



The wiiw Balkan Observatory

Working Papers | 110 | May  
2013

*Mario Holzner*

Inequality and the Crisis: A Causal Inference Analysis  
Quantitative Research on New Quarterly  
Income Inequality Data for CESEE





# The wiiw Balkan Observatory

[www.balkan-observatory.net](http://www.balkan-observatory.net)

## *About*

Shortly after the end of the Kosovo war, the last of the Yugoslav dissolution wars, the Balkan Reconstruction Observatory was set up jointly by the Hellenic Observatory, the Centre for the Study of Global Governance, both institutes at the London School of Economics (LSE), and the Vienna Institute for International Economic Studies (wiiw). A brainstorming meeting on Reconstruction and Regional Co-operation in the Balkans was held in Vouliagmeni on 8-10 July 1999, covering the issues of security, democratisation, economic reconstruction and the role of civil society. It was attended by academics and policy makers from all the countries in the region, from a number of EU countries, from the European Commission, the USA and Russia. Based on ideas and discussions generated at this meeting, a policy paper on Balkan Reconstruction and European Integration was the product of a collaborative effort by the two LSE institutes and the wiiw. The paper was presented at a follow-up meeting on Reconstruction and Integration in Southeast Europe in Vienna on 12-13 November 1999, which focused on the economic aspects of the process of reconstruction in the Balkans. It is this policy paper that became the very first Working Paper of the wiiw Balkan Observatory Working Papers series. The Working Papers are published online at [www.balkan-observatory.net](http://www.balkan-observatory.net), the internet portal of the wiiw Balkan Observatory. It is a portal for research and communication in relation to economic developments in Southeast Europe maintained by the wiiw since 1999. Since 2000 it also serves as a forum for the Global Development Network Southeast Europe (GDN-SEE) project, which is based on an initiative by The World Bank with financial support from the Austrian Ministry of Finance and the Oesterreichische Nationalbank. The purpose of the GDN-SEE project is the creation of research networks throughout Southeast Europe in order to enhance the economic research capacity in Southeast Europe, to build new research capacities by mobilising young researchers, to promote knowledge transfer into the region, to facilitate networking between researchers within the region, and to assist in securing knowledge transfer from researchers to policy makers. The wiiw Balkan Observatory Working Papers series is one way to achieve these objectives.



# The wiiw Balkan Observatory

## Global Development Network Southeast Europe

*This study has been developed in the framework of research networks initiated and monitored by wiiw under the premises of the GDN–SEE partnership.*

The Global Development Network, initiated by The World Bank, is a global network of research and policy institutes working together to address the problems of national and regional development. It promotes the generation of local knowledge in developing and transition countries and aims at building research capacities in the different regions.

The Vienna Institute for International Economic Studies is a GDN Partner Institute and acts as a hub for Southeast Europe. The GDN–wiiw partnership aims to support the enhancement of economic research capacity in Southeast Europe, to promote knowledge transfer to SEE, to facilitate networking among researchers within SEE and to assist in securing knowledge transfer from researchers to policy makers.

The GDN–SEE programme is financed by the Global Development Network, the Austrian Ministry of Finance and the Jubiläumsfonds der Oesterreichischen Nationalbank.

For additional information see [www.balkan-observatory.net](http://www.balkan-observatory.net), [www.wiiw.ac.at](http://www.wiiw.ac.at) and [www.gdnet.org](http://www.gdnet.org)

# ***Inequality and the Crisis: A Causal Inference Analysis***

*Quantitative Research on New Quarterly Income Inequality Data for CESEE\**

*by Mario Holzner<sup>†</sup>*

*May 2013*

## ***Abstract:***

A new database for the calculation of quarterly income inequality measures was established for 11 economies from Central, East and Southeast Europe for the period of 1<sup>st</sup> quarter 2000 to 4<sup>th</sup> quarter 2011. Based on the large panel of the acquired quarterly Gini coefficients an 'Acemoglu-style' causal inference analysis on the impact of the global financial crisis on economic growth and income inequality in transition economies was performed. The results suggest that at least in the short and medium run the growth model of transition economies switched to an industrial, export-led growth model as foreign capital flows dried up. While in the private sector wage dispersion further continued to increase during the boom just as during the economic break-down, the public sector acted inequality reducing both in the period of plenty as well as in the age of austerity.

*Keywords:* Income inequality, economic growth, transition economies, economic crisis

*JEL-Classification:* C36, C82, D63, F43, H12, P36

## **Introduction**

In the years prior to the global financial crisis, transition economies experienced high GDP growth rates. Convergence to the EU average income level seemed to be feasible within reasonable time. The influx of direct investment from abroad was assumed to be the main engine of growth. A number of transition economies with abundant resources benefited from the ballooning commodity price bubble. Policy makers throughout Central, East and Southeast Europe (CESEE) differed in their ability to implement policies to deal with their often overheated economies. However, in most cases practical constraints such as the EU integration process limited the room for manoeuvre of local politicians.

During this period income inequality decreased especially in countries with higher GDP growth rates. This relationship was found in earlier research on inequality and growth (see Holzner, 2010). Even signs of labour shortages were reported in several transition economies. The shape of a Kuznets curve was observable, especially with the sharp increase of inequality in the early stages of transition and a subsequent improvement after the year 2000 when growth became more robust throughout the transition countries (see Leitner and Holzner, 2008). Earlier studies have rejected the Kuznets hypothesis for transition economies (see Wan, 2002), a hypothesis that was thought to be an empirical regularity confirmed by Barro (2000) and others.

---

\* Research was realized in cooperation with the Global Development Network (GDN) and financed by the Jubiläumsfonds of the Oesterreichische Nationalbank (OeNB), Project No. 14396.

<sup>†</sup> The Vienna Institute for International Economic Studies (wiiw); Rahlgasse 3, 1060 Vienna, Austria;  
Email: [holzner@wiiw.ac.at](mailto:holzner@wiiw.ac.at)

However, economic growth in CESEE experienced a dramatic trend reversal after the global financial crisis erupted, international capital flows went dry, commodity prices plummeted and international trade broke down in late 2008. As many other countries, most transition economies witnessed a substantial recession in 2009. In the recovery period, however, some countries are faring better than the others. Those economies that had a large export oriented industry sector and that performed a more flexible real exchange rate policy were able to gain from the international trade rebound and could thereby leave recession much quicker.

Our research question is: 'What was the impact of the global financial crisis on income inequality in CESEE?'. Our hypotheses to be tested are the following: (i) 'CESEE economic growth before the outbreak of the crisis was determined by foreign direct investment inflows and a commodity price bubble.'; (ii) 'CESEE economic growth after the outbreak of the crisis was determined by the size of the industrial base and the level of real exchange rate appreciation.'; (iii) 'Economic growth in CESEE reduced income inequality since the beginning of transition (and *vice versa*).'

Recent literature on inequality, growth and the crisis is abundant. However, many authors are focusing rather on the impact of inequality before the crisis on economic performance after the crisis, focusing on Western Europe, the US and East Asia in a more descriptive way (e.g. Stockhammer, 2012), using case studies (e.g. Atkinson and Morelli, 2011) or simple econometrics (e.g. Georgopoulos, Papadoganos and Sfakianakis, 2012). One reason for the applied focus and methods in the recent literature might be the fact that income inequality data is generally collected on an annual basis using household survey data that is typically published with a certain lag only. Hence there are at the moment not that many observations of inequality after the crisis outbreak at hand in order to use more sophisticated quantitative methods of analysis, also looking at the reverse case of the impact of economic growth on income inequality in the wake of the global financial crisis.

One article that examines the impact of the economic crisis on employment, earnings, inequality and poverty in the EU again in a descriptive case study manner is De Beer (2012). He finds that during the period 2008-2010 real wages reacted counter-cyclically in most countries, thus diverging from the pattern observed in previous recessions. He finds considerable cross-national variation in the severity and direction of changes in terms of inequality and poverty rates. However, he argues that inequality may widen because of the potential regressive effects of the announced austerity programmes.

Having a dataset based on observations of periods less than a year and including more recent periods which already should include periods of fiscal austerity could be a way out of the problem of too few post-crisis annual observations, though. However, to our knowledge there were so far hardly any attempts to find income inequality data for instance on a quarterly basis. Apparently, Staehle (1937) had quarterly income data for Germany available in order to analyse the changes of income distribution and their impact on aggregate demand. More recently, Qin et al. (2009) use quarterly provincial urban and rural household data from China. However, their quarterly income inequality measures are only interpolated from annual data. To our knowledge, the only somewhat recent work that was applying genuine quarterly income inequality data was Cheong

(2001), using quarterly data for urban worker-households in Korea in order to investigate the effect of the 1997 Asian economic crisis on income and consumption inequality. Seemingly, so far, nobody has been analysing income inequality in a panel of quarterly data across different countries.

We want to close this gap in the literature and therefore suggest a method to calculate income inequality measures from quarterly data available on wages and employees by economic sectors, pensions and number of pensioners as well as unemployment benefits and number of unemployment benefit receivers. We also want to focus on transition economies from CESEE as to our knowledge, there has so far been no analysis specifically looking at this region and the crisis impact on income distribution.

Moreover, most transition economies, as small open economies integrating into the EU are rather policy takers than policy makers. In general their creative leeway is limited. Many of the important decisions about their economic development in the 1990s and 2000s were made in the headquarters of western European companies investing in CESEE and can therefore be seen as rather exogenous. Also their economic structure depends in many ways on the decisions of foreign investors or was determined already much earlier by former occupational foreign powers such as Germany, Austria, Turkey or Russia. Hence, important pre- and post-crisis factors that could explain their economic development such as for instance FDI inflows, commodity prices, the share of industry, and to a certain extent also the level of real exchange rate appreciation can be seen as mostly exogenous, which is another argument to perform the suggested analysis on a set of CESEE countries. This would certainly be rather different in the case of the USA or the UK for instance, where investment, prices, economic structure and exchange rate policy are much more endogenous to their economic development.

### **Empirical model**

We estimate the influence that the crisis had upon income inequality in CESEE. We employ quarterly data on inequality, GDP growth and growth explaining factors from before and after the crisis. This data is available for the majority of transition countries. In order to make a causal inference using the observational database at hand that most likely suffers from omitted variable and selection bias as well as possible simultaneous causality we employ an instrumental variable (IV) method. The model applied is a two-stage least-squares (2SLS) model following Acemoglu (2010), respectively Acemoglu and Johnson (2007). The second stage relationship can be described as follows.

$$I_{it} = \alpha g_{it} + \zeta_i + \mu_t + \varepsilon_{it}, \quad (1)$$

where  $I_{it}$  represents income inequality (Gini coefficient) in country  $i$  and quarter  $t$  and  $g$  represents economic growth (real GDP percentage change compared to corresponding period of the previous year). The parameter of interest  $\alpha$ , measures the relationship between inequality and growth. The variables  $\zeta$  and  $\mu$  represent country and seasonal dummies respectively and  $\varepsilon$  is the error term. To overcome the problem of biased estimates of  $\alpha$  we define the first stage relationship to be as follows.

$$g_{it} = \beta X_{it} + \zeta_i + \tilde{\mu}_t + u_{it}, \quad (2)$$

where  $X_{it}$  is a matrix of growth explaining variables and the remainder consists again of country and seasonal dummies as well as an error term. The matrix of growth explaining variables is defined as follows.

$$X_{it} = (1 - c_t) \sum_{j=1}^2 y_{jit} + c_t \sum_{j=1}^2 y_{jit} + (1 - c_t) \sum_{k=1}^2 z_{kit} + c_t \sum_{k=1}^2 z_{kit}, \quad (3)$$

where  $c_t$  is the intervention dummy for the global financial crisis, that is equal to 1 for all dates after the third quarter 2008.  $y_{jit}$  are the two pre-crisis growth explaining variables (net FDI inflow share in GDP and commodity export share) and  $z_{kit}$  the two post-crisis growth explaining variables (industry share in GVA and real effective exchange rate) respectively. This is not necessarily a permanent new growth model and it remains to be seen whether it holds empirically. However, we consider it to be the relevant one for the immediate period before and after the crisis for which data is available, but we also want to test for the influence of the pre- and post-crisis growth explaining variables in each opposite period. Therefore both types of variables are interacted with both  $(1 - c_t)$  as well as  $c_t$ .

Thus, the first stage is based on the hypothesis that global crisis intervention changed the growth model for the transition economies from a foreign capital and commodity price bubble fuelled to a competitive industrial export-led growth model. The second stage is derived from a Kuznets curve type of theory.

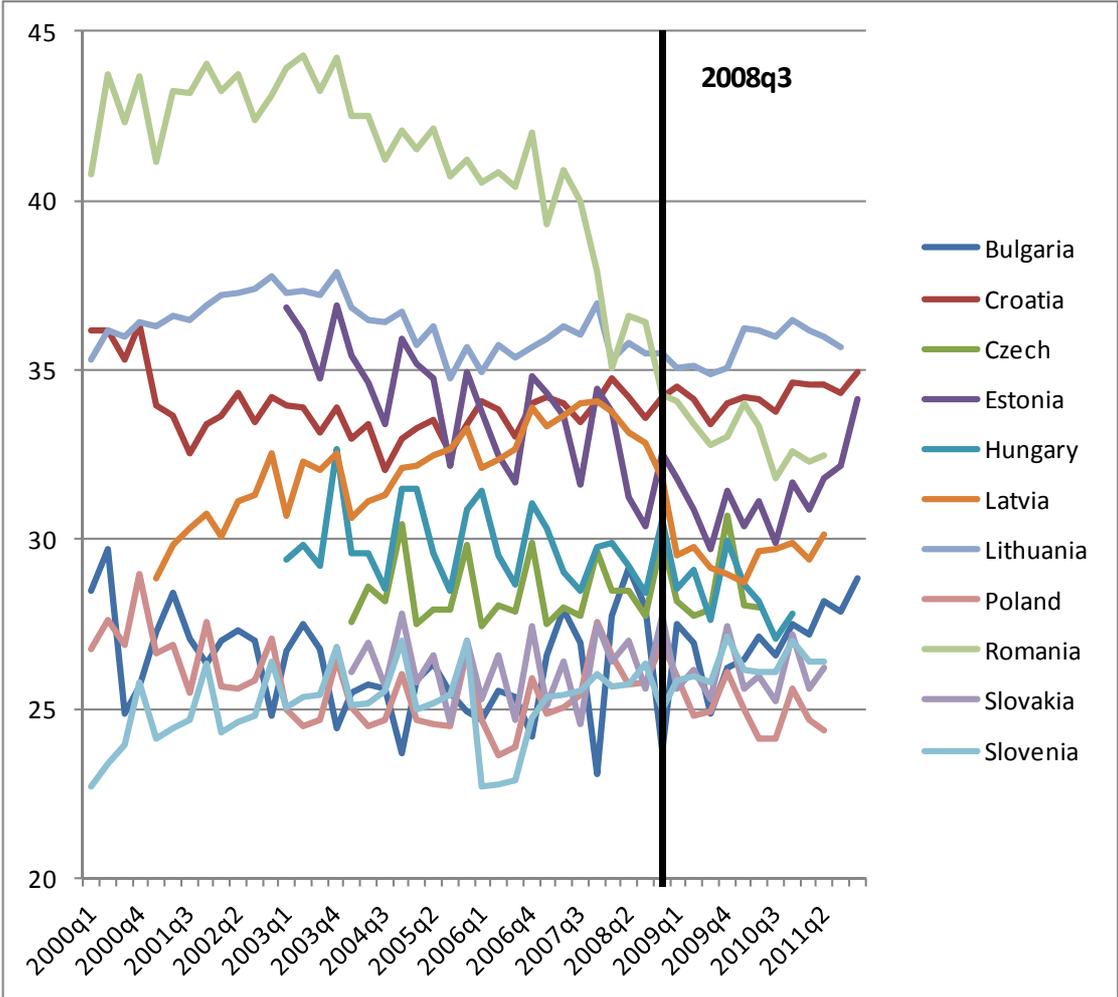
## Data

The data used stems from national statistical offices, finance ministries, labour offices and state pension funds as well as the wiiw Monthly Database on Eastern Europe and Eurostat (especially for the macroeconomic data). As a proxy for income inequality we calculate a simple Gini coefficient for each quarter between 2000-2011 according to data availability. Here we use monthly or quarterly data for average gross wages and number of employed by NACE categories as well as the number of unemployment benefit receivers and pensioners and average unemployment benefits and pensions.

Unfortunately this type of data is not easily available and classifications are quite different across countries and time. Some countries publish only employment and wage data disaggregated at the one-digit level, others at the two-digit level. Enterprise coverage in the registries is also different due to different cut-off points for micro enterprises. For publicly owned units wage and employment data should be exhaustive but for Poland it is missing altogether. For some countries data is available for the full period, other countries do not publish detailed data from the early 2000s and/or the most recent years. In some cases national industry classifications were kept for the full period available, in most cases there was a shift from NACE revision 1 to NACE revision 2 in the year 2008, without a possibility to combine the series. In those cases the NACE revision 2 data established new sector-series with missing values before the date of switch, while the old ones show missing values after the date of switch.

Data for average unemployment benefits was not always available. In these cases aggregate general government expenditures data for unemployment benefits from the ministry of finance were used in order to calculate average benefits per unemployment benefit receiver. In some cases a similar procedure had to be applied also for pensions. For some countries only average pensions and number of pensioners are reported on a monthly or quarterly basis. For others we can use detailed data covering for instance apart from old-age pensions also disability, survivors and other types of pensions.

**Graph 1:** Quarterly Gini coefficients based on wage, pension and unemployment benefits data



Source: Own calculations using national data.

While we have tried to collect this data for a wider group of countries from CESEE we end up only with a set of 10 new EU member states plus Croatia. Statistical data from other West Balkan and CIS countries is unfortunately not comprehensive enough. Given all the shortcomings and differences in the data described above it is surprising how well the annualised acquired quarterly Gini coefficients compare to the official Gini coefficients of disposable income as calculated by Eurostat for the later years and by UNICEF’s TransMonEE (Transformative Monitoring for Enhanced Equity) database for the earlier years in the sample (taking into account that these official Gini coefficients describe income distribution with a lag of one year).

Gini coefficients for Estonia, Slovenia, Slovakia and Lithuania differ only by about 4 percent from the official coefficients. Those for Latvia, Romania, Hungary, Croatia and the Czech Republic differ by some 14 percent. For Bulgaria and Poland on average our Gini coefficients are too small by around 22 percent. This is possibly due to a large part of population in these countries being engaged in subsistence farming or being self-employed (i.e. in the shadow economy). These parts of the population as well as the employers and capital income receivers we cannot cover in our quarterly Gini calculations due to data constraints. Also there are no observations with zero or even negative income as compared to household survey data.

Looking specifically at the change of the annualised quarterly and the official annual Gini coefficients between 2007 and 2010 (the latest actual official annual data available) we find that in the vast majority of cases trends go into the same direction. However, there is a tendency observable for our quarterly Gini coefficients to underestimate inequality increases (or vice versa), which probably has again to do with the development of the extreme tails of the distribution which we cannot cover in our inequality measure. Still, we believe that the sacrifice in the quality of our quarterly Gini coefficients is not that large and is more than outweighed by the econometric possibilities we have in terms of degrees of freedom.

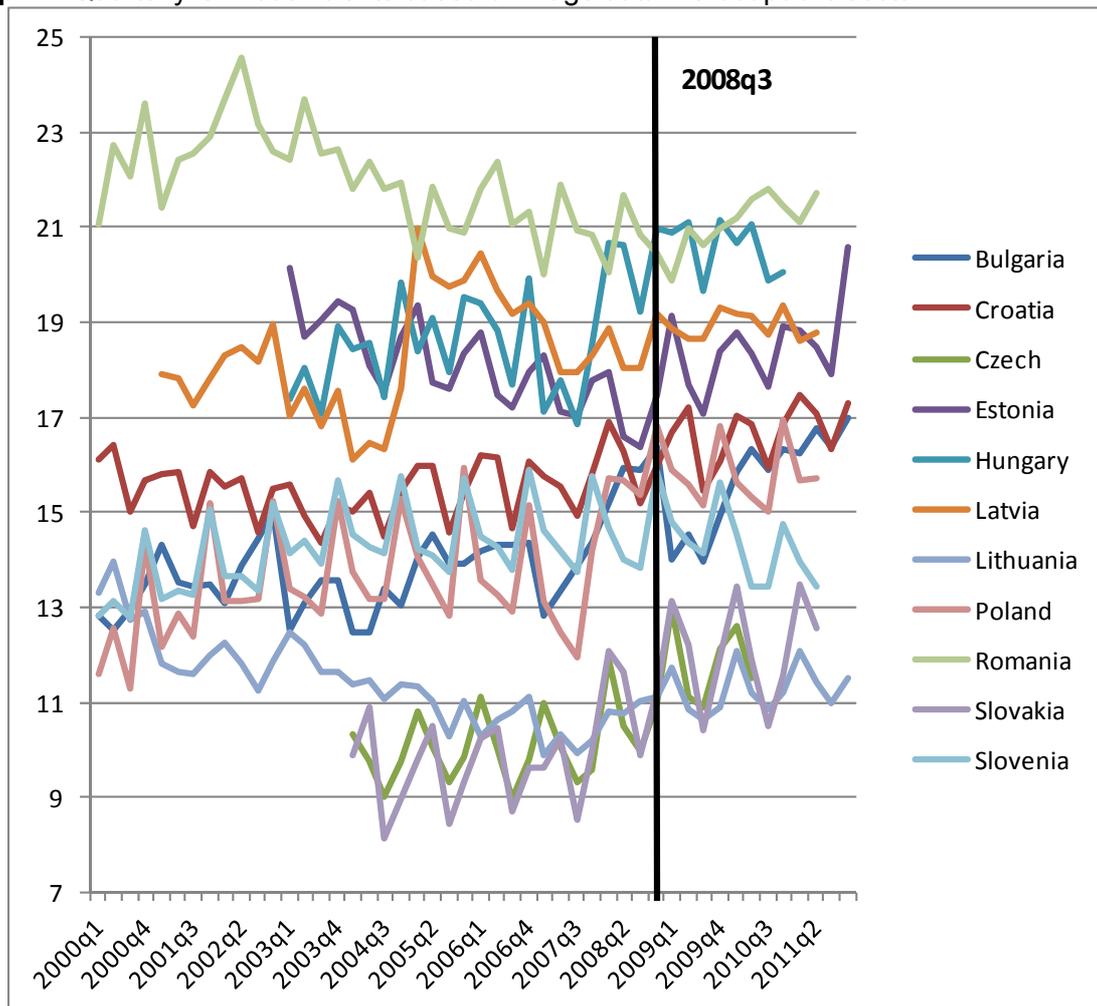
## **Results**

The results for the calculations of the quarterly Gini based on all the information available on gross wages of employees by economic sector, pensions, unemployment benefits as well as the number of employees by economic sector, pensioners and receivers of unemployment benefits are presented in Graph 1. It can be seen that for a number of countries the development of income inequality appears to be rather flat and the global financial crisis did not seem to have a major impact. However, a number of other countries, especially Romania, Estonia, Latvia and Hungary, experienced quite a reduction of income inequality already before the crisis and even more so after the outbreak of the crisis in the third quarter of 2008.

The latter three countries entered recession well before the outbreak of the global financial crisis. Estonia and Latvia experienced the bust of a real estate bubble in 2007 and Hungary had to cope with a current account crisis back in 2006. All the three countries as well as Romania have consequently introduced austerity packages that aggravated the impact of the global financial crisis on local GDP growth. However, it appears as if the fiscal measures in these countries had rather progressive effects.

This also corresponds to simulation results published by the EC (2012), based on 2007 household income data and fiscal measures implemented between 2009 and 2011 for the year 2012. These show that for instance Latvia had the strongest simulated cut in public sector wages in the upper three deciles of the income distribution, while for instance Lithuania had almost no change at all. Also cuts in non-pension benefits in Latvia were especially targeting the top deciles while in Lithuania the effects were flat across income groups. While overall quarterly income inequality in Latvia experienced quite a drop during the crisis, the Lithuanian inequality development remained flat.

**Graph 2:** Quarterly Gini coefficients based on wage data without public sector



Source: Own calculations using national data.

In this respect it is also interesting to have a look at income inequality development excluding those sectors that are directly and predominantly influenced by the state. Therefore we have repeated our Gini calculations for a sample without gross wages for the sectors of public administration, education, human health and social work activities as well as pensions and unemployment benefits. Graph 2 shows the results of this exercise. In general these Gini coefficients appear much less volatile as compared to the previous ones. Also for most countries in the sample, again with the exception of Romania, Estonia, Latvia and Hungary the development before the outbreak of the crisis was rather flat. However, in contrast to the previous results, most of the Gini coefficients experienced quite a marked increase after the outbreak of the global financial crisis in the third quarter of 2008. Hence it seems that in the private sector the reaction to the crisis was opposite to the public sector. Higher wages continued to increase or at least fell to a less extent in relative terms, while lower wages had to suffer most.

**Table 1:** Inequality, growth and the crisis

Model: Dependent variable:	First stage Growth		Second stage Total Gini		Second stage Private Gini	
Independent variables:						
Pre-crisis FDI inflow	0.050 (0.044)		-		-	
Pre-crisis commodity exports	0.148 (0.052)	***	-		-	
Pre-crisis industry share	0.165 (0.122)		-		-	
Pre-crisis real exchange rate	-0.052 (0.020)	***	-		-	
Post-crisis FDI inflow	0.373 (0.102)	***	-		-	
Post-crisis commodity exports	0.285 (0.082)	***	-		-	
Post-crisis industry share	0.774 (0.120)	***	-		-	
Post-crisis real exchange rate	-0.313 (0.036)	***	-		-	
GDP growth	-		0.093 (0.019)	***	-0.068 (0.012)	***
Country and season dummies	Yes		Yes		Yes	
Number of observations	435		435		435	
Number of countries	11		11		11	
R <sup>2</sup>	0.585		0.890		0.919	
adj. R <sup>2</sup>	0.564		-		-	

*Note:* Standard errors appear in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

**Table 2:** Inequality, growth and the crisis, robustness check

Model: Dependent variable:	First stage Growth		Second stage Total Gini		Second stage Private Gini	
Independent variables:						
Pre-crisis FDI inflow	0.040 (0.043)		-		-	
Pre-crisis commodity exports	0.102 (0.053)	*	-		-	
Pre-crisis industry share	0.266 (0.138)	*	-		-	
Pre-crisis real exchange rate	-0.054 (0.022)	**	-		-	
Post-crisis FDI inflow	0.373 (0.101)	***	-		-	
Post-crisis commodity exports	0.291 (0.081)	***	-		-	
Post-crisis industry share	1.100 (0.143)	***	-		-	
Post-crisis real exchange rate	-0.371 (0.038)	***	-		-	
GDP growth	-		0.041 (0.013)	***	-0.067 (0.012)	***
Country and season dummies	Yes		Yes		Yes	
Number of observations	389		389		389	
Number of countries	10		10		10	
R <sup>2</sup>	0.626		0.920		0.890	
adj. R <sup>2</sup>	0.605		-		-	

*Note:* Standard errors appear in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

Therefore we will apply our empirical model to both types of Gini coefficients that we have calculated – the total wage, pension and unemployment Gini as well as the private sector wage Gini. Table 1 presents the econometric results of the 2SLS regression on both Gini coefficients. All the regressions include a constant term as well as country and seasonal dummies, of which however the coefficients are not being reported in the table. In the first column the first stage growth regression results are shown. Among the two growth-explaining factors that we have assumed to be especially relevant for the pre-crisis period only the coefficient of the pre-crisis commodity export share proved to be positive and significant in the period before the crisis.

Hence, some countries in the sample with high commodity export shares such as for instance Bulgaria and Lithuania (both with a share in the range of 25%-30%) were able to profit from the pre-crisis commodity price bubble. However, the coefficient of the pre-crisis FDI inflow share in GDP is statistically insignificant. This is probably because the variation among the countries in CESEE was not very high before the outbreak of the crisis. Most of them received in that period on average around 5% of FDI inflows as a share of GDP. While the coefficient of the industry share in GVA is, as expected, insignificant in the period before the crisis, the coefficient of the level of the real effective exchange rate index (3rd quarter 2008 = 100) ends up negative and significant. Especially Latvia and Estonia with rather undervalued real exchange rates at that time experienced growth rates of above 7% on average before the crisis.

It is interesting to note that in the post crisis period all the four growth explaining variables have significant coefficients. Countries such as Slovenia and Hungary that did not receive any FDI inflows after the crisis are among the economies with the weakest growth performance. Commodity exporters were not too much hit by the bust of the commodity price bubble which to a certain extent has rebuilt quickly after the bust again.

The coefficients of the two variables that were initially assumed to be the main explanatory variables for the period after the outbreak of the global financial crisis prove to be significant in the post-crisis period. Both have the expected signs. Economies with a large industrial base such as the Czech Republic (about 30% of GVA) fared much better in terms of GDP growth as compared to economies with a rather small share of industry in GVA such as for instance Latvia (with a share of about 15%). Also, economies that were able to devalue their real effective exchange rate such as Poland that still has an own currency with a flexible exchange rate regime fared better in growth terms as compared to those economies that have further appreciated and that have either a fixed exchange rate regime or that have adopted the Euro such as for instance Slovenia.

The second and third columns of Table 1 present the GDP growth coefficients of the second stage of the 2SLS regression, first for the case of the Gini calculated on the basis of gross wages by economic sector as well as pensions and unemployment benefits and second for the case of the Gini calculated only on the basis of gross wages in private sectors of the economy. In the first case the coefficient is positive and in the second it is negative. Both are highly significant. This corresponds to the impression one gets from Graph 1 and 2.

**Table 3:** Inequality and growth without crisis

Model: Dependent variable:	First stage Growth		Second stage Total Gini		Second stage Private Gini	
Independent variables:						
Pre-crisis FDI inflow	0.029 (0.038)		-		-	
Pre-crisis commodity exports	-0.002 (0.053)		-		-	
Pre-crisis industry share	0.081 (0.106)		-		-	
Pre-crisis real exchange rate	-0.064 (0.021)	***	-		-	
Post-crisis FDI inflow	0.391 (0.094)	***	-		-	
Post-crisis commodity exports	-0.088 (0.083)		-		-	
Post-crisis industry share	0.669 (0.121)	***	-		-	
Post-crisis real exchange rate	-0.075 (0.045)	*	-		-	
GDP growth	-		-0.123 (0.053)	**	0.084 (0.028)	***
Country and time dummies	Yes		Yes		Yes	
Number of observations	435		435		435	
Number of countries	11		11		11	
R <sup>2</sup>	0.749		0.891		0.940	
adj. R <sup>2</sup>	0.705		-		-	

*Note:* Standard errors appear in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

**Table 4:** Inequality and growth without crisis, robustness check

Model: Dependent variable:	First stage Growth		Second stage Total Gini		Second stage Private Gini	
Independent variables:						
Pre-crisis FDI inflow	0.021 (0.036)		-		-	
Pre-crisis commodity exports	-0.050 (0.051)		-		-	
Pre-crisis industry share	0.270 (0.118)	**	-		-	
Pre-crisis real exchange rate	-0.051 (0.022)	**	-		-	
Post-crisis FDI inflow	0.375 (0.090)	***	-		-	
Post-crisis commodity exports	-0.103 (0.079)		-		-	
Post-crisis industry share	1.133 (0.137)	***	-		-	
Post-crisis real exchange rate	-0.080 (0.045)	*	-		-	
GDP growth	-		0.041 (0.030)		0.121 (0.022)	***
Country and time dummies	Yes		Yes		Yes	
Number of observations	389		389		389	
Number of countries	10		10		10	
R <sup>2</sup>	0.793		0.928		0.928	
adj. R <sup>2</sup>	0.753		-		-	

*Note:* Standard errors appear in parentheses. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

It is useful to think of the negative growth rates after the outbreak of the global financial crisis in order to see that the effect of this decline on inequality was reinforcing when private sectors' gross wages are taken into consideration only, while it was the opposite effect when both public and private sectors' wages are taken into consideration together with pensions and unemployment benefits. Apart from further dampening the economy, it seems that progressive austerity packages had the potential of decreasing income inequality, while otherwise the private sector tended to increase income inequality in the period of negative growth following the outbreak of the global financial crisis.

It follows from both Graphs as well as from the comparison of our annualised quarterly Gini coefficients with those calculated on an annual basis with the help of household data by TransMonEE and Eurostat that especially Romanian figures appear as outliers both in terms of levels as well as dynamics. The quarterly Gini for Romania has by far the largest variance in the differences with the TransMonEE and Eurostat Gini coefficients. Somewhere around 2006-2007 there has been a break in the series, it seems. As this outlier might drive the regression results we need to remove it from the sample as a robustness check. However, Table 2 reveals little change in the results when our empirical model is applied to a sample without Romania. The coefficient of the pre-crisis commodity exports in the first stage regression becomes less significant. Otherwise some coefficients change a bit in size. Here the coefficient of the post-crisis industry share increases quite a lot. In the second stage regression on the total (public and private data based) Gini the size of the economic growth coefficient more than halves.

Finally, we want to compare the results acquired so far with a case where we rule out all common economic growth shocks to the CESEE region (including especially the impact of the global financial crisis) by introducing instead of the seasonal dummies time dummies for each quarter separately. Hence, comparing the new results without crisis effects in Table 3 with the original ones in Table 1 yields the following. Fewer coefficients in the first stage growth regression are now significant. Only the pre-crisis real exchange rate level as well as the post-crisis FDI and industry share remains statistically significant at the 1% level. However, size and sign of the coefficients mainly remain the same. More interestingly, the signs of the GDP growth coefficient in the total and the private Gini second stage regressions switch as compared to the original results that allow for the common shocks over time.

Now, the coefficient of GDP growth is negative for the total quarterly Gini. This corresponds to the results acquired in Holzner (2010) for the period before the global financial crisis (1993-2006) for a somewhat larger CESEE sample (14 countries) based on annual Gini coefficients. Before the crisis the booming private sector was increasing wage inequality while the public sector was redistributing incomes, which overall lead to a general reduction of inequality in CESEE. However, this latest result is not very robust as can be seen from Table 4 where we again exclude Romania from the sample and where the GDP growth coefficient in the total Gini second stage regression becomes insignificant. Therefore it can be claimed that the redistribution of income by the public sector before the crisis has at least let overall income inequality stabilise, while dispersion in private wages was increasing.

The marked differences in the second stage regression results between Table 1 and 3, the case that allows the crisis impact and the case that filters this common external shock to the CESEE region, suggest that the effects of the global financial crisis on the economy and public finances had a significant impact on the income distribution. While the private sector has been contributing to increasing income inequality during the boom period, just like during the growth slump, the public sector has been trying to ameliorate the overall distributional outcome, both before as well as after the outbreak of the crisis. However, it has to be repeated that our quarterly Gini coefficient does not take into consideration incomes at the tails of the distribution as there is no quarterly data on capital income and profits of employers as well as income of the self-employed and those who are living on subsistence-farming and similar activities available.

Also, the crisis seems to have changed the growth model for the transition economies, at least in the short to medium term. While large FDI inflows were evenly watering the whole region in the period before the crisis, only few economies could attract FDI in the period after the outbreak of the crisis. Those economies, that were able to keep foreign capital flows pouring in even after the outbreak of the global financial crisis and that have a large industrial base, had above average economic growth or at least less contraction. An undervalued real exchange rate was correlated with a favourable economic development both before and after the crisis outbreak.

## **Conclusions**

Our analysis aimed at answering the following question: 'What was the impact of the global financial crisis on income inequality in CESEE?'. The hypotheses we wanted therefore to test were: (i) 'CESEE economic growth before the outbreak of the crisis was determined by foreign direct investment inflows and a commodity price bubble.'; (ii) 'CESEE economic growth after the outbreak of the crisis was determined by the size of the industrial base and the level of real exchange rate appreciation.'; (iii) 'Economic growth in CESEE reduced income inequality since the beginning of transition (and vice versa).'

For this purpose we created a new database for quarterly Gini coefficients for 11 CESEE countries over the period of the 1st quarter of 2000 to the 4th quarter 2011. The income data as well as the information on the respective number of income receivers necessary to calculate the Gini coefficient stems from registered data on gross wages and the number of employees by economic sector as well as from official data on pensions and pension receivers as well as unemployment benefit and unemployment benefit receivers. To our knowledge this is the first attempt to create a cross-country, time-series database for income inequality on a quarterly basis.

Employing an 'Acemoglu-style' causal inference 2SLS model we tried to test the hypotheses using our overall quarterly Gini coefficients as well as Gini coefficients calculated only for private wages in order to see whether the public sector (wages, pensions, unemployment benefits) influenced inequality outcomes. The results suggest that foreign capital was abundantly available for all the CESEE before the crisis and that some of the countries were able to profit from a commodity price bubble. An undervalued real exchange rate was correlated with GDP growth both before as well as after the outbreak of the global economic crisis. It is interesting to note that

both FDI inflows as well as commodity exports remain growth enhancing factors also after the outbreak of the crisis. Hence it can be claimed that a change in the growth model of transition economies triggered by the global financial crisis really occurred only in so far as after the crisis outbreak foreign capital flows switched from a 'scattergun approach' to a very selective targeting and CESEE economies now need a solid industrial base in order to generate economic growth, which before was not a significant growth explaining determinant.

Moreover it seems that the impact of economic growth on income distribution outcomes switched with the crisis as well. Allowing for common external shocks yields a positive relationship between growth and inequality for the total quarterly Gini based on wages, pensions and unemployment benefits. The same exercise for the private wages' Gini coefficient yields the opposite effect. In terms of the big growth slump of 2009 we see the private sector further increasing wage dispersion, while the public sector apparently has been able to reduce inequality even via progressive austerity packages. When controlling for the common external shocks (i.e. especially filtering out the global financial crisis), the exactly opposite effects for both the total as well as the private Gini can be observed. In the boom period again the private sector was increasing wage dispersion while the public sector was able to reduce overall income inequality.

In conclusion it can be argued that the global financial crisis had quite a strong influence on the transition economies of CESEE, which in most cases are policy takers, strongly dependent on the development of the main Western European economies. As foreign capital became scarce a strong industrial base is pivotal for economic growth. While in the private sector wage dispersion further continued to increase during the boom just as during the economic break-down, the public sector acted inequality reducing both in the period of plenty as well as in the age of austerity. Hence we can neither fully confirm our initial hypotheses nor fully reject.

The policy recommendations arising from the above observations are the following. It is important for small open economies that are mostly policy takers to use their little scope of action to increase their industrial base as this helps to make the economy less dependent on foreign capital flows. It is also important to have the means to influence the real exchange rate which is a major determinant of GDP growth at all times. Hence a flexible exchange rate regime or a functioning social partnership can help to moderate extreme GDP developments. Finally, in case it is a society's aim to reduce inequality (for a large number of reasons), state intervention via public sector wages and generous pensions and unemployment benefits are imperative.

## References

- Acemoglu, D., 2010. Theory, General Equilibrium and Political Economy in Development Economics. NBER Working Papers, No. 15944.
- Acemoglu, D. and Johnson, S., 2007. Disease and Development: The Effect of Life Expectancy on Economic Growth. *Journal of Political Economy*, Vol. 115, No. 6, pp. 925-985.
- Atkinson, A.B. and Morelli, S., 2011. Economic crises and Inequality. *Human Development Research Paper*, No. 2011/06.
- Barro, R.J., 2000. Inequality and Growth in a Panel of Countries. *Journal of Economic Growth*, Vol. 5, No. 1, pp. 5-32.
- Cheong, K.S., 2001. Economic Crisis and Income Inequality in Korea. *Asian Economic Journal*, Vol. 15, No. 1, pp. 39-60.
- De Beer, P., 2012. Earnings and income inequality in the EU during the crisis. *International Labour Review*, Vol. 151, No. 4, pp. 313-331.
- EC, 2012. The distributional effects of fiscal consolidation in nine EU countries. European Commission, Directorate- General for Employment, Social Affairs and Inclusion, Research note 01/2012.
- Georgopoulos D., Papadoganos, T. and Sfakianakis, G., 2012. Factors related to the depth of the latest crisis for EU-27 countries: The key role of relative inequality/poverty. *Economics Letters*, Vol. 116, No. 3, pp. 308-311.
- Holzner, M., 2010. Inequality, Growth and Public Spending in Central, East and Southeast Europe. *wiiw Working Papers*, No. 71.
- Leitner, S., Holzner, M., 2008. Economic Inequality in Central, East and Southeast Europe. *Intervention. European Journal of Economics and Economic Policies*, Vol. 5, No. 1, pp. 155-188.
- Qin, D., Cagas, M.A., Ducanes, G., He, X., Liu, R., Liu, L., 2009. Effects of income inequality on China's economic growth. *Journal of Policy Modeling*, Vol. 31, No. 1, pp. 69-86.
- Staehle, H., 1937. Short-period variations in the distribution of income. *Review of Economic Statistics*, Vol. 19, pp. 133-143.
- Stockhammer, E., 2012. Rising Inequality as a Root Cause of the Present Crisis. *UMASS PERI Working Paper Series*, No. 282.
- Wan, G.H., 2002. Income Inequality and Growth in Transition Economies. *UNU WIDER Discussion Paper*, No. 2002/104.