

A Panel Cointegration Analysis of the Nexus between Second Job Holding, Hours Constraint and Unemployment in Baltic Nations

Dr. Shyamsundar Pal

Assistant Professor in Economics

Hooghly Mohsin College, Chinsurah, Hooghly, W.B.

[Abstract]

The purpose of this study is to unveil the long run association between second job holding, unemployment and hours constraint in the Baltic states of Estonia, Latvia, and Lithuania using quarterly panel data from Eurostat for the period of 2009Q1 to 2017Q4. The Levin, Lin, and Chu (LLC), and Im, Pesaran and Shin (IPS) tests revealed that all series are integrated of order one. The panel cointegration tests of Pedroni, and Kao confirmed the long run association between second job holding, unemployment and hours constraint. Both the Trace and Maximum Eigenvalue tests of the Johansen Fisher Panel Cointegration Test suggested that the panel series contains one cointegrating equation. The estimated Panel Vector Error Correction Model (PVECM) has a significant and negative error correction coefficient, indicating that the panel data on second job holding, unemployment, and hours constraint are cointegrated and approaching towards a long-run equilibrium. The estimated coefficients of the Fully Modified Ordinary Least Squares (FMOLS) and Dynamic Ordinary Least Squares (DOLS) revealed that both hours constraint and unemployment have a long-run impact on second job holding in Baltic countries, but the effect of hours constraint is more significant than unemployment.

Keywords: *Second Job Holding, Hours Constraint, Unemployment, Panel Cointegration Analysis, Panel VECM, FMOLS, DOLS*

1. Introduction

The issue of second job holding or moonlighting is present in almost every advanced economy (Combos, McKay and Wright (2007)). In contemporary economies, more people are taking on second occupations in addition to their primary ones because of the flexible working conditions (Baines and Newell (2004), Combos, McKay and Wright (2007)). In today's world, the impact of second job holding is usually unclear. According to Casacuberta and Gandelman (2006), society may benefit in terms of value creation when workers moonlight as part-time artists. Activities related to moonlighting businesses may assist moonlighters in developing certain abilities. Second job holding is a technique that may influence the process of professional transition and may facilitate the development of skills (Dickey, Watson and Zangelidis (2009), Panos, Pouliakas and Zangelidis (2011)). However, multiple jobholders usually attempt to avoid paying taxes to the national tax collection authorities on their subsidiary income, which is a drawback of second job holding. This trend of tax

evasion may strengthen the shadow and underground economy (Frey and Schneider (2000), Barth and Ognedal (2005), Schneider (2010)). Moonlighting in jobs related to both public and private responsibilities may lead to some inefficiencies in performance and productivity (Biglaiser and Ma (2007)).

Teaching performances may suffer if faculty members moonlight (Akande, Akindele and Ologunde (2013)). Sangwan (2014) listed several other disadvantages of moonlighting, such as the potential for competition, conflicts of interest in corporate secrets, labour inefficiencies, etc. Multiple job holding may also have impact on employment levels (Bell, Hart and Wright (1997), Panos, Pouliakas and Zangelidis (2011), Hirsch, Husain and Winters (2015)). The economics of second job holding is a challenging field of study since it affects economies in ways that are both beneficial and detrimental.

There are numerous aspects to the concept of holding a second job. Regardless of the nature of secondary employment, any kind of work done in addition to the principal job is regarded as second job holding (O'Connell (1979), Shisko and Rostker (1976), Krishnan (1990), Ritter (1998), Renna and Oaxaca (2006)). Guariglia and Kim (1999) defined second job holding (moonlighting) as maintaining an informal second job in addition to an official one after acknowledging that the majority of secondary occupations are a part of the unorganized sector of the economy. According to Sennholz (1984), Frey and Schneider (2000), and Schneider and Enste (2002), second job holding (moonlighting) is the practice of working numerous jobs without reporting earnings from secondary jobs to the income tax office in order to avoid paying taxes. Working a part-time job in addition to principal full-time job is known as moonlighting (Betts (2006)). Blue-moon refers to part-time secondary jobs, and full-moon refers to a circumstance where secondary jobs are full-time heterogeneous jobs, according to Banerjee (2012).

Using quarterly data for the period of 2009Q1 to 2017Q4 from Eurostat, this study uses a panel cointegration approach to determine the long-run association between second job holding, unemployment and hours constraint in the Baltic states of Estonia, Latvia, and Lithuania from 2009Q1 to 2017Q4. One of the most well-known financial justifications for second job holding is hours constraints. The concept of the 'hours constraint' motivation for multiple job holding was originally suggested by Shisko and Rostker (1976). When a utility-maximizing worker cannot provide all of the utility-maximizing hours of work in primary job at a given (current) wage rate, the worker becomes hours-constrained. In addition to unemployment, the 'hours constraint' is considered another important predictor of second job holding since prospective studies confirm 'hours constraint' as an important motive behind second job holding.

Three Northern European sovereign states (Estonia, Latvia, and Lithuania) that are located along the Baltic Sea's eastern shore are referred to as the Baltic nations. After decades of Soviet domination, the Baltic states of Estonia, Latvia, and Lithuania regained their freedom in the early 1990s. On September 6, 1991, the USSR recognized their independence. In tandem with the shift to democracy and political reform, the former command economies under Soviet rule were converted into market economies through laws that updated key macroeconomic elements, such as the central bank, national audit, budgetary regulations, and currency. Together with their competent and reasonably low-paid workforce, the Baltic nations saw significant economic liberalization and reforms around 2000, which drew significant international investment and spurred economic expansion.

The Baltic countries experienced the highest rates of growth in Europe between 2000 and 2007. Cross-border capital flows collapsed as a result of the 2008 financial crisis, leading to some of Europe's worst recessions. The economic downturn of Baltic states accelerated as the crisis spread throughout the Eastern and Central Europe. Their economic conditions stabilized in 2010 and they saw the fastest recovery in the European Union in 2011. Each of the three countries belongs to the European Union. Latvia adopted the Euro in January 2014, Lithuania in January 2015, and Estonia in January 2011. The World Bank has categorized all three Baltic nations as high-income economies, and they all maintain extremely high Human Development Index.

This study contributes to the body of knowledge by examining the predictive value of 'hours constraint' and 'unemployment' in predicting the second job holding in the Baltic states using Panel Cointegration Analysis (PCA) and Panel Vector Error Correction Model (PVECM). This paper is organized as follows: Section 2 reviews some selected literature, Section 3 describes the data, methodology and empirical results and Section 4 concludes the study.

2. Review of Literature

The 'Hours Constraint' is the most significant factor influencing employees' decisions to hold second job. Shisko and Rostker (1976) were the first to propose the idea of the 'hours constraint' explanation for multiple job holding. A utility-maximizing worker becomes hours-constrained due to inability of supplying all of the utility-maximizing hours of work in primary job at a specific (existing) wage rate. In order to maximize utility, the hours constrained worker will often use their 'unused' time for other (secondary) jobs. Given the wage rate and utility-maximizing objectives, it describes a circumstance in which employees are unable to deliver as many hours in their primary job as they would want. To put it another way, multiple job holders are underemployed in their primary occupation in terms of hours worked.

Based on the microeconomic theory of labor-leisure choice, the 'Hours Constraint' motive has been confirmed in the prospective studies (e.g., Krishnan (1990), Allen (1998), Conway and Kimmel (1998), Averett (2001), Nadrei (2003), Heineck (2009), Boheim and Taylor (2004), Adhikary and Pal (2012)). There is a strong theoretical and empirical relationship between second job holding and the 'hours constraint'. But panel data-based cointegration analysis of second job holding is still in its early stages.

Using data from 4,448 married couples in the United States from the Survey of Income and Program Participation, Krishnan (1990) constructed a double self-selection model to analyse the husband's decision to have a second job and the wife's decision to work. Her key results are that spouses' working hours can be substituted and that skilled workers' likelihood of moonlighting is declining. This study supports the 'hours constraint' motive of multiple job holding.

Allen's (1998) study offers a fascinating look at how family relationships and labour market constraints influence moonlighting behaviour, particularly among unmarried adults. Allen (1998) supported the idea that moonlighting is a reasonable reaction to constraints in the primary job, particularly when people aim to

increase utility through additional employment. This is in line with previous studies by Shisko and Rostker (1976) and Krishnan (1990). The study concluded that women are less likely to moonlight due to time constraints, while men with more children are more likely to do so due to financial pressure. Unmarried people are more likely to moonlight because they lack access to intra-household income. According to this study, hours constraint greatly raises the probability of working in multiple jobs.

By constructing a utility-maximizing model in which labor supply decisions on primary and secondary occupations are endogenous, Conway and Kimmel (1992) came into the conclusion that job heterogeneity and hours constraint are the two fundamental drivers of holding multiple jobs. Job heterogeneity is the practice of working in numerous occupations that may bring non-monetary rewards or personal satisfaction, and hours constraint is the difficulty of workers to work enough hours as a result of labor market demand conditions. By estimating labour supply equations for primary and secondary employment using SIPP data (Survey of Income and Program Participation), they have empirically supported their arguments.

Conway and Kimmel (1998) emphasized the intricacy of multiple job holding options and questioned the widely held belief that the male labor supply is inelastic. This study, which refined the prior research of Conway and Kimmel (1992), concentrated on males in their prime and made clear that moonlighting is not only a temporary solution but can also be a reflection of long-term labour market strategies. After confirming both hours constraint and job heterogeneity motives of second job holding, Conway and Kimmel (1998) concluded that moonlighting is highly responsive to wage changes in all jobs. They also have demonstrated how labour supply elasticity, particularly for men, is understated when second-job activity is ignored.

Employing a bivariate probit analysis to jointly estimate labour supply and moonlighting decisions of men and women, Averett (2001) came to the conclusion that while the reasons for moonlighting are often the same for both sexes, wage effects on moonlighting decisions vary. According to a salary decomposition analysis of Averett (2001), visible traits do not account for 93% of the wage difference between male and female multiple job holders. There is little relationship between moonlighting pay and human capital (such as education or experience). The notion that moonlighting is solely motivated by financial gain is not taken into consideration in this study.

In economies with low job security and underemployment, multiple job holding can serve as a coping strategy, as demonstrated in Nadrei's (2003) study. The 'hours constraint' motive for second job holding is also supported by this study. Nadrei (2003) found that the Iranian economy is also suffering from increased moonlighting. Moonlighting rose with age, but at a slower rate. Income from the principal employment had a negative impact on moonlighting decisions in Iran.

Heineck (2009) studied multiple job holding in Germany and the UK considering panel data from SOEP (Socio-Economic Panel of Germany and BHPS (British Household Panel Survey) of UK. This study concluded that multiple job holding is driven more by hours constraint owing to a regulated labor market in Germany, whereas multiple job holding is driven more by job heterogeneity due to a liberal labor market in the United Kingdom.

The necessity for money is another reason to work multiple jobs (Culler and Bazzoli (1985)). The financial motive is also confirmed by Abdukadir (1992). Workers prefer to moonlight because their current wage is insufficient to afford a standard lifestyle like the rest of society. This is known as liquidity constraint. Abdukadir (1992) made a significant contribution to the moonlighting literature by recognizing liquidity constraints as a crucial economic motivator for the decision to work multiple jobs. Due to lack of data, this paper does not include liquidity constraint as a predictor of second job holding in Baltic nations.

The desire to work in a variety of jobs (heterogeneity motive) is another direct reason for keeping up a second job. Numerous prospective studies endorse the idea that work heterogeneity is the driving force for holding multiple jobs (Conway and Kimmell (1998), Kimmel and Conway (2001), Boheim and Taylor (2004), Renna and Oaxaca (2006)).

Boheim and Taylor (2004) showed that when people faced a financial setback, such as confined working hours, loss of benefits, or wage reduction, they were much more likely to take up second employment. This study lent credence to the idea that moonlighting is more than just desire or passion; it can also be a survival strategy, particularly in unpredictable labor markets. According to them, having a second job, especially for those with lower wages, is mostly motivated by financial stress. People commonly take on second jobs to boost their income and provide a safety net in the event of job uncertainty.

Paxson and Sicherman (1996) questioned the tendency to explore for second job holding as a result of hours constraint or liquidity constraint. They have developed a job portfolio (job packaging) model to explain multiple job holding. They contended that workers select a combination of primary and additional employment based on income stability and variability. The primary employment often gives a consistent but lower income, whereas the secondary job produces larger but more erratic earnings. Using data from the United States' PSID (Panel Study of Income Dynamics) from 1976 to 1989, Paxson and Sicherman (1996) have identified that moonlighting by specialized professionals in other occupations may not match with the hours constraint explanation of moonlighting.

According to Bell, Hart, and Wright (1997), moonlighting is a means of avoiding prospective unemployment. This study suggested the link between unemployment and multiple job holding. They suggested that workers take on second job as a hedging technique, to cushion the financial hit if their primary employment is lost or becomes uncertain. This behavior is especially relevant in labor markets with high job instability, when the threat of termination is enormous. Using data from the BHPS (British Household Panel Survey), their study provided weak but suggestive evidence that people use moonlight to avoid unemployment.

Friesen (2001) provided a persuasive economic perspective on multiple job holding, tying it to overtime pay regulations and hours constraint in primary job. Friesen (2001) stated that when overtime pay is regulated or discouraged by legislation or business policy, workers may be unable to earn more owing to the inability to work longer hours (hours constraint), forcing them to seek second jobs in order to meet their income aspirations. Using data from OECD countries, Friesen (2001) concluded that decreasing standard working hours through labour regulations or union agreements increased the likelihood of moonlighting.

Several studies have identified unemployment as a significant factor influencing second job holding. Shisko and Rostker (1976) linked the decision to take on a second job with the hours constraint by describing the income and substitution effects of the labor-leisure choice. Leisure becomes less appealing when wages fall, and workers are induced to work more hours either in their primary job or by switching to alternative employment based on wage rates due to income effect. In contrast, when wages fall, workers choose more leisure and less work due to substitution effect. The eventual decision to pursue a second job is influenced by the combined impact of income and substitution effects.

Lawrence Mishel (1999) of the Employment Policy Institute found a direct association between multiple job holding and unemployment. Mishel (1999) showed that multiple job holding increased during periods of economic expansion, indicating a pro-cyclical relationship between moonlighting and unemployment. The study asserted that teachers and other underpaid professionals frequently worked second jobs, not merely to supplement their income, but also because their primary pay was lower than that of equally educated colleagues.

Stinson (1987) found some evidence of a significant increase in moonlighting during the US economic boom from 1960 to 1970, but no such association was observed during recessions. Panos, Pouliakas, and Zangelidis (2011) provided a new viewpoint on multiple job holding, viewing it as a strategic career tool rather than just a financial fallback. They suggested that secondary employment can assist workers learn new skills or qualifications that are not available in their primary career. Moonlighting has been proved to serve as a stepping stone into new careers, particularly self-employment. The study followed workers over time and discovered that those who moonlighted in several occupations were more likely to change principal careers later. Experience gained in secondary occupations frequently improved performance or chances in primary work. The study by Panos, Pouliakas, and Zangelidis (2011) found that moonlighting may increase the likelihood of self-employment.

According to Partridge (2002), multiple job holding operates pro-cyclically, which means it tends to grow during periods of economic expansion. As the economy grows, more people take on second occupations, most likely due to increased job availability and rising leisure opportunity costs. This is consistent with Stinson (1987) and Mishel (1999), which found that moonlighting increased during economic booms.

Using data from the 1979 National Longitudinal Survey of Youth, Amuedo-Dorantes and Kimmel (2005) found that during economic expansions, both men and women are more likely to moonlight. This study countered the widely believed belief that multiple job holding rises during recessions because to financial problems. Instead, it appeared to be driven by increased job availability and leisure opportunity costs during boom periods. Hipple (2010) illustrated a loose relationship between moonlighting and local unemployment rates. Hirsch, Husain, and Winters (2015) explored the relationship between local unemployment rates and moonlighting in the United States from 1998 to 2013. Their study found a moderate inverse connection between unemployment and moonlighting. Although moonlighting is slightly lower in labour markets with high unemployment, their study was unable to show a clear link between moonlighting and unemployment over time.

Adequate research on the factors' influencing moonlighting has been undertaken using cross-sectional and panel data. Only a few studies have applied time series methodologies to the economics of moonlighting. Since most of the cross-sectional and panel studies have identified 'hours constraint' and 'unemployment rate' as most influential factors of multiple job holding, we have influenced to conduct dynamic panel data analysis to examine the cointegration between moonlighting, hours constraint and unemployment in the Baltic nations.

3. Methodology and Empirical Results

This study is assigned to find out the long run relationship between second job holding and unemployment among Baltic nations (Estonia, Latvia and Lithuania) utilizing the panel cointegration approach for the period of 2009Q1 to 2017Q4 using quarterly data from Eurostat. Data on the 'Number of Employed Persons (NEP)', 'Number of Employed Persons having Second Job (NEPSJ)', 'Unemployment Rate' (UNEMP) and 'Average Number of Actual Weekly Hours of Work in Main Job' are published on a regular basis by Eurostat. Afterwards, the rate of second job holding (SJH) is computed as the percentage of SJH to NEP ($SJH = NEPSJ/NEP \times 100$). The Hours Constraint, abbreviated as HWPJ (Hours Worked in Primary Job) is proxied by the 'Average Number of Actual Weekly Hours of Work in Main Job'. Our target is to find out the efficacy of unemployment and hours constraint in explaining in second job holding among Baltic countries. That means we consider the basic model

$$SJH = f(UNEMP, HWPJ)$$

To start with, the basic Panel VAR (Vector Autoregression) model is considered in this study which consists the endogenous variables SJH, UNEMP and HWPJ. The primary methods taken into consideration in this study to ascertain the long-run relationship between variables are panel unit root tests, panel cointegration tests, estimation of FMOLS (Fully Modified Ordinary Least Square) and the DOLS (Dynamic Ordinary Least Square). Finally, the PVECM (Panel Vector Error Correction Model) is considered to establish the dynamic long run linkage between variables.

Table – 1: Summary Statistics

	SJH	UNEMP	HWPJ
Mean	5.05	11.87	38.8
Median	4.94	11.25	38.9
Maximum	6.68	21.50	39.8
Minimum	3.22	5.40	38
Std. Dev.	0.656059	4.031837	0.371995
Skewness	0.210717	0.465075	-0.204343
Kurtosis	3.200258	2.277333	2.700468
Jarque-Bera	0.979696	6.243428	1.155344
Probability	0.612720	0.044082	0.561203
Observations	108	108	108

Source: Own computation based on secondary data from Eurostat

The descriptive statistics is presented in Table – 1. This table clears that SJH, UNEMP, and HWPJ have mean values of 5.053244, 11.87130, and 38.82222, respectively. Since SJH ranges from 3.2 percent to 6.68 percent, UNEMP ranges from 5.4 percent to 21.5 percent, and HWPJ ranges from 38 hours to 39.8 hours, this table further supports the large variability of the variables. Except UNEMP, all variables are normally distributed since the probability value of the Jarque Bera statistic is greater than 0.05.

Table – 2: Correlation Matrix

	SJH	UNEMP	HWPJ
SJH	1		
UNEMP	-0.168 (0.0835)	1	
HWPJ	-0.547 (0.0000)	-0.039 (0.6909)	1

Note: () denotes probability value of the t statistic of respective correlation coefficient.
Source: Own computation based on secondary data from Eurostat

The correlation matrix is described in Table 2 to gauge the direction and strength of linear relationship between two variables. There is no meaning to the correlation coefficients between SJH and UNEMP, and HWPJ and UNEMP because they are both insignificant since respective probability values are greater than 0.05. However, there is a significant negative association between SJH and HWPJ, suggesting that a rise in HWPJ could lead to a decrease in SJH. This result is compatible to the hours constraint explanation of second job holding. This outcome is in conformity with the theory of second job holding due to hours constraints.

To avoid spurious regression, two different statistics are considered for unit root test. The first test is Levin, Lin and Chu (LLC) which assumes common unit root process across the cross sections; and the second is Im, Pesaran and Shin (IPS) test which assumes that there are individual unit root processes across the cross sections. The unit root test results are presented in Table-3. Under the LLC panel unit root test, all variables SJH, UNEMP and HWPJ are non-stationary in level but stationary in first difference at the 1% level of significance. Therefore, LLC panel unit root test confirms that all variables are $I(1)$. At 1% level of significance, all variables are non-stationary in level but stationary in first difference according to IPS panel unit root test. However, at 5% level of significance SJH is stationary in level. Since the panel data set under consideration is balanced, we will rely more on the LLC test. Therefore, all variables are confirmed to be integrated of order one ($I(1)$).

To investigate the presence of a long-run cointegration between the variables, we'll proceed to the panel cointegration test since all of the variables are integrated with order one. For the purpose of carrying out cointegration tests, the immediate step is the identification of optimal lag order. The optimal lag order selection is presented in Table – 4. The Schwarz information criterion (SC) and Hannan–Quinn (HQ) criterion affirm that the optimal lag length will be of one. For cointegration testing, the optimal lag length is therefore selected to be one.

Table – 3: Panel Unit Root Test

	LLC Test Statistic				IPS Test Statistic			
	Intercept		Trend and Intercept		Intercept		Trend and Intercept	
	Level	First Difference	Level	First Difference	Level	First Difference	Level	First Difference
SJH	-0.53999	-9.81564***	0.4577	-8.44058***	-1.91534**	-11.0496***	-0.69868	-10.3288***
UNEMP	1.31060	-7.41273***	5.6383	-6.43726***	2.17756	-7.6640***	-0.62583	-6.66805***
HWPJ	0.80266	-9.87347***	0.8601	-8.87931***	-0.59122	-10.4795***	-0.40587	-10.0866***

Notes: *** and ** denotes rejection of null hypothesis that the panel data has a unit root at the 1% and 5% level of significance, respectively.

Source: Own computation based on secondary data from Eurostat

Table – 4: Lag Selection Criteria

VAR Lag Order Selection Criteria				
Endogenous variables: SJH UNEMP HWPJ				
Sample: 2009Q1 2017Q4				
Included observations: 96				
Lag	LogL	AIC	SC	HQ
0	-378.3469	7.944727	8.024863	7.977120
1	-176.1624	3.920050	4.240594*	4.049619*
2	-172.2844	4.026758	4.587710	4.253504
3	-155.7267	3.869305*	4.670664	4.193228
4	-149.8097	3.933536	4.975302	4.354635
* Indicates lag order selected by the criterion				
AIC: Akaike information criterion				
SC: Schwarz information criterion				
HQ: Hannan-Quinn information criterion				

Source: Own computation based on secondary data from Eurostat

Since all the variables are $I(1)$, we'll investigate the existence of long run relationship between SJH, UNEMP and HWPJ using both Pedroni's (1999, 2004) cointegration test and the Kao test. The Pedroni's cointegration test results are presented in Table - 5 and Kao test result is presented in Table – 6.

The majority of Pedroni's cointegration tests show that there is cointegration among variables, as Table – 5 makes clear. The long run cointegration is also confirmed by the Kao cointegration test. As Table – 6 demonstrates, the null hypothesis of no cointegration is rejected at less than one percent level of significance. Strong cointegration between SJH UNEMP HWPJ is thus confirmed. Table – 7 demonstrates Johansen's Fisher panel cointegration test. Both the Trace and Maximum Eigenvalue tests confirm that one cointegrating equation is present in the panel series.

Table – 5: Panel Cointegration Test (Pedroni)

Indicators	Intercept		Intercept and Trend		No Intercept and No Trend	
	Statistic	Weighted Statistic	Statistic	Weighted Statistic	Statistic	Weighted Statistic
Panel v-Statistic	2.496706***	1.752299**	0.872782	0.301113	2.235926***	1.419420*
Panel rho-Statistic	-2.136139***	-2.269587***	-1.566328*	-1.885195**	-2.243066***	-2.179597***
Panel PP-Statistic	-2.321855***	-2.622676***	-2.179855***	-2.652125***	-2.406815***	-2.526086***
Panel ADF-Statistic	-1.743651**	-2.329884***	-0.857258	-1.480828*	-1.499874*	-1.591632**
Group rho-Statistic	-1.448473*		-0.924675		-2.177249***	
Group PP-Statistic	-2.404971***		-2.038309**		-3.282922***	
Group ADF-Statistic	-1.755320**		-0.707665		-2.010505**	

Notes: *, ** and *** denotes rejection of null hypothesis of no cointegration at the 10%, 5% and 1% levels of significance, respectively.

Source: Own computation based on secondary data from Eurostat

Table – 6: Kao Residual Cointegration Test

Series: SJH UNEMP HWPJ		
Sample: 2009Q1 2017Q4		
Included observations: 108		
Null Hypothesis: No cointegration		
	t-Statistic	Prob.
ADF	-2.568314	0.0051
Residual variance	0.265002	
HAC variance	0.149321	

Source: Own computation based on secondary data from Eurostat

Table – 7: Johansen Fisher Panel Cointegration Test

Series: SJH UNEMP HWPJ				
Sample: 2009Q1 2017Q4				
Included observations: 108				
Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)				
Hypothesized	Fisher Stat.*		Fisher Stat.*	
No. of Cointegrating Equation(s)	(Trace test)	Prob.	(Maximum Eigenvalue)	Prob.
None	25.19	0.0003	27.79	0.0001
At most 1	4.986	0.5456	4.215	0.6476
At most 2	9.055	0.1705	9.055	0.1705

Note: * Probabilities are computed using asymptotic Chi-square distribution.

Source: Own computation based on secondary data from Eurostat

Next step is to proceed through the VECM with one cointegration equation. Vector Error Correction Model (VECM) is a method for examining the short- and long-run equilibrium relationships between cointegrated variables by expanding Vector Autoregression (VAR) model through adding an error correction term. The cointegrating equation obtained from VECM analysis to explain the degree of long run association between variables is given by Table – 8. All the coefficients are of desired sign and are significant. The positive sign of the UNEMP(-1) and HWPJ(-1) coefficients in Table – 8 actually indicates that UNEMP and HWPJ have a detrimental effect on SJH.

The estimated Panel VECM is given by the following equation.

$$D(SJH) = C(1) * (SJH(-1) + 0.0590904523726 * UNEMP(-1) + 1.45363429689 * HWPJ(-1) - 62.1975697154) + C(2) * D(SJH(-1)) + C(3) * D(UNEMP(-1)) + C(4) * D(HWPJ(-1)) + C(5)$$

Table – 8: Estimation of Panel VECM parameters: The Cointegration Relationship

The Panel Cointegration Relationship			
Sample (adjusted): 2009Q4 2017Q4			
Included observations: 99 after adjustments			
Standard errors in () & t-statistics in []			
SJH(-1)	UNEMP(-1)	HWPJ(-1)	C
1.000000	0.059090	1.453634	-62.19757
	(0.02420)	(0.26375)	
	[2.44182]	[5.51149]	

Source: Own computation based on secondary data from Eurostat

The Table – 9 shows the value of coefficients in the above Panel VECM. The speed at which the model returns to equilibrium after an external shock is given by the error correction term C(1). The error correction coefficient (-0.347339) is negative and significant at 1% level of significance. This suggests that the SJH, UNEMP and HWPJ are cointegrated and move together towards a long-run equilibrium. Furthermore, the quarterly divergence from the long-term equilibrium appears to be adjusted by 34.7%, according to the error correction coefficient.

Now let us concentrate on estimating the model

$$SJH = f(UNEMP, HWPJ)$$

Unless the regressors are precisely exogenous, the OLS estimation may result in a biased estimator of the parameters when used to estimate the long-run equation in the cointegrated panel data set. Since panel cointegration between variables is established, we'll perform the panel dynamic ordinary least squares (DOLS) and fully modified ordinary least squares (FMOLS) for evaluating the long-run cointegration vector.

The results are presented in Table – 10. Both the FMOLS and DOLS estimation clears that HWPJ affects SJH significantly. This result supports hours constraint motive of second job holding. The coefficient of UNEMP is significant at 10% level in FMOLS while significant at 5% level in DOLS. Therefore, we can conclude that unemployment affects second job holding. Since coefficients of UNEMP and HWPJ are negative, both affect SJH in an inverse way.

Table – 9: Estimation of VECM parameters: The Short Run Dynamics

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.347339	0.105378	-3.296129	0.0014
C(2)	-0.103551	0.115797	-0.894247	0.3734
C(3)	0.022383	0.045194	0.495265	0.6215
C(4)	0.127766	0.250827	0.509378	0.6116
C(5)	0.014857	0.052158	0.284848	0.7764

Source: Own computation based on secondary data from Eurostat

Table – 10: Panel FMOLS and DOLS Estimation Results

Independent Variables	FMOLS		DOLS	
	Coefficient	Prob.	Coefficient	Prob.
UNEMP	-0.034788	0.0813	-0.045213	0.0537
HWPJ	-1.075275	0.0009	-1.536113	0.0046
R-squared	0.334297		0.479246	
Adjusted R-squared	0.307669		0.328501	

Source: Own computation based on secondary data from Eurostat

4. Conclusion

This paper is entrusted to find out the long run association between second job holding (SJH), unemployment (UNEMP) and hours constraint (HWPJ) in the Baltic states of Estonia, Latvia, and Lithuania by employing Panel Cointegration Analysis (PCA) and Panel Vector Error Correction Model (PVECM) using quarterly data for the period of 2009Q1 to 2017Q4. The primary idea that has been addressed in this paper is that second job holding is induced by unemployment and time constraints. The data are obtained from Eurostat. Both the Levin, Lin, and Chu (LLC) and Im, Pesaran, and Shin (IPS) tests confirm that all series are $I(1)$. The Pedroni, Kao and Johansen Fisher Panel Cointegration Tests confirm that second job holding (SJH), unemployment (UNEMP) and hours constraint (HWPJ) are cointegrated in the Baltic nations. This suggests that, in the long run, there is an equilibrium relationship between unemployment, hour limitations, and moonlighting.

In presence of the cointegration vector, the estimation of Panel VECM is continued to evaluate the dynamic behaviour of the variables. The estimated cointegration equation indicates that unemployment and hours constraint have a negative impact on second job holding in Baltic nations. In the Panel VECM, the error correction term determines how quickly the model recovers to equilibrium following an external shock. The estimated Panel VECM shows that the error correction coefficient is significant with a negative sign. This indicates that the panel data on second job holding, unemployment, and hours constraint are cointegrated and moving toward a long-term equilibrium. The Dynamic Ordinary Least Squares (DOLS) and Fully Modified Ordinary Least Squares (FMOLS) to evaluate the long-run cointegration vector has been estimated. The estimation results indicated that both hours constraint and unemployment have a long-run impact on second job holding in Baltic countries, but the effect of hours constraint is more significant than unemployment.

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