Microeconomic Aspects of Productivity Developments during the Great Recession in Croatia – the CompNet Productivity Module Research Results

Miljana Valdec and Jurica Zrnc

Zagreb, July 2017

SURVEYS S-22

Microeconomic Aspects of Productivity Developments during the Great Recession in Croatia – the CompNet Productivity Module Research Results

Miljana Valdec and Jurica Zrnc

Abstract

This paper explores microeconomic aspects of productivity in Croatia based on Competitiveness Research Network (CompNet) main findings. Several stylised facts emerge from our analysis. Overall, the Croatian economy consists of a small number of highly productive firms and a large portion of relatively unproductive firms, no matter the measure used. During the Great Recession productivity in Croatia decreased and this was accompanied by a sharper percentage point fall in the productivity of relatively unproductive firms, while top decile firms were less hit by the recession. Our estimates show that the recession had beneficial effects on resource allocation of labour among firms, thus increasing productivity. These benefits were especially present in the tradable sector. However, the recession was accompanied by growing misallocation of capital, which adversely affected productivity dynamics ubiquitously across all sectors.

Keywords:

CompNet, heterogeneity, productivity distribution, resource allocation

JEL:

D21 D24 L11 L25

Croatian National Bank, e-mail: miljana.valdec@hnb.hr.
Vienna Graduate School of Economics, Croatian National Bank, e-mail: jurica.zrnc@univie.ac.at.

Content

1 Introduction

Economic research is quite unanimous on productivity growth being the most important driver of long term improvements in economic standards. Similarly, productivity levels are shown to be the main determinant of large income differences among countries (see for example, Caselli, 2005). During the Great Recession, according to multiple data sources and measures, Croatia saw large decreases in productivity. In this study we confirm these trends and present rich evidence on various aspects of this decrease in productivity. Usually, analysis of productivity at the macroeconomic level hinges on aggregate statistics and averages. However, widespread heterogeneity in performance of firms is also well documented in the literature (Caves 1998, Bartelsman and Dooms 2000, Loof and Heshmati, 2002). This heterogeneity usually maps into skewed distributions of firm performance measures, which makes averages unsuitable for the description of productivity. The importance of distinguishing among the aggregates and distributions that generate these aggregates is evident in our analysis.

In this paper we present the results of an extensive investigation of Croatian firms' productivity done by the Croatian National Bank under the auspices of the ECB for Competitiveness Research Network (CompNet). The purpose of this paper is to analyse and discuss in more detail some of the main CompNet findings in the productivity module focusing mainly on the microeconomic aspects of aggregate productivity using firm level data. This paper contributes to the literature with its detailed assessments of Croatian firms' productivity by sectors. Furthermore, it is the first study to present and analyse various indicators of allocative efficiency in Croatia, through time and in comparison with other countries. The cross-country comparability of results was possible using the CompNet database, which ensures that empirical methodologies across countries are synchronised.

Firstly, we document decreasing real labour productivity and total factor productivity (TFP) in Croatia during the Great Recession, according to various sources, including our calculations. Next, we explore the distribution of productivity across firms. Overall, the Croatian economy consists of a small number of highly productive firms and a large portion of relatively unproductive firms, irrespective of the measure used. The recession was accompanied by a sharper percentage point fall in the productivity of relatively unproductive firms, while top decile firms were less hit by the recession in percentage terms. Total factor productivity dynamics were more subdued across the whole distribution. Our estimates show that the recession had beneficial effects on resource allocation of labour among firms, thus increasing productivity. These benefits are especially present in the tradable sector. However, the recession was accompanied by growing misallocation of capital, which adversely affected productivity dynamics across all sectors.

This paper is organised as follows. In the next section, a short introduction to CompNet is presented. Section 3 summarizes the productivity developments of non-financial firms. Section 4 analyses whether resource allocation in Croatia is efficient or not and section 5 concludes.

2 About CompNet

The CompNet[1] was set up by the European Union (EU) System of Central Banks in March 2012. Its two main objectives were to study competitiveness in the EU using a multi-dimensional approach (macro, micro and cross-border levels) and to understand better the theoretical and empirical links among the drivers of competitiveness and macroeconomic performance for research and policy analysis.

As a result, many research projects were published accompanied by two databases: a diagnostic toolkit on

---

[1] More information available at http://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_compnet.en.html and http://www.compnet.org/index.php?id=239.

competitiveness and a micro dataset. The Compendium diagnostic toolkit is a macro dataset that includes around 100 indicators, 20 of which are novel in nature and were developed by CompNet (for more details consult Karadeloglou et al., 2015). The micro dataset or CompNet database is based on firm level data, described in detail in Lopez-Garcia et al. (2014 and 2015), and contains a comprehensive set of indicators drawn from national sources in about twenty EU countries. In order to overcome the usual problems accompanying firm-level data problems, which include confidentiality issues and lack of comparability across countries, in the CompNet common methodology, protocol, computation and aggregation to sector and country level were used to analyse the data. Since June 2015 CompNet has been a self-governing network managed by a Steering Committee[2].

The analysis includes the majority of non-financial corporations in the business sector[3]. Observed are firms from approximately sixty NACE divisions (sectors), which are then aggregated using different weights into nine macro-sectors and the level of the overall economy. Macro-sectors include the following: manufacturing; construction; wholesale and retail trade; transport and storage; accommodation and food service activities; information and communications; real estate activities; professional, scientific and technical activities; and administrative and auxiliary activities. The data were organised in two samples: a full sample (ALL) including firms with at least 1 employee and a restricted sample (20E) including only firms with more than 20 employees. The beginning period covered by this dataset varies from one country to another and the data are updated annually. The most recent, 5th, vintage of the CompNet database ends with 2013. Up to this point, the number of EU countries[4] that participated could differ depending on the vintage and sample.

The source of Croatian firm-level data used in the analysis is the Annual Financial Statements Registry that Croatian non-financial companies are obliged to provide to the Financial Agency (FINA). Due to availability, the overall analysis for Croatia was prolonged up to 2014, and overall results cover the period 2002-2014.

3 Productivity developments

The focus of this section is on productivity developments in the Croatian economy over the years. We shall present the microeconomic stylised facts about productivity in Croatia resulting from the CompNet Productivity module. Dominantly, two measures of productivity were used: labour productivity (real value added per employee in thousands of euros) and total factor productivity (TFP). Total factor productivity (TFP) is the portion of total output that is not attributed to measured inputs of labour and capital, which is usually estimated as a residual in a Cobb-Douglas production function. In this analysis TFP is calculated using the methodology of Wooldridge (2009)[5]. Since TFP is calculated as a residual one needs to take care when interpreting the results of this analysis due to fact that it is not clear which portion of movements in TFP are due to other, unmeasured, factors, such as capacity utilization, which might play an important role.

Although, we are primarily interested in the distribution of productivity across firms, we first check the CompNet aggregate TFP and labour productivity calculations with available sources. Labour productivity declined between 2008 and 2014 for 1.1% according to Eurostat[6] aggregate data, while in the CompNet database a 1.3% contraction was recorded, which is very similar. Furthermore, available estimates point to a de-

---

crease in TFP with the European Commission[7] estimating a 10.7% decrease, while the CompNet estimate of TFP amounts to –4.9%. It is well established that capacity utilization is pro-cyclical (Fernald and Wang, 2015), so a sizeable portion of these dynamics may be attributed to capacity utilization. However, this needs to be left for further research, since the CompNet database does not contain data on capacity utilization.

The CompNet database is very suitable to describe the productivity distribution of firms in various sectors. The analysis in this module is performed for all NACE sectors available across countries. As in similar research, the results show substantial dispersion and asymmetry of productivity across Croatian firms, with a relatively large number of low productive firms and a smaller number of highly productive firms. Labour productivity distribution in Croatia is highly skewed, which is evident from the distance of the median from the average as well as the distance of the 90th percentile from the average in a given year. This holds for other productivity indicators as well. Due to the richness of the dataset, which includes sufficient moments of the productivity distribution, we represent the density functions as well.

The features of the labour productivity dispersion in Croatia show that 90th percentile productivity (top productive firms) fell sharply at the start of the recession, while 10th percentile productivity (least productive firms) decreased more in terms of percentage points. Both changes indicate less productivity dispersion as its standard deviation decreased. Kernel density function

also points to the accumulation of density around low productivity levels with a long right-tail of the distribution i.e. a small share of highly productive firms. It is interesting that during the crisis, productivity distribution slightly shifted to the left, indicating that the mass of less productive firms increased during the recession. Furthermore, differences among macro-sectors can also be noticed (Figure A1).

The Figure 2 represents the distribution of labour productivity across countries. The figure is constructed with the use of a restricted sample (firms with more than 20 employees). In this way, countries can be compared more reliably, since data collection and representativeness for small and micro firms vary by country. Looking at the country mean labour productivity, CompNet firm-level data mimic the rankings calculated at the macro level across countries.

Nonetheless, cross-country comparisons of labour productivity levels have to be made with lots of caution for several reasons. First, the labour productivity measures reported above are expressed in country-specific (thousands of) euros, while for international comparisons of productivity levels one should use purchasing parity units. Moreover, labour productivity differences can be largely driven by differences in capital intensity, which varies widely (i.e. across sectors). Also, even if the restricted sample (above 20 employees) is more suitable for comparisons, there still remain important sample differences that might be affecting these rankings. For all these reasons, the intention in Figure 2 is not to com-

Figure 1 Labour productivity distribution

Note: Country-year averages are computed as simple averages across NACE sectors in order to obtain average distribution for each year.
Source: Authors' calculations based on the CompNet database (sample ALL).
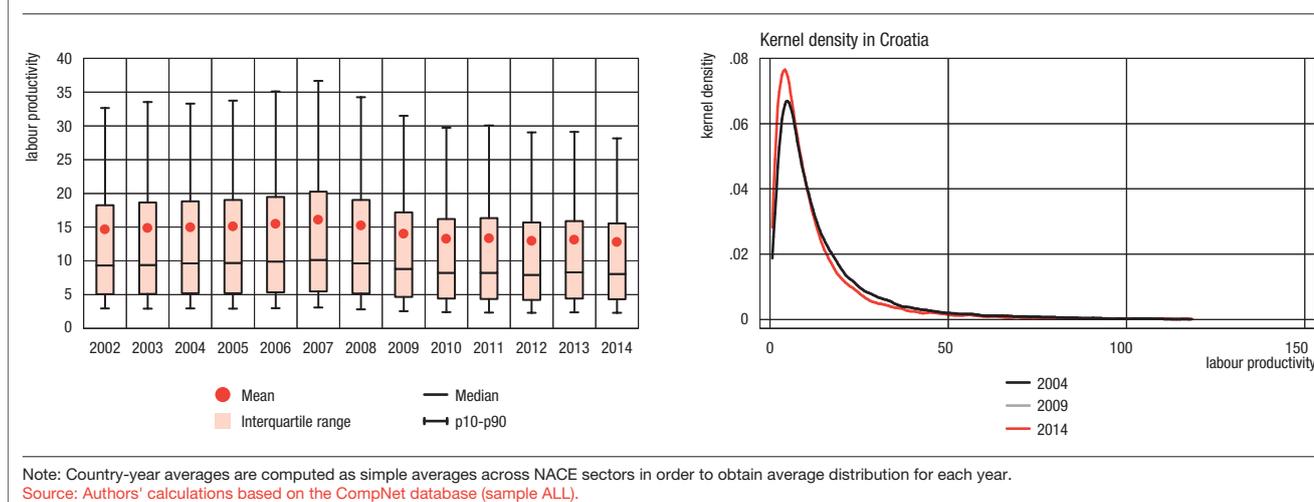
7   Available at: http://ec.europa.eu/economy_finance/ameco/user/serie/ResultSerie.cfm.

pare country productivity levels, but rather to point out that the large within-country dispersion of productivity as well as the high skewness of the distribution is common not only for case of Croatia, but also for other European countries in the sample.

Figure 2 Labour productivity distribution across countries

Note: The distribution of labour productivity across countries is averaged over the period 2002-2012, common to all countries.
Source: Authors' calculations based on the CompNet database (sample 20E).
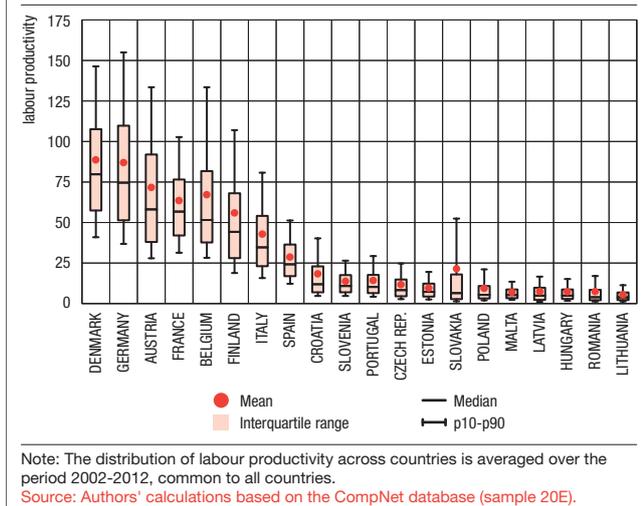
The second measure of productivity that we investigated in more detail is TFP. Total factor productivity distribution also shows that there is a relatively large number of low productive firms and a small number of highly productive firms, but the dispersion is much less pronounced than in labour productivity, which is also a common result of empirical research (Bartelsman et al., 2013). Similar conclusions can be drawn for all macro-sectors within the economy (Figure A2). One should note that comparison across countries in the case of TFP

is not possible, due to fact that each country's TFP is estimated based on a country specific production function. Moreover, there is also evidence of smaller productivity dispersion in recent years, but it is less evident than in case of labour productivity.

As we saw, there is a high degree of heterogeneity across firms within countries and within industries in the same country. In that manner, it is interesting to analyse in more detail some of the features of firms from different parts of the productivity distribution. Therefore, we will compare the behaviour of firms that are in the first (p10), last (p90) decile and in median of the productivity distribution in their own industry over time.

The comparison between firm productivity and size (measured in terms of the number of employees) confirms that the most productive firms in Croatia are on

Figure 4 Average size of firms in different productivity percentile, average (2002-2014)

Note: The average firm size in each percentile of the labour productivity or TFP distribution is computed at the sector/year level.
Source: Authors' calculations based on the CompNet database (sample ALL).
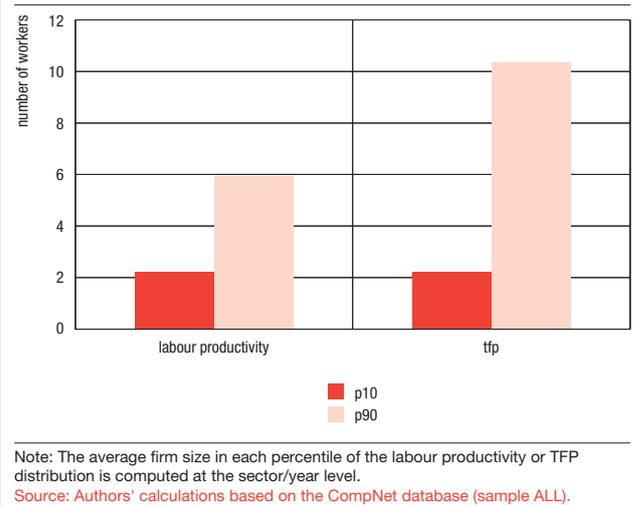
Figure 3 TFP distribution

Note: Country-year averages are computed as simple averages across NACE sectors in order to obtain average distribution for each year.
Source: Authors' calculations based on the CompNet database (sample ALL).
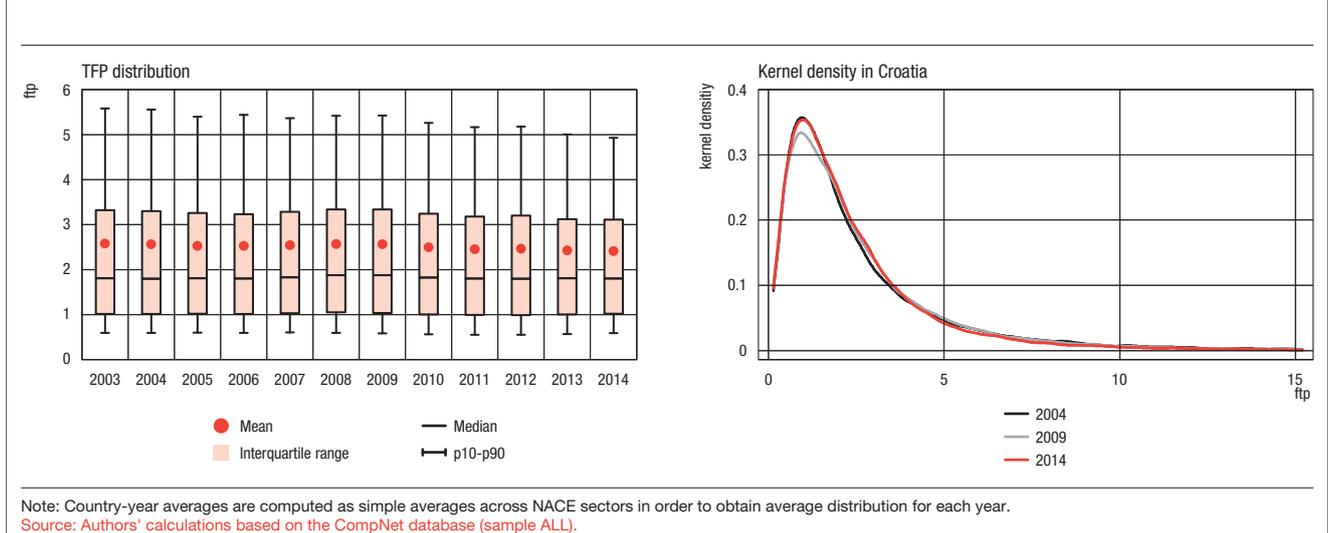
Figure 5 Evolution in different moments of the productivity distribution

Note: The average labour productivity in each percentile of the labour productivity distribution is computed at the sector/year level.
Source: Authors' calculations based on the CompNet database (sample ALL).
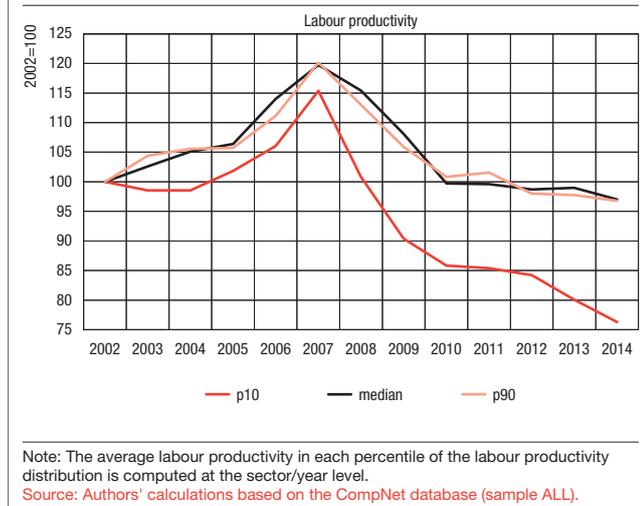
average larger than the least productive firms, which is in line with the findings for other countries and previous empirical analysis (Lopez-Garcia et al., 2014, Mayer and Ottaviano, 2008). In case of the TFP distribution, the difference in firm size is even more evident.

In the graph below we show the dynamics of labour productivity for different groups of firms over time, namely, the least (p10), median and most (p90) productive firms within the sector. The deterioration of labour productivity in the post crisis period is evident for all three groups. However, in recent years it stabilised for median and most productive firms but continued to decline for low-productivity firms.

The results presented above emphasise the importance of reallocating factors of production towards more productive firms so as to facilitate their growth. In following section resource allocation in Croatia is analysed in more detail.

4 Resource allocation

In the previous section we showed that economic activity in Croatia is generated by relatively few highly productive firms and many low productive firms, which also holds true for other EU countries (Lopez-Garcia et al., 2014). This stresses the importance of the economy's ability to enable the flow of resources to more productive firms. In other words, the market system should enable efficient resource allocation so that better performing firms use more factors of production.

However, markets are characterised by a series of inefficiencies, which is why resource reallocation is often less than optimal, as confirmed in, for example, Hsieh and Klenow (2009) and Bartelsman et al. (2013). Resource misallocation between firms can potentially explain large differences in incomes between countries. Hsieh and Klenow (2009) calculate manufacturing TFP gains of 30–50% in China and 40–60% in India if capital and labour are hypothetically reallocated to equalize marginal products to the extent observed in the United States. However, misallocation is not static, it can also change through time. Gopinath et al (2015), attribute the productivity stagnation in the South of Europe prior to the Great Recession to misallocation of capital. One of the factors driving the variation of allocative efficiency across countries is, for example, the

institutional characteristics of a country (Andrews and Cingano, 2012; Restuccia and Rogerson, 2008; Aghion et al., 2007). In their empirical analysis, Andrews and Cingano point to employment protection legislation and product market regulations (including barriers to entry and bankruptcy legislation) as determinants of allocative efficiency.

The extent to which resources are allocated efficiently across firms in Croatia becomes even more important in view of the fact that Croatia lags behind most of its peers according to various measures of institutional development and the business environment (such as the Doing Business index). In the following paragraphs we assess how the allocation of resources changed during the Great Recession in Croatia.

Having established that there are noticeable differences in productivity across firms, the remainder of the text quantifies the importance of resource reallocation across firms for aggregate productivity level and dynamics. Two approaches are applied: assessing the contribution of resource reallocation to the level of aggregate productivity by means of the Olley and Pakes decomposition (1996) and assessing the dynamics of misallocation of resources through measures of dispersion following Hsieh and Klenow (2009).

4.1 Olley-Pakes decomposition

The Olley-Pakes (OP) decomposition divides productivity into the un-weighted average productivity in a particular sector and the covariance between size (measured by number of employees) of the firm and its productivity.

$$y_{st} = \sum_{i \in s} \Theta_{it} \omega_{it} = \overline{\omega}_{st} + \sum_{i \in s} (\Theta_{it} - \overline{\Theta}_{st})(\omega_{it} - \overline{\omega}_{st}), \qquad (2)$$

where Θ_{it} represents the size of a firm i in industry s and at time t, while ω_{it} is a measure of productivity. $\overline{\omega}_{st}$ is the unweighted average productivity in a particular industry and $\overline{\Theta}_{st}$ is the unweighted average size in the industry. The un-weighted average would be equal to the average productivity if all firms were equal in size. However, this is not the case in reality. Thus, the OP covariance (or OP gap) term which equals $\sum_{i \in s} (\Theta_{it} - \overline{\Theta}_{st})(\omega_{it} - \overline{\omega}_{st})$ captures the extra productivity that is associated with larger enterprises. A larger covariance implies a stronger correlation between productivity of a firm and its size. An increase in the covariance implies that resources are distributed across firms in such a way that more productive firms use more resources than before. Since labour is used as a weight in OP decomposition, it can be also viewed as an indicator of efficiency in labour allocation.

Figure 6 shows the OP covariance, evidencing that the productivity level of the Croatian non-financial business sector was on average around 25% higher due to larger firms employing more resources. This means that firms of above-average productivity had more employees than the sector average. In addition, this indicator in-

Figure 6 OP gap in overall economy
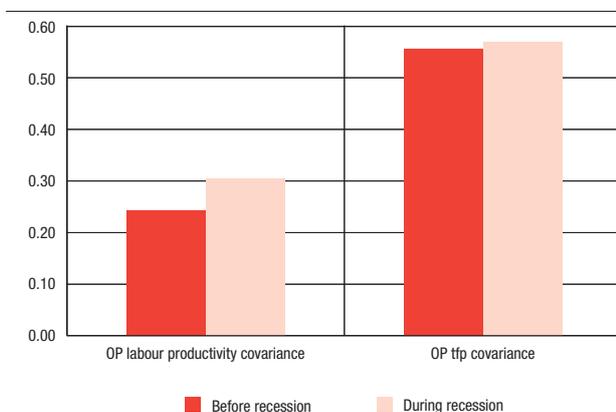
Note: Before the recession refers to the years between 2002 and 2008, while during the recession refers to the years between 2009 and 2014.
Source: Authors' calculations based on the CompNet database (sample ALL).

Figure 7 OP labour productivity gap in tradable and non-tradable sectors
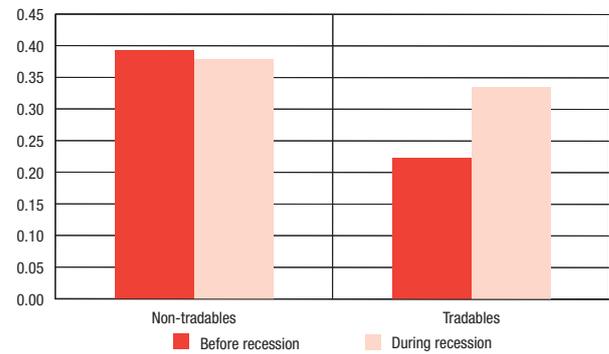
Note: Before the recession refers to the years between 2002 and 2008, while during the recession refers to the years between 2009 and 2014. Non-tradable sectors are Construction, Accommodation and food service activities, Information and communication, Professional, Scientific and technical activities and Administrative and support service activities. Tradable sectors are Manufacturing with exclusion of Manufacture of coke and redefined petroleum products.
Source: Authors' calculations based on the CompNet database (sample ALL).

creased during the recession, to some 30% of total productivity, which indicates possible positive effects of the recession on the allocative efficiency of the Croatian economy. These effects are visible in several countries in the CompNet sample (Figure A3), so the Croatian case is not unique. Similarly, the OP gap for TFP increased during recession.

However, this increase in the allocative efficiency during the recession shows heterogeneity across sectors. Tradable sectors such as manufacturing experienced an increase in allocative efficiency parallel with the recession. On the other hand, non-tradable sectors which are usually subject to less competition, saw a decrease in the OP gap during the recession (Figure 7).

4.2 Measures of dispersion of marginal revenue products of capital and labour

Hsieh and Klenow (2009) propose a simple model to measure misallocation of resources. In the model, an undistorted market economy is characterised by equal marginal revenue products of capital (labour) across firms. In reality, economies often depart from this ideal case. Hsieh and Klenow (2009) use the undistorted market economy as a benchmark and subject it to firm specific policy distortions. The higher the distortions, the larger is the variation in the marginal revenue products across firms and hence larger misallocation.

We calculate the marginal revenue product of capital the following way:

$$MRPK_{it} = \frac{\beta * rva_{it}}{k_{it}}, \qquad (3)$$

where β is the coefficient corresponding to capital in the estimation of TFP, rva is real value added, k is capital, i is the firm index and t is the time index. β differs across sectors.

Analogously for marginal revenue product of labour:

$$MRPL_{it} = \frac{\omega * rva_{it}}{l_{it}}, \qquad (4)$$

where ω is the coefficient corresponding to labour in the estimation of TFP and l is labour. Next, we use measures of dispersion of marginal revenue product of capital and labour. First, we calculate the firm level MRPK and MRPL. Secondly, we calculate the within sector standard deviation of these measures. Finally, we aggregate the sector level standard deviations using output weights.

Figure 8 shows that the dispersion of MRPK markedly increased during the recession. This suggests that capital was increasingly misallocated during the crisis, which might be expected due to possible financial constraints arising during the recession. This result is similar to those from several other Eurozone countries, especially from the South of Europe (Gopinath et al, 2015). The authors find that, prior to the crisis, increasing misallocation of capital can be connected to decreasing interest rate and capital inflows coupled with financial frictions. During the pre-recession period when there were high capital inflows into the South these were allocated largely to firms with high net worth, which could provide collateral. High net worth firms could expand their capacity while potentially productive firms but with insufficient collateral could not access credit. This led to misallocation of capital which, as Gopinath et al (2015) argue, resulted in the productivity stagnation of the South prior to the Great Recession. The case of Croatia is yet to be studied in more detailed manner.

Figure 8 Dispersion of MRPK, MRPL
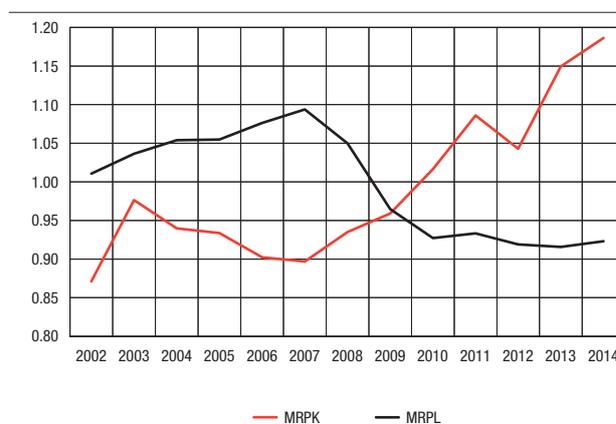
Source: Authors' calculations based on the CompNet database (sample ALL).

However, a different trend is visible in the marginal revenue product of labour which decreased from the start of the recession. This decline in misallocation of labour might be connected to the fact that firms were extensively adjusting their labour force during the recession. Furthermore, newly employed workers were mostly employed on fixed term contracts, lowering labour adjustment costs to the firms. On the other hand, capital is to a great extent irreversible and difficult to adjust downwards. Furthermore, bankruptcy regulation in Croatia suffers from serious drawbacks rendering capital adjustment harder and even more costly. This implies that labour and capital market regulation can have substantial effects on aggregate productivity and needs to be taken into account by policymakers.

When we look at the sector composition of the above measures it is visible that the dispersion of MRPK increased across almost all sectors (Figure A4). On the other hand, the dispersion in MRPL was stagnant for some sectors, but its dynamics were driven by manufacturing, construction and a few service activities (Figure A5).

5 Conclusion

The main CompNet contribution is a dataset that enables better understanding of the concept of competitiveness in an individual country and also permits international comparison of a firm's individual performance.

Other than information about sector and country averages, this dataset contains information about firm-level performance distribution across different dimensions (productivity, size, employments, costs, exporting activ-

ity, etc.). The aim of this study was to provide a series of stylised facts about underlying firm level distributions in Croatian economy.

We show that the economy consists of a small number of highly productive firms and a large portion of relatively unproductive firms, which is evident in the highly skewed productivity distribution, irrespective of the measure used. This highlights the importance of reallocating resources to more productive firms. We quantify the dynamics of misallocation by using Olley-Pakes decomposition and dispersion measures. Our estimates show that capital was increasingly misallocated during the recession, while labour misallocation exhibited more favourable dynamics.

Finally, due to the results presented in this paper we can state that aggregate indicators of productivity developments alone can be misleading and risk yielding incomplete policy recommendations. Therefore, the shape of the productivity distribution is also relevant and should be taken into account.

6 References

Aghion, P., T. Fally, and S. Scarpetta (2007): *Credit Constraints as a Barrier to the Entry and Post-Entry Growth of Firms,* Economic Policy (October), pp. 731-779.

Andrews, D., and F. Cingano (2012): *Public policy and resource allocation: evidence from firms in OECD countries*, OECD Economics Department Working Papers 996, OECD Publishing.

Bartelsman, E., and M. Doms (2000): *Understanding Productivity: Lessons from Longitudinal Microdata*, Journal of Economic Literature, Vol. 38, pp. 569-594.

Bartelsman, E., J. Haltiwanger, and S. Scarpetta (2013): *Cross-Country Differences in Productivity: The Role of Allocation and Selection*, American Economic Review, Vol. 103(1), pp. 305-334.

Caselli, F. (2005): *Accounting for Cross-Country Income Differences*, Handbook of Economic Growth, in: Philippe Aghion & Steven Durlauf (ed.), Handbook of Economic Growth, Edition 1, Volume 1, Chapter 9, pp. 679-741 Elsevier.

Caves, R. E. (1998): *Industrial Organization and New Findings on the Turnover and Mobility of Firms*, Journal of Economic Literature, Vol. 36, pp. 1947-1982.

Di Mauro F., and M. Ronchi (2015): *CompNet Report – Assessing European Competitiveness: the contribution of CompNet research*, ECB, June.

Fernald, J. G., and J. C. Wang (2015): *Why has the cyclicality of productivity changed? What does it mean*?, Current Policy Perspectives 15-6, Federal Reserve Bank of Boston.

Gopinath, G., S. Kalemli-Ozcan, L. Karabarbounis, and C. Villegas-Sánchez (2015): *Capital allocation and productivity in South Europe*, NBER Working Paper (21453).

Hsieh, C. T., and P. J. Klenow (2009): *Misallocation and Manufacturing TFP in China and India*, The Quarterly Journal of Economics, Vol. 124(4), pp. 1403-1448.

Karadeloglou P., K. Benkovskis, and the CompNet Task Force (2015): *Compendium on the diagnostic toolkit for competitiveness*, ECB, Occasional Paper (163).

Loof, H., and A. Heshmati (2002): *Knowledge capital and performance heterogeneity: A firm-level innovation study*, International Journal of Production Economics, Vol. 76, pp. 61-85.

Lopez-Garcia, P., F. Di Mauro, N. Benatti, C. Angeloni, C. Altomonte, M. Bugamelli, L. D'Aurizio, G. Barba Navaretti, E. Forlani, S. Rossetti, D. Zurlo, A. Berthou, C. Sandoz-Dit-Bragard, E. Dhyne, J. Amador, L. D. Opromolla, A. C. Soares, B. Chiriacescu, A. M. Cazacu, T. Lalinsky, E. Biewen, S. Blank, P. Meinen, J. Hagemejer, P. Tello, A. Rodríguez-Caloca, U. Čede, K. Galuščák, J. Meriküll, and P. Harasztosi (2014): *Micro-based evidence of EU competitiveness : the CompNet database*, ECB Working Paper (1634).

Lopez-Garcia, P., F. Di Mauro, and the CompNet Task Force (2015): *Assessing European competitiveness: the new CompNet micro-based database*, ECB Working Paper (1764).

Mayer, T., and G. Ottaviano (2008): *The Happy Few: The Internationalisation of European Firms*, Intereconomics: Review of European Economic Policy, Vol. 43(3), pp. 135-148.

Olley, G. S., and A. Pakes (1996): *The Dynamics of Productivity in the Telecommunications Equipment Industry*, Econometrica, Vol. 64(6), pp. 1263-1297.

Restuccia, D., and R. Rogerson (2008): *Policy distortions and aggregate productivity with heterogeneous establishments*, Review of Economic Dynamics, Vol. 11, pp. 707-720.

7 Appendix

Figure A1 Labour productivity distributions across macro-sectors
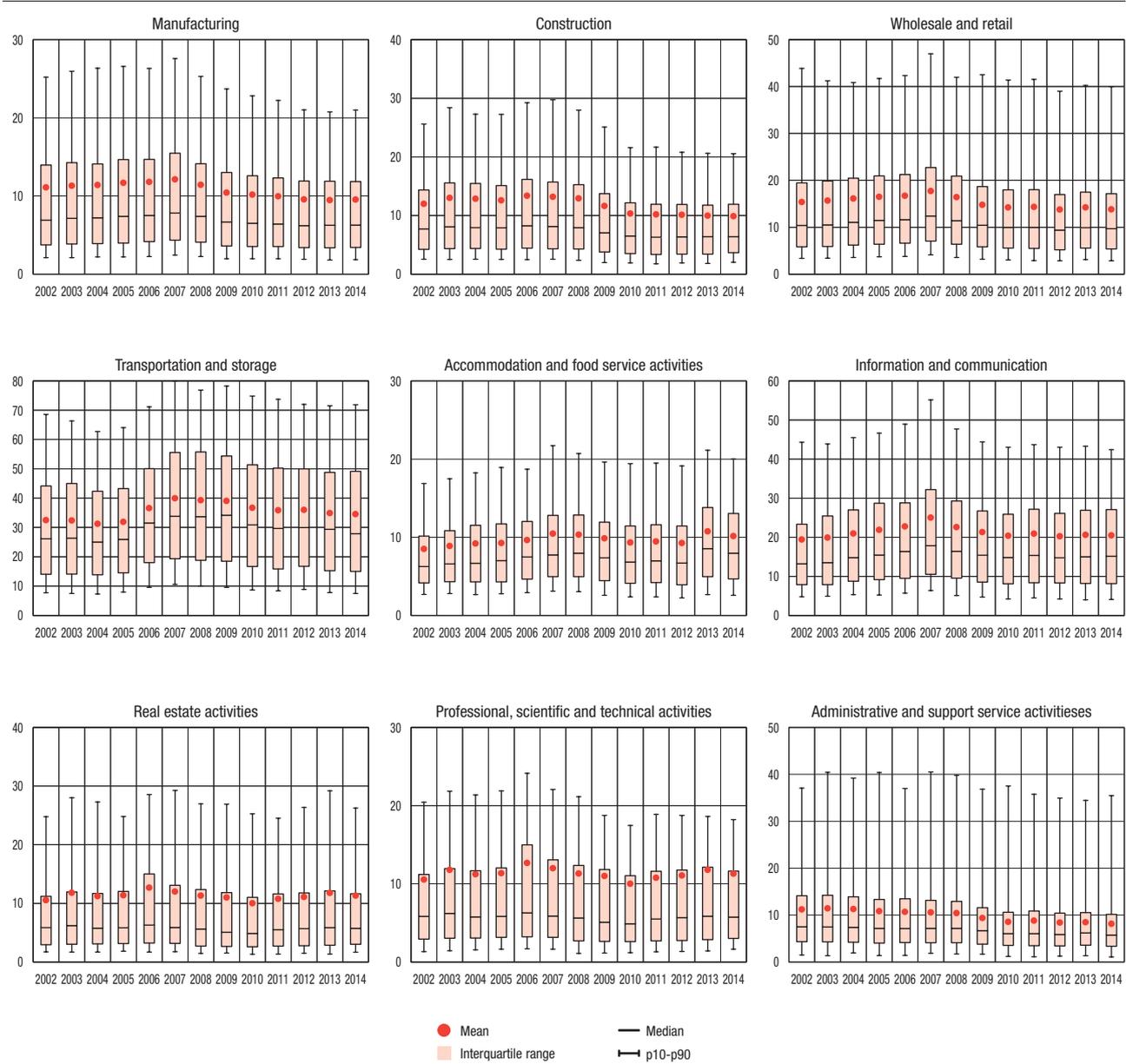
Note: Macro-sector-year averages are computed as simple averages across NACE sectors in order to obtain average distribution for each year in each macro-sector.
Source: Authors' calculations based on the CompNet database (sample ALL).

## Figure A2 Total factor productivity distributions across macro-sectors
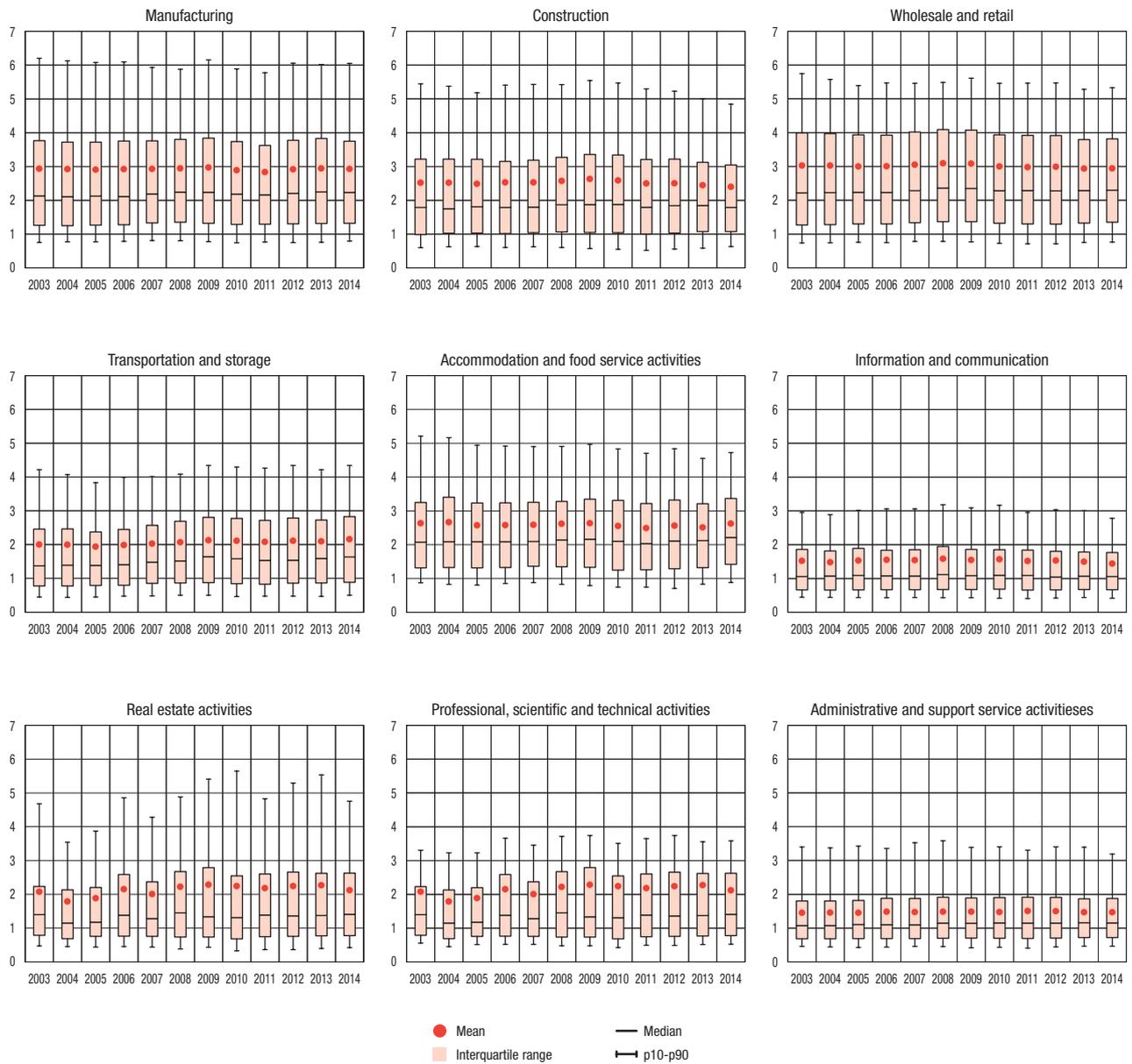
Note: Macro-sector-year averages are computed as simple averages across NACE sectors in order to obtain average distribution for each year in each macro-sector.
Source: Authors' calculations based on the CompNet database (sample ALL).

Figure A3 OP labour productivity gap across countries
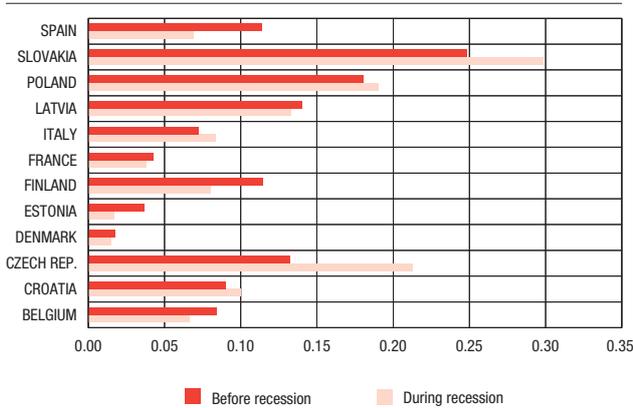
Before recession   During recession

Note: Before the recession refers to the years between 2002 and 2008, while during the recession refers to the years between 2009 and 2013.
Source: Authors' calculations based on the CompNet database (sample 20E).

Figure A5 Sector dispersion of MRPL
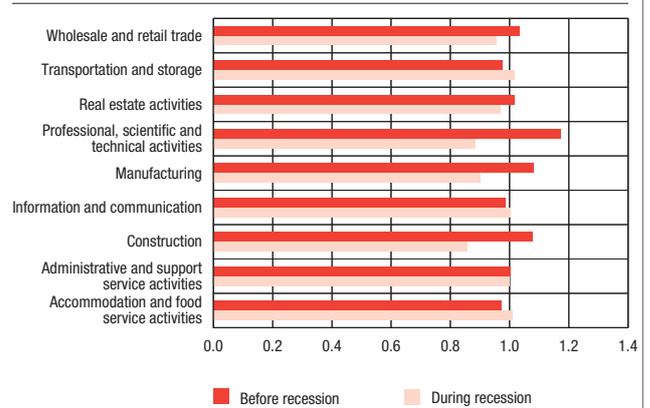
Before recession   During recession

Note: Before the recession refers to the years between 2002 and 2008, while during the recession refers to the years between 2009 and 2014.
Source: Authors' calculations based on the CompNet database (sample ALL).

Figure A4 Sector dispersion of MRPK
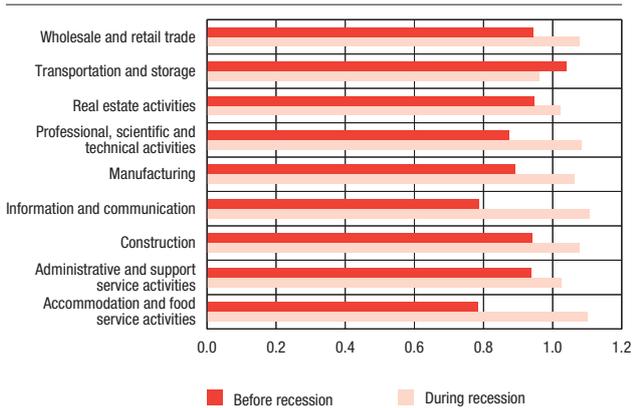
Before recession   During recession

Note: Before the recession refers to the years between 2002 and 2008, while during the recession refers to the years between 2009 and 2014.
Source: Authors' calculations based on the CompNet database (sample ALL).

The following Surveys have been published

No.	Date	Title	Author(s)
S-1	March 2000	Banking Sector Problems: Causes, Solutions and Consequences	Ljubinko Jankov
S-2	April 2000	Banking System in 1998	
S-3	December 2000	The Lending Policies of Croatian Banks: Results of the Second CNB Bank Interview Project	Evan Kraft with Hrvoje Dolenec, Mladen Duliba, Michael Faulend, Tomislav Galac, Vedran Šošić and Mladen Mirko Tepuš
S-4	December 2000	What Has Been the Impact of Foreign Banks in Croatia	Tomislav Galac and Evan Kraft
S-5	September 2001	Currency Crises: Theoretical and Empirical Overview of the 1990s	Ante Babić and Ante Žigman
S-6	April 2002	An Analysis of the Operation of Building Societies in the Republic of Croatia	Mladen Mirko Tepuš
S-7	April 2002	Ten Years of Transition Central Banking in the CEE and the Baltics	Warren Coats and Marko Škreb
S-8	May 2002	Fiscal Consolidation, External Competitiveness and Monetary Policy: A Reply to the WIIW	Evan Kraft Tihomir Stučka
S-9	November 2004	Survey and Analysis of Foreign Direct Investment in the Republic of Croatia	Alen Škudar
S-10	February 2005	Does Croatia Need Risk-Based Deposit Insurance Premia?	Tomislav Galac
S-11	February 2005	How Can Croatia's Deposit Insurance System Be Improved?	Michael Faulend and Evan Kraft
S-12	April 2005	An Analysis of Housing Finance Models in the Republic of Croatia	Mladen Mirko Tepuš
S-13	July 2005	EU Criteria with Special Emphasis on the Economic Convergence Criteria – Where is Croatia?	Michael Faulend, Davor Lončarek, Ivana Curavić and Ana Šabić
S-14	December 2005	Results of the Third CNB Bank Survey: Croatian Banking in the Consolidation and Market Positioning Stage, 2000 – 2002	Tomislav Galac
S-15	November 2008	Results of the Fifth CNB Bank Survey	Lana Ivičić, Mirna Dumičić, Ante Burić, Ivan Huljak
S-16	December 2008	Results of the Fourth CNB Bank Survey	Tomislav Galac and Lana Dukić
S-17	September 2014	Framework for Monitoring Macroeconomic Imbalances in the European Union – Significance for Croatia	Mislav Brkić and Ana Šabić
S-18	August 2015	A Brief Introduction to the World of Macroprudential Policy	Mirna Dumičić
S-19	October 2015	Features of the Labour Market and Wage Setting in Croatia: Firms Survey Results	Marina Kunovac and Andreja Pufnik
S-20	November 2016	Are Shadow Banks Hiding in Croatia as Well?	Mirna Dumičić and Tomislav Ridzak
S-21	December 2016	A Note on Kuna Lending	Igor Ljubaj and Suzana Petrović

Guidelines to authors

In its periodical publications *Working Papers, Surveys* and *Technical Papers*, the Croatian National Bank publishes scientific and scholarly papers of the Bank's employees and other associate contributors.

After the submission, the manuscripts shall be subject to peer review and classification by the Manuscript Review and Classification Committee. The authors shall be informed of the acceptance or rejection of their manuscript for publication within two months following the manuscript submission.

Manuscripts are submitted and published in Croatian and/or English language.

Manuscripts submitted for publication should meet the following requirements:

Manuscripts should be submitted via e-mail or optical storage media (CD, DVD), accompanied by one printed paper copy. The acceptable text format is Word.

The first page of the manuscript should contain the article title, first and last name of the author and his/her academic degree, name of the institution with which the author is associated, author's co-workers, and the complete mailing address of the corresponding author to whom a copy of the manuscript with requests for corrections shall be sent.

Additional information, such as acknowledgments, should be incorporate in the text at the end of the introductory section.

The second page should contain the abstract and the key words. The abstract is required to be explicit, descriptive, written in third person, consisting of not more than 250 words (maximum 1500 characters). The abstract should be followed by maximum 5 key words.

A single line spacing and A4 paper size should be used. The text must not be formatted, apart from applying bold and italic script to certain parts of the text. Titles must be numerated and separated from the text by double-line spacing, without formatting.

Tables, figures and charts that are a constituent part of the paper must be well laid out, containing: number, title, units of measurement, legend, data source, and footnotes. The footnotes referring to tables, figures and charts should be indicated by lower-case letters (a,b,c…) placed right below. When the tables, figures and charts are subsequently submitted, it is necessary to mark the places in the text where they should be inserted. They should be numbered in the same sequence as in the text and should be referred to in accordance with that numeration. If the tables and charts were previously inserted in the text from other programs, these databases in the Excel format should also be submitted (charts must contain the corresponding data series).

The preferred formats for illustrations are EPS or TIFF with explanations in 8 point Helvetica (Ariel, Swiss). The scanned illustration must have 300 dpi resolution for grey scale and full colour illustration, and 600 dpi for lineart (line drawings, diagrams, charts).

Formulae must be legible. Indices and superscript must be explicable. The symbols' meaning must be given following the equation where they are used for the first time. The equations in the text referred to by the author should be marked by a serial number in brackets closer to the right margin.

Notes at the foot of the page (footnotes) should by indicated by Arabic numerals in superscript. They should be brief and written in a smaller font than the rest of the text.

References cited in the text are listed at the last page of the manuscript in the alphabetical order, according to the authors' last names. References should also include data on the publisher, city and year of publishing.

Publishing Department maintains the right to send back for the author's revision the accepted manuscript and illustrations that do not meet the above stated requirements.

All contributors who wish to publish their papers are welcomed to do so by addressing them to the Publishing Department, following the above stated guidelines.

The Croatian National Bank publications

Croatian National Bank – Annual Report
Regular annual publication surveying annual monetary and general economic developments as well as statistical data.

Croatian National Bank – Semi-annual Report
Regular semi-annual publication surveying semi-annual monetary and general economic developments and statistical data.

Banks Bulletin
Publication providing survey of data on banks.

Croatian National Bank – Bulletin
Regular monthly publication surveying monthly monetary and general economic developments and monetary statistics.

Croatian National Bank – Working Papers
Occasional publication containing shorter scientific papers written by the CNB employees and associate contributors.

Croatian National Bank – Surveys
Occasional publication containing scholarly papers written by the CNB employees and associate contributors.

Croatian National Bank – Technical Papers
Occasional publication containing papers of informative character written by CNB employees and associate contributors.

The Croatian National Bank also issues other publications such as, for example, numismatic issues, brochures, publications in other media (CD-ROM, DVD), books, monographs and papers of special interest to the CNB as well as proceedings of conferences organised or co-organised by the CNB, educational materials and other similar publications.