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ECONOMIC GROWTH AND CHANGE IN INCOME DISTRIBUTION

Traditional method using growth in real GDP per capita as a measure of improvement of welfare does not consider the effect of changes in income distribution between people. The article provides means in order to adjust for this effect. The author calculates the value of such an adjustment in recent years and analyzes possible factors that may affect it.

Традиционный метод, использующий прирост реального ВВП как меру улучшения благосостояния, не учитывает эффект изменений в распределении дохода между людьми. В статье показан способ поправки на действие такого эффекта. Автор оценивает величину такой поправки и анализирует факторы, которые могли на нее повлиять.

Key words: economic growth, income distribution, inequality.

Economic crisis in 2008-2009 contrasts with previous years of continuous economic growths. During 1995-2009 real GDP per capita grew in Azerbaijan by 312%, in China – by 249%. The lowest real GDP per capita growth was in Bahrain (-7%), Saudi Arabia (5%), and Italy (7%). This indicator grew by 33% in Ukraine. But do all people benefit from economic growth?

Income inequality dynamics has been analyzed in several studies. For example, Giannini M. (1997) claims that differences in accumulated human capital may affect income distribution. Also under absence of a redistributive policy the growth process causes increasing inequality. But inequalities may be reduced by means of redistribution policies without altering the growth process.

Li H., Xie D., Zou H-f (1999) show that as an economy grows, income distribution does improve. This holds even under control for government spending (on education, welfare, social security, health and infrastructure) that are supposed to lower income inequality.

Turnovsky S., Garcia-Peñalosa C. (2006) analyze several factors affecting income distribution dynamics. In particular, under certain conditions the accumulation of capital and increase in productivity may reduce the degree of wealth inequality. If the initial stock of capital is below the steady state level, then wealth inequality will decrease during the transition. Under aging of population the reduction in the labor supply and the increase in the capital-labor ratio reduce the relative reward to capital and increase that to labor, which results in a more equal distribution of income. The increase in wage inequality since the late 1970s was accompanied by the increase in the difference between the hours worked by high-wage and by low-wage individuals.

But the existing research lacks a measuring inequality dynamics, adequate for adjusting indicators of economic growth. Growth of real GDP per capita does not consider its distribution, thus it should be adjusted by a certain coefficient in order to reflect growth in welfare of the

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general public. In this paper we aim at estimating this effect and determining factors that may influence it.

Let's suppose that economy consists of two persons. Person A earns \$100, person B – \$200. If next year person A earns \$120 and person B – \$300, we may say, that their total income will grow by 40% ((120+300)/(100+200) = 1.4). But the average growth of their income is 35% only ((120/100)/2+(300/200)/2 = 1.35). The latter is a better indicator to consider increase in income of the general public. That is why we may apply an adjustment coefficient (AC) 1.35/1.4 = 0.965 to growth in real GDP.

If AC is smaller than 1, then upper income population benefits more from economic growth, which causes concentration of wealth. A better option is AC slightly more than 1 (it means that income of lower income population grows more than income of upper income population). But it is better to consider adjusted by AC economic growth indicator in long-term period, since excessive redistribution of income by state to help the poor may curb economic growth by deterioration of motivation to earn income.

Let's calculate the AC in countries by using statistical data of average household annual disposable income by decile during 1995-2009 in 74 countries and territories (we used www.euromonitor.com statistical database to get the necessary time series for our analysis). These countries represent all the regions of the world. Unfortunately, considering availability of the data, Sub-Sahara Africa is represented in our sample only by two countries.

The average (among countries) long-term (i.e. during 15 years) AC (unweighted by population of countries) was 0.98. I.e. average annual AC was almost 0.9987. Thus, we should decrease annual economic growth in an average country by 0.13% in order to adjust for income distribution effect. Thus, we could say that, economic growth was only slightly more beneficial for upper income population.

But long-term AC weighted by population was lower – 0.94 (mainly due to the impact of low AC in China and India – countries with the biggest population). This means that the average annual AC weighted by population was 0.9959. I.e. we should decrease annual economic growth in the world by 0.41%. This means that economic growth was even more beneficial for upper income population (not slightly, but still not dramatically).

As for particular countries, in the following table countries are sorted by real GDP per capita growth, adjusted real GDP per capita growth, and long term AC.

Table 1 Country rankings by economic growth during 1995-2009,
considering adjustment for changes in income distribution, times

Country	Real GDP per capita growth	Country	Adjusted real GDP per capita growth	Country	Long-term AC
Azerbaijan	4.121	Azerbaijan	3.681	Chile	1.187
China (mainland)	3.494	China (mainland)	2.919	Brazil	1.175
Belarus	2.374	Kazakhstan	2.293	Turkey	1.155
Vietnam	2.352	Belarus	2.271	Colombia	1.127
Estonia	2.212	Estonia	2.264	Kazakhstan	1.078
Kazakhstan	2.128	Vietnam	2.149	Mexico	1.074
Lithuania	2.099	Lithuania	2.100	Thailand	1.056
India	2.097	India	1.945	Greece	1.038
Latvia	2.072	Slovakia	1.906	Spain	1.034
Poland	1.978	Latvia	1.897	Argentina	1.032
Slovakia	1.902	Chile	1.859	Tunisia	1.025
Ireland	1.815	Poland	1.822	Estonia	1.023

Country	Real GDP per capita growth	Country	Adjusted real GDP per capita growth	Country	Long-term AC
South Korea	1.762	Tunisia	1.784	Indonesia	1.022
Croatia	1.754	Ireland	1.759	Italy	1.010
Tunisia	1.741	Croatia	1.758	Venezuela	1.009
Turkmenistan	1.733	Turkey	1.658	Portugal	1.007
Nigeria	1.706	Serbia	1.654	Croatia	1.002
Serbia	1.683	South Korea	1.646	Slovakia	1.002
Taiwan, China	1.665	Bulgaria	1.632	Hungary	1.002
Russia	1.647	Taiwan, China	1.614	Netherlands	1.002
Bulgaria	1.636	Slovenia	1.613	Belgium	1.001
Slovenia	1.635	Greece	1.573	Lithuania	1.001
Egypt	1.598	Russia	1.564	France	1.000
Romania	1.587	Hungary	1.553	Australia	1.000
Singapore	1.584	Egypt	1.529	Bulgaria	0.998
Chile	1.566	Peru	1.520	Morocco	0.994
Peru	1.560	Romania	1.520	Germany	0.994
Hungary	1.550	Czech Republic	1.516	Ecuador	0.994
Czech Republic	1.526	Singapore	1.497	Czech Republic	0.993
Greece	1.515	Brazil	1.490	Austria	0.992
Jordan	1.474	Indonesia	1.488	Bahrain	0.990
Morocco	1.469	Turkmenistan	1.481	Slovenia	0.987
Malaysia	1.460	Thailand	1.468	Philippines	0.986
Finland	1.457	Morocco	1.460	Algeria	0.985
Indonesia	1.455	Jordan	1.449	USA	0.984
Turkey	1.436	Spain	1.398	Jordan	0.983
Hong Kong, China	1.391	Colombia	1.397	Serbia	0.983
Thailand	1.390	Finland	1.371	Switzerland	0.981
Philippines	1.365	Nigeria	1.367	United Kingdom	0.981
Algeria	1.357	Argentina	1.366	Ukraine	0.977
Spain	1.353	Malaysia	1.362	Peru	0.975
Sweden	1.348	Australia	1.347	United Arab Emirates	0.971
Australia	1.347	Philippines	1.345	Saudi Arabia	0.971
Israel	1.340	Algeria	1.337	Taiwan, China	0.970
Ukraine	1.330	Netherlands	1.320	Ireland	0.969
South Africa	1.328	Ukraine	1.300	Bolivia	0.967
Argentina	1.323	Sweden	1.289	Qatar	0.966
Netherlands	1.318	Israel	1.288	Israel	0.961
Norway	1.317	Ecuador	1.282	Japan	0.958
United Kingdom	1.306	United Kingdom	1.281	Romania	0.958
Pakistan	1.295	Austria	1.270	Egypt	0.957
Ecuador	1.290	Portugal	1.260	Belarus	0.957
Bolivia	1.288	Belgium	1.252	Sweden	0.956
Austria	1.281	Bolivia	1.246	Denmark	0.955
Canada	1.268	USA	1.241	Russia	0.950
Brazil	1.268	Norway	1.239	Singapore	0.946
USA	1.261	Mexico	1.237	Canada	0.944
New Zealand	1.253	South Africa	1.236	Kuwait	0.944

Country	Real GDP per capita growth	Country	Adjusted real GDP per capita growth	Country	Long-term AC
Belgium	1.251	Hong Kong, China	1.217	Norway	0.941
Portugal	1.250	France	1.203	Finland	0.941
Qatar	1.242	Qatar	1.200	South Korea	0.934
Colombia	1.240	United Arab Emirates	1.199	Malaysia	0.932
United Arab Emirates	1.235	Canada	1.197	South Africa	0.931
France	1.203	Pakistan	1.177	India	0.927
Denmark	1.181	Germany	1.166	Poland	0.921
Switzerland	1.179	Switzerland	1.157	Latvia	0.916
Germany	1.173	Venezuela	1.143	Vietnam	0.914
Kuwait	1.170	Denmark	1.127	Pakistan	0.909
Mexico	1.152	New Zealand	1.114	Azerbaijan	0.893
Venezuela	1.132	Kuwait	1.104	New Zealand	0.889
Japan	1.103	Italy	1.089	Hong Kong, China	0.875
Italy	1.079	Japan	1.056	Turkmenistan	0.854
Saudi Arabia	1.052	Saudi Arabia	1.021	China (mainland)	0.835
Bahrain	0.928	Bahrain	0.919	Nigeria	0.802

In most cases adjustment does not change rank of a country significantly. For example Azerbaijan and China (mainland) remain the fastest growing economies even after adjustment, while Bahrain and Saudi Arabia took the lowest places. But there are exceptions. Long-term AC was the highest in Chile, Brazil, Turkey, Colombia, Kazakhstan, Mexico, Thailand, Greece, Spain, and Argentina. In these countries the lower income people benefited more from the economic growth in comparison with the upper income people. It is logical that half of these countries represent Latin America, which is the region with high income inequality. Thus, we may observe the inequality convergence effect.

Long-term AC was the lowest in Nigeria, China (mainland), Turkmenistan, Hong Kong, New Zealand, Azerbaijan, Pakistan, Vietnam, Latvia, Poland, India, South Africa, Malaysia, South Korea, Finland, Norway, Kuwait, Canada, Singapore, Russia. These countries include fast growing economies (in this case growth of inequality in income is usually inevitable) and countries, where inequality in income is traditionally low, such as Scandinavian countries (thus, we may observe the inequality convergence effect again). Ukraine was in the middle of the ranking, with its long-term AC being almost equal to the global average unweighted long-term AC.

If we consider particular years, the highest average unweighted annual AC was in 2001 and 2003 (1.001), while the lowest figure was is 1997, 2000, and 2005 (0.997).

The highest annual AC was registered in Serbia-2002 (1.078), Venezuela-2006 (1.078), Argentina-2004 (1.067), New Zealand-2002 (1.062), Thailand-2001 (1.061), China (mainland)-1995 (1.055), Turkey-2003 (1.051), Brazil-2001 (1.050), Chile-2001 (1.048), Argentina-1999 (1.049), Columbia-1995 (1.046), Turkey-2004 (1.045), Ecuador-1997 (1.043), Mexico-2000 (1.043), Bolivia-1998 (1.041).

The lowest annual AC was registered in Serbia-2000 (0.928), Nigeria-1995 (0.929), Nigeria-1996 (0.945), Nigeria-1997 (0.947), China (mainland)-2002 (0.948), Venezuela-2002 (0.949), New Zealand-2001 (0.957), Bulgaria-2002 (0.960).

The highest variation of annual AC was observed in Venezuela, Argentina, China (mainland), and Nigeria, while the lowest variation was in Pakistan, Morocco, Ukraine, and Slovakia. In Ukraine the annual AC fluctuated within the narrow margins 0.997-1.000. The highest figure

(1.000) was in 2009 during the economic crisis. It is interesting, that there was a general decrease of variation of average annual AC in recent years. The average (during 14 years) standard deviation of the average (among countries) annual AC was 0.012. And in 2008 and 2009 the standard deviation was only 0.004 and 0.002, respectively.

As for factors affecting AC, we do not find evidence of influence, caused by the majority of factors considered. Correlation between average annual indicators during 1995-2009 and long-term AC was the following:

- real lending rates (0.24);

- change in GDP from agriculture, hunting, forestry and fishing / GDP (0.23);

- gross income from investments / GDP (0.23);

- life expectancy at birth (0.22);

- gross income from benefits / GDP (0.19);

- average working week in non-agricultural activities (0.16);

- change in life expectancy at birth (0.16);

- change in savings / GDP (0.15);

- change in government expenditure on education / GDP (0.14);

- Gini idex (0.12);

- government expenditure on social security and welfare / GDP (0.12);

- energy intensity (0.11);

- change in government expenditure on defense / GDP (0.11);

- GDP from financial intermediation, real estate, renting and business activities / GDP (0.09);

- GDP from education, health, social work and other community, social, personal service activities / GDP (0.09);

- change in death rate (0.09);

- government expenditure on health / GDP (0.08);

- GDP from manufacturing / GDP (0.07);

- change in GDP from manufacturing / GDP (0.07);

- government expenditure on education / GDP (0.06);

- change in foreign debt / GDP (0.06);

- ease of Doing Business Index (0.06);

- change in gross income from investments / GDP (0.05);

- change in average working week in non-agricultural activities (0.05);

- mean age of population (0.05);

- change in foreign direct investment inflows / GDP (0.05);

- change in government expenditure on housing and community amenities / GDP (0.05);

- change in exports of goods and services / GDP (0.04);

- change in net migration / population (0.04);

- foreign debt / GDP (0.03);
- depreciation of national currency against US dollar (0.03);
- change in birth rate (0.03);
- change in possession of personal computer (0.02);
- foreign debt / GDP (0.01);
- change in government expenditure on health / GDP (0.01);
- possession of passenger car (0.00);
- change in inflation (0.00);
- inflation (-0.01);
- corruption perceptions index (-0.01);
- change in corruption perceptions index (-0.01);
- change in mean age of population (-0.01);
- change in gross income from benefits / GDP (-0.01);
- government expenditure on housing and community amenities / GDP (-0.01);
- change in possession of passenger car (-0.02);
- change in government expenditure on social security and welfare / GDP (-0.03);
- change in public debt / GDP (-0.04);
- government expenditure on defense / GDP (-0.06);
- change in GDP from mining and quarrying / GDP (-0.06);
- government budget balance / GDP (-0.07);
- change in gross fixed capital formation / GDP (-0.07);
- possession of personal computer (-0.08);
- net migration / population (-0.09);
- birth rate (-0.09);
- offences (-0.09);
- change in GDP from financial intermediation, real estate, renting and business activities / GDP (-0.10);
- foreign direct investment inflows / GDP (-0.10);
- change in GDP from education, health, social work and other community, social, personal service activities / GDP (-0.11);
- change in offences (-0.11);
- GDP deflator growth (-0.12);
- global competitiveness index (-0.12);
- change in bank claims on the private sector / GDP (-0.12);
- gross fixed capital formation / GDP (-0.14);
- death rate (-0.14);

- bank claims on the private sector / GDP (-0.15);
- change in government budget balance / GDP (-0.15);
- energy intensity growth (-0.16);
- GDP from mining and quarrying / GDP (-0.17);
- change in market capitalization / GDP (-0.17);
- agricultural output growth (-0.18);
- current account balance / GDP (-0.18);
- total expenditure on R&D / GDP (-0.20);
- market capitalization / GDP (-0.20);
- change in current account balance / GDP (-0.22);
- exports of goods and services / GDP (-0.23);
- GDP from agriculture, hunting, forestry and fishing / GDP (-0.24);
- real GDP per capita growth (-0.29);
- change in Gini Index (-0.63).

Let's consider now those indicators that correlate the most.

Correlation between average annual real lending rate and long-term AC is 0.24, but correlation between annual data on lending rate and annual AC is close to zero (0.03). Such difference can be explained both by difference in the amount of observations and possibly longer lag of influence. Another obstacle to recommendation to use higher real lending rate is the fact that it correlates slightly negatively with the average adjusted real GDP growth (-0.12). Moreover, according to correlation of lagged data, the relationship could be reverse. Lower growth of income of upper-income population could lead to lack of savings, and, thus, higher real interest rates.

A similar problem exists, if we consider change in GDP from agriculture, hunting, forestry and fishing / GDP. Correlation of annual data is close to zero as well (-0.02). Also this indicator correlates negatively with the adjusted real GDP growth (-0.63). Moreover, as we see, correlations with the absolute value and change in GDP from agriculture, hunting, forestry and fishing / GDP have opposite signs. As for GDP from agriculture, hunting, forestry and fishing / GDP, correlation of annual data is -0.078, while its correlation with adjusted real GDP growth is 0.35.

As for gross income from investments / GDP, correlation of annual data is 0.07. Its correlation with adjusted real GDP growth is -0.23. As for life expectancy at birth, correlation of annual data is 0.07, and its correlation with adjusted real GDP growth is -0.25. As for total expenditure on R&D / GDP, correlation of annual data is -0.08, while its correlation with adjusted real GDP growth is -0.30. As for market capitalization / GDP, correlation of annual data is -0.09, and its correlation with adjusted real GDP growth is -0.32.

As for change in current account balance / GDP, correlation of annual data is -0.004, while its correlation with adjusted real GDP growth is -0.01. As for exports of goods and services / GDP, correlation of annual data is -0.06, and its correlation with adjusted real GDP growth is 0.02.

As for real GDP per capita growth, correlation of annual data is 0.01, while its correlation with adjusted real GDP growth is 0.96. The latter shows that adjusted real GDP depends mostly on unadjusted real GDP growth, and depends less on the AC itself.
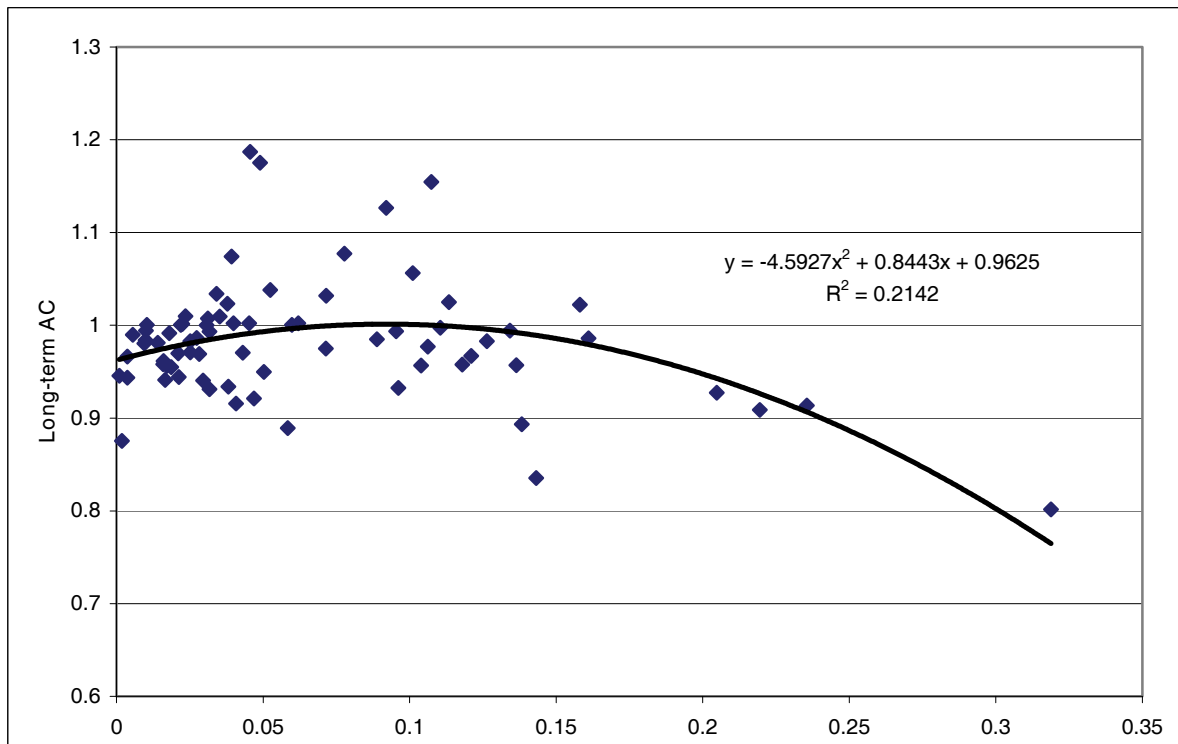
$$y = -4.5927x^2 + 0.8443x + 0.9625$$
$$R^2 = 0.2142$$

Diagram 1. Non-linear dependence between GDP from agriculture, hunting, forestry and fishing / GDP and AC.

As for change in Gini index, correlation of annual data is -0.12 (but -0.91 with 1 year lag, which may be a result of the effect of statistics methodology), while its correlation with adjusted real GDP growth is 0.30. Obviously, high correlation between change in Gini index and AC is natural, since they reflect the same phenomenon in different ways.

Despite considerable correlation in several cases, according to the first method (using average data during the whole period of 1995-2009), another method (using annual data) does not provide enough evidence to support the preliminary conclusions about relatively strong linear links between AC and the main economic and demographic indicators. Interaction of several factors could take place. Also the links could be nonlinear. For example, the following diagram shows such a link.

Thus, from methodological point of view, adjustment for changes in income distribution in several cases may be very important in order to estimate increase in welfare of the population better. The future research may consider also the effect of changes in prices and difference in structure of goods and services consumed by people with different income. Another problem is shadow economy. That is why, officially published income distribution data may be biases. Solving this problem may be subject of further research as well.

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