Euro Area Accession and Its Effect on Manufacturing

Magdalena Vlahova-Veleva

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Abstract: *A single currency could bring both benefits and challenges, hence, this paper examines one of the various dimensions of euro adoption. Moreover, although previous studies have illuminated the euro effect on inflation and trade, the research on manufacturing remains limited. The paper aims to make an assessment of whether euro area accession has an impact on industrial output in the context of the manufacturing sector, as this sector is considered to have a crucial role for sustainable economic growth. The research fits a panel regression model for seven-euro area member states from Central and Eastern Europe and covers a 16-year period from 2003 to 2018. The findings suggest that the participation in the monetary union might increase manufacturing turnover for its members.*

Keywords: Economic and Monetary Union, euro, panel regression, manufacturing

JEL: E50, F45, L60, O52

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[1] Sofia University "St. Kliment Ohridski", Sofia, Contact: m_vlahova@abv.bg

Introduction

All member states of the European Union (EU) have committed to participating also in the euro area, with the exception of Denmark and United Kingdom (they have "opt-out" clauses in the EU Treaties). Firstly, high level of economic convergence should be ensured by fulfilling the Maastricht criteria, in order to adopt the euro. Various studies investigate the change in some macroeconomic indicators of member states when becoming part of the euro area. However, the effect on industrial indicators is not profoundly studied, revealing unexplored potentials which this paper strives to address.

Theoretical background

Currently, 19 member states are part of the euro area and share the common European currency – the euro. A monetary union offers various benefits among which price transparency, elimination of exchange-rate fluctuations, lower transaction costs, enlarging markets for business and promoting trade, enhancing links between member states' economies etc. Moreover, according to Daianu et al. (2017) euro area accession could accelerate insertion into core European industrial networks.

An essential component and precondition for euro area membership is economic convergence, which was at the core of the monetary union proposal, set out in the Delors Report (European Council, 1989). A nominal convergence concept is put forward in the Maastricht Treaty, consisting of the following economic conditions for candidates to introduce the single currency: sound and sustainable public finances, price stability, exchange-rate stability and the criteria for long-term interest rates. The legal provisions relating to convergence criteria are defined in article 140 of the Treaty on the Functioning of the European Union.

Maastricht criteria are aimed at ensuring that candidate member states are prepared for accession and guaranteeing the smooth functioning of the euro area. Thus, they have been subject to numerous analyses.

Various empirical studies have been focused on trade, following the publication of Rose (2000), estimating that bilateral trade between member states in a currency union raises by 200%. Future studies indicate that the single currency affects positively bilateral trade, but reporting more modest results varying from 15 to 35% (Frankel 2010, Baldwin 2006, Sadeh, 2013). Furthermore, a recent study conducted by Glick & Rose (2016) employed a panel data

methodology and revealed that the Economic and Monetary Union has increased exports by approximately 50%.

Concurrently, the aftermath of euro introduction in the context of industrial output remains insufficiently investigated. This research examines the euro area membership effect on manufacturing, highlighting the significance of single currency introduction on sector level, so far lacking in the scientific literature.

Previous studies have emphasized that manufacturing is a fundamental sector of many national economies (European Economic and Social Committee, 2013, Westkämper, 2014). Naudé & Szirmai (2012) postulated that manufacturing, historically, has been „the driver of economic growth, structural change, and catch-up". As has been previously reported in the literature, tradable manufacturing sector is the vehicle of industrial science and knowledge across countries (Rodrik, 2007). Therefore, the manufacturing sector has a crucial role in the economy.

Szirmai & Verspagen (2015) provide evidence that manufacturing has a moderate positive impact on growth in the period 1950-2005 in developed and developing countries. Likewise, other studies, such as the one conducted by Haraguchi et al. (2017) consider likely that industrialization will continue to be a key driver of growth. Therefore, as has been previously reported also by the European Commission (2012) manufacturing is seen as the engine of the European Union economy.

Baldwin et al. (2008) emphasize that euro introduction has a very strong effect on foreign direct investment (FDI), specifically in the manufacturing sector. Moreover, Aiginger (2012) highlights that "the manufacturing sector remains competitive if an economy is open to imports and inward FDIs". Ottaviano et al. (2009) analysed several manufacturing sectors in the first 12-euro area member states and contend that euro introduction enhanced competitiveness, which is consistent with the overall outcome reported in the current paper.

For this research, it was of interest to examine the demand for industrial output or the market growth. Thus, the manufacturing turnover is analysed to investigate the development in sales and the sector activity in general. To the author's knowledge, the euro effect on industrial output, measured by the industrial turnover index, has not been studied yet.

The indicator is defined by Eurostat and it is part of the structural business statistics. According to short-term statistics (Ec.europa.eu, 2019), the turnover index is a business cycle indicator, measured at current prices and its objective is to indicate the development of the market for goods and services in the industrial sector. In general, manufacturing comprises „the physical or chemical transformation of materials, substances, or components into new products" (Eurostat, 2008).

The overall results of this study are consistent with a previous research reported by Žúdel & Melioris (2016), arguing that euro adoption has a positive gain in the case of Slovakia, but in terms of real GDP per capita. They estimated the euro introduction macroeconomic effect by applying a synthetic control method and stated an increase in the indicator by around 10% from 2009 to 2011. To the best of the author's knowledge, no other paper has yet examined data for the group of countries from Central and Eastern Europe regarding their accession in the monetary union and its effect on industrial output.

Methodology

The research is focused on countries that have most recently adopted the single currency. Thus, seven-euro area member states are studied: Cyprus, Estonia, Latvia, Lithuania, Malta, Slovakia and Slovenia. Data in this work are collected from the official statistics of the European Union, i.e., Eurostat and they consist of monthly observations of the variables from January 2003 to November 2018.

The unit root test of Philips and Perron (1988) is applied to study the stationary of the index with a null hypothesis indicating that there is a unit root. The parametric two-sample T-test is conducted to perform a comparison between the indicators before and after euro adoption, grouped by member state.

Statistical analysis is performed by using a panel regression model, with a response variable industrial turnover index of manufacturing and explanatory variables: unemployment rate, inflation, global crisis and euro adoption. Unemployment is presented as a percentage of total population, including all ages and both male and female employees. Inflation is measured by the monthly data on annual rate of change of all-items harmonised index of consumer prices. The third predictor variable is a dummy variable, taking values of 1 when the respective country is already a member state of the euro area and 0 when it is not. The Great Recession

is presented by a dummy variable as well, with 1 indicating the years of the crisis (2008, 2009 and 2010) and 0 for the rest of the studied period. All data are calendar adjusted with 2015 as a reference year.

Empirical study

The skewness of the analysed data is -0.28, hence, the data is close to the Gaussian distribution but slightly skewed to the left. In the meantime, the kurtosis of the data is -0.17, which falls within the acceptable range[2]. The Phillips-Perron unit root test, a modification of the Dickey-Fuller test that corrects for autocorrelation and heteroscedasticity in the errors, is applied and outlines that data on manufacturing turnover index is stationary. As illustrated in Figures 1 and 2, the variable is with an approximately normal distribution with a bell-curve shape. However, these results need to be interpreted with caution, as data do not meet some normality tests.

Figure 1: Manufacturing turnover histogram with a normal curve

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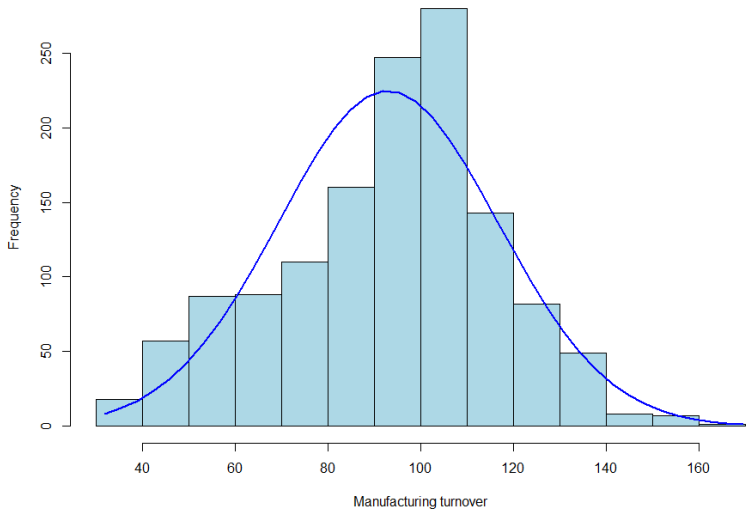
[2] According to George & Mallery (2010) values between -2 and +2 are acceptable.

Figure 2: Q-Q plot
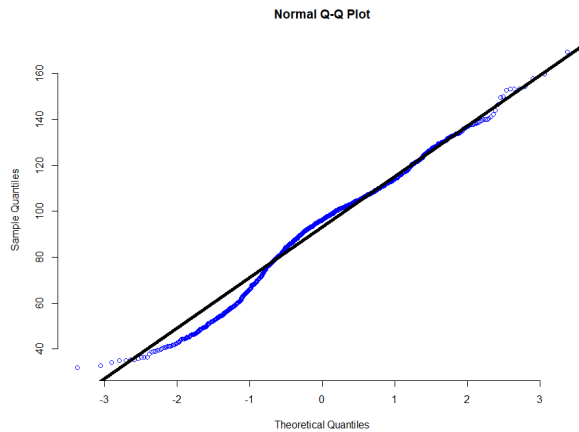
Tables 1, 2 and 3 represent the descriptive statistics – minimum, mean and maximum values for manufacturing turnover index, unemployment rate and inflation rate, respectively before and after euro area membership.

Table 1: Descriptive statistics of manufacturing turnover

	Min		Mean		Max	
Country	0	1	0	1	0	1
Cyprus	86.30	81.70	116.91	116.82	149.90	169.50
Estonia	35.20	77.70	60.33	100.63	85.90	132.70
Latvia	35.30	88.20	75.51	107.01	109.70	132.90
Lithuania	31.80	82.80	76.45	108.07	117.40	138.50
Malta	93.60	71.60	115.50	100.88	139.80	119.60
Slovenia	65.10	72.00	85.41	100.23	105.30	136.40
Slovakia	38.80	51.70	65.00	91.69	90.90	132.80

(*) 0 – euro is not adopted
    1 – euro is adopted

Table 2: Descriptive statistics of unemployment (%)

	Min		Mean		Max	
Country	0	1	0	1	0	1
Cyprus	3.5	3.4	4.5	10.4	5.8	16.9
Estonia	3.8	4.6	9.4	7.9	18.9	14.3
Latvia	5.4	6.9	12.2	9.3	20.5	11.5
Lithuania	4.0	5.8	10.9	7.6	18.3	9.6
Malta	5.8	3.5	7.0	5.7	8.5	7.4
Slovenia	5.4	4.2	6.4	7.4	7.2	10.9
Slovakia	8.7	6.0	14.4	11.8	19.1	15.0

Table 3: Descriptive statistics of inflation (%)

	Min		Mean		Max	
Country	0	1	0	1	0	1
Cyprus	0.0	-2.4	2.5	1.1	6.4	5.3
Estonia	-2.1	-0.5	4.2	2.6	11.6	5.6
Latvia	-4.3	-0.8	5.2	1.3	17.7	3.3
Lithuania	-1.9	-1.5	3.1	1.6	12.7	4.6
Malta	-1.1	-0.5	2.1	1.9	4.3	5.7
Slovenia	1.6	-1.1	3.6	1.8	6.7	6.9
Slovakia	1.2	-0.9	4.8	1.4	9.5	4.8

The data were analysed with a T-test at a 5% significance level, indicating that, in general there is a significant difference between the variables before and after euro adoption (see Table 4). Figure 3 reveals that manufacturing turnover is considerably increasing once the single currency is introduced, with the exception of Cyprus. For the most part unemployment is diminishing after euro area accession, exclusive of Cyprus and Slovenia (see Figure 4). Moreover, apart from Malta, inflation is also observed to be lower when being part of the monetary union (see Figure 5).

Table 4: T-test p-values

Country	Index	Unemployment	Inflation
Cyprus	0.97*	< 2e-16	5.9e-08
Estonia	< 2e-16	0.0023	0.00013
Latvia	< 2e-16	6.5e-11	6.2e-15
Lithuania	< 2e-16	3.6e-15	6.5e-05
Malta	1.2e-12	< 2e-16	0.3538*
Slovenia	2.8e-12	5.3e-08	4.6e-10
Slovakia	< 2e-16	8.4e-08	< 2e-16

(*) Above the 5% reference level.

Figure 3 Manufacturing turnover before and after euro area accession
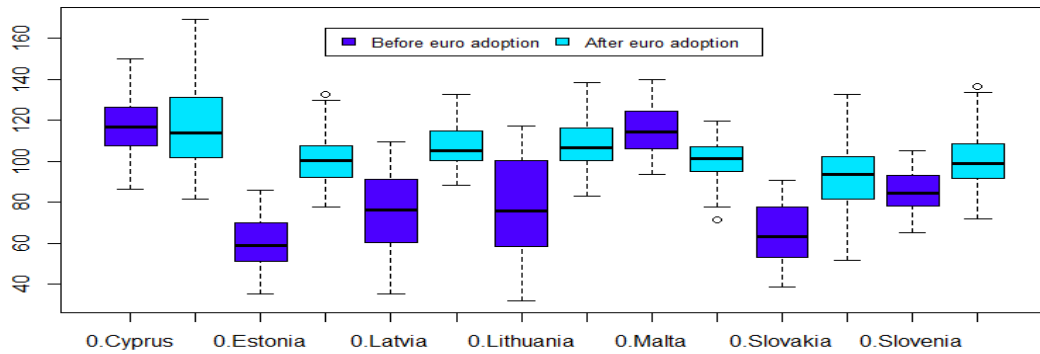

Figure 4 Unemployment before and after euro area accession
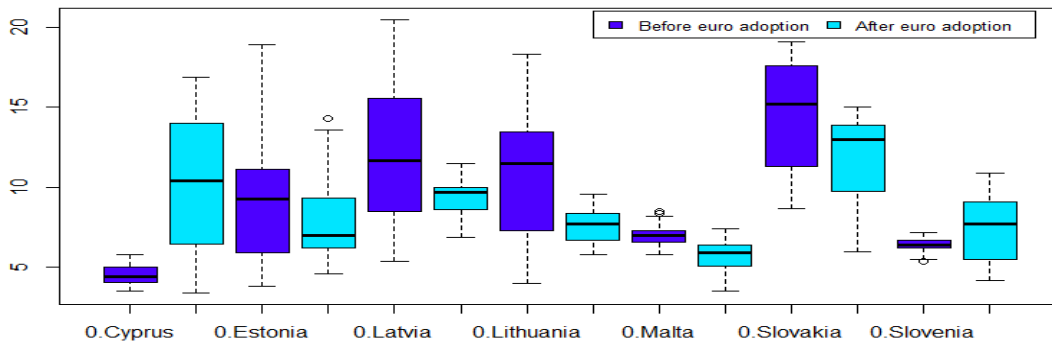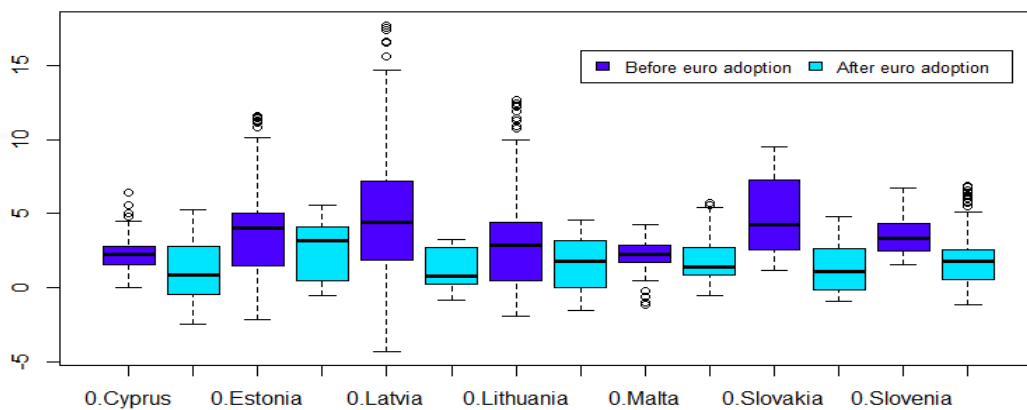

Figure 5 Inflation before and after euro area accession

A panel regression model is conducted to examine the relationship between industrial turnover index of manufacturing and several potential predictors: introduction of the euro, level of unemployment, inflation and global crisis.

H_0: Euro area accession does not affect manufacturing.

H_A: Euro area accession affects manufacturing.

The model includes 1337 observations on seven-euro area member states from Central and Eastern Europe from January 2003 to November 2018. Nearly 30% of the variation of manufacturing turnover can be explained by the predictor variables (see Table 3). At the 1% of significance, there is convincing evidence that the alternative hypothesis is true and euro adoption has an impact on manufacturing. The estimated results indicated a non-significant modest negative effect of inflation on manufacturing.

Moreover, these findings suggest that euro area accession has a strong positive effect on manufacturing. The model reveals that industrial turnover index of manufacturing for the member states from Central and Eastern Europe, expands by 17, holding all other variable predictors constant (see Table 5). A single currency leads to price transparency across borders, to lower transaction costs and ensures exchange rate stability. Consequently, the euro improves competition and stimulates cross-border trade, which correspondingly triggers higher manufacturing turnover.

Table 5 Panel model – manufacturing as a dependent variable

	Coefficients*			
	Estimate	Std. Error	z-value	Pr(>|t|)
Intercept	102.866	4.360	23.592	< 2.2e-16 ***
Euro	17.071	1.077	15.850	< 2.2e-16 ***
Unemployment	-1.928	0.150	-12.858	< 2.2e-16 ***
Inflation	-0.284	0.195	-1.460	0.144
Crisis	-3.669	1.210	-3.031	0.002

(*) P-value less than 0.01. Adjusted R^2 = 0.298.

The data extrapolate a negative relationship between manufacturing turnover and unemployment. Thus, a higher unemployment rate means lower manufacturing turnover index, after controlling for the other variables in the model.

There is a strong negative linear association between the economic and financial crisis and manufacturing. This is consistent with the statement of Malgarini (2011) that the Great recession has defined a substantial fall of manufacturing activity. The Great Recession would have deteriorated the turnover index by 3.7 on average, ceteris paribus.

Conclusion

The common European currency – the euro is believed to ensure closer cooperation among member states, strengthened single market and to improve economic stability and growth. This sign of European identity provides opportunities for markets and business. However, a single currency could also cause some costs. On this basis, its specific effects on the various economic and industrial indicators should be explored. Therefore, to illuminate this unchartered area, the effect of euro introduction on industrial turnover index of manufacturing is investigated in this paper.

Overall, the findings of this paper demonstrate a strong positive effect of euro adoption on manufacturing turnover in the sample of seven-euro area member states from Central and Eastern Europe. More generally, these basic results are consistent with previous findings in literature, showing that being part of the Economic and Monetary Union could be beneficial for member states. More precisely, being part of a monetary union could have a favourable impact on manufacturing. In addition, the paper provides additional information about the relations between manufacturing turnover and unemployment rate, inflation and the Great Recession.

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