HAS FINANCIAL CRISIS (RECESSION) AFFECTED LABOUR PRODUCTIVITY IN EU COUNTRIES?

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Abstract

Labour productivity reflects the effectiveness of its use and provides an insight into production capacity of a company. Therefore, this measure is of great importance when observed on both a company and a country level. Given that business decisions and final outcomes are largely influenced by this measure, the main research objective of this study is to explore the influence of financial crisis i.e. recession on labour productivity of companies operating in manufacturing industry in European Union. In addition to that, the comparison of the obtained data is also used to detect possible differences among observed countries. The influence of financial crisis is analysed through changes in labour productivity in years during crisis (2008-2013) and the year before crisis (2007). Two measures of labour productivity have been used. The first one presents a ratio between total revenue and number of employees while the second one focuses on total sales instead of on total revenue. Number of employees is analysed as well. Data is collected from Amadeus database where only very large, large and medium sized active companies, whose primary activity was manufacturing, have been analysed.

Key words: financial crisis, recession, labour productivity, EU countries

JEL Code: D24, E32

Introduction

Productivity is an economic measure that provides information about the rate at which outputs are produced per unit of input. When expressed as units of output produced per unit of a particular input, a single-factor productivity measure is obtained, and the most common measure of this type is labour productivity (Syverson, 2011). It can be measured at the level of firms, industries or for entire economies, and can be expressed as a physical measure, a monetary measure or an index. Productivity (regardless of being single-factor or multi-factor) has been researched in a number of fields and explored from different points of view. The role of this paper is to contribute to the better understanding of changes in productivity that have

occurred in years during crisis (2008-2013) and the year before crisis (2007) at the firms operating in manufacturing industry in European Union.

In order to explore the influence of financial crisis i.e. recession on firm productivity, a labour productivity measure, expressed in monetary term, is used. Although productivity might not be seen as an ultimate objective of firm/industry/economy, it is definitely one of the most important intermediate goal that helps in improving firm/industry performance and/or economic welfare, income and living standards.

The rest of the paper is organised as follows. An overview of the previous studies and their findings relating productivity and crisis is provided in section 1. Section 2 presents data description and estimation procedure, while section 3 gives an insight into the empirical results. Section 4 presents concluding remarks.

1 Literature review

The exploration of origins of productivity differences have been researched in a number of fields such as macroeconomics, labour economy, industrial organization, trade economy and so on. While macroeconomists were mainly focused on sources of aggregate productivity growth, labour economists have linked productivity differences with the importance of workers‘ human capital, various human resources practices, workers'/managers' talent and abilities, social connections among co-workers, etc. On the other hand, the general belief that the aggregate productivity gains come from the intensified competition and improved selection that trade brings, has shaped theoretical frameworks and give trajectory to the empirical researches in trade economy. Finally, in the field of industrial organization, productivity levels have been, among others, related to market rivalry, demand, technology, sunk costs etc. (Syverson, 2011).

It is quite evident that there has been in general a large amount of papers that explored different aspects of productivity. Since in the present paper the authors wanted to analyse the influence of financial crisis on labour productivity, it is worthwhile to briefly present studies that were dealing with the productivity and different forms of crises, as well as to mention that this relationship is not only studied in the manufacturing sector (e.g. Yilmazkuday, 2009; Oberfield, 2013), but in the financial sector as well (e.g. Martin-Oliver et al, 2013; Curi and Lozano-Vivas, 2015). For example, by separating out the contributions to productivity growth from industry-wide technological progress and from business practices, Martin-Oliver et al. (2013) explored the productivity growth in Spanish banks in the pre-crisis period. Also, by investigating the actual productivity change and its components, Curi and Lozano-Vivas (2015)

wanted to detect the response of banks operating in financial centres to the financial crisis. Some authors even investigated the influence of bank distress on the productivity of borrowing firms operating in manufacturing industry (e.g. Akiyoshi and Kobayashi, 2010). On the other hand, by comparing the productivity cycles of public and private manufacturing sectors in Turkey and with the usage of multimove Gibbs-sampling approach, Yilmazkuday (2009) showed that the public sector has higher productivity growth rates and that the productivity in public/private sector is procyclical in periods of real/financial shocks. In order to examine the influence of crises on productivity and misallocation in Chilean manufacturing sector, Oberfield (2013) developed a measure of allocational efficiency and derived aggregate productivity to be compared with it. Though within-industry allocational efficiency improved or remained constant in 1982, about one-third of the reduction in TFP is caused by a decline in between-industry allocational efficiency.

While numerous studies examined influence of crises on productivity in only one country (see for example, Wilhelmsson and Kozlov, 2007 for Russian firms; Etxeberria-Garaigorta and Iza, 2015 for Hong Kong; Pratap, and Urrutia, 2012 for Mexico), a much smaller number of studies focused on a several countries simultaneously (e.g. Chouard et al., 2014 for four largest euro area economies: France, Germany, Italy, Spain and the rest of the euro area; Ma and Liu, 2014 for Australia, both, at national and state levels). Specifically, while using a reduced-form equation of TFP, Chouard et al. (2014) showed that the permanent impact on potential TFP varies across countries from –3.9 points to –1.3 points. The study of Wilhelmsson and Kozlov (2007) showed that exporters are more productive and larger than non-exporters, while the one of Etxeberria-Garaigorta and Iza (2015) tried to quantify the role played by exogenous total factor productivity shocks, real interest rate shocks and financial frictions. Finally, Pratap, and Urrutia (2012) explored the role of financial frictions in deteriorating the misallocation of resources and clarifying this drop in total factor productivity.

There were also studies that focused their attention on only one particular industry. For example, by engaging the error correction model and panel regression methods, Ma and Liu (2014) explored the direct and indirect effects of the financial crisis on the changes in Australian construction labour productivity. However, since neither the direct nor the indirect effects of the financial crisis on national construction labour productivity appear to be statistically significant, the authors concluded that the influence of the financial crisis on Australian national and state construction labour productivity is somewhat limited. On a sample of 202 firms of various size, Shinkai and Hossain (2011) analysed the influence of the financial crises on productivity of the IT sector in Bangladesh. The results revealed that even if financial crisis

negatively influenced firms' performances in 2007, most of the analysed IT firms have been recovered in 2008.

Although there were studies that investigated productivity in different EU countries (e.g. Gardiner, 2004), according to the authors' best knowledge, none of these studies analysed/compared labour productivity before and during the crisis (recession) at the firm level data for all EU countries. Therefore, the present study contributes to this path of the empirical research.

2 Data description and estimation procedure

Research includes firm level data obtained from Amadeus database (Bureau van Dijk) and involves only active firms with primary activity code from category C (manufacturing) according to NACE Rev. 2 statistical classification of economic activities.[1]

An initial sample covered all members of the European Union. Due to large gaps in data for certain categories and/or observed years, a significant number of companies have been excluded from the empirical analysis. Specifically, in order to be included in the research, at least 30 companies from the observed country (member state) had to have usable data. Member states whose data have not complied with the requirement have been exempted from the research.[2]

Since the aim of the research was to explore the impact of recession on labour productivity in European countries, data for 2007 are used as a benchmark. Therefore, data for each year from 2008 to 2013 have been compared with it since it was the last year before crisis occurred. Paired sample t-test for each country has been performed by using two indicators of labour productivity[3] (presented in Table 1).

Tab. 1: Indicators of labour productivity

Indicator	Denotement	Methodology for calculating performance indicator
Labour productivity	LnSalesNumber	natural logarithm of Sales and Number of employees ratio
	LnTRNumber	natural logarithm of Total revenue and Number of employees ratio

[1] Data from Amadeus database are presented in thousands of Euros.
[2] Member states with sample smaller than 30 are: Cyprus, Denmark, Luxemburg and Malta, while for Ireland and UK data for sales were not available for the observed period.
[3] Methodology for calculating these indicators corresponds to those in similar empirical studies (Schiffbauer and Ospina, 2010 etc.)

Number of employees	LnNumber	natural logarithm of Number of employees

Source: Compiled by authors.
Note: Total revenue was calculated by summing data for operating, financial and extraordinary revenues. Considering large variations in values among the observed companies a logarithm of corresponding indicator has been used in analysis.

Due to incomplete data set for all observed companies, the analysis has been made by using unbalanced data. Consequently, the number of observations differs depending on used indicator. However, missing data were not obtained from any other source than Amadeus data base in order to maintain their consistency. SPSS Statistics 19.0 was used for data processing.

3 Results

Table presented below shows the impact of recession on labour productivity for each of the observed 23 countries when their values in 2008-2013 period are compared to their respective values in 2007. It is evident that a crisis has made a different influence on observed countries. There are countries (e.g. Belgium, Estonia and Rumania) whose labour productivity hasn't been at all negatively influenced by recession. On the other hand, there are countries whose labour productivity has been hit hard by recession during the whole observed period (e.g. Italy, Greece, Poland and Spain). Rest of the sample follows a pattern where used indicator of productivity decreased for a short period and then is recovered.

Tab. 2: Results of paired sample test for labour productivity[4]

Paired Differences - Mean						
Country	lnTRNumber 2007 - 2008	lnTRNumber 2007 – 2009	lnTRNumber 2007 – 2010	lnTRNumber 2007 – 2011	lnTRNumber 2007 – 2012	lnTRNumber 2007 - 2013
Belgium	-0,16669	-0,0865	-0,19787	-0,31228	-0,38415	-0,40653
Bulgaria	-0,10706	**0,04931**	-0,03105	-0,12611	-0,086	-0,20506
Croatia	-0,07499	**0,04427**	**0,07564**	**0,04782**	-0,05232	**0,04456**
Czech Republic	**0,01062**	**0,14569**	**0,04633**	**0,0447**	**0,01181**	**0,08058**
Estonia	-0,03882	**0,06009**	-0,13427	-0,26357	-0,3115	-0,37118
Finland	-0,02925	**0,13755**	**0,03195**	-0,06564	-0,08296	-0,08014
France	-0,02999	**0,0608**	-0,00781	-0,07311	-0,08048	-0,08
Germany	-0,10031	**0,08954**	**0,00368**	-0,13882	**0,03509**	-0,69934
Greece	-0,02795	**0,21584**	**0,24242**	**0,25848**	**0,30758**	**0,27984**
Holland	-0,14665	**0,24316**	**0,2459**	**0,1259**	**0,25539**	**0,47674**
Hungary	-0,01965	**0,07885**	**0,05966**	**0,07349**	-0,02037	-0,01244
Ireland	**0,01169**	**0,22623**	**0,12627**	**0,03289**	-0,00039	**0,20025**
Italy	**0,016**	**0,208**	**0,11**	**0,073**	**0,111**	**0,101**

[4] Values that are bolded show negative impact of a recession in an observed year, while values that are underlined are statically insignificant at 5% confidence level.

Latvia	-0,04161	**0,13263**	-0,00923	-0,13375	-0,14374	-0,18162
Lithuania	-0,11885	**0,11115**	**0,01732**	-0,12073	-0,17712	-0,21169
Poland	**0,137**	**0,20369**	**0,11043**	**0,119**	**0,027**	-0,069
Portugal	-0,02141	**0,02818**	**0,00468**	-0,00262	**0,02237**	-0,03712
Romania	-0,06952	-0,00732	-0,06439	-0,10589	-0,10726	-0,10271
Slovakia	**0,00738**	**0,11611**	**0,0338**	-0,03833	-0,01817	**0,0247**
Slovenia	-0,04637	**0,1074**	**0,00261**	-0,07577	-0,06781	-0,07262
Spain	**0,02189**	**0,13457**	**0,06371**	**0,01695**	**0,01273**	-0,04161
Sweden	**0,07296**	**0,14328**	-0,04589	-0,11933	-0,14902	-0,12496
UK	**0,17174**	-0,60756	-0,78358	-0,86748	-0,92322	-0,95718

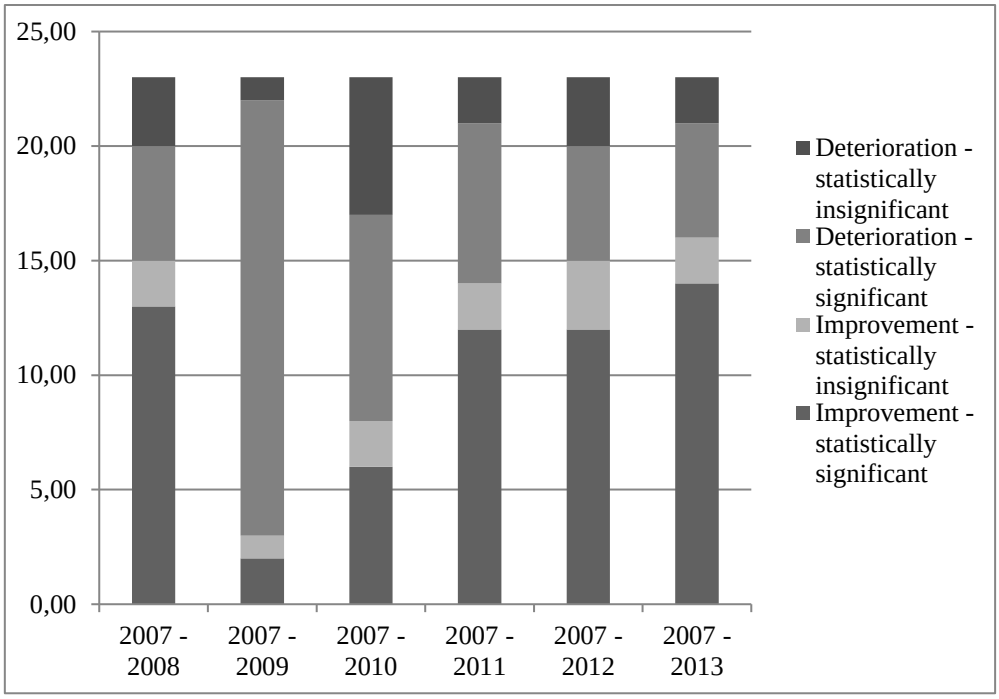
Source: Compiled by authors.

Results of the analysis on EU level are more easily interpreted when they are presented in a figure. From the observed data for these 23 countries it is evident that recession had a relatively weak impact in 2008 since it was still in its beginning. Evidently, one additional year was enough for crisis to hit hard so it had a strong negative impact on majority of countries in 2009 (in 19 out of 23), yet in 2010 these ratios moderately improved. A weaker impact of recession, as expected, is seen in 2011 and 2012, while numbers for 2013 indicate that in 14 out of 23 countries labour productivity significantly improved when compared to data for 2007.

In order to test robustness of the obtained results, the same type of analysis has been made using LnSalesNumber indicator. As anticipated, robustness test confirmed formerly presented results almost completely (only 0,0217%[5] of values obtained with indicator using data for sales demonstrated different impact of recession).

Fig. 1: Overall impact of recession on labour productivity in observed EU countries (using LnTRNumber indicator)

[5] Data for Belgium in 2009 and 2010 and for Croatia in 2012. Due to space limitations results of a robustness check are not presented here but can be obtained at request.



Source: Compiled by authors.

Presented results show that productivity can increase even during the period of recession. Having in mind that labour productivity measure was used in this study, there are several possible explanations for its increase, such as ones regarding structure of labour force (their structure can be unaltered yet workers try harder, or it is changed by employing only high quality workers), number of workers and values of total revenue. Having in mind nature of observed data the research also included analysis of impact of recession on the number of employees in aforementioned countries.

Impact of recession on the number of employees for each year is presented in Table 3 and, similarly to labour productivity, such effects are various among countries. There are countries with an increase (e.g. Belgium, Italy etc.) or decrease (Ireland, Lithuania, UK) in number of workers during the whole period. However, in significant number of countries recession had a weak and/or short impact on number of employees.

Tab. 3: Results of paired sample test for number of workers[6]

Paired Differences - Mean						
Country	lnNumber 2007 - 2008	lnNumber 2007 – 2009	lnNumber 2007 – 2010	lnNumber 2007 – 2011	lnNumber 2007 – 2012	lnNumber 2007 - 2013
Belgium	-,03220	-,01972	-,00874	-,02733	-,03559	-,03048
Bulgaria	-,06247	-,00747	**,04641**	**,00073**	-,09599	-,02262

[6] Values that are bolded show negative impact of a recession in an observed year while values that are underlined are statically insignificant at 5% confidence level.

Croatia	-,02103	**,03338**	**,00583**	-,04314	-,04143	-,04488
Czech Republic	-,02186	**,06687**	**,04198**	-,03069	-,06965	-,05765
Estonia	-,03047	**,03335**	**,04475**	**,01059**	-,00183	-,00490
Finland	-,01738	**,00078**	**,00624**	-,00190	-,00928	-,02931
France	-,02477	-,14220	-,10703	-,03290	**,01439**	-,02115
Germany	-,04587	-,02209	**,00605**	-,02907	-,02938	-,03535
Greece	**,00802**	**,09831**	**,13220**	**,12288**	**,09694**	**,09163**
Holland	-,027	-,033	-,046	-,073	-,083	-,096
Hungary	-,01874	**,11230**	**,06631**	-,02750	-,09269	-,12571
Ireland	**,05063**	**,14397**	**,12397**	**,07121**	**,05623**	**,03605**
Italy	-,03560	**,03919**	**,01775**	-,03041	**,00743**	-,01915
Latvia	**,11550**	-,06867	-,00847	-,03600	-,07023	-,07175
Lithuania	-,03359	-,01912	-,01567	-,04691	-,07152	-,06681
Poland	-,02286	-,01285	-,01233	-,018	-,030	-,003
Portugal	-,03005	-,01954	-,03543	-,04947	-,04625	-,07071
Romania	-,02876	**,06199**	**,04863**	-,04081	-,06809	-,08029
Slovakia	-,09045	**,08769**	**,08315**	**,03902**	**,03294**	**,00233**
Slovenia	-,06897	-,03073	-,05119	-,06738	-,07107	-,05859
Spain	-,01934	**,03542**	**,03956**	**,02322**	**,03187**	**,02273**
Sweden	-,04830	-,00238	-,00860	-,05945	-,07417	-,07727
UK	**,00421**	**,07016**	**,08026**	**,06248**	**,05441**	**,04287**

Source: Compiled by authors.

When results on labour productivity and number of workers are analysed simultaneously there are several possible outcomes. The most favourable option is a situation where recession hasn't at all disturbed labour productivity and number of employees in a country, yet both vales grew during the whole observed period (e.g. in Belgium). Although growth of productivity in almost all years may seem as a positive outcome, when at the same time number of workers decreases (as in UK) it is evident that recession had an impact on revenues in an observed country (e.g. UK). Caution in drawing conclusions is also needed when there is evident fall in labour productivity while number of employees grows during the analysed period (e.g. Italy, Poland). There are also countries in which these two observed values moved in a similar way meaning they were influenced by recession for a relatively short time. The least desirable option is evident when both of these indicators decrease during most of the observed years (e.g. Spain) meaning that crisis hit both workers and their employers via impact on total revenue.

Conclusion

Taking into consideration both indicators of labour productivity as well as the number of employees, it is evident that they have a similar trend during the observed period when all countries are analysed together. Nevertheless, a weaker impact of recession on number of

workers is noticeable. Further, there are countries whose productivity hasn't been at all negatively influenced by recession and those that were hit hard during the observed period. However, in majority of countries productivity decreased for a short period and then recovered. Since there are significant differences between some of the observed countries, a general conclusion should be made with caution since each country has its own specific economic environment influencing objects of this research. In that sense this paper could serve as a starting point for a future, more expanded research.

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