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A Johansen Cointegration Test for the Relationship between Hours of Work in Main Job, Unemployment and Second Job Holding in North Macedonia

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[Abstract]

The aim of this paper is to give an insight about the long run cointegration between second job holding, hours constraint (Hours of work in main job) and unemployment in North Macedonia. To establish the long run association, the Johansen Cointegration Analysis is applied on quarterly data obtained from Eurostat for the period of 2006 Q1 to 2020 Q4. Both the Trace and Maximum Eigenvalue tests confirm non-existence of any long run cointegration between second job holding, hours constraint and unemployment in North Macedonia.

Key Words: Second Job holding, Unemployment, Johansen Cointegration Analysis

I

INTRODUCTION

Holding additional jobs in addition to a main job simultaneously by a worker is commonly known as second job holding or moonlighting (Shisko and Rostker (1976), Krishnan (1990), Renna and Oaxaca (2006), Yamb and Bikoue (2016), Pouliakas (2017)). Practice of second job holding is increasing due to flexible working conditions in modern economies (Baines and Newell (2004), Combos, McKay and Wright (2007), Ashwini, Mirthula and Preetha (2017)).

Economists differ with the definition of second job holding or moonlighting in terms of the nature of the secondary jobs. Shisko and Rostker (1976) considered steady, full-time employment as primary and other additional jobs, irrespective of their nature, as secondary jobs. The study of Guariglia and Kim (1999) put importance on the job informality criterion to the additional secondary jobs. In addition, the studies of Sennholz

(1984), Frey and Schneider (2000), Schneider and Enste (2002) considered second jobs as illicit, illegal or taxevading informal jobs. Holding a part time job in addition to a primary full-time job is considered as moonlighting in the study of Betts (2006). Since our study is based on the data from Eurostat (European Union's official statistics portal <u>https://ec.europa.eu/eurostat/web/lfs/data/database</u>), the term 'second job holding' is synonymous with the 'employed persons with a second job'.

Although there has been a lot of study on the economics of second job holding, the literature has remained dispersed (Campion, Caza and Moss (2020)). The majority of the literature has been concentrated on the cross sectional or panel data analysis to pinpoint the variables affecting the prevalence of second jobholding (Adhikary and Pal (2011)).

Various economists have different perspectives on the nature of second jobs and the factors that have influence on second job holding (moonlighting). Among several economic and non-economic factors, the most important is the 'Hours Constraint'. The 'Hours Constraint' is defined as the worker's inability to supply all utilitymaximizing hours of work in the primary job with a given wage rate. The utility maximizing worker will typically invest 'unused' hours into additional (secondary) jobs if they are unable to supply as much hours in their primary job as they desire in order to maximize their utility (Shisko and Rostker (1976), O'Connell (1979), Krishnan (1990), Allen (1998), Conway and Kimmel (1998), Böheim and Taylor (2004), Adhikary and Pal (2011)). In addition to the 'hours constraint' motivation, desire for employment in heterogeneous jobs is also identified as another proximate reason behind second job holding (Conway and Kimmell (1998), Kimmel and Conway (2001), Boheim and Taylor (2004)).

Liquidity constraint, the workers' inability to maintain an average lifestyle like other members of the society due to low current income compared to their level of education, is another proximate reason behind second job holding (Abdukadir (1992). Due to the lack of relevant time series for North Macedonia, liquidity constraint is not specifically included in the variable list of this study. Boheim and Taylor (2004) found evidence of the impact of negative financial shock on moonlighting decision of British people. Negative financial shock is also ignored in this study due to data unavailability.

The relationship between second job holding and unemployment is determined by the relative strength of the income and substitution effects. The income effect of decreased pay during a downturn will make leisure less attractive to the worker and the worker will try to supply more working hour either in main job or will switch to hold additional jobs on the basis of wage rates (Shisko and Rostker 1976). However, the worker will work less due to the substitution effect of a decrease in the wage rate during downturn. This suggests that the long run association between second job holding and unemployment is unclear.

During the U.S.'s economic expansion between 1960 and 1970, Stinson (1987) found some evidence of a significant increase in multiple jobholding, but no such link was observed during recessions. The theoretical

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argument of Conway and Kimmel (1998) suggests that a rise in non-wage income might result in a decrease in multiple job holding. Kimmel and Conway (2001), in estimating hazard function of moonlighting, have pointed out effects of unemployment on moonlighting. The positive correlation between moonlighting and unemployment is asserted in the study of Employment Policy Institute (1999). Partridge (2002) argued that multiple jobholding may increase when there is a labour shortage and significant economic growth. Amuedo-Dorantes and Kimmel (2005) found relationship between multiple jobholding and unemployment and recognized that the likelihood of doing multiple jobholding may rise during times of economic expansion. Using unemployment rates as the major business cycle measure, Zangelidis (2014) established an overall procyclical second job holding. Hirsch, Husain and Winters (2016) established acyclic relationship between multiple jobholding in Ghana, according to the study of Nunoo, Darfor, Koomson, and Arthur (2018).

North Macedonia has gained independence from Yugoslavia in 1991. The country has experienced damaging shocks until 1996. Economic reforms, free trade, globalization, successful privatization and regional integration has helped the country to experience a steady economic growth in the last two decades. Data from Eurostat show that North Macedonia, like all other European nations, is also affected by second job holding (moonlighting). This paper is aimed to address the question that whether hours constraint and unemployment rate are cointegrated with second jobholding in North Macedonia in the long run. The Johansen Cointegration Test is used on quarterly data for the period from 2006 Q1 to 2020 Q4 to identify the long-term association.

II METHODOLOGY

To investigate the long run relationship between 'Hours Constraint', 'Unemployment Rate' and 'Second Job Holding' in North Macedonia, the following model is considered:

$$SJH_t = \beta_0 + \beta_1 WHMJ_t + \beta_2 UNEMP_t + u_t \tag{1}$$

Where

 SJH_t stands for percentage of Second Job Holders to the total employed persons at time t.

 $WHMJ_t$ stands for 'Working Hours in Main Job at time t' as a proxy for 'hours constraint' and is measured by "average number of actual weekly hours of work in main job".

 $UNEMP_t$ stands for unemployment rate at time t.

The Johansen's co-integration test is employed in this paper to determine the cointegration relationships. The Augmented Dickey Fuller (ADF) test is used to find out the order of integration of the variable. To transform nonstationary data into stationary, the first difference method is applied. This study aims to analyze the

dynamics of the link between hours constraint, unemployment and moonlighting in North Macedonia. To evaluate the short run dynamics among variables, the relevant ECM (Error Correction Model) equation to be estimated is,

$$\Delta SJH_t = \beta_0 + \beta_1 \Delta W H M J_t + \beta_2 \Delta U N E M P_t + \beta_3 E C M_{t-1} + \epsilon_t \tag{2}$$

where ECM_{t-1} signifies the Error Correction Term at time (*t*-1) and Δ indicates first difference of respective variables.

III

EMPIRICAL RESULTS

All data for empirical analysis is sourced from the Eurostat (European Union's official statistics portal <u>https://ec.europa.eu/eurostat/web/lfs/data/database</u>). The quarterly data of North Macedonia from the first quarter of 2006 to the last quarter of 2020 on "number of employed persons ('000)", "number of employed persons having second job ('000)", 'average number of actual weekly hours of work in main job' (WHMJ) and the "unemployment rate" (UNEMP) are downloaded. Then data on percentage of employed persons having second job (SJH) is calculated. Table – 1 shows the summary statistics of the data.

The Table -1 affirms that Second Job Holding (SJH) rate varies from a very low (only 0.73 percent) to a moderately high level (4.4 percent) in North Macedonia. Unemployment rate (UNEMP) varies from a 16.2 to 36.3 and 'average number of actual weekly hours of work in main job' (WHMJ) varies from 37.5 hours to 44.1 hours in a week. This suggests that the variables are highly variable within the period 2006 Q1 to 2020 Q4 in North Macedonia.

	SJH	WHMJ	UNEMP
Mean	2.132081	41.56667	27.68833
Median	2.037075	41.55000	28.75000
Maximum	4.391468	44.10000	36.30000
Minimum	0.726322	37.50000	16.20000
Std. Dev.	0.910786	1.125162	6.169144
Skewness	0.398896	-0.770859	-0.477169
Kurtosis	2.582565	5.203515	2.012442
Jarque-Bera	2.026806	18.08093	4.715076
Probability	0.362982	0.000119	0.094653
Sum	127.9249	2494.000	1661.300
Sum Sq. Dev.	48.94237	74.69333	2245.442
Observations	60	60	60

Table –	1:	Summary	Statistics
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Source: Own computation.

VAR Lag Order Selection Criteria								
Endogenous variables: SJH WHMJ UNEMP								
		Exog	enous variat	oles: C				
		Samp	ole: 2006Q1 2	2020Q4				
		Includ	ded observat	ions: 55				
Lag	Lag LogL LR FPE AIC SIC HQ							
0	-312.1180	NA	19.01481	11.45884	11.56833	11.50118		
1	1 -150.0128 300.6315 0.072695 5.891375 6.329339* 6.060739							
2	-138.5621	19.98670	0.066723	5.802258	6.568695	6.098646		
3	-115.6405	37.50801*	0.040545*	5.296020*	6.390929	5.719430*		
4	-108.8569	10.36045	0.044615	5.376615	6.799997	5.927049		
5	-101.1872	10.87703	0.047991	5.424990	7.176844	6.102446		
* indicate	s lag order s	elected by the	e criterion					
LR: sequential modified LR test statistic (each test at 5% level)								
FPE: Final prediction error								
AIC: Akaike information criterion								
SIC: Schwarz information criterion								
HQ: Hannan-Quinn information criterion								

Table -2: Lag Selection Criteria

Source: Own computation based on secondary data from https://ec.europa.eu/eurostat/web/lfs/data/database

In order to continue Johansen Cointegration analysis, we must first choose an adequate lag. As shown in Table - 2, lag three should be selected since, with the exception of SIC, all other criteria have suggested lag three. Therefore, lag three is the optimum lag to be used for Johansen Cointegration Test.

To carry out Johansen Cointegration Test, we have to check the order of integrations of the variables. Table - 3 presents unit root test results on the basis of Augmented Dicky Fuller (ADF) test. The ADF unit root test results are based on Schwarz Information Criterion with maximum lag ten. Table 3 makes it very evident that every variable is integrated at the first difference, i.e., all variables are I(1). Since all the variables are I(1), there is no problem to use Johansen Cointegration Test to determine the number of co-integrating relationships.

Table 3. Unit Root Test

	ADF Test Statistic (Based on SIC, Max Lag=10)			
	Interd	cept	Trend and	Intercept
	Level	First Difference	Level	First Difference
SJH	-2.295831	-12.65999*	-2.042253	-8.878659*
WHMJ	-0.017994	-8.901283*	-2.216762	-8.878232*
UNEMP	0.914115	-6.453169*	-1.582025	-6.547458*

Note: * denote rejection of the null hypothesis at 1% level of significance.

Source: Own computation

Hypothesized		Trace	0.05			
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**		
None	0.240037	26.24922	29.79707	0.1214		
At most 1	0.175802	10.87802	15.49471	0.2191		
At most 2	0.000906	0.050755	3.841466	0.8217		
Trace test indicates no cointegration at the 0.05 level						
* denotes rejection of the hypothesis at the 0.05 level						
**MacKinnon-Haug-Michelis (1999) p-values						
	Source Own computation					

Table -4	Unrestricted	Cointegration	Rank Test	Trace	١
1 able - 4.	Uniesuicieu	Connegration	Kalik Test	(ITACE))

Source: Own computation

The Johansen Unrestricted Cointegration Rank Test (Trace) is presented in Table – 4. Since trace value (26.24922) is less than its critical value (29.79707), we accept the null hypothesis that there is no cointegration. Unrestricted Cointegration Rank Test (Maximum Eigenvalue) is presented in Table - 5. This table also clears that Maximum Eigenvalue statistic (15.37119) is less than its critical value (21.13162) and the null hypothesis that there is no cointegration is accepted.

Table – 5: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05		
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**	
None	0.240037	15.37119	21.13162	0.2637	
At most 1	0.175802	10.82727	14.26460	0.1631	
At most 2	0.000906	0.050755	3.841466	0.8217	
Max-eigenvalue test indicates no cointegration at the 0.05 level					
* denotes rejection of the hypothesis at the 0.05 level					
**MacKinnon-Haug-Michelis (1999) p-values					
Source: Own computation					

Both Trace and Maximum Eigenvalue tests confirm that there is no cointegration between SJH, WHMJ and UNEMP. There is thus no long run association between SJH, WHMJ, and UNEMP. Since the variables do not show cointegration, we refrain from estimating the ECM model presented in equation (2). Therefore, the Johansen cointegration test disapproves any long run relationship between second job holding, hours constraint and unemployment.

IV

CONCLUSION

According to the earlier studies, there should be a correlation between having a second job, hours constraint and unemployment. But, this Johansen cointegration study indicates that there is no such evidence of long run cointegration between having a second job, hours constraint and unemployment for the period of 2006 Q1 to 2020 Q4 in North Macedonia.

The theoretical relationship between second job holding and hours constraint has been established in a strong microeconomic foundation by Shisko and Rostker (1976). Strong evidence of the hours-constraint motive for multiple jobholding has been identified in the majority of prospective cross-section studies (Campion, Caza and Moss 2020). However, any such relationship for the period of 2006 to 2020 in North Macedonia is refuted by this Johansen Cointegration study.

The studies of Stinson (1987), Employment Policy Institute (1999), Partridge (2002), and Amuedo-Dorantes and Kimmel (2005) gave some clue about the relationship between second job holding and unemployment. The Johansen cointegration test, however, is unable to uncover any long run association between 'having a second job by employed persons' and unemployment in North Macedonia. Therefore, we conclude that application of the Johansen cointegration test to the Eurostat data reveals no indication of any long run association between having a second job, hours constraint and unemployment in North Macedonia from 2006 Q1 to 2020 Q4.

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