	21.871
Schwarz criterion	22.169

In order to reduce the publishing space, we have not presented the cointegrating equations for the other variables: $\frac{CHA}{PIB}$, $\frac{CHS/SOM}{CSN/1000}$ and $@PC(GDP_{t-1})$.

In the model, $\beta = -8.77E\text{-}05 < 0$, is negative and significantly different from zero (t-stat = -5.28629). This means there is a long-term relationship between dynamics of employment and the exogenous variables from model:

$$d(OCUP_{i,t-1}) = 5402.507\, d\left(\frac{CHA_{t-1}}{GDP_{t-1}}\right) -$$

$$- 5086.404 \frac{CHS_{t-1}/SOM_{t-1}}{CSN_{t-1}/1000} +$$

$$+ 639.835 \ @PC(GDP_{t-1})$$

and all variables are significantly different from zero. But, the connexion between employment and compensation payments converges extremely slowly for this long-term stable relationship.

In other words, the raise of the expenditure for active policies to stimulate the increase of employment (CHA) was associated, in the period under review, with a positive trend in employment as long-term trend. Also as a long-term trend, increase in payments for unemployment indemnity and support allowance, in relation to average net nominal monthly salary earnings had a negative effect on employment growth, probably by stimulating a behavior of discouraging job search. Obviously, as was anticipated, the link between gross domestic product growth, @PC(GDP) and the dynamics of employment, d(OCUP) is positive on long term and significantly not null.

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