

Inequality and economic growth: theoretical and operational approach

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Abstract. *The relationship between inequality and the process of economic development is still controversial. In this paper, besides a short overview of the economic literature, we present selected models used to verify the relationship between growth and inequality. We also make a brief analysis of income inequality and poverty in Romania.*

Keywords: economic growth, economic inequality, Kuznets curve, Gini coefficient, income distribution, welfare economics.

JEL Classification: D63, E01, E10, F63.

1. Introduction

In the economic theory, the economic inequality is defined as the discrepancy between poor and rich in terms of income distribution, the distribution of wealth, of the education, of the employment, of life satisfaction and happiness within a country, between countries and geographical areas.

Decades following the Second World War were marked by a significant overall growth, with low social inequality in the industrialized countries and in some developing countries.

In the last decades, marked by slowing global growth and by appearance of global crisis in 2008, the social inequality has increased dramatically, reaching levels encountered in the 1920s, with high imbalances within and between countries.

The subject of social and economic inequality has been treated in the abundance of economic literature from the remarkable work of Kuznets (1955).

Among the main *channels of economic disparities* that could be found in the literature we mention first the industrialization and urbanization which attracted an unequal distribution of income between village and city, between industry and agriculture (Kuznetz 1955); high inflation (Walsh and Yu (2012)) that deepens the income inequality; fiscal policies (Peñalosa-Turnovsky (2005), Marrero, Novales (2001), Atkinson et al. (2011)); globalization and technical progress (Krueger, 2012), Peñalosa (2008) and also the factor productivity differences between developed and poor countries (Atolia et al. (2009), Romer (2005)). In the studies of Venieris, Gupta (1986), Grossman, Kim (1996) socio-politic instability is another important channel affecting income inequality. Alesina, Rodrik (1994), Persson, Tabellini (1994), Bénabou (1999), Saint-Paul, Verdier (2002), Perotti (1996) found redistributive economic policies as one of the main channels of economic disparities. Capital market imperfections and investments in human capital (Banerjee, Newman (1991), Galor, Zeira (1993) (Peñalosa 2008)), are also important channels of inequalities.

The principal channels of transmission of economic inequality on growth, considered in the literature in this approach, are political economy and credit market.

Research has moved from the analysis of the various aspects of economic inequality to the study of the relationship between inequality and economic growth.

Barro (2000) found three *categories of studies* on inequality- growth relationship: those focused on credit market imperfections as the cause of social inequalities; those including models and policies of income distribution as a cause of inequalities and also an instrument for reducing social inequality; those comprising models based on social disturbances generated by social inequality and poverty.

Recent empirical studies can be divided into three categories:

1. The first group uses cross-country data to study the long-term relationship between inequality and growth (Persson, Tabellini (1994), Alesina, Rodrik (1994), Perotti (2007));

2. The second group second group of research are based on medium-term analysis of inequality and growth using panel or longitudinal data (Li and Zou (1998), Atkinson et al (2011))
3. The third group of studies includes the panel data analysis of the correlation between social inequality and economic growth for a country. (Ortega Diaz (2007), Kolawole et al. (2015), Barro (2000), Gregorio and Lee (2002)).

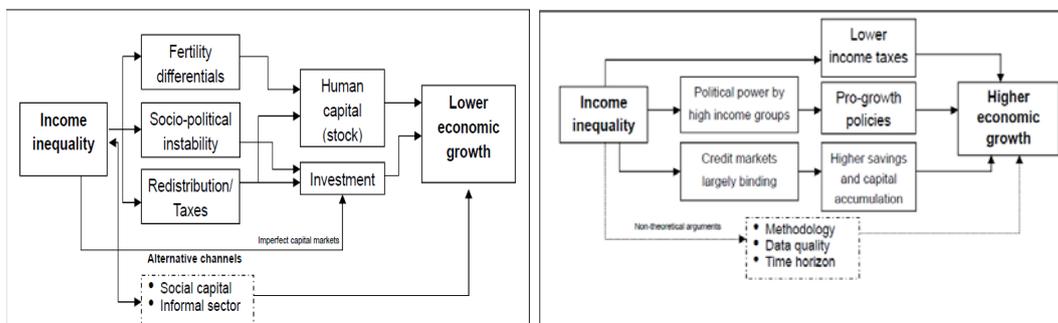
Regarding the sense of the impact of inequality on economic growth, the studies could be divided in four categories: some found negative relationship, some found positive relationship, some found a nonlinear relationship with changing sign and some found no relationship between inequality and growth as well.

Alesina, Perotti (1993), Perotti (1996), De la Croix and Doepke (2002), Persson and Tabellini (1994), Castelló and Domenech (2002) also emphasize the income inequality effect on access on education and on the human capital formation that farther affects the economic productivity and long term growth.

Alesina and Rodrik (1994), Persson and Tabellini (1994) are also supporters of negative relationship between inequality and growth, proving that the tax policy and unequal levels of income determine the rate of economic growth.

De la Croix and Doepke (2003), conclude that fertility differentials affect productivity and economic growth through the reduction of the human capital stock.

Figure 1. a. Transmission mechanism in the negative influence of inequality on growth, b. Transmission mechanisms for the positive relationship between income inequality and economic growth (Charles-Coll, 2013)



Positive relationship between inequality and growth is found by Partridge (1997), Li and Zou (1998), Nahum (2005).

Li and Zou (1998) consider that in an economy with high median income, the government expenditures are in a high measure allocated to consumption, high taxes can reduce economic growth rate. Partridge (1997) found that the positive inequality-growth relationship is a consequence of political economy programmes.

Nonlinear relationship with changing sign has Robert Barro as the main supporter that found a weak and non-linear relationship between inequality and growth, conditional to the average income (Barro, 2000).

Pagano (2004) reached a nonlinear relationship between inequality and growth but with contrary effects (a positive relation for rich countries and a negative one for poor countries).

Voitchovsky (2005) obtained a nonlinear relationship income-growth with different signs for groups with high income and low income.

Castelló-Climent, Cabrillana-Hidalgo (2010) study the effect of human capital inequality on economic growth, finding both negative (for the poor countries) and positive (for developed countries) relationship of inequality on growth.

In Romania considerable research has been done on this topic. Molnar (2010), analysed the income inequality in Romania, using a set of indicators among which Kuznets index, Gini coefficient, Éltető-Frigyes indices, Theil index, Atkinson index. She concluded that income gaps between different categories of households have increased between 1995 and 2008, stated so that the income distribution in Romania is marked by the general low income level and a relatively high and increasing inequality. Another conclusion she stated is that the economic crisis has a strong negative impact on household incomes while the protection exists at a low level, having in any case an important contribution the leveling of income distribution.

Precupețu (2013a), using NIS and EUROSTAT data, and using relative and absolute measures of poverty, analyzes three levels of inequality: income, labour market and education inequality. The conclusion is that in Romania there has been a growing process of inequality and of risk of poverty between individuals and households, between regions and between ethnical groups as well.

Domnisoru (2014), using 2011 Romanian Household Budget Survey data, shows that a 4.5 point drop in the Gini coefficient during the years affected by the severe economic crisis in Romania, is caused both by the austerity policies that cut at the top of the income distribution and by the social insurance and social protection transfers policies.

Precupețu and Precupețu (2013b), conclude that Romania became the most unequal country in Europe around 2007, that having serious political and social impacts. They also study well-being, life satisfaction and happiness, which for Romania have low values and found also high values for negative feelings.

2. Income inequality-growth modelling

There is a high variety of indexes, indicators and models which measure economic inequality, its impact on economic growth and main factors influence addiction. In what follows we present only some selected models that we intend to apply in our further empirical work.

Alesina, Perotti (1996), used the following system for the econometric estimation on 70 countries:

$$INV = \alpha_0 + \alpha_1 SPI + \alpha_3 PRIM + \alpha_4 PPPIDE + \alpha_5 PPPI + \varepsilon_1$$

$$SPI = \beta_0 + \beta_1 PRIM + \beta_2 GDP + \beta_3 INV + \beta_4 MIDCLASS + \varepsilon_2$$

Where *INV* is total investments (private and public), *SPI* is the sociopolitic instability index, *PRIM* is the growth rate of primary school students, *PPPI* is the PPP (purchasing power parity) value of the investment deflator, *PPPIDE* the deviation of *PPPI* from sample mean, *GDP* is the real GDP per capita, *MIDCLASS* is the share of the third and fourth quintiles of the population (the “midclass”).

For the first approximation of the *SPI* data, they applied the principal component method, for the variables: *ASSASS*, the number of politically motivated assassinations;

DEATH, the number of people killed in conjunction with phenomena of domestic mass violence, as a fraction of the total population; *SCOUP*, the number of successful coups;

UCOUP, the number of attempted but unsuccessful coups; *DEM*, a dummy variable that takes the value of 1 in democracies, .5 in "semi-democracies" and 0 in dictatorships.

$$SPI = \alpha_1 ASSASS + \alpha_2 DEATH + \alpha_3 SCOUP + \alpha_4 UNCOUP + \alpha_5 DEM$$

They concluded that an increase by one standard deviation of the share of the middle class causes a decrease in the index of political instability of about 3.3, that farther causes an increase in the share of investment in GDP (so, on growth) of one percentage point.

Ortega Diaz (2007) across the federal entities of Mexico used Perotti (1996) model with two-stage estimation, for fiscal channel of inequality on growth:

$$Growth_t = \gamma_1 GSP_{t-1} + \gamma_2 EXP_{t-1} + \gamma_3 Maleliterancy_{t-1} + \gamma_4 Femaleliterancy_{t-1} + z + u_t$$

$$EXP_{t-1} = \delta_1 Inequality_{t-1} + \delta_2 POP65_{t-1} + \delta_3 Deprivation_{t-1} + v + e_t$$

where *EXP* is government expenditure, *GDP* is Gross Domestic Product,

Inequality is the Gini coefficient of the income of the household survey, *Female* and

Male literacy index – is the number of males, respective females that can read and write in total population, *Pop65* is the share of population of 65 years or more,

Deprivation is the deprivation index computed as a composite index of seven distinct types of deprivation, *z*, *v* are state effects.

Socio-political instability channel of the effects of inequality on growth, is:

$$Growth_t = \lambda_1 GSP_{t-1} + \lambda_2 Inequality_{t-1} + \lambda_3 Maleliterancy_{t-1} + \lambda_4 Femaleliterancy_{t-1} + \lambda_5 EXP_{t-1} + \lambda_6 SPI_{t-1} + \alpha + \eta_t t + \tau_t$$

where α is the intercept representing the unobserved invariant effect, $\eta_t t$ is the unobserved time dependent effect.

In a study, Kolawole et al. (2015) examines the relationship among poverty, inequality and economic growth in Nigeria, used the nonlinear model of income inequality by Barro (2000), Gregorio and Lee (2002):

$$G_t = a_0 + a_1 X_t + a_2 X_t^2 + a_3 Z_t + \varepsilon_t$$

Where G_t the Gini index for income inequality is X_t is the natural logarithm of GDP, and Z_t is a vector of macroeconomic variables.

The influence on per capita income of the GDP growth rate, literacy, government expenditures in education and health is modelled with a log linear equation:

$$\ln Pci_t = \alpha_0 + \alpha_1 \ln Gdpgr_t + \alpha_2 \ln Lit_t + \alpha_3 \ln Gxpe_t + \alpha_4 \ln Gxph_t + \varepsilon_t$$

Where Pci_t is the per capita income, $Gdpgr_t$ is the growth rate of GDP, Lit_t literacy rate, $Gxpe_t$, is the government expenditures in education, $Gxph_t$ government expenditures for health, ε_t error term and α_0 is the intercept. It is expected that $\alpha_i > 0, i = 1, 4$.

A variant of the above model is the influence on poverty head count ratio in logarithms of the variables independent Pci_t , $Gdpgr_t$, Lit_t , $Gxpe_t$, $Gxph_t$ in logarithms:

$$\ln Phr_t = \beta_0 + \beta_1 \ln Pci_t + \beta_2 \ln Gdpgr_t + \beta_3 \ln Lit_t + \beta_4 \ln Gxpe_t + \beta_5 \ln Gxph_t + \eta_t$$

Phr_t is the poverty headcount ratio the proportion of a population that lives, below the poverty thresholds, with expected $\beta_i < 0, i = 1, 5$.

Islam's (2014) model, is based on "inverted-U" Kuznetz (1955) hypothesis of long run relationship between inequality and growth that means that, as the income increases, the inequality initially increases and then decreases.

He used a sample of 72 countries and data of World Bank, the IMF statistics, in order to estimate the model:

$$GC = b_0 + b_1 Yppp + b_2 Yppp^2 + b_3 GYL + b_4 GPOP + b_5 GLOBE + u$$

Where GC is Gini coefficient, $Yppp$ is GDP per capita in PPP\$, GYL is lagged growth rate of real GDP, $GPOP$ is the population growth rate, $GLOBE$ is the degree of openness of the economy, u is the random error term with zero mean and constant variance.

The first three terms formalise the Kuznetz hypothesis, the last are the Islam's extension.

The coefficients b_1, b_4 are expected to be positive, and b_2 negative. The other coefficients have ambiguous signs.

Tian (2012), in order to test the effect of economic inequality on economic growth in China, used the following model:

$$GR = b_0 + b_1 SR + b_2 CF + b_3 GINI + b_4 PG + b_6 TI$$

With GR the GDP growth rate, SR saving rate, CF capital formation rate, $GINI$ Gini coefficient, PG population growth rate, TI total investment rate.

3. The evolution of inequality and growth in Romania

Given the need of rigorous study of inequality and the effects on growth, to overcome the persistence effects of the global crisis (UNCTAD report 2012), we initially make a brief summary of inequality studies for Romania.

From World Bank, Development Research Group data, based on primary household survey data obtained from government statistical agencies and World Bank country departments, we have investigated the evolution of some indicators.

The income shares held by highest and lowest 10% income groups of population, could be seen in figure 1, panels *a* and *b*. The data include the period 1989-2013, where zero values mark the absence of the data. We can observe that the share income for the high 10% income groups are in between 20-25% and for the low 10% income groups are between 4-3% , this marking a high difference of income between the two decile and a very small percentage of income spent for the last 10% of the population

Figure 1. *a. Income shares for high 10%; b. Income shares held by low 10% (based on WB statistics)*

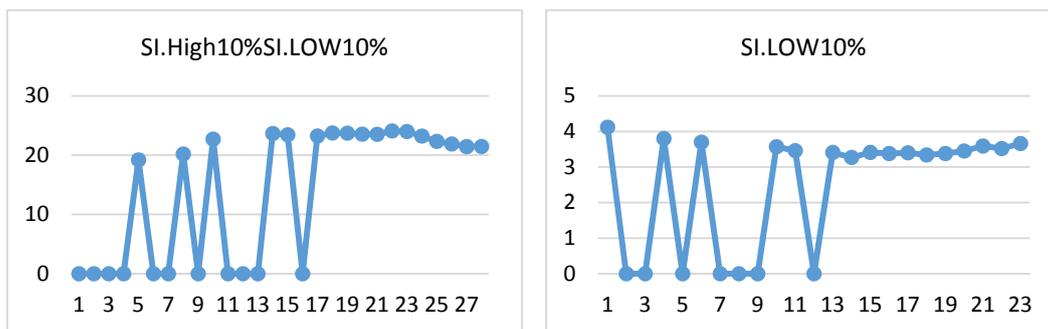
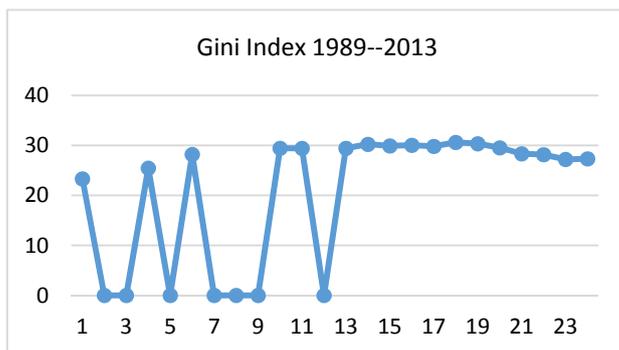
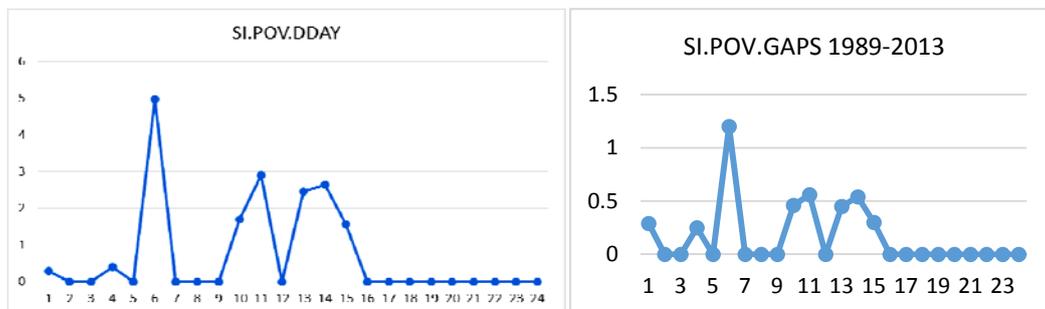


Figure 2. *Gini Index for Romania 1989=2013 (based on WB statistics)*



In Figure 2, using the WB data, we plotted the evolution of Gini index for the period 1989-2013, observing that the evolution remains in the last years close 30% and close to Gini values of Eastern European countries (Slovak Republic, Hungary, Czech Republic, Belarus, Poland).

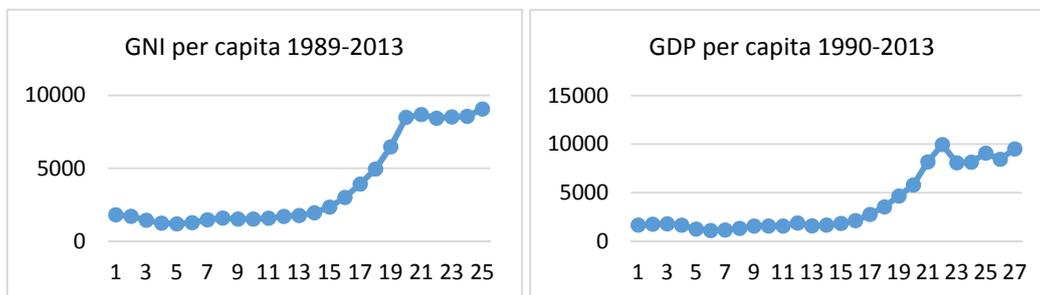
Figure 3. a. Poverty headcount ratio at 1.25\$ a day (% of population, based on WB statistics); b. Poverty gap at 1.25\$ a day (% of population, based on WB statistics)



Poverty headcount ratio at 1.25\$ a day, is the percentage of the population living on less than \$1.25 a day at 2005 international prices. In the panel (a) one can see values around 0%-3% of population with a daily income less than 1.25\$.

Poverty gap at 1.25\$ a day is the average gap from the poverty line of 1.25\$ a day, reflecting the depth and incidence of poverty. The values for that indicator are low, around 0.3-0.4%, and are again close to the Eastern European countries (Hungary, Czech Republic, Slovak Republic, Poland).

Figure 4. a. GNI per capita 1989-2013; b. GDP per capita 1990-2013 (figures based on World Bank national accounts data, and OECD National Accounts data files)



Gross National Income per capita is obtained by dividing GNI converted in USD by the midyear population, and GDP per capita is gross domestic product divided by midyear population, converted in USD. It can be seen that the two indicators had a positive evolution, with certain reductions in recent years marked by global economic crisis.

4. Conclusions and further topics

The literature highlights the importance of studying the inequality in all its aspects, the relationship with economic growth in order to formulate efficient economic policies to reduce disparities.

UNCTAD 2012 Report concludes that the full overcome of the global crisis, with persistent effects of Hysteresis type, and renewed growth is determined by the success of

policies to reduce inequality between different social groups, regions of a country, and between countries as well.

Regarding the situation of inequality in Romania, that started from a low level of inequality, in 1990, compared to that of Sweden, deepening in short time to reach the top of the hierarchy of European countries.

In our future research on this topic, assuming that there exists a pattern of growth-inequality relationship of Eastern European countries, we will apply the models stated in the second paragraph of this work both for countries in this area and for the regions of Romania.

Another possible research direction would be to apply various clustering methods, for instance Self-Organizing Maps, in order to classify the Eastern European countries according to poverty and inequality indicators. In this study GDP would be the main indicator.

References

- Alesina, A., Perotti, R. (1993). "Income Distribution, Political Instability and Investment", *NBER Working Papers*, 4486, National Bureau of Economic Research, Inc., 1
- Alesina, A., Rodrik, D. (1994). "Distributive Politics and Economic Growth", *Oxford Journal of Economics*, Vol. 109, Issue 2
- Andrei, A., Imperato, A. (2012). "Inequality and Economic Growth: Some Theoretical and Empirical Aspects, Proceedings of the seventh international conference on economic cybernetic analysis: The new economic crisis- Evolution and recovering ways (NEC-12012) AES", Bucharest, 2012
- Atkinson, A.B., Piketty, T., Saez, E. (2011). "Top Incomes in the Long Run of History", *Journal of Economic Literature*, 49:1, 3-71; <http://www.aeaweb.org/articles.php?doi=10.1257/jel.49.1.3>
- Atolia, M., Chatterjee, S., Turnovsky, S.J. (2009). "Growth and Inequality: Dependence on the Time Path of Productivity Increases (and other Structural Changes)", *Working Papers*, UWEC-2009-23, University of Washington, Department of Economics
- Barro, R.J. (2000). "Inequality and Growth in a Panel of Countries", *Journal of Economic Growth*, 5
- Banerjee, A.V., Newman, A.F. (1991). "Risk-Bearing and the Theory of Income Distribution", *Review of Economic Studies*, Wiley Blackwell, vol. 58(2), pp211-35
- Benabou, R. (1999). "Tax and Education Policy in a Heterogenous Agent Economy: What Level of Redistribution Maximize Growth and Efficiency?", NBER WP 7132, National Bureau of Economic Research, Inc
- Castello-Climent, A., Cabrillana, Hidalgo, A. (2010). "Quality and quantity of education in process of development", *Economics Working Papers*, we1020, Universidad Carlos III, Departamento de Economía
- Castello-Climent, A., Domeneck, R. (2002). "Inequality and Economic Growth: Some New Evidences", *The Economic Journal*, Vol. 112, Issue 478, pp. C187-C200, March 2002
- Charles-Coll, J.A. (2015). "The Debate over the Relationship Between Income Inequality and Economic Growth: Does Inequality Matter for Growth?", *Research in Applied Economics*, ISSN 1948-5433, 2013, Vol. 5, No. 2
- De la Croix D, Doepke M. (2002). "Public versus Private Education when Differential Fertility Matters", *UCLA Economic Workpapers*, 816, UCLA Department of Economics
- Domnişoru, C. (2014). "The largest drop in income inequality in the European Union during the Great Recession: Romania's puzzling case", International Labor Office, Geneva, Conditions of Work and Employment, No. 51, ISSN: 2226-8944; 2226-8952
- Galor, O., Zeira, J. (1993). "Income Distribution and Macroeconomics", <http://links.jstor.org/sici?sici=0034-6527%28199301%2960%3A1%3C35%3AIDAM%3E2.0.CO%3B2-U&origin=bc>
- Gregorio, J., Lee, J-W. (2002). "Income Inequality Is Not Harmful for Growth: Theory and Evidence", *Review of Income and Wealth*, Series 48, No. 3

- Grossman, H.I., Kim, M. (1996). "Inequality, Predation and Welfare", *NBER Working Papers*, 5704, National Bureau of Economic Research, Inc.
- Islam, A. (2014). "Economic Factors Affecting Distribution of Income Among Nations: A Preliminary Discussion", 2014 Hawaii University International Conferences Arts, Humanities & Social Sciences http://www.huichawaii.org/assets/islam_anisul_m_economic_factors_affecting_distribution_ahs2014.pdf
- Kolawole, B.O., Omobitan, O.A., Yaqub, J.O. (2015). "Poverty, Inequality and Rising Growth in Nigeria: Further Empirical Evidence", *International Journal of Economics and Finance*, Vol. 7, No. 2; 2015
- Kuznets, S. (1955). "Economic growth and income inequality", *American Economic Review* 45, 1-28
- Li, H., Zou, H. (1998). "Income Inequality Is Not Harmful for Growth: Theory and Evidence" <http://down.aefweb.net/WorkingPapers/w74.pdf>
- Marrero, G.A., Novales, A. (2001). "Growth and Welfare: Distorting versus Non-Distorting Taxes", *Journal of Macroeconomics*; 27 (3), pp. 403-433
- Molnar, M. (2011). "Income polarisation in Romania", *Romanian Journal of Economic Forecasting* – 2/2011
- Molnar, M. (2010). "Romanian's households' income inequality", *Romanian Statistical Review*, No. 7/2010
- Morrison, C., Murtin, F. (2010). *The Kuznets Curve of Education: A Global Perspective on Education Inequalities*, Centre for the Economics of Education, London School of Economics
- Nahum, R.-A. (2005). "Income Inequality and Growth: A Panel Study of Swedish Countries 1960-2000", *Working Papers Series*, 2005:8, Uppsala University, Department of Economics
- Ncube, M., Anyanwu, J.C., Hausken, K. (2013). "Inequality, Economic Growth, and Poverty in the Middle East and North Africa (MENA)", African Development Bank Group, *Working Paper*, No. 195
- Ortega, Diaz, A. (2007). "Channels to which income inequality influences growth: Fiscal and Sociopolitical Instability Approaches", http://sitios.itesm.mx/egap/que_es_egap/inv_pub/EGAP_EC_09_07.pdf
- Pagano, M. (2004). *The European Bond Markets under EMU*, Oxford Review of Economic Policy, Oxford University Press, Vol. 20(4)
- Peñalosa-García, C. (2008). "Inequality and Growth: Goal Conflict or Necessary Prerequisite?", Proceedings of OESTERREICHISCHE NATIONALBANK Workshops
- Peñalosa-García, C., Turnovsky, S. (2005). "Growth and Income Inequality: A canonical model", *Working Papers*, UWEC-2006-04-P, Univ of Washington
- Perotti, R. (1996). "Redistribution and Non-consumption Smoothing in an Open Economy", *Review of Economic Studies*, Wiley Blackwell, Vol. 63(3), pp. 411-33
- Perotti, R. (2007). In Search of the Transmission Mechanism of Fiscal Policy, in NBER Macroeconomics Annual 2007, Vol. 54(3)
- Person, T., Tabellini, G. (1994). "Is Inequality Harmful for Growth?", *American Economic Review*, Vol. 84(3)
- Precupețu, I. (2013a). "Inequality trends in Romania", CALITATEA VIETII, XXIV, No. 3, 2013, pp. 249-276
- Precupețu, I., Precupețu, M. (2013b). "Growing Inequalities and Their Impact in Romania", GINI growing inequalities' impact, Country Report for Romania; http://www.uva-aias.net/uploaded_files/publications/Romania.pdf
- Romer, D. (2005). *Advanced Macroeconomics*, McGraw Hill, Boston, New York
- Saint-Paul, G. (2002). "Distribution and Growth in an Economy with limited Needs", *CEPR Discussion Papers*, 2834, C.E.P.R. Discussion Papers
- Tian, Ye (2012). "The Effect of Income Inequality on Economic Growth in China", *Economics & Business Journal: Inquiries & Perspectives*, Vol.4, No. 1, October 2012
- Venieris, Y.P., Gupta D.K. (1986). "Income distribution and socio-political instability as determinants of savings: A cross-sectional model"
- Voitchovsky, S. (2005). "Does the Profile of Income Inequality Matter for Economic Growth?", *Journal of Economic Growth*, Springer, Vol. 10(3), pp 273-296
- Walsh, J.P., Yu, J. (2002). "Inflation and Income Inequality: Is Food Inflation Different?", WP/12/147, *IMF Working Paper*
- INDEXMUNDI dataset <http://www.indexmundi.com/facts/indicators/SI.DST.04TH.20/compare#country=ro>
- ***IMF cross country macroeconomic statistics https://www.quandl.com/data/ODA/ROU_NID_NGDP-Romania-Total-Investment-of-GDP
- ***Trade and Development Report, 2012, United Nations Conference on Trade and Development Geneva: Prosperity for All; http://unctad.org/en/PublicationsLibrary/dom2013d1_en.pdf