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DIVISION OF LABOUR, PRODUCTIVITY, AND COMPETITIVENESS OF THE GREEK TRADABLE SECTOR

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ABSTRACT

This article compares the evolution of productivity for the domestic tradable sector vis-à-vis the Eurozone countries and its impact on cost competitiveness, during the period 2000-2014. In particular, we track for possible changes into the domestic division of labour that might have favoured low-productivity industries exerting a negative impact on the cost/price competitiveness. However we must point out that the cost advantage does not depend only on the labour cost, but it is also the profit margin that determines the final price of goods and services. For that reason we also compare the evolution of profit margin between the domestic and the Eurozone tradable sector in order to ascertain if there are any cost disadvantages due to excessive profitability of Greek enterprises. Our results indicate that in the case of the tradable sector, the greatest part of the productivity divergence is attributed to differences in intra-industry productivities and not to a less favoured division of labour. These differences in intra-industry productivity are the main cause for the modest decrease in unit labour cost despite the major decline in the nominal unit wage that was imposed by the austerity policies. Finally, the profit margin of the tradable sector exhibits an increase during the crisis period which possibly undermines cost competitiveness.

Keywords: Productivity, Division of Labour, Tradable Sector, Competitiveness, Profit Margin

JEL Classification: D24, E24, J31, O24

Introduction

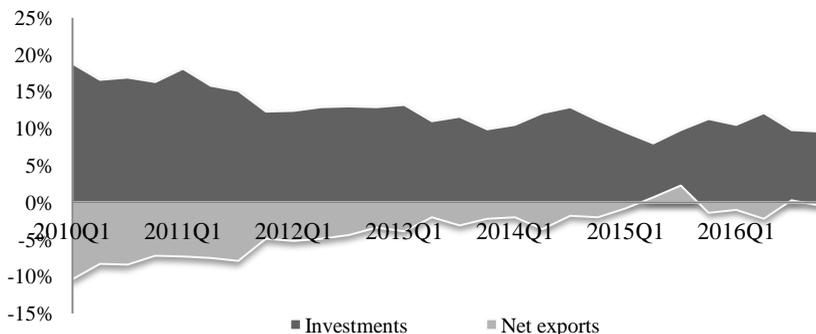
According to the official circles of the European Union one of the basic and timeless problems of the Greek economy is the declining cost/price competitiveness that caused among others the emergence of the twin deficits¹. The Greek government pledged to improve competitiveness at the first Economic Adjustment Programme (EAP), but it was actually the second EAP that promoted the labour market flexibility and the reduction of the minimum wage, as necessary conditions for restoring competitiveness (European Commission 2012). The decrease in the labour costs of the private sector combined with the decrease in public expenditures resulted to a significant drop of total consumption which in turn led to an unprecedented decline in the GDP. On the other hand, the EU organizations and the IMF that formed the Troika (which has been re-baptized to Institutions) were confident that the decrease in public and private consumption constitutes a beneficial restructure of the GDP components. In particular, the Troika believed that the lower share of total consumption to GDP would be replaced by an increase in investments and net exports. The first EAP makes this argument clear by stating that *the medium-term programme objective is to improve competitiveness and alter the economy's structure towards a more investment- and export-led growth model* (European Commission 2010, p. 10). Figure 1 shows the investments and net exports as a percentage of GDP for the period 2010-2016, where it is obvious that Troika's expectations were not fulfilled. In reality, investments retreated to a level close to 10% of GDP whilst the trade account of goods and services was improved though not enough to compensate for the reduction in total consumption and investment. So, the implementation of such front-loaded and pro-cyclical programmes that aspired for a quick transition from a consumption-led growth model to an investment- and export-led growth model did not work. The reason for this failure is that the architecture of the EAPs did not consider the peculiar characteristics of the Greek macroeconomic model where the impact of wage decline in total exports is much less significant than the impact in domestic consumption (Theodoropoulou 2016; Argitis et. al. 2017).

The abovementioned policies that aimed to restore the cost/price competitiveness through a decrease in nominal wages must be considered as shortsighted for two extra reasons. The first reason is that such policies do not consider productivity

¹ A twin deficit occurs when an economy suffers simultaneously from alarming levels of fiscal deficit and current account deficit. For an analysis of the twin deficits explanation of the Greek crisis see Mavroudeas and Paitaridis (2014).

as an equivalent determinant of competitiveness. In reality, all the attempts for increasing Greek productivity relied upon the intensification of the labour effort which was eased by the flexibilization of the labour market and the huge increase in the reserve army of labour that induced the fear of being replaced to those already employed. However, the increase in productivity by increasing the intensification of labour effort has limits which are bounded by the physical and spiritual stamina of the workers. In economic history, the expansion of the productivity frontier was actually achieved by the technological evolution, the more efficient management of the firms and the development of human capital. Furthermore, a decrease in unit labour cost through an increase in productivity rather than through a decrease in nominal wages is more efficient because: a) it is not happening against the consumption expenditures which in turn cause negative (multiplicative) impact in total demand and b) it decisively contributes to the diminution of the debt to GDP ratio via economic growth. Of course an increase in labour productivity requires a long term designation which comes in contrast with the frontloaded designation of the EAPs. So, it was preferred the ease and quick solution of the nominal wages haircut. As we will see at the next sections this policy was inefficient and did not fully succeed. The second reason is that for the EAPs, the cost/price competitiveness is unilaterally determined by the labour cost. However, the final price of goods and services has two more determinants, the cost of the intermediate inputs per unit of output and the profit margin of the firms. In particular, a decrease in labour cost is not necessary to be transmitted to a price decrease but to an increase in profit margin leaving the prices unchanged.

Figure 1: Investment and net exports as a percentage of GDP (Quarterly data, seasonally adjusted)



This article focuses on the evolution of productivity vis-à-vis the Eurozone countries and its impact on cost/price competitiveness. The reason for selecting

the Eurozone countries is twofold. First, they constitute a significant trade partner of Greece. Second, Greece is also a member of the Eurozone and shares a common currency with the other eighteen countries. So, there is no exchange mechanism for restoring cost/price competitiveness through devaluation and its only substitute is unit labour cost reduction. Furthermore, the improvement of competitiveness is more meaningful in the case of the tradable sector² or to put it differently, in the sector whose production could be traded internationally. For that reason our analysis focuses on the tradable sector rather than the total economy. However, there is a difficulty in drawing a line between tradable and non-tradable industries, especially when the service sector is considered. So, we provide estimates for two versions of the tradable sector. The first one is more “old-fashioned” as it includes only the industries of the primary and manufacturing sector and we call it *Narrow Tradable Sector*. The second one considers the increasing possibility of service tradability and we call it *Broad Tradable Sector*. The reason for this discrimination is that the inclusion of the tradable services gives a different perspective of the trade potentials of an economy.

The remainder of the paper is structured as follows. Section 2 discusses the difficulties in drawing a line between the tradable and non-tradable services. Section 3 evaluates the differences in the productivity of the tradable sector between Greece and the Eurozone countries in the period 2000-2014. Section 4 shows the impact of productivity divergences on the competitiveness of the Greek economy against its European counterparts. Section 5 evaluates how austerity policies affected the competitiveness advantage of the Greek tradable industries. Section 6 provides evidence about the profit margin and the redistribution of income during the crisis period. Finally Section 7 summarizes and concludes.

Drawing a line between the Tradable and non-Tradable sector

There is a theoretical and empirical difficulty, in the relevant literature, in identifying the economic industries as tradable or non-tradable, especially when

² This does not mean that the tradable and non-tradable sectors are not interconnected. Namely, according to the Balassa-Samuelson effect productivity growth differs among sectors, while wages tend to be less differentiated. Productivity is supposed to grow faster in the tradable sector. The subsequent sectoral wage increase spills over to the whole economy increasing wages in all sectors. Thus, the prices of non- tradable goods relative to those of tradable goods rise leading to the increase of the general price index. Given that productivity growth is typically faster in developing countries, this effect implies that their real exchange rate will tend to rise over time. The European Commission at the first EAP argues that structural reforms in the Greek economy would accelerate reallocation of resources from the non-tradable to the tradable sector (European Commission 2010, 10)

the service sector is considered. In particular, the goods that are produced in the primary or manufacturing sector have a material substance which makes it possible to be used away from their point of production. For that reason there is unanimity on their identification as tradable. But this is not the case with the service industries as long as their basic feature is that their product is consumed instantaneously at the time they are produced. On the other hand the development of new technologies and trade liberalization has facilitated the tradability of many service industries (Jensen and Kletzer 2005; Amador and Soares 2012; Gonzales et. al. 2012) and this could have a positive impact on the current account, especially for economies such as Greece which have a “service-biased” productive structure. There are several papers either for Greece (Gibson and Malley 2008; Malliaropoulos and Anastasatos 2013) or for a panel of countries (Mano and Castillo 2015) that attempt a classification between tradable and non-tradable industries. However, the fact that none of these papers share a common classification of the services as tradable or non-tradable, it indicates the difficulties to draw such a rigorous line. Gregorio et. al. (1994) consider as tradable those sectors (including services) that exhibit an export-to-production ratio above 10 percent, while Dixon et al (2004) and Amador and Soares (2012) raise this threshold above 15 percent. However, the fact that the rest of the sectors or industries have an export to sale ratio below 10 or 15 percent might be “country specific” and this does not mean that these services are not tradable at whole. Furthermore, according to Gouveia and Canas (2016) these approaches do not consider the import side which it is also an evidence of tradability. Gouveia and Canas attempt in the case of Portuguese economy to correct this approach by estimating the sum of exports and imports as a percentage of the gross value added and then by setting a 10 percent threshold above which the industry is considered as tradable. Though Gouveia and Canas’ approach is more complete, it should be tested for a collection of countries in order to control for possible “country specific” bias. Jensen and Kletzer (2005) develop a rather sophisticated empirical approach for the classification of the tradable services. Jensen and Kletzer use the geographic concentration of service activities within the United States to identify which service activities are traded domestically. Then they consider the activities that are traded domestically as internationally potentially tradable. However, this approach does not consider the different institutional, cultural and lingual background that exists between different countries that could make difficult the tradability of services such as the real estate or the membership organizations.

In our analysis we attempt to distinguish the service activities into tradable and non-tradable in two steps. The first step is to distinguish the marketed activities from the non-marketed (Eurostat 2016). The reasoning here is that the

fundamental goal of the world trade is profitability which is usually not the case for the non-marketed industries. Indeed, from Eurozone's³ input-output table we notice that these industries have nearly zero exports. The only exception is the industry "Postal and courier services" where many relevant private companies⁴ operate worldwide and for that reason it shows a high exports-to-final use ratio (35.71%). The second step is to exclude from marketed service activities those that have fairly low export-to-final use ratio (Sections I, L and Division 79, ISIC Rev. 4). Furthermore, following the majority of the relevant literature we exclude the trade sector. Finally, from the secondary sector except for the manufacturing industries we consider as tradable the industry "Electricity, gas, steam and air-conditioning" because many countries cover their needs⁵ for electricity and gas by imports. The classification of tradable industries is presented in Annex A and it resembles to that of Jensen and Kletzer (2005) and Zahler et. al. (2014).

Productivity of the Tradable Sector in Greece and Eurozone countries

Labour productivity is the most crucial productivity index as it measures the ability of workers to produce a given amount of goods or services. This ability is determined by various factors such as the augmentation of physical capital stock, the adoption of technological and organizational innovations from the firms, the existence of economies of scale in the production process, intensification of labour effort, etc. The labour productivity index is estimated by the ratio of the total gross value added (GVA) in constant prices to total employment (L):

$$y = \frac{\sum_{j=1}^n \text{GVA}_j}{\sum_{j=1}^n L_j} = \frac{\text{GVA}}{L} \quad (1).$$

Where GVA_j and L_j are the gross value added and total employment in industry j . Figure 2 shows the evolution of productivity in the Greek narrow tradable sector (NTS) against the rest of the Eurozone countries (EZ) for the period 2000-2014. Specifically, the left side of Figure 2 shows productivity in absolute terms and the right side shows productivity, indexed in terms of 2000, in order to capture the convergence patterns between Greece and EZ. It is obvious from the left side part of Figure 1 that the productivity of the domestic NTS is constantly

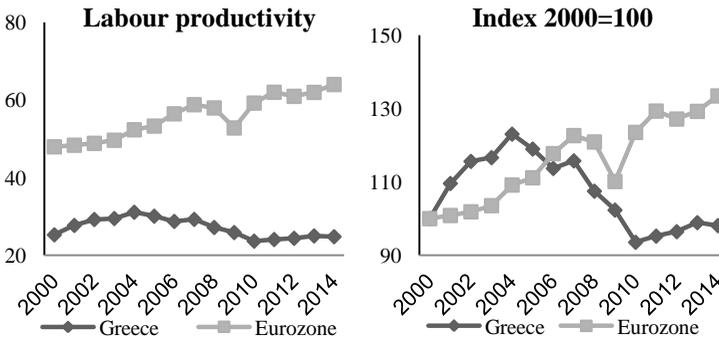
³ We use the Eurozone's input-output table in order to control for possible "country specific" bias.

⁴ We must note that the distinction between market and non-marketed, usually public services on an industry-based definition is only approximate, as some services can be provided by public or private entities, or by a mix of the two (OECD 2014).

⁵ According to Eurostat in 2014, Lithuania, Luxembourg and Hungary were net importers of electricity for 83%, 79% and 39% respectively while Estonia, Bulgaria and the Czech Republic were net exporters for 40%, 34% and 29% respectively.

lagging behind EZ. However, the convergence pattern is not uniform during the selected period. In the beginning of the 2000's the productivity of the Greek NTS converges with its European counterparts due to the higher productivity growth rate, as we can see at the right side of Figure 2. This period was characterized by high growth rates of GDP and an increasing prosperity of the Greek citizens built on euro-cheap credit that promoted an artificial and insecure growth. Indeed, in the middle of the 2000's and after the completion of the Olympic Games of Athens this picture dramatically changes. Domestic NTS productivity reveals a sharp decline in contrast with the EZ. The eruption of the 2008 economic crisis resulted to a short-term decline in EZ's productivity index that lasted until 2009 when a new upturn arised. Greece, after a long period of poor performance, exhibits only in the early 2010's an anemic and fragile recovery. But it was not enough to cover the previous losses and this finally resulted in the augmentation of the divergence between Greece and its European counterparts.

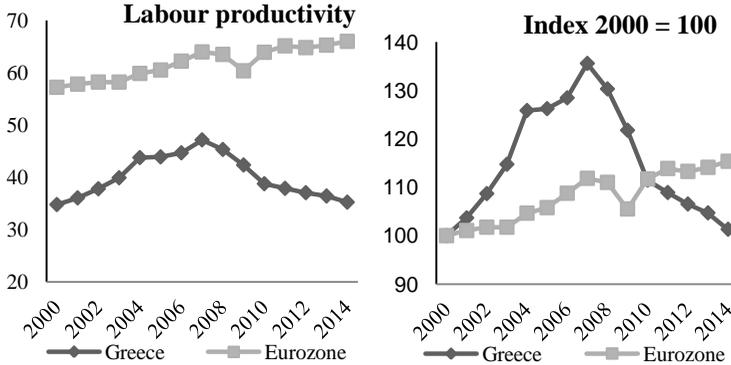
Figure 2: Labour productivity in the narrow tradable sector



The level of productivity for all the selected countries improves when the broad tradable sector (BTS) is considered, as we can see in Figure 3. This is obviously attributed to the better performance of the tradable services compared to the primary and manufacturing sectors that constitute the NTS. At the right side graph we can see that the Greek BTS convergences with the EZ for a longer period compared to the NTS. As in Figure 2, the eruption of the financial crisis resulted in a productivity decline for all the selected countries. However, the EZ recovered instantaneously whereas this is not the case with Greece where the productivity of the BTS continued to decline at fast pace until 2014. The net outcome for the domestic BTS productivity was a fall back to early 2000's levels

and likewise with the NTS, the maximization of the productivity gap⁶ against Eurozone countries.

Figure 3: Labour productivity in the broad tradable sector



To explore in more depth the reasons behind the divergence of Greek productivity against EZ, we proceed to an analysis of the changes that were made in the domestic productive structure. In particular, we investigate whether the loss of traditional tools of economic policy in exchange to Greece’s accession to the Eurozone have altered the division of labor, in favour of low-productivity sectors which are usually characterized by low technological level and little knowledge intensity. For this purpose, we deploy the shift share method (Van Ark et al. 2002; Mason and Osborne 2007), in order to ascertain to what degree the divergence between productivities could be attributed to deviations in intra-industry productivity or to deviations in the labour division. The shift share method is presented at the following relationship:

$$y^B - y^A = \sum_{i=1}^n (y_i^B - y_i^A) \frac{1}{2} (s_i^B + s_i^A) + \sum_{i=1}^n (s_i^B - s_i^A) \frac{1}{2} (y_i^B + y_i^A) \quad (2).$$

Where A and B are the selected countries, y_i is the productivity of industry i which is estimated by the ratio of GVA_j to L_j , and s_i is the industry share in employment. If intra-industry labour productivity between the country B and the country A is equal then the first term in equation (2) is eliminated and the deviation of total labour productivity is attributed completely to differences in the division of labour. In the case where the division of labour between countries A and B is the same, then deviations in total productivity are totally attributed to

⁶ The same applies for the European Union members, for both NTS and BTS.

differences in intra-industry productivity. Setting Greece as country A and EZ as country B, we estimate the equation (2) and the results are presented in Table 1. In particular, comparing the Greek NTS productivity with that of the EZ we can see that for the period 2000-2007, the divergence in productivity is due to EZ's more favourable division of labour. However, in the period 2008-2014 the picture changes where the divergence in productivity is attributed by 64.12% to the inferior intra-industry productivity of the domestic NTS and the rest to the inferior division of labour.

Table 1: Productivity deviations by using the shift share method, narrow tradable sector

Eurozone countries - Greece					
Year	Intra-industry %	Division of Labour %	Year	Intra-industry %	Division of Labour %
2000	32.65	67.35	2008	58.13	41.87
2001	33.25	66.75	2009	63.33	36.67
2002	35.63	64.37	2010	66.19	33.81
2003	28.56	71.44	2011	67.33	32.67
2004	40.28	59.72	2012	65.53	34.47
2005	36.92	63.08	2013	63.36	36.64
2006	46.62	53.38	2014	64.98	35.02
2007	49.35	50.65	Avg.	64.12	35.88
Avg.	37.91	62.09			

In a similar fashion we estimate equation (2) for the broad tradable sector and the results are shown in Table 2. From the comparison of Greek BTS productivity with that of the EZ we can deduce that the contribution of the intra-industry productivity deviations to the productivity divergence is much more significant compared with the NTS one. Particularly, for the period 2000-2007 the intra-industry differences explain the 65.07% of the productivity deviances whilst for the period 2008-2014 the same percentage upsurges to the 87,78%. Finally, making a whole appraisal of the Tables 1 and 2 we can conclude that the problem of productivity lagging behind the EZ is mainly attributed to the intra-industry differences in productivity and secondarily to the worse division of labour. This conclusion is sounder in the case of the broad tradable sector.

Table 2: Productivity deviations by using the shift share method, broad tradable sector

Eurozone countries - Greece					
Year	Intra- industry %	Division of Labour %	Year	Intra- industry %	Division of Labour %
2000	54.48	45.52	2008	84.67	15.33
2001	58.95	41.05	2009	84.73	15.27
2002	61.71	38.29	2010	87.29	12.71
2003	59.60	40.40	2011	89.80	10.20
2004	70.85	29.15	2012	89.74	10.26
2005	69.91	30.09	2013	89.21	10.79
2006	69.84	30.16	2014	89.04	10.96
2007	75.20	24.80	Avg.	87.78	12.22
Avg.	65.07	34.93			

Productivity and Competitiveness of the Tradable Sector

For the measurement of the cost/price competitiveness, the Economic Adjustment Programmes are based on the Unit Labour Cost (ULC) which is the most reputed index of cost/price competitiveness. The ULC is estimated by the following relationship:

$$ULC = \frac{w}{y} \quad (3).$$

Where w is the nominal unit wage⁷ or elsewhere the wage per employee, and y is the labour productivity that is estimated by the relationship (1). The reasoning of the ULC as competitiveness index is that an economy will be competitive if the increase (decrease) in nominal wages is lower (higher) than that of productivity. In this way, the average cost is reduced and the country's production could be sold cheaper than competing countries. Though the ULC suffers from theoretical and empirical deficiencies⁸, its ease estimation renders it as one of the most

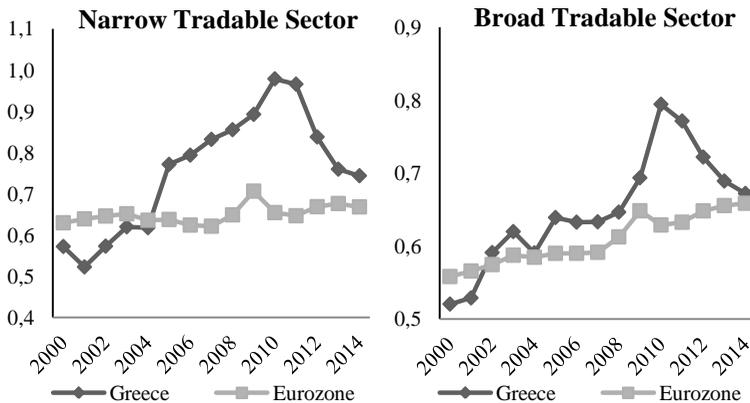
⁷ As wage we consider the full compensation of employees.

⁸ For a more detailed critical appraisal on the ULC, see Mavroudeas and Paitaridis (2014), Felipe and Kumar (2014) and Paitaridis (2015).

attractive measures of competitiveness. At the left side of Figure 4 we can see the evolution of the ULC in the narrow tradable sector for both Greece and the Eurozone countries. During the first years of the 2000's decade, the ULC in the Greek NTS was lower than that of the Eurozone countries. But in 2005 the domestic ULC exhibits a steep rise that lasts until 2010. This resulted to a huge increase of the domestic ULC at higher levels than those of EZ. During the following years, the ULC declines and manages to converge with the EZ, bridging thus the competitiveness gap.

In the case of the broad tradable sector, the cost/price competitiveness of Greece performs better as for the most years of the period 2000-2014, the domestic ULC lies beyond or quite close to the EZ level. The only exception is the early 2010's when the Greek economy enters into an abnormal phase but soon the ULC descalates. The reason that the Greek ULC of the BTS presents a more moderate increase compared to that of the NTS is attributed to the relative lower ULC of the tradable services. Making a whole appraisal of Figure 4 we can conclude that Greece managed to restore its competitiveness to a great extent but as we will see at the next section this was not a result of the superior productivity but due to the austerity policies and the formation of a reserve army of labour that led to a sharp wage decline.

Figure 4: Unit Labour Cost in the tradable sector



According to the relationship (3) an increase in the unit nominal wage has a positive impact on ULC whilst an increase in productivity has a negative impact. In order to find out the impact of these two determinants on the ULC we estimate the growth rate of relationship (3). By taking natural logarithms and then by differentiating by time, the relationship (3) can be written as:

$$\widehat{ULC} = \widehat{w} - \widehat{y} \quad (4).$$

While in discrete time it can be written as:

$$\Delta \ln ULC_t = \Delta \ln w_t - \Delta \ln y_t \quad (5).$$

In order to verify how structural changes affect ULC, we set productivity in the right-side of the relationship (5) in Törnqvist index form⁹. In our case the privilege of this index is that it can be used to show the contribution of each component to aggregate growth because it can get a log-linear form (Goodridge 2007):

$$\Delta \ln y_t = \sum_{j=1}^n \left(s_{VA}^j \ln \frac{VA_t^j}{VA_{t-1}^j} - s_L^j \ln \frac{L_t^j}{L_{t-1}^j} \right) \quad (6).$$

Where s_{VA}^j (s_L^j) is the average share of industry's j value added (employment) between years t and $t-1$. Taking into account the relationship (5) the difference in the growth rates of the ULC for the countries A and B can be written as:

$$\Delta \ln ULC_t^B - \Delta \ln ULC_t^A = \Delta \ln w_t^B - \Delta \ln w_t^A - (\Delta \ln y_t^B - \Delta \ln y_t^A) \quad (7).$$

Using the relationship (6), the second part of the right-side of the relationship is equivalent with:

$$\begin{aligned} \Delta \ln y_t^B - \Delta \ln y_t^A &= \sum_{j=1}^n (s_{VA}^j)_B \ln \left(\frac{VA_t^j}{VA_{t-1}^j} \right)_B + \sum_{j=1}^n (s_L^j)_A \ln \left(\frac{L_t^j}{L_{t-1}^j} \right)_A - \\ &- \sum_{j=1}^n (s_L^j)_B \ln \left(\frac{L_t^j}{L_{t-1}^j} \right)_B - \sum_{j=1}^n (s_{VA}^j)_A \ln \left(\frac{VA_t^j}{VA_{t-1}^j} \right)_A \end{aligned} \quad (8).$$

In order to verify in which degree the convergence (or divergence) in productivity between countries A and B is attributed to changes in intra-industry productivity, or to changes in the division of labor or to a combination of the above, we apply the shift share method to the relationship (8):

⁹ For more details see OECD (2001).

$$\begin{aligned}
 \Delta \ln y_t^B - \Delta \ln y_t^A &= \sum_{j=1}^n \left[\ln \left(\frac{VA_t^j}{VA_{t-1}^j} \right)_B - \ln \left(\frac{VA_t^j}{VA_{t-1}^j} \right)_A \right] \frac{1}{2} \left[(s_{VA}^j)_B + (s_{VA}^j)_A \right] - \\
 &- \sum_{j=1}^n \left[\ln \left(\frac{L_t^j}{L_{t-1}^j} \right)_B - \ln \left(\frac{L_t^j}{L_{t-1}^j} \right)_A \right] \frac{1}{2} \left[(s_{EA}^j)_B + (s_L^j)_A \right] + \\
 &+ \sum_{j=1}^n \left[(s_{VA}^j)_B - (s_{VA}^j)_A \right] \frac{1}{2} \left[\ln \left(\frac{VA_t^j}{VA_{t-1}^j} \right)_B + \ln \left(\frac{VA_t^j}{VA_{t-1}^j} \right)_A \right] - \\
 &- \sum_{j=1}^n \left[(s_L^j)_B - (s_L^j)_A \right] \frac{1}{2} \left[\ln \left(\frac{L_t^j}{L_{t-1}^j} \right)_B + \ln \left(\frac{L_t^j}{L_{t-1}^j} \right)_A \right]
 \end{aligned} \tag{9}$$

And finally from the combination of (5) and (8) we end up with the relationship:

$$\begin{aligned}
 \Delta \ln ULC_t^B - \Delta \ln ULC_t^A &= \Delta \ln w_t^B - \Delta \ln w_t^A - \left[\sum_{j=1}^n \left[\ln \left(\frac{VA_t^j}{VA_{t-1}^j} \right)_B - \ln \left(\frac{VA_t^j}{VA_{t-1}^j} \right)_A \right] \frac{1}{2} \left[(s_{VA}^j)_B + (s_{VA}^j)_A \right] - \right. \\
 &- \sum_{j=1}^n \left[\ln \left(\frac{L_t^j}{L_{t-1}^j} \right)_B - \ln \left(\frac{L_t^j}{L_{t-1}^j} \right)_A \right] \frac{1}{2} \left[(s_{EA}^j)_B + (s_L^j)_A \right] + \sum_{j=1}^n \left[(s_{VA}^j)_B - (s_{VA}^j)_A \right] \frac{1}{2} \left[\ln \left(\frac{VA_t^j}{VA_{t-1}^j} \right)_B + \ln \left(\frac{VA_t^j}{VA_{t-1}^j} \right)_A \right] \left. \right] - \\
 &- \sum_{j=1}^n \left[(s_L^j)_B - (s_L^j)_A \right] \frac{1}{2} \left[\ln \left(\frac{L_t^j}{L_{t-1}^j} \right)_B + \ln \left(\frac{L_t^j}{L_{t-1}^j} \right)_A \right]
 \end{aligned} \tag{10}$$

According to the relationship (10) differences in the growth rate of the ULC between countries A (Greece) and B (EZ) could be attributed to: a) different growth rates between unit nominal wages (the first two terms at the right side of the relationship), b) differences in the change of intra-industry productivity (the first two terms inside the square brackets), c) differences in the change of labour division (the second two terms inside the square brackets).

Table 3: The determinants of change in ULC differences between Greece and Eurozone countries

Narrow Tradable Sector				
	2000-2007		2008-2014	
Unit Wage	-0.330	0.835	0.435	2.413
Intra-Industry Productivity	0.066	-0.167	0.258	1.431
Division of Labour	-0.001	0.002	-0.003	-0.017
Unit Labour Cost	-0.396	1.000	0.180	1.000
Broad Tradable Sector				
	2000-2007		2008-2014	
Unit Wage	-0.331	2.333	0.370	8.153
Intra-Industry Productivity	-0.094	0.666	0.345	7.593
Division of Labour	-0.095	0.667	-0.020	-0.440
Unit Labour Cost	-0.142	1.000	0.045	1.000

The results from the estimation¹⁰ of the relationship (10) are presented in the first column of the Table 3 whilst the second column shows the same estimates normalized by the values of total change. The first three lines display the impact of changes in the three variants of the relationship (10) to the changes in the ULC. During the period 2000-2007, the increase in the domestic NTS unit labour cost against that of the EZ (denoted by the minus sign) is mainly attributed to the relatively higher increase in the domestic unit wage. Regarding productivity it also has a negative impact on the increase of the Greek ULC though to a lesser extent and it is attributed exclusively to differences in intra-industry productivity. During the period 2007-2014 when the Greek NTS regains its cost competitiveness (Figure 3) this is attributed exclusively to the strong decrease of the domestic nominal wages due to the austerity policies that were imposed upon the Greek workers. However, this positive impact was greatly offset by the remarkable retreat of the domestic industry productivity compared to the EZ. This retreat is the outcome of the wave of disinvestment that emerged in the period 2010-2014 because of the economic and sociopolitical turmoil in Greece. When the analysis is focused on the broad tradable sector, the increase in the relative unit labour cost at the period 2000-2007 is more moderate despite the fact that the increase in the relative unit wage is equivalent with that of the NTS. Furthermore, in the case of the NTS, the differences in the intra-industry labour productivity and in the division of labour favour the cost competitiveness of the

¹⁰ From the estimation of relationship (10) by both sides, we find that the mean absolute percentage deviation is fairly small, namely 2.08% for the NTS and 2.46% for the BTS. Such small deviations confirm the precision of the right side of the relationship (10).

domestic BTS. But this is not the case with the period 2008-2014 where the advantages that arise from the decline of the relative unit wages are almost offset by the retreat of the domestic intra-industry productivity whilst changes in the division of labour have not any significant impact. Concluding, it seems that for both versions of tradable sector, the decline in the productivity of the Greek industries undermines the restore of cost competitiveness and makes austerity policies rather ineffective.

Competitive Industries of the Greek economy at the aftermath of the crisis

The decline in productivity combined with the wage depression induced quantitative and qualitative changes in the competitiveness of the Greek (broad) tradable sector. In particular for industry j , the country A has a cost advantage against the country B, if its ULC is relatively lower. This is the case when:

$$\frac{ULC_j^A}{ULC_j^B} = \frac{w_j^A}{w_j^B} \frac{y_j^B}{y_j^A} < 1 \quad (11).$$

Table 4 presents the top ten competitive industries of the Greek tradable sector against its Eurozone counterparts on average¹¹ for the periods 2000-2007 and 2008-2014. Looking at the pre - crisis period, the competitive advantage of the domestic industries is mainly based on a combination of relative lower unit wage ($w_{GRC}/w_{EZ} < 1$) and higher productivity ($y_{EZ}/y_{GRC} < 1$). Only two industries are based exclusively on the relative lower domestic wage (industries 7 and 9). Turning our attention to the period 2008-2014, we notice an increase in average relative wages and even more in relative productivity which both undermine the cost/price competitiveness. At the same time, there is an increase by one industry, at the number of the top ten competitive industries that are based exclusively on lower wages. In a similar fashion, Table 5 presents the top ten competitive industries of EZ's tradable sector against the Greek one. For both periods, EZ's competitive advantage is based exclusively on the superior productivity which is attributed to the higher efficiency of its industries. Furthermore, the average relative productivity increased during 2008-2014 and this might have exerted more pressure to domestic industries for a further reduction in wages since increasing productivity is a more complicated and time-consuming process. But, a new drop in nominal wages might refresh the vicious cycle of depression. On the other hand, the First Economic Adjustment

¹¹ For the estimation of averages we use geometrical mean.

Programme (European Commission 2010) sets the counterargument that the implementation of structural reforms including the further flexibilization of the labour market would attract foreign direct investments (FDI), making stronger the productive capacity of the Greek economy. However, according to Seguíno (2006) capital mobility measured by total FDI (and not only inward FDI which is usually stated) increases firms' bargaining power against the workers by posing the threat of capital flight (e.g. Greek firms migrating to low-wage Balkan countries). This in turn can reduce the pressure on firms to innovate or adopt new technologies, leading to a slower productivity growth and finally to a low wage-low productivity trap. Our empirical estimates indicate that the Greek economy is in danger to fall into this trap.

Making an overall assessment of the period 2000-2014, we can conclude that even though the domestic competitive advantage before the crisis was based on lower wages or to a combination of lower wages and higher productivity, Greece succeeded to be competitive in 25 industries against 17 industries from the side of the EZ countries, as we can see in Figure 5. After the eruption of the global crisis that triggered the Greek crisis and the submission of the Greek economy to austerity policies dictated by the two Economic Adjustment Programmes, the number of industries with a cost advantage decreased to 16. This change denotes that the declared aims of the EAPs for restoring competitiveness did not really succeed at that time and this could also be verified by the anemic growth of Greek exports. On the other hand, the cost advantage of all the Eurozone competitive industries is attributed exclusively to higher productivity¹² and as it was mentioned before, this situation complicates the "catch-up" from the side of the Greek tradable sector.

¹² From a Marxian perspective, Seretis and Tsaliiki (2016) by selecting four Eurozone countries (Greece, Spain, Finland, and the Netherlands) with efficiency and productivity differences, they show that deviations in productivity may give rise to transfers of value towards the units of capital with an absolute advantage in production. So, they conclude that it is the law of the absolute advantage that regulates international trade instead of the Ricardian law of the comparative advantage. Also for a criticism on the law of the competitive advantage from a neo-Ricardian perspective, see Mariolis (2004).

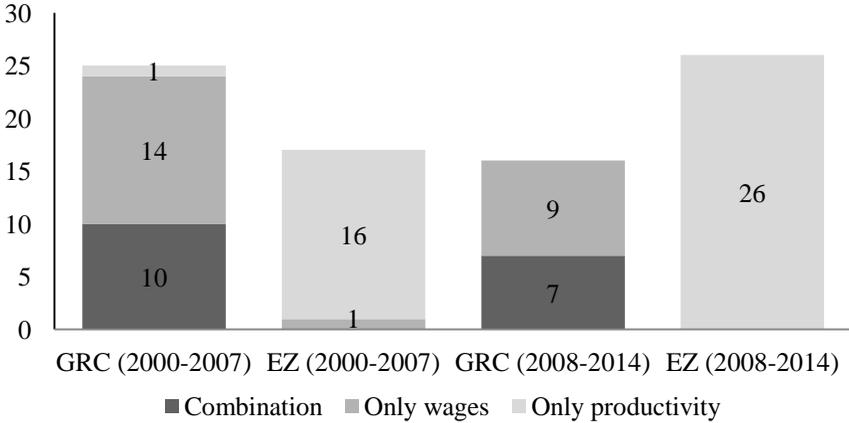
Table 4: The most competitive industries of the Greek tradable sector

2000-2007				
	Industries	W_{GRC}/W_{EZ}	Y_{EZ}/Y_{GRC}	Relative ULC
1	Water transport	0.648	0.408	0.265
2	Manufacture of electrical equipment	0.564	0.646	0.365
3	Printing and reproduction of recorded media	0.746	0.550	0.410
4	Manufacture of basic metals	0.620	0.756	0.469
5	Manufacture of computer, electronic and optical products	0.565	0.880	0.497
6	Advertising and market research	0.758	0.693	0.525
7	Computer programming, consultancy, and information service activities	0.445	1.209	0.538
8	Manufacture of coke and refined petroleum products	0.657	0.847	0.557
9	Air transport	0.287	1.952	0.561
10	Other professional, scientific and technical activities; veterinary activities	0.724	0.880	0.636
	Average	0.581	0.807	0.469
2008-2014				
	Industries	W_{GRC}/W_{EZ}	Y_{EZ}/Y_{GRC}	Relative ULC
1	Water transport	0.708	0.612	0.433
2	Fishing and aquaculture	0.554	0.893	0.495
3	Air transport	0.598	0.922	0.552
4	Manufacture of coke and refined petroleum products	0.887	0.622	0.552
5	Manufacture of basic metals	0.677	0.899	0.609
6	Insurance, reinsurance and pension funding, except compulsory social security	0.822	0.836	0.688
7	Postal and courier activities	0.704	1.060	0.746
8	Manufacture of electrical equipment	0.544	1.411	0.767
9	Activities auxiliary to financial services and insurance activities	0.396	2.015	0.798
10	Security and investigation, service and landscape, office administrative and support activities	0.874	0.923	0.807
	Average	0.659	0.959	0.631

Table 5: The most competitive industries of the Eurozone tradable sector

2000 - 2007				
	Industries	W_{EZ}/W_{GRC}	Y_{GRC}/Y_{EZ}	Relative ULC
1	Mining and quarrying	1.214	0.462	0.561
2	Land transport and transport via pipelines	1.260	0.495	0.623
3	Crop and animal production, hunting and related service activities	1.309	0.532	0.696
4	Employment activities	1.946	0.382	0.744
5	Manufacture of chemicals and chemical products	1.786	0.417	0.745
6	Forestry and logging	3.787	0.200	0.759
7	Activities auxiliary to financial services and insurance activities	2.094	0.374	0.783
8	Electricity, gas, steam and air conditioning supply	1.294	0.611	0.790
9	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	1.666	0.475	0.791
10	Architectural and engineering activities; technical testing and analysis	1.905	0.417	0.794
	Average	1.720	0.421	0.724
2008 - 2014				
	Industries	W_{EZ}/W_{GRC}	Y_{GRC}/Y_{EZ}	Relative ULC
1	Rental and leasing activities	2.787	0.156	0.435
2	Mining and quarrying	1.147	0.416	0.477
3	Manufacture of basic pharmaceutical products and pharmaceutical preparations	2.329	0.236	0.550
4	Architectural and engineering activities; technical testing and analysis	2.456	0.248	0.608
5	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	2.540	0.248	0.631
6	Advertising and market research	1.272	0.540	0.686
7	Manufacture of paper and paper products	1.763	0.423	0.746
8	Scientific research and development	1.027	0.729	0.748
9	Land transport and transport via pipelines	1.128	0.675	0.761
10	Crop and animal production, hunting and related service activities	1.800	0.426	0.767
	Average	1.713	0.368	0.630

Figure 5: Composition of the competitive industries in Greece and Eurozone countries



Profit margin of Greece and Eurozone countries

At the previous sections we discussed the issue of the unit labour cost as a competitiveness determinant of the economies. However, though the labour cost¹³ (w) is a crucial parameter of the final price of a good or service, it is not the only one that determines cost/price competitiveness. Actually, the final price of a good or service includes and other elements as well, such as the intermediate inputs (m) and the profit of the entrepreneur (r). So, the final selling price set by enterprise j is:

$$p_j = m_j + w_j + r_j \quad (12).$$

Let's suppose that sector i includes k firms, the total gross output (GO) depends on the total quantity produced (q_j) and the selling price (p_j):

$$GO_i = \sum_{j=1}^k p_j q_j \quad (13).$$

Setting profit as a mark-up on the value of the intermediate inputs and wages, namely the direct cost that is required for the production of a good or service, relationship (13) can be written as:

¹³ For the estimation of labour cost we use data on compensation of employees adjusted for the equivalent of self-employed.

$$p_j = m_j + w_j + \mu_j(m_j + w_j) \text{ or } p_j = j_j(m_j + w_j) \quad (14).$$

Where $j_j = (1 + \mu_j)$ is the profit mark-up which obviously is equal to:

$$j_j = p_j / (m_j + w_j) \quad (15).$$

While for the industry i , the profit mark-up could be estimated by the following relationship:

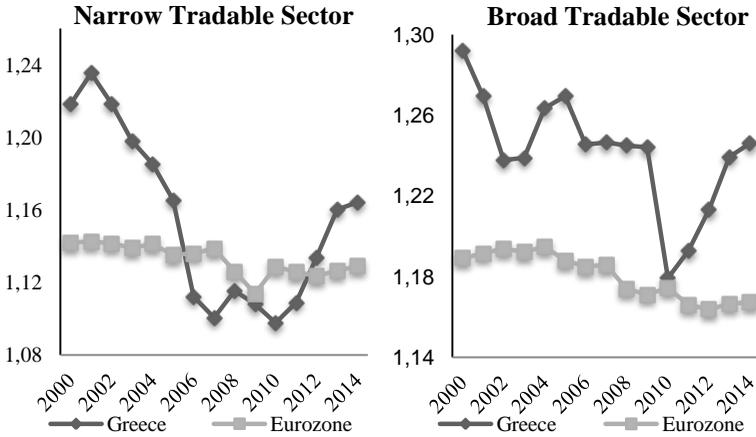
$$J_i = \sum_{j=1}^k p_j q_j / \sum_{j=1}^k (m_j + w_j) q_j \quad (16).$$

And finally, for an economy or a sector that includes n industries, the profit mark-up is estimated as follows:

$$J = \sum_{i=1}^n \sum_{j=1}^k p_j q_j / \sum_{i=1}^n \sum_{j=1}^k (m_j + w_j) q_j = \sum_{i=1}^n GO_i / \sum_{i=1}^n C_i = GO/C \quad (17).$$

Figure 6 shows the profit mark-up of Greece against that of the Eurozone countries, for both versions of the tradable sector. Starting our analysis from the NTS we can see that initially Greece had a higher profit margin which subsequently fell lower than that of the EZ countries. However, in 2010 when the first Memorandum of Understanding (MoU) was signed, the profit margin starts to recover whilst in 2012 and afterwards it gets higher than the EZ's. This turnover denotes that the austerity measures that aimed to the improvement of cost competitiveness through the reduction of prices did not succeed because the associated decrease in wages was transformed into profit gains (INE GSEE 2016). Turning our attention to the BTS we can see that the profitability of the Greek firms is more robust compared to the NTS due to the higher profit margin of the tradable services. The only exception is the year 2010 when the profit margin exhibits a sudden decline. However, during the next years the profit margin recovers to early 2000's levels. Making a whole appraisal of Figure 6 we can conclude that for both NTS and BTS, the profit margin exhibits a strong increase rendering the produced goods and services more expensive and thus less competitive. Finally, it is noteworthy that in the EZ countries the relation between profit and direct cost remains fairly stable whilst this is not the case with Greece where this relation oscillates. These different patterns denote that the domestic firms do not have any stable profit strategy which in turn determines investment decisions.

Figure 6: Profit margin at the tradable sector



In order to capture the dynamics on the relative changes of the profit margin between Greece and Eurozone countries, the relationship (17) can be written as:

$$\frac{J^A}{J^B} = \frac{GO^A/C^A}{GO^B/C^B} = \frac{GO^A}{GO^B} \frac{C^A}{C^B} \quad (18).$$

Using the relationship (18) we can measure the deviations between two different time periods:

$$\frac{(J_t/J_{t-1})^A}{(J_t/J_{t-1})^B} = \frac{GO_t^A}{GO_{t-1}^A} \left(\frac{GO_t^B}{GO_{t-1}^B} \right)^{-1} \left(\frac{C_t^A}{C_{t-1}^A} \right)^{-1} \left(\frac{C_t^B}{C_{t-1}^B} \right) \quad (19).$$

Taking natural logs from both sides of the relationship (19) we end up with:

$$\Delta \ln J_t^A - \Delta \ln J_t^B = (\Delta \ln GO_t^A - \Delta \ln GO_t^B) - (\Delta \ln C_t^A - \Delta \ln C_t^B) \quad (20).$$

According to the relationship (20), the difference in the growth rate of the profit margin between countries A and B is positively related with the difference in the growth rate of the gross output and negatively related with the difference in the growth rate of the direct cost. Setting Greece as country A and EZ as country¹⁴

¹⁴ Because of lack on detailed industry data on gross output, Malta and Luxemburg are omitted.

B, the decrease in the profit margin of the Greek NTS at the pre-crisis period is attributed exclusively to the increase in domestic direct cost compared to that of its EZ counterparts, as we can see in Table 6. During the period 2008-2014, the Greek crisis induced a sharp decrease in the relative gross output which however was more than fully compensated by the decrease in the relative cost mainly because of the fall on nominal wages. In that way, the Greek firms succeeded to restore their relative profit margin by about two thirds of the pre-crisis level. Likewise, the strong expansion of the BTS during the period 2000-2007 was overcompensated by the increase in relative cost and the net outcome was a moderate decrease in the relative profit margin. However, at the period 2008-2014 the profit margin of the BTS was partially recovered because of the higher decrease in the relative cost compared to the gross output. So, it seems that in the case of Greece, the wage-cut policies did not succeed to restore cost competitiveness. Instead, what really happened at the crisis period was a redistribution of total income that benefited capital.

Table 6: Contribution of relative output and direct cost changes to the profit margin (%)

	Narrow Tradable Sector		Broad Tradable Sector	
	2000-2007	2008-2014	2000-2007	2008-2014
Difference in gross output	1.23	-9.03	13.00	-25.97
Difference in total cost	11.14	-15.52	16.32	-27.50
Difference in profit margin	-9.91	6.49	-3.32	1.52

Conclusions

This article has investigated the development of labour productivity and the impact on the cost/price competitiveness of Greek economy against the Eurozone counterparts. In our analysis we focused on the tradable sector where two versions were considered. The first one is the Narrow Tradable Sector (NTS) that includes only the industries of the primary and manufacturing sector and the second one is the Broad Tradable Sector (BTS) that includes the NTS and some service industries. The reason for this discrimination is that the development of the new technologies and the trade liberalization have rendered many services tradable improving the trade performance of the economies, especially those that are highly relied on the service sector such as Greece¹⁵.

¹⁵ This argument is confirmed by the domestic trade account data. I.e. by using data from the AMECO database, we estimate for the year 2015 the exports of services to be 6.54% higher than the exports of goods.

The empirical estimates show a growing divergence on productivity between Greece and the EZ that accelerates after the financial crisis, for both the NTS and the BTS. For the period 2000-2007 the divergence in productivity of the NTS is attributed mostly to a less favoured division of labour, but this is not the case for the BTS where the total labour productivity divergence is attributed mostly to intra-industry differences in productivity. However, at the period 2008-2014 the divergence in productivity between Greece and the Eurozone countries is attributed to differences in intra-industry productivity for both the NTS and BTS. So, the problem of cost/price competitiveness against the EZ especially at the period after the 2008 crisis is the lower efficiency of domestic firms and not the division of labour that favours low-productivity industries. This is actually the main reason for the failure of the austerity policies to restore cost/price competition. The sharp decline in nominal wages was partially offset by the weakening of intra-industry productivity so the net outcome on competitiveness was limited. Furthermore, although the austerity policies succeeded in decreasing the total unit labour cost (ULC) of the tradable sector, the number of competitive industries was significantly decreased and this might result to a less differentiated exports basket that weakens Greece's position¹⁶ in the world trade.

Finally, the unilateral connection between ULC and the cost/price competitiveness does not consider other components of the final price such as the profit margin of the firms. In particular, a decrease in the labour cost might be realized as an increase in profit margin and not as a diminution of the final price. This is the case with the Greek economy where the domestic firms succeeded to restore their profit margin during the crisis period at a level higher than that of the Eurozone countries redistributing total income for their own benefit.

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¹⁶ See Abdon et. al. (2010).

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Annex A: Classification of tradable industries

1	Crop and animal production, hunting and related service activities	22	Manufacture of furniture; other manufacturing
2	Forestry and logging	23	Electricity, gas, steam and air conditioning supply
3	Fishing and aquaculture	24	Land transport and transport via pipelines
4	Mining and quarrying	25	Water transport
5	Manufacture of food products; beverages and tobacco products	26	Air transport
6	Manufacture of textiles, wearing apparel, leather and related products	27	Warehousing and support activities for transportation
7	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	28	Postal and courier activities
8	Manufacture of paper and paper products	29	Motion picture, video, television programme production; programming and broadcasting activities
9	Printing and reproduction of recorded media	30	Telecommunications
10	Manufacture of coke and refined petroleum products	31	Computer programming, consultancy, and information service activities
11	Manufacture of chemicals and chemical products	32	Financial service activities, except insurance and pension funding
12	Manufacture of basic pharmaceutical products and pharmaceutical preparations	33	Insurance, reinsurance and pension funding, except compulsory social security
13	Manufacture of rubber and plastic products	34	Activities auxiliary to financial services and insurance activities
14	Manufacture of other non-metallic mineral products	35	Legal and accounting activities; activities of head offices; management consultancy activities
15	Manufacture of basic metals	36	Architectural and engineering activities; technical testing and analysis
16	Manufacture of fabricated metal products, except machinery and equipment	37	Scientific research and development
17	Manufacture of computer, electronic and optical products	38	Advertising and market research
18	Manufacture of electrical equipment	39	Other professional, scientific and technical activities; veterinary activities
19	Manufacture of machinery and equipment n.e.c.	40	Rental and leasing activities
20	Manufacture of motor vehicles, trailers and semi-trailers	41	Employment activities
21	Manufacture of other transport equipment	42	Security and investigation, service and landscape, office administrative and support activities

Annex B: Data sources

All the data used were extracted from the Eurostat National Accounts database (<http://ec.europa.eu/eurostat/data/database>).