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Uneven Development and Intensified Labor in the Eurozone

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Abstract

The objective of this research is to furnish empirical evidence to support the hypothesis that uneven development in the Eurozone is explained by discrepancies in the amount of intensified labor with respect to mean social labor in the region. To do so, a dynamic panel data model was built, consisting of the top seven countries in the Eurozone and their respective manufacturing sectors in the time period 2000-2014. The Granger causality test indicates that intra-sectoral disparities in capital compensation are spurred by the relative levels of real unit labor costs, capital intensity, and the accumulation rate.

Keywords: Eurozone; intensified labor; uneven development; manufacturing sector; dynamic panel data.

INTRODUCTION

European integration rests on two fundamental pillars: *i*) the Treaty on European Union (hereafter TEU), designed to consolidate the objective of creating a common market; and *ii*) the Economic and Monetary Union (EMU), establishing the nominal eurozone exchange rate on January 1, 1999, and, ultimately, launching the euro into circulation on January 1, 2002.

It goes without saying that nearly two decades after the TEU and 15 years since the eurozone effectively came into existence, the empirical evidence bears out that there has been economic divergence across member countries, which has only intensified since the 2007 crisis (Lapavitsas, 2012; Álvarez *et al.,* 2013; Boundi, 2017; Mateo Tomé, 2017).

Prima facie, the widening gap between the economies of the north and the economies of the south in the eurozone contradicts the convergence theories (beta and sigma) posited in neoclassical theory (Barro and Sala-i-Martin, 1992). Much to the contrary, the Marxist political economy understands uneven development in the eurozone as the manifestation of the laws of capital accumulation on the international scale (Marx, 1867 and 1894; Shaikh, 2016).

Based on these aspects of Marxist theory (1848, 1867, 1894, and 1939), namely, real competition, the uneven development of nations, and the origins of extraordinary profits, the objective of this research is to furnish empirical evidence to support the hypothesis pursuant to which uneven development in the eurozone can be traced back to differences in the amount of intensified labor with respect to the average amount of social labor in the region.

To do so, a dynamic data panel was put together, composed of the top seven countries in the eurozone and their respective manufacturing sectors in the time period 2000-2014.

The idea is to contribute to the existing literature, to the extent that most of the recent papers out there have linked inequalities in the eurozone to the sphere of circulation, income and wealth distribution, financialization, imbalances across the monetary union, the degree of monopolism or dependent development (Lapavitsas, 2012; Álvarez *et al.,* 2013; Bellofiore, 2013; Bellofiore *et al.,* 2015; Seretis and Tsaliki, 2015; Jäger and Springer, 2015).

This research is divided into three sections. The first takes a Marxist stance to analyze the concepts of competition, uneven development, international trade, and the notion of intensified labor. The second dives into the main aspects of the methodology used in the econometric method. The final section discusses the results and shares some of the most salient conclusions.

REAL COMPETITION, UNEVEN DEVELOPMENT, AND INTENSIFIED LABOR

Just as Anwar Shaikh (2016, p. 259) argued, capital is the particular social form that wealth created under the imperative of obtaining maximum gains acquires. With that said, capital is *value in the process of valorization.* Or, much the same, *capital accumulation* arises as the *primum movens* that coverts capital into more capital and profit into more profit (Marx, 1867).

Not in vain, the mechanism regulating the *laws of capital accumulation in real* is *real competition*,[2] as both an antagonistic and destructive process (Marx, 1848, 1894, and 1939; Guerrero, 1995; Shaikh, 1991 and 2016; Weeks, 2009). Recall that, *per definitionem, real competition* is the movement of capital. Thus, technical change is integrated into this capital movement and productive efficiency develops unequally within a sector (Marx, 1939; Weeks, 2009).

Shaikh (2016, pp. 261-264) adduces that *intra-sectoral competition* emerges as a struggle embodied by each individual company seeking to win a bigger market share. For that reason, Shaikh goes on to say (2016), price becomes the main weapon, while publicity is propaganda.

Each individual enterprise[3] must adjust its unit costs of production[4] in order to maintain its prices at the same level as its competitors. *Intra-sectoral competition* involves this sort of a trend toward the equalization of market prices in a given sector (Shaikh, 2016).

As a necessary consequence of the foregoing, *intra-sectoral competition* induces each individual enterprise to develop and adopt new techniques in order to reduce the unit costs of production.[5] The trend toward market price equalization reveals a positive correlation among the profit margin,[6] the production scale, and the capital/labor ratio.

Concretely, the larger the scale of production and the greater the capital intensity, the lower the unit costs of production will be (Semmler, 1981; Guerrero, 1995; Weeks, 2009; Shaikh, 2016).

It is worth mentioning that different capitals with different cost structures coexist alongside one another with any given sector, derived from the movement of capital and technical change. At the intra-sectoral level, a constellation of disparate profit rates arises at the mercy of the trend toward market price equalization (Marx, 1848 and 1894; Semmler, 1981; Weeks, 2009; Shaikh, 2016). On another note, capital does not move exclusively within a given sector, but rather also *between sectors.*

Adam Smith (1776), David Ricardo (1821), and Karl Marx (1894) inferred from the *movement of capital between sectors* a trend toward the leveling off of profit rates. Which is to say, the *movement of capital* permits new investments to flow toward sectors with higher profit rates. The increase volume of new investments in sectors with higher profitability rates raises production above the level of demand.

Ultimately, an oversupply pushes market prices back down toward a level similar to the production price which guarantees the *general profit rate.* In sectors with low profit rates, the process is the opposite. This dimension is defined as *inter-sectoral competition* (Góchez and Tablas, 2013; Shaikh, 2016).

To the extent that *intra-sectoral* competition throws off the balance of the profit rates as a consequence of the trend toward market price equalization in a sector, *inter-sectoral competition* tends to even out profit rates by virtue of the *movement of capital.* According to Shaikh (2016, p. 265), these two apparently contradictory trends coexist in the capitalist mode of production as a corollary of the fact that within a branch, the profit rates of capitals with better production techniques are those that most determine the volume of new investments.

Shaikh (1991 and 2016) defines these capitals as *regulating capitals,* in the sense that they reproduce the technical conditions of production that are most favorable to earning the largest profit margins and high profit rates. The *profit rates* and *production prices* of the *regulating capitals* act, respectively, as the centers of gravity around which new investments and market prices orbit (Marx, 1894; Shaikh, 1991 and 2016).

It is also salient to recall that within a given country, the unit costs of production of the regulating capitals in each sector are—*in sensu stricto*—the center of gravity regulating the fundamental dynamics of relative levels of prices of production and market prices.

Moreover, Shaikh (2016, pp. 508-535) reiterates that *real competition* implies that the real terms of exchange between nations are subject to the *absolute cost advantage.* That means that real effective exchange rates are driven by the relative levels of the real unit labor costs and are vertically integrated with the regulating capitals in each nation.[7]

Uneven development among nations is thus the outcome of real competition and the absolute cost advantage (Shaikh, 1991 and 2016). John Weeks (2009) added that the movement of capital tendentially levels off the profit rates, as the process that paves the way to the uneven development of outputs across sectors, regions, and countries.

Suffice it to say that traditionally, the Marxist literature has theorized that uneven development around the globe is a process emanating from the transfers of value and surplus across nations (Grossman, 1929; Baran, 1957; Gunder-Frank, 1966; Emmanuel, 1972; Marini 1974; Carchedi, 1991; Shaikh, 1991 and 2016; Seretis and Tsaliki, 2015).

In his noteworthy *Law of Accumulation and Breakdown of the Capitalist System,* Henryk Grossman (1929, p. 280) asserts that within a sector, lead companies sell their goods at market prices, obtaining extraordinary gains to the detriment of less-competitive companies.

Grossman (1929) added that *uneven development*[8] is reproduced around the world to the extent that intra-sectoral value transfers take place in the sphere of circulation from technically less-developed countries toward sectors in countries that boast high technological development. Guglielmo Carchedi (1991) and Shaikh (1991 and 2016) came up with something similar to Grossman. According to these two authors, companies with lagging production techniques making less intensive use of *constant capital* transfer value to less technically efficient companies. Because all of the companies within the same sector tend to sell their goods at the same market price, differences in the technical conditions of production guarantee extraordinary profits for the leading companies, via the transfer of value from technically behind companies.

When it comes to world trade, as a result, companies in lagging countries generate a greater magnitude of value as a consequence of the use of more labor-intensive production techniques. As such, in the sphere in which the goods made by companies in the lagging countries circulate, they are sold at a market price lower than the value that has been produced, which is transferred to companies in countries with a higher level of technological development.

Stergios Seretis and Persefoni Tsaliki (2015) tend to assume the Grossman, Carchedi, and Shaikh thesis of *unequal exchange* to elucidate the uneven development of the eurozone.[9] Seretis and Tsaliki point out that intra-sectoral differences in productivity levels may very well reveal a transfer of value from Greece to Finland and the Netherlands.[10] Expressed in other terms, the absolute cost advantage of the Finnish and Dutch manufacturing sectors enables extraordinary gains for them at the cost of the Greek manufacturing sectors.

Two important questions arise with respect to the Seretis and Tsaliki (2015) hypothesis of *unequal exchange.* First, just as Diego Guerrero (1995) asserted, the absolute cost advantage cannot be reduced to a productivity advantage, to the extent that the unit costs of production are jointly determined by wages and productivity. A country with low wages may be more competitive than a highly productive country, if the difference in wages is higher than in productivity.

Second, Rolando Astarita (2013) remarked that technical change and productive innovations make workforce qualification more complex. In this way, the workforce employed by the companies in a sector using production techniques superior to those of the social average may generate more value per unit of time.

Astarita alludes to the Marxist concept of intensified labor to explain the seeds of extraordinary earnings. In Chapter X of Book 1 of *Das Kapital,* Marx (1867, pp. 250-258) adduces that the labor whose productive power is exceptional shall serve as intensified labor, more so for the fact that it will create in the same space of time higher values of average social work. In such a way, companies with enhanced production methods shall appropriate more surplus value than the rest of the companies in the same sector.

From this extraordinary surplus stems the extraordinary profit, to the degree that the leading companies sell their goods for the social value, which exceeds the individual value.[11] On the flipside, once the most efficient production method becomes widespread, the extraordinary surplus disappears.

In short, Marx's concept of intensified labor emerges from the fact that *uneven development between nations is rooted in the sphere of production. Id est,* countries in which the sectors use more intensified labor as compared to the global social average will be in a position to create more value per unit of time than their international competitors.

HYPOTHESIS, DATABASE, AND ECONOMETRIC MODEL

As stated in the Introduction, this research endeavors to contrast the *general hypothesis* pursuant to which uneven development in the eurozone springs forth from the differences in the amount of intensified labor used with respect to average social labor in the region. According to the theoretical framework, the interpretation is that intra-sectoral disparities in the capital reward are subject to the relative levels of unit costs of production, capital intensity, and the accumulation rate with respect to the average in the eurozone.

It is from this *general hypothesis* that two specific hypotheses tied to the econometric procedure used here arise. The *first specific hypothesis* assumes that the four variables are non-stationary and are integrated at degree I(1). Consequently, there ought to be a stable long-term relationship between them.

The *second specific hypothesis* implies that, in the Granger sense, intra-sectoral differences in the capital reward are caused by relative levels of real unit labor costs, capital intensity, and the accumulation rate compared to the eurozone average.

The data were gathered from the 2016 EU KLEMS database, the methodology behind which is based on the new *European System of Accounts* (ESA) (O'Mahony and Timmery, 2009; Jäger, 2016). 2016 EU KLEMS offers sectoral information about gross added value, effective gross production, gross fixed capital formation, price indices, total remuneration for wage workers, the gross surplus on exploitation, the total number of hours worked, and the fixed capital stock for the top ten economies in the European Union (hereafter, EU) from 1995 to 2014[12] (Jäger, 2016).

The 2016 EU KLEMS industrial classification is borrowed from the *Statistical Classification of Economic Activities in the European Union,* version 2 (hereafter NACE 2). Likewise, NACE 2 is consistent with the International Standard Industrial Classification of All Economic Activities, version 4 (hereafter, ISIC Rev. 4) (Jäger, 2016). The 2016 EU KLEMS job series were developed using information from the European Labor Force Survey (hereafter, LFS) and the Structure of Earning Survey (hereafter, SES).

Seven of the ten countries listed in the 2016 EU KLEMS were chosen for the econometric analysis: Germany, Austria, Spain, Finland, France, Italy, and the Netherlands. Belgium was excluded, because the 2016 EU KLEMS did not have any data on the fixed capital stock there. The United Kingdom and Sweden were not included, as they do not belong to the eurozone.

The analysis was restricted to the time period 2000 to 2014, as the 2016 EU KLEMS only contained data on the fixed capital stock starting in 2000 for Germany and the Netherlands. The decision was made to work exclusively with the 11 manufacturing sectors (see Table 1), as these are the branches of production characterized by growing returns (Smith, 1776; Ricardo, 1821; Marx, 1894; Kaldor, 1957).

Table 1. Manufacturing Sectors in Eurozone Countries Pursuant to the 2016 EU KLEMS Classification

Sector	NACE 2 Code
Food, beverages, and tobacco products	10-12
Textile, clothing, leather, and footwear	13-15
Wood, paper, and publishing activities	16-18
Coke and refined petroleum products	19
Chemical industry	20-21
Rubber, plastics, and other non-metal mineral products	22-23
Common metals and metal products, except machinery and equipment	24-25
Optical and electrical equipment	26-27
Machinery and equipment n.e.c.	28
Transport equipment	29-30
Other manufactures; repair and installation of machinery and equipment	31-33

Source: Created by the author based on 2016 EU KLEMS.

Below are the variables used in the econometric analysis. The dependent variable (hereafter, E_{ij}) is the ratio of the gross surplus of exploitation at constant prices from 2010 of the *i*-th manufacturing sector for the *j*-th country (hereafter, EBE_{ij}) to the average of the eurozone gross exploitation surplus at constant prices from 2010 of the *i*-th sector (hereafter, EBE_{ieur}):

$$E_{ij} = \left(\frac{EBE_{ij}}{EBE_{ieur}} \right) = \frac{EBE_{ij}}{\frac{1}{n}\sum_{ij=1}^{n} EBE_{ij}}; \ (i = 1...11), \ (j = 1..7), \ (n = 7) \tag{1}$$

The first explanatory variable (hereafter, $CLURR_{ij}$) is direct real unit labor costs of the *i*-th manufacturing sector for the *j*-th country (hereafter, $CLUR_{ij}$) with respect to the eurozone average of direct real unit labor costs for the *i*-th manufacturing sector (hereafter, $CLUR_{ieur}$):

$$CLURR_{ij} = \frac{CLUR_{ij}}{CLUR_{ieur}} = \frac{\left(\frac{Wr}{YLr} \right)_{ij}}{\frac{1}{n}\sum_{ij=1}^{n} \left(\frac{Wr}{YLr} \right)_{ij}}; \ (i = 1..11), (j = 1..7), \ (n = 7) \tag{2}$$

Where:

Wr_{ij}=hourly wage at constant prices from 2010[13] for the *i*-th sector for the *j*-th country.

YLr_{ij}= productivity per hour worked at constant prices from 2010[14] for the *i*-th sector for the *j*-th country.

The second explanatory variable (hereafter, K_{ij}) is the capital/labor ratio for the *i*-th manufacturing sector for the *j*-th country (hereafter, (KL_{ij}) with respect to the eurozone average capital/labor ratio for the *i*-th manufacturing sector (hereafter, KL_{ieur}:

$$K_{ij} = \frac{KL_{ij}}{KL_{ieur}} = \frac{\left(\frac{K}{L} \right)_{ij}}{\frac{1}{n}\sum_{ij=1}^{n} \left(\frac{K}{L} \right)_{ij}}; \ (i = 1..11), (j = 1..7), \ (n = 7) \tag{3}$$

Where:

K_{ij}= fixed capital stock at constant prices from 2010 for the *i*-th sector for the *j*-th country.

L_{ij}= amount of labor in physical units for the *i*-th sector for the *j*-th country.

The third explanatory variable (hereafter, k_{ij}) is the capital accumulation rate for the *i*-th manufacturing sector for the *j*-th country (hereafter, I_{ij}) with respect to the eurozone average capital accumulation rate in the *i*-th manufacturing sector (hereafter, I_{ieur}):

$$k_{ij} = \frac{I_{ij}}{I_{ieur}} = \frac{\left(\frac{FBKF}{VAB}\right)_{ij}}{\frac{1}{n}\sum_{ij=1}^{n}\left(\frac{FBKF}{VAB}\right)_{ij}}; \ (i = 1..11), (j = 1..7), \ (n = 7) \quad (4)$$

Where:

$FBKF_{ij}$= gross fixed capital formation at constant prices from 2010 for the *i*-th sector in the *j*-th country.

VAB_{ij}=gross added value at constant prices from 2010 for the *i*-th sector in the *j*-th country.

The specification of the econometric model estimated by least ordinary squares (LOS) is expressed as per the following functional relationship:

$$E_{ij} = f(CLURR_{ij}, K_{ij}, k_{ij}) \quad (5)$$

Taking Napierian logarithms, the LOS multiple regression of the panel data is written as follows:

$$Ln(E_{ijt}) = \alpha_0 + \beta_1 Ln(CLURR_{ijt}) + \beta_2 Ln(K_{ijt}) + \beta_3 Ln(k_{ijt}) + \varepsilon_{ijt} \quad (6)$$

Where:

Ln= Napierian log.

α_0= constant term vector.

β_i= vector of multiple determination parameters or coefficients.

ε_{ijt}= random disturbance error term vector.

t = (2000 ... 2014).

The econometric analysis consisted of a dynamic panel data model, so the Breitung (2001), Im, Pesaran, and Shin (2003) (hereafter, IPS), Maddala and Wu (1999) (hereafter, MW), and the Fisher-type augmented Dickey-Fuller (hereafter, ADF-Fisher) and Hadri (2000) unit root detection tests were chosen The null hypotheses for each of the tests are summarized in Table 2.

Table 2. Unit Root Tests and Null Hypotheses to Contrast

Test	*Null hypothesis*
Breitung (2001)	Common unit root process
Im, Pesaran, and Shin (2003)	Individual unit root process
Maddala and Wu (1999)	Individual unit root process
Hadri (2000)	Stationarity

Source: Created by the author.

Following statistical verification that the four series in the model contain grade I(1) unit roots, the next step was to analyze cointegration using the Pedroni (1999) and Kao (1999) tests, both of which are based on the Engle and Granger (1987) procedure.

To estimate the cointegration vector, the DOLS model and the FMOLS model were used. These two dynamic regression models make it feasible to interpret the sign of the correlation between the dependent variable and the explanatory variables (Stock and Watson, 1993; Pedroni, 1999 and 2001); Wagner and Hong, 2016).

The correlation between the variables, however, should not be interpreted as a relationship of causality between them (Granger and Newbold, 1974). With that said, the next step was to use the Granger (1969) test to statistically contrast the existence of causal relationships between the dependent and explanatory variables.

Following a brief dive into the main aspects of the methodology, the next section contains an analysis of the results of the econometric model.

ECONOMETRIC ANALYSIS

The econometric analysis begins by proving that the variables in the model are not stationary at level and integrated on order I(1). That is to say, the four tests to detect unit roots were done with just one lag, following the Akaike criterion, and the choice was made to include the intercept and the trend.

The Breitung (2001), IPS (2003), and MW (1999) tests indicated that it is not possible to reject the null hypothesis of the existence of the unit root for the four variables at level, while the Hadri (2000) test did permit rejecting the null hypothesis of stationarity (see Table 3). That means that there is enough statistical information supporting the hypothesis that the four variables at level contain a unit root of grade I(1). Note, moreover, that according to the Breitung, IPS, and MW tests, the four variables are stationary and integrated at grade I(o) in their first differences.

Table 3. Results of the Unit Root Tests (One Lag and Individual Intercept and Individual Trend)

Variable/Test	*Breitung (2001)*		*IPS (2003)*		*MW (1999)*		*Hadri (2000)*		
At level	*t-Statistic*	*Prob.*	*t-Statistic*	*Prob.*	*ADF-Fisher X*	*Prob.*	*z-Statistic*	*Prob.*	*Order*
LnE	0.810	0.791	-0.882	0.189	174.700	0.121	11.932	0.000***	I(1)
LnCLURR	3.335	0.999	3.536	0.999	102.128	0.999	14.238	0.000***	I(1)
LnKL	4.212	1.000	-1.139	0.127	117.52	0.987	16.412	0.000***	I(1)
Lnk	1.016	0.845	-0.243	0.404	164.319	0.270	130.196	0.000***	I(1)
In first difference	*t-Statistic*	*Prob.*	*t-Statistic*	*Prob.*	*ADF-Fisher X*	*Prob.*	*z-Statistic*	*Prob.*	*Order*
ΔLnE	-3.967	0.000***	-6.752	0.000***	317.558	0.000***	20.1046	0.000***	I(0)
ΔLnCLURR	-2.048	0.020**	-8.017	0.000***	335.927	0.000***	18.877	0.000***	I(0)
ΔLnKL	-4.798	0.000***	-6.688	0.000***	302.662	0.000***	20.494	0.000***	I(0)
Δlnk	-6.197	0.000***	-7.705	0.000***	318.681	0.000***	17.963	0.000***	I(0)

***Denotes rejection of the null hypothesis at 1%, 5%, and 10%; **Denotes rejection of the null hypothesis at 5% and at 10%.

Source: Created by the author based on Eviews9.

Table 4 summarizes the results of the Pedroni (1999) and Kao (1999) cointegration tests. According to the Pedroni (1999) test, the probability associated with the statistics in panels V, PP, ADF, and the PP and AF groups, enables a rejection of the null hypothesis of no cointegration.

On another note, the rho-statistic and PP-statistic groups do not admit rejection of the aforementioned null hypothesis. Not in vain, seven of the eleven Pedroni (1999) test statistics indicate, statistically, that the variables are indeed cointegrated.

Similarly, the probability associated with the Kao (1999) test ADF statistic permits rejection of the null hypothesis of no cointegration (see Table 4). Furthermore, the statistical evidence suggests that there is a stable long-term relationship among the four variables.

Table 4. Results of the Pedroni Cointegration Test (1999) (Individual Intercept and Individual Trend) and the Kao (1999) Test (Individual Intercept)

Pedroni (1999): Null hypothesis = no cointegration				
Within the dimensions	*Statistic*	*Prob.*	*Size of the statistic*	*Prob.*
Panel v-statistic	2.560	0.005***	-1.579	0.943
Panel rho-statistic	2.471	0.993	5.568	1.000
Panel PP-statistic	-23.670	0.000***	-9.187	0.000***
Panel ADF-statistic	-5.221	0.000***	-10.443	0.000***
Between the dimensions	*Statistic*	*Prob.*		
Group rho-statistic	8.382	1.000		
Group PP-statistic	-16.003	0.000***		
Group ADF-statistic	-12.245	0.000***		
Kao (1999): Null hypothesis = no cointegration				
	t-Statistic	*Prob.*	*Residual variance*	*HAC variance*
ADF	-2.662	0.004***	0.053	0.051

***Denotes rejection of the null hypothesis at 1%, 5%, and 10%.

Source: Created by the author based on Eviews9.

For their part, the DOLS and FMOLS estimators reveal that the coefficients or β_i *β_i* parameters of Ln(*CLURR*), Ln(*KL*), and Ln(*k*) are statistically significant at 1%, 5%, and 10% (see Table 5).

Table 5. Results of the DOLS and FMOLS Panels (Trend with Constant at Level, Pooled Method, and Variables with one Lag)

Dependent variable: LnE				
DOLS				
Variable	*Coefficient*	*Standard Error*	*t-Statistic*	*Prob.*
LnCLURR	-1.040	0.240	-4.328	0.000***
LnKL	0.760	0.206	3.683	0.000***
Lnk	0.960	0.251	3.830	0.000***
FMOLS				
Variable	*Coefficient*	*Standard Error*	*t-Statistic*	*Prob.*
LnCLURR	-0.673	0.146	-4.605	0.000***
LnKL	0.743	0.153	4.857	0.000***
Lnk	0.785	0.147	5.334	0.000***

***Denotes rejection of the null hypothesis at 1%, 5%, and 10%.

Source: Created by the author based on *Eviews9*.

The sign of the coefficients is as expected, and is consistent with the theoretical framework underpinning this research. Thus, for example, the negative sign of Ln(CLURR) means that an increase in 1% of the CLUR in the *i*-th sector for the *j*-th year with respect to the eurozone average spurs, *ceteris paribus,* a -1.04% (DOLS) or a -0.673% (FMOLS) decline in Ln(E).

From that it can be inferred that using a smaller quantity of intensified labor with respect to the social average, as well as the rising cost of the technical conditions of production, entails lower surplus production than the eurozone mean.

Put another way, the manufacturing sectors in countries with higher CLUR are characterized by a lower rate of exploitation of the workforce, low capital intensity, and an unfavorable competitive position as compared to the economies with an absolute cost advantage (Guerrero, 1995; Astarita, 2013; Góchez and Tablas, 2013; Boundi, 2017).

An increase in 1% of Ln(*KL*) induces, *ceteris paribus,* an increase of 0.760% (DOLS) or 0.743% (FOMLS) in Ln (E). From the Marxist standpoint, adopting capital-intensive techniques that are more efficient than the social average shall exceptionally elevate the productive capacity of labor such that it can generate more value per unit of time (Marx, 1867).

It emerges from that, then, that the leading companies in the sectors in the most competitive eurozone countries produce an extraordinary surplus from which emanate extraordinary profits, once the goods are sold at market prices.

Table 5 shows that a 1% increase in Ln(*k*) generates, *ceteris paribus,* an increase in Ln(E) of 0.960% (DOLS) and 0.785% (FMOLS). It is apparent from the narrowness of the capital accumulation scale of a sector at a higher rate than the eurozone average, there ensues an increase in the demand for intensified labor, which shall enable the appropriation of a higher exploitation surplus.

Finally, the next move was to analyze the direction of causality between the variables in the model using the Granger test with two lags. Table 6 shows that it is feasible to reject the null hypothesis that Ln (CLURR) does not cause, in the Granger sense Ln(*E*), but not vice versa. This means that there is enough statistical information to support the hypothesis that the changes that Ln(CLURR) undergoes over the time period cause changes in Ln(E), with this being a one-way relationship.

As in the case prior, the results of the causality test indicate that the null hypothesis that Ln(KL) does not cause, in the Granger sense, Ln(E) can be rejected. Nevertheless, the test does not admit rejection of the null hypothesis that Ln(E) does not cause, in the Granger sense, Ln(KL) (see Table 6).

The direction of causality between Ln(K) and Ln(E) is two-way, to the extent that in both cases the null hypothesis is rejected (see Table 6). This result is backed theoretically. On the one hand, any increase in the product depends on the capital accumulation rate (Smith, 1776; Ricardo, 1821; Marx, 1894; Shaikh, 1991 and 2016). On the other, capital accumulation is intimately related to profitability attained and profitability expected from new investments in means of production and the work force (Marx, 1984; Kaldor, 1957; Morishima, 1973; Pasinetti, 1974; Shaikh, 1991 and 2016).

In other words, an increase in the exploitation surplus at a rate higher than that of the constant capital stock [profit rate] acts as a spur to capital accumulation (Mateo Tomé, 2017). In short, the statistical evidence evinces relevant information supporting the research hypotheses.

Table 6. Results of the Granger Causality Test with Two Lags (Variables at Level)

Null hypothesis	*Obs.*	*F-statistic*	*Prob.*	*Relationship*
LnCLURR does not cause *LnE* in the Granger sense	914	4.371	0.013**	Causa
LnE does not cause *LnCLURR* in the Granger sense		0.933	0.394	No causa
LnKL does not cause *LnE* in the Granger sense	914	4.806	0.008***	Causa
LnE does not cause *LnKL* in the Granger sense		0.230	0.795	No causa
Lnk does not cause *Lne* in the Granger sense	914	2.756	0.064*	Causa
LnE does not cause *Lnk* in the Granger sense		4.289	0.014**	Causa

***Denotes rejection of the null hypothesis at 1%, 5%, and 10%; **Denotes rejection of the null hypothesis at 5% and at 10%; *Denotes rejection of the null hypothesis at 10%.

Source: Created by the author based on *Eviews9*.

DISCUSSION OF THE RESULTS AND CONCLUSIONS

The econometric analysis was highly fruitful to the extent that the results suggest that the origin of uneven development among the main eurozone countries is rooted in the sphere of production.

With that said, it is important to note that wage containment in the time period 2000-2014 was greater in Germany, Finland, and the Netherlands, to the degree that they are more competitive economies in the region than Spain, France, and Italy (see Table 7). And it is this last group of countries in which Spain displays certain traits worthy of brief analysis.

According to Boundi (2017), the productivity differences between Germany and Spain began to take off around 1993, which is when controls on the mobility of goods and capital in the EU *de facto* began. Luis Cárdenas del Rey (2017) wrote, in this regard, that during the second phase of expansion of the economic cycle in Spain (1994-2007), the rise in investment in equipment did not translate into improvements in the manufacturing industry.

Javier López Prol and Enrique Palazuelos (2016) pointed out that throughout 1994-2007, only the high- and medium high-tech manufacturing sectors had sufficiently high productivity growth rates to sustain the increase in real wages without affecting the unit cost of production. Nevertheless, during the Great Recession (2008-2014), wage deflation helped the Spanish manufacturing sectors climb to a more competitive position[15] by bringing down CLUR (see Table 7).

The top German, Finnish, and Dutch manufacturing sectors maintained their absolute cost advantage, both thanks to high productivity levels and the ability to cheapen the cost structure by containing the growth rate of real wages (see Table 7).

Table 7. Cumulative Mean Rates of the Real Wage per Hour Worked and Real Productivity per Hour Worked for the Entire Manufacturing Industry (constant prices from 2010)

	Germany %	*Austria* %	*Spain* %	*Finland* %	*France* %	*Italy* %	*Netherlands* %
Real wage (2000-2007)	0.18	0.75	1.61	1.68	1.43	0.75	0.66
Real wage (2008-2014)	0.98	0.90	-0.21	0.02	1.47	1.10	0.39
Real wage (2000-2014)	0.42	0.91	0.76	0.67	1.29	0.88	0.72
Real productivity (2000-2007)	3.72	3.80	2.24	6.39	3.99	1.14	3.88
Real productivity (2008-2014)	1.35	1.48	2.86	-1.11	2.74	1.58	0.96
Real productivity (2000-2014)	2.11	2.54	2.25	2.45	2.98	1.12	2.20

Source: Created by the author based on EU KLEMS 2016 and Eurostat.

The rise in real productivity at a rate higher than that of the real wage indicates that in aggregate terms, German, Finnish, and Dutch manufacturing companies are in the position to create an extraordinary surplus, which *ex post* is manifest as *extraordinary profit* in the sphere of circulation.

Stricto sensu, the only *unequal exchange* happening is between labor and capital in the sphere of production. Or, more precisely, in Germany, Finland, and the Netherlands, the wage in relation to the new added value from labor (relative wage in the Marxist sense) is lower than in Spain, France, and Italy.

By using more intensified labor than the mean social labor in the region, the share of capital increases, by virtue of which the inference is that workforce exploitation rates are higher in Germany, Finland, and the Netherlands than in Spain, France, and Italy.

Having gotten this far, it is worthwhile to underscore that uneven development in the eurozone is not linked solely to differences in the exploitation rate, whose proxy is CLUR in this research, but also to intra-sectoral differences in the capital/labor ratio.

It is also worth remembering that within a production sector, disparities in the capital/labor ratio do not entail a transfer of the surplus of the labor-intensive companies to capital-intensive companies.

Accordingly, constant fixed capital-intensive techniques enable the leading companies to scale up production and intensify labor. In this way, their unit cost of production is lower than that of their competitors, while their profit rates will be higher than the sectoral average.

On that note, Rafael Muñoz de Bustillo and Enrique Fernández Macías (2007) showed that the economies of Northwest Europe made the effort to adopt and design methods of labor organization, which, among other things, have permitted more intensive use of time in the constant fixed capital installed in an endeavor to reduce unit production costs. For all of those reasons, uneven development in the eurozone can be seen as an expression of the internationalization of the social relations of production.

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[2] In Book II of *Grundrisse,* Marx (1939) underscores that competition is the mechanism by which the laws of capital accumulation manifest. However, competition cannot create said laws, insofar as and to the extent that they are forged by the social relations of production. According to Marx, competition is (1939, p. 45), the consequence and executor of the economic laws that govern the capitalist mode of production.

[3] It is useful to point out the difference that Shaikh (2016, p. 262) underscores between the number of capitals and the number of companies. According to Shaikh, the average production capacity of a given sector depends on the number of capitals. *Id est,* the amount of physical units of machinery, plant, and equipment operating. The number of capitals is subject both to the size and number of companies. Companies do enjoy the ability to influence price, but the technical conditions of the production of the capitals drive the unit production costs.

[4] Another important thing to note is that the unit costs of production are determined by the length and intensity of the normal work day, the real unit wage, and the technical conditions of production or the technology in use (Marx, 1867, 1894; Guerrero, 1995; Shaikh, 1991 and 2016).

[5] It emerges from the theory of *real competition* that technical change is generated endogenously, to the degree that each individual company must develop the productive labor force and reduce production costs in order to push out competitors.

[6] The profit margin is thus the percentage of earnings over the monetary value of sales. To calculate it the value-added tax is not taken into account, as it is borne by the buyer.

[7] The real and vertically-integrated unit costs of labor are constructed following the Pasinetti (1973) notion of vertically-integrated sectors. For an extensive development of the theoretical modeling of the absolute cost advantage, see Góchez and Tablas (2013), Shaikh (2016), and Boundi (2017).

[8] It is worth a digression to recall that the literature has proposed the deviation from the exchange rate index (ERDI) as an indicator to quantify unequal exchange between nations. IT denotes the ratio of purchasing power parity (PPP) to the nominal exchange rate (Köhler, 1998; Somel, 2003). There are, however, two major objections to be had. First, Subasat (2013) remarked that the ERDI disregards the Balassa-Samuelson effect, cost of transportation, the international movement of capital, and monetary policy on the dynamics of the prices of goods. Subasat's (2013) main conclusion is that deviation from international prices to some extent can be considered a reliable measure of unequal exchange. Second, the ERDI assumes that labor is entirely homogenous (Kölher, 1998; Somel, 2003; Ricci, 2016), which loses sight of the importance of Marx's concept of intensified labor analyzed in this paper.

[9] The Seretis and Tsaliki analysis only looked at four eurozone countries: Greece, Spain, Finland, and the Netherlands. The justification these authors use is that Greece and Spain suffered from the highest unemployment rates during the Great Recession, while Finland and the Netherlands (besides Germany) have enjoyed the most dynamic economies throughout the region.

[10] Greece had to be excluded from this econometric analysis as the 2016 EU KLEMS limits the sectoral data on employment, production, and price to just ten EU economies, specifically: Austria, Germany, Belgium, Spain, Finland, France, Italy, Holland, Sweden, and the United Kingdom.

[11] The difference between the social value and the individual value constitutes, according to Marx, the extraordinary profit of the most technically-developed companies. Because they incur lower production costs, the sale of goods at market prices guarantees the leading companies extraordinary profit.

[12] Worth remembering that one of the limitations of the 2016 EU KLEMS is precisely that the statistical information does not cover all 27 EU countries. Some of the most important gaps include Greece and Portugal, as their unique situations would have merited an extensive study through the lens of this research hypothesis.

[13] First, the real hourly wage was calculated as the quotient of wage worker remuneration at current prices divided by total number of hours worked by wage-earners in the i-th manufacturing sector in the j-th eurozone country. The next step was to deflate the nominal hourly wage using the harmonized consumer price index based on the year 2010 obtained from Eurostat.

[14] Productivity per hour worked at constant prices was deflated, first, by the gross added value (GAV) at current prices for the i-th manufacturing sector in the j-th eurozone country by the price index of the sector based on the year 2010. Finally, the GAV was divided at current prices by the total number of hours worked in the i-th sector of the j-th country. All of the variables were gathered from the 2016 EU KLEMS.

[15] According to data from Eurostat, the volume of goods exported from Spain to the EU grew at around 2.98% on average in the time period 2011-2014, even as goods coming from the EU grew scarcely at all, at 0.26%. The decline in imports between 2011 and 2012 was approximately -7.53%, as exports shrunk -0.41% (data from Eurostat).

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