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DIRECT AND INDIRECT EFFECTS OF PRO-POOR GROWTH

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Abstract

Balancing sustainable growth requires poverty to be reduced. The paper is aimed at determining under which conditions growth can be considered pro-poor. Own approaching to the definition of pro-poor growth is suggested. It allows identifying the growth factors, which directly reduce poverty. Furthermore, it analyses two transmission mechanisms through which growth can reduce poverty; a labor market and local redistribution. It reveals barriers in poverty reduction thus pointing at necessary state intervention. It also helps to evaluate if the sectors of strongest foreign direct investments contribute to poverty reduction. The hypotheses suggested in the paper are verified on a base of data from two sources: the Polish Household Budget Surveys and Local Data Bank offered by the Central Statistical Office of Poland for a period of 2005-2011. To identify the direct effects of growth on poverty reduction through labor market and local redistribution, we apply mediation models. Estimations of panel data models are used to assess dependence of poverty on economic growth and its factors, and relationships in the mediation models.

Keywords: pro-poor growth, labor market, local redistribution
JEL Classification: I32, J21

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I. INTRODUCTION

Since the beginning of the new century the new discussion about sustainable poverty reduction has been held in the developmental economics literature. The key topic of it is pro-poor growth. The literature suggests some pro-poor growth definitions and some suitable measures (Kakwani and Peronia, 2000; Ravallion and Datt, 2002; Dollar and Kraay, 2002; Ravallion and Chen, 2003; Lopez, 2004; Kraay, 2006; Duclos, 2009).

Empirical research of growth features which are strongly in favor of the poor has not given unequivocal results. The influence of income inequality on growth and poverty relationship is the one investigated best. The results show that: 1) High income inequality undermines pro-poor growth impact (Ravallion, 2004); 2) Two income inequality sources are relevant: asset inequality (Christiaensen, Demery and Paternostro, 2002) and gender inequality (Klasen and Lamanna, 2009). But there are no suggestions which policies are the best for poverty reduction. There is necessity of research where policies could reduce income inequality and at the same time rise economic activity. Until now two such areas – education and health care – were defined. The positive impact of efficiency in agriculture is the best investigated one by now (Lipton et. Al, 2003). Development of high tech industry is the most controversial one. Should it be promoted at the expense of traditional sectors which contribute to poverty reduction but limit the lowest income rise thus preserving differences in regional wellbeing? The biggest challenge for researchers is to suggest such policies and procedures which would be in favor for growth as well as for poverty reduction. The paper is aimed at determining under which conditions growth can be considered pro-poor. The research uses data for Poland, one of emerging economies.

The next section of this paper outlines the research hypotheses, related theory, and existing studies. Section three present the data, variable and proxies, and the methods used.

Section four are described in the second section; the third one offers the definition of the poor used in the research; direct effects of growth on poverty are considered in the forth section; the fifth one shows a difference in an income surplus over consumption between the poor and the non-poor; indirect effects of growth on poverty via labor market and local redistribution are presented in the sixth and seventh sections, respectively; the last section covers main conclusions.

II. THEORY

In the literature there are two types of an analysis depending on the definition of pro-poor growth. According to the first one growth can be considered pro-poor when observed poverty reduction is bigger than the hypothetical poverty reduction when income growth would be the same for all disregarding the income level. This approach proposed by Kakwani and Peronia (2000) is an example of the relative influence of growth on the poverty level. Among the relative analysis, Lopez (2004, p.7) suggests other possibilities of pro-poor growth definition

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which occur when income growth among the poor is bigger than among the non-poor. The second approach of analysis – the absolute approach - defines growth as pro-poor when it is followed by poverty reduction (Ravallion and Chen, 2003).

In this paper, own approaching to the definition of pro-poor growth is suggested. It allows to identify growth factors which directly reduce poverty and additionally it analyses two transmission mechanisms through which growth can reduce poverty: a labor market and local redistribution (the central level redistribution depends to large extend on political factors). It reveals barriers in poverty reduction thus pointing at necessary state intervention. It also helps to evaluate if the sectors of strongest foreign direct investments contribute to poverty reduction.

Growth can be regarded pro-poor based on its direct effect and its indirect effect both via labor market and via local redistribution. Related to the direct effects of pro-poor growth, the criteria to fulfill are:

- Real GDP growth is followed by poverty reduction – it is a necessary condition according to the definition of pro-poor growth suggested by Ravallion and Chen, (2003).
- Growth of a private sector (private investments, industrialization, efficiency in agriculture, new technologies in industry) leads to poverty reduction and shifts in the income distribution of the poor which enables households to become non-poor.
- Real GDP growth allows the poor to create savings (the surplus of income over consumption).

Related to the indirect effects of pro-poor growth via labor market, the criteria for a growth to be pro-poor are:

- Growth creates demand for labor in economy sections in which low-skilled workers can work – employment and wages increase in these sections;
- Growth increases a number of economically active women;
- Growth changes duration of unemployment – it means growth reduces a share of long-run unemployment and extends a share of short-run unemployment (up to three months or so- called friction unemployment);
- Growth reduces personal inactivity caused by conviction of impossibility to find work.

While for the indirect effects of pro-poor growth via local redistribution, the criteria to use is the economic growth raises revenue of communities which allows social allowances to grow.

Poverty

The first indicator to measure poverty is Watts index. In the literature it is required a good measure of poverty to have some properties. Ravallion (2004) suggests the following: focus axiom, monotonicity axiom, transfer axiom. The Watts index meets all of them what makes it a poverty measure often used in researches (for example: Kraay, 2004; Essama-Nssah, 2005 and Lambert, 2009; Haughton and Khandker, 2009).

The Watts index is defined by a following formula:

$$W = \frac{1}{N}\sum_{i=1}^{q} \ln\left(\frac{z}{y_i}\right)$$

where : q means a number of the poor with income y_i below a poverty line z.

Additionally, the Watts index allows to include both a fraction of the poor in a population as well a level of income inequality across the poor. Due to its properties the Watts index is a poverty measure used in the paper.

Another indicator for poverty is the shifts in income distribution of the poor. This includes lower relative polarization index (LRP) or upper relative polarization index (URP).

The relative polarization indices are based on the "relative distribution" developed by Morris, Bernhardt, and Handcock (1994). The relative distribution is the ratio of the fraction of households in the baseline year to the fraction of households in the current year in each decile. The relative distribution shows changes in the shape of income distribution.

Economic growth and its factors

We may use various proxies for the economic growth and its determinant. This include the real GDP per capita, (log), CPI2005=100; the real private investment per capita, (log), CPI2005=100; the real public investment per capita, (log), CPI2005=100; the industrialization = real industrial production per capita, (log), CPI2005=100; the procurement of crops per 1 ha of agricultural land; the procurement of milk per 1 ha of agricultural land; and the employment rate by level of education

Labor market

The first alternative to measure the labor market condition is employed persons per 100 000 citizens by sections, (log). On this paper, we focus on six sectors including Agriculture, forestry and fishing, Manufacturing, Construction, Trade, Transportation and storage, and Accommodation and catering.

The other indicators include the gross wages and salaries by sections (log), CPI2005=100; the unemployment rate by educational level; the fraction of unemployed by duration of unemployment; the personal inactivity caused by conviction of impossibility to find work; and the employment rate by sex and age.

Savings and debts

We may use consumption expenditure as % of income both for poor households and non-poor households to measure the saving and debts. The other option is using credit burden (poor households).

Local redistribution

In Poland, the primary administrative unit to measure the local distribution is "gmina". We may use two proxies; first is the real own revenue per citizen, (log), CPI2005=100; and the second is the real expenditure for social assistance per citizen, (log), CPI2005=100.

III. METHODOLGY

Data and Mediation Model

The hypotheses suggested in the paper are verified on a base of data from two sources: the Polish Household Budget Surveys and Local Data Bank offered by the Central Statistical Office of Poland for a period of 2005-2011.

To identify the in direct effects of growth on poverty reduction through labor market and local redistribution mediation models are applied. A variable is regarded a mediator when it transmits the impact of independent variable (X) on dependent variable (Y). It is assumed the mediation effect occurs when: 1) the variable X influences mediator significantly; 2) the variable X influences the Y in the absence of the mediator; 3) the mediator influences Y significantly; and 4) the influence of the X on the Y shrinks upon the addition of the mediator to the model.

The research uses Sobel, Aroian and Goodman tests. The tests are applied to evaluate mediation effects of labor-market variables. It means the following hypotheses are verified:The indirect impact of real GDP on poverty (Watts index) - via, for example: employment in sections/ wages in these sections - is significantly different from zero. The values of parameters used in the mediation tests are estimated in the panel data models.

Econometric Models

Estimations of panel data models are used for statistical relevance assessment of dependence of poverty on economic growth /growth factors; and for relationships in the

mediation models. The latter includes economic growth (X) and mediator (mediators are variables describing labor market and local redistribution), and also the mediator and poverty (Y).

Models of fixed effects were estimated by OLS while models of random effects were estimated by GLS. Observation unit is a *voivodship* (M=16)[3]. A research period covers years of 2005 – 2011 (T=7). The year 2005 is the first year of observation because of data availability in the local data base offered by the Central Statistical Office of Poland. The panel size is N = 112 (for one year delayed variable used in the model N = 96). Limitation of the research is a short period for which the local data are available. Each voivodship is described by a set of variables including poverty, economic growth and its factors, labor market, and savings and debts.

IV. RESULT AND ANALYSIS

In the literature there are two distinguishable types of poverty: absolute and relative. Absolute poverty is defined as a lack of means to cover the cost of basic material needs. It means the poverty line between poor and non-poor fractions of population is defined as an income level necessary to cover certain needs – the subsistence minimum is the smallest income necessary for surviving which commonly in international comparisons is defined in USD's per capita per day – usually 1 or 2$ (compare World Bank research carried out by Kraay, 2004).

Relative poverty defines the poor as people who are excluded from standard social existence because of low income.

The aim of the research puts aside the subsistence minimum as the poverty line. The analysis of economic growth influence on poverty should cover the group of the working poor whose income is higher then subsistence minimum and thus the poverty line is defined as income equal to equivalent social minimum for 4 member working family of man, woman, older and younger child (a modified equivalent scale suggested by OECD was applied). In Poland the social minimum has been estimated by the Institute of Labour and Social Studies since 1981. The pattern of social minimum covers social needs at relatively low level but sufficient for general renewal of vital power of an individual on every step of biological development, for having and bringing-up children and for maintaining social ties (Deniszczuk and Sajkiewicz 1997).

Maintaining social ties seems crucial for the social minimum (Kurowski, 2001) and because of that the social minimum basket contains not only goods sufficient for subsistence minimum (food, clothing, shoes, lodging, healthcare and hygiene) but also for : having job (local transportation and communication) education and bringing-up children and maintaining family and social ties as well as participation in cultural life.

3 The Polish local government reforms adopted in 1998 went into effect early 1999, created sixteen new voivodeships. These replaced the 49 former voivodeships that had existed from 1 July 1975. Today's voivodeships are mostly named after historical and geographical regions, while those prior to 1998 generally took their names from the cities on which they were centered. The new units range in area from under 10,000 km2 (3,900 sq mi) (Opole Voivodeship) to over 35,000 km2 (14,000 sq mi) (Masovian Voivodeship), and in population from one million (Lubusz Voivodeship) to over five million (Masovian Voivodeship).

Thus the households which income is insufficient for covering needs at "minimum wellbeing" level – the social minimum level - are regarded poor in this paper. Characteristics of poor household groups, defined above, for years 2001–2011 are presented in Table 1

Table 1. Characteristics of poor households*, Poland, 2005-2011, by educational level, social-economic groups, place of residence, age

Year	Poor households, as % of total number of households	Educational level of household head		Social-economic groups, by main income source				Place of residence	Age of household head		
		basic vocational	primary**	Employees	Farmers	Pensioners	Social beneficiaries	Towns with more than 100 000 habitants	15-29	30-39	40-49
	% of poor households										
2005	54.4	39.8	30.8	41.8	6.1	37.3	10.7	22.6	7.7	17.1	26.8
2006	48.0	40.8	37.3	42.8	6.6	37.7	9.0	19.3	7.1	16.4	26.1
2007	43.0	40.2	32.4	43.1	6.1	39.2	7.9	19.2	6.3	15.3	24.8
2008	37.7	40.1	33.5	41.3	6.4	41.6	7.1	18.1	5.7	14.6	22.3
2009	34.6	40.2	33.5	40.0	6.6	42.1	7.7	16.7	5.8	14.7	21.6
2010	35.1	40.8	32.4	39.6	6.3	42.6	7.9	16.7	7.5	15.0	20.1
2011	37.1	41.0	30.3	40.1	6.3	41.8	7.9	17.3	7.4	15.0	19.5

Note: *Poverty line is defined as equivalent social minimum calculated for 4-person family with one younger child and one older child; ** A primary level of education covers the following educational levels: lower secondary, primary, primary notcompleted and without school education
Source: own calculation on a base of the 2005-2011 Polish HBSs

The percentage of poor households was lowering constantly in the years 2001 – 2009 (from 54% in 2001 to 35% in 2009). Unfortunately due to financial crises in 2008 the figure rose to 37% in 2011. The structure of poor households differs much depending on the feature examined. In the whole period of 2001 – 2011 70% were the ones which head was primary or only vocational educated (with the majority of vocational education). Considering source of income the share of employee and farmer households (respectively appr. 40% and 6%) proved to be stable. Contrary the share of pensioner households rose from 37% in 2005 to 42% in 2011 when social beneficiary ones decreased from 11% in 2005 to 8% in 2011.

Distinguishable percentage of poor households living in towns of more than 100 000 inhabitants decreased from 23% in 2005 to 17% in 2011. Considering the age of household head the older households – which a household head is 40-49 years old – dominated. Older households are not analyzed because market creates very little jobs for people older than 50 and the economic growth does not influences incomes of such households (results presented further confirm it). Worsening of economic situation in years 2010 – 2011 caused shift in age structure of households – the percentage of younger ones grew (head younger than 29) and the percentage of older ones (household head is 40-49 years old) decreased. One of the main reasons of that was taking over by younger generation the role of household head in

multigenerational households – income of parents decreased and income of grown-up child became the highest. Changes in poverty (poverty measured by the Watts index) in the years of 1999-2011 are presented in the Table 2.

Table 2.
Watts index (a poverty measure*) in 1999-2011, Poland

Year	A whole sample of households	Households by:										
		Educational level of household head			Social-economic groups, by main income source				Place of residence	Age of household head		
		primary**	basic vocational	tertiary	Emp-loyees	Farmers	Pensioners	Social beneficiaries	Towns with more than 100 000 habitants	15-29	30-39	40-49
1999	0.21	0.35	0.26	0.03	0.18	0.46	0.33	0.64	0.12	0.17	0.17	0.19
2000	0.25	0.41	0.29	0.04	0.20	0.48	0.40	0.69	0.13	0.23	0.27	0.28
2001	0.25	0.38	0.31	0.04	0.21	0.48	0.38	0.66	0.14	0.23	0.26	0.30
2002	0.26	0.41	0.34	0.04	0.22	0.47	0.39	0.64	0.15	0.25	0.27	0.31
2003	0.26	0.34	0.42	0.06	0.21	0.51	0.36	0.65	0.15	0.30	0.28	0.29
2004	0.26	0.41	0.35	0.05	0.23	0.47	0.40	0.63	0.17	0.27	0.27	0.32
2005	0.27	0.40	0.35	0.05	0.23	0.43	0.25	0.61	0.16	0.26	0.29	0.33
2006	0.22	0.34	0.29	0.04	0.19	0.37	0.20	0.55	0.12	0.20	0.23	0.28
2007	0.18	0.30	0.24	0.03	0.15	0.33	0.18	0.51	0.10	0.15	0.18	0.22
2008	0.15	0.26	0.20	0.02	0.12	0.34	0.17	0.47	0.07	0.12	0.14	0.19
2009	0.14	0.25	0.18	0.02	0.11	0.31	0.15	0.49	0.07	0.11	0.14	0.17
2010	0.14	0.28	0.18	0.02	0.10	0.29	0.15	0.50	0.07	0.11	0.13	0.16
2011	0.15s	0.30	0.20	0.03	0.11	0.33	0.16	0.52	0.07	0.14	0.14	0.18

Note: *Poverty line is defined as equivalent social minimum calculated for 4-person family with one younger child and one older child; ** A primary level of education covers the following educational levels: lower secondary, primary, primary notcompleted and without school education
Source: own calculation on a base of the 2005-2011 Polish HBSs

Poverty in 1999 – 2011 measured by the Watts index decreases for the whole sample of households as well as for groups distinguished by education , a main income source, a place of residence and household head age (changes over time are analyzed in the chapter discussing a relationship between economic growth and poverty).

Considering household groups shown in Table 2 the highest poverty level is among households supported by social benefits, then farmers and where the household head has no or only elementary education. Lowest poverty is observed among high educated households – the Watts index is significantly lower than for other groups.

Several features from the above table are (i) distinguishing by education households with vocational education do better than ones with primary; (ii) ranking inside economic groups starts from employees followed by pensioners; the Watts index lowered almost by half for households living in big cities – poverty there was significantly limited; the youngest households

(the household head below 29) do much better than the oldest (the household head between 40-49). To summarize the result shown in Table 2 above: we may conclude that the poverty effects older, living outside big cities, with primary education households.

Direct Effects of Economic Growth on Poverty

Data displayed in Table 3 suggest a relationship between economic growth and poverty. Higher GDP growth rate 2005 – 2008 was accompanied by lowering the Watts index. Economy slowing down during 2009 – 2011 stopped poverty reduction. Watts index changes are time lagged comparing to GDP dynamics.

Table 3.
Real GDP growth rate per capita (CPI2005 =100) and Watts index, Poland , 2001 - 2011

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Annual real GDP growth rate per capita	-0.005	0.018	0.037	0.059	0.042	0.068	0.082	0.040	0.009	0.026	0.034
Watts index	0.250	0.261	0.255	0.263	0.27	0.223	0.184	0.154	0.141	0.141	0.153

Source: own calculation and the Central Statistical Office of Poland

The Watts index allows to estimate time necessary for average poor household to „go out" from poverty – to achieve equivalent income equal to poverty line, here defined as social minimum. Time estimation bases on formula where the Watts index is divided by expected equivalent income growth (spending on consumption) of a poor household , assuming the real GDP growth per capita will stay stable during the time necessary for "going out" from poverty and GDP growth will be distributed neutrally among the poor (Morduch, 1998).

Table 4.
Average poverty "going out" time for households in Poland

Expected annual real GDP growth rate per capita	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08
Average poverty "going out" time (years)	15	8	5	4	3	3	2	2

Averagepoverty "going out" time = Watts index in 2011 (=0.153) / expected real GDP growth per capita. The average poverty "going out" time is calculated assuming the real GDP growth per capita will stay stable during the time necessary for "going out" from poverty and GDP growth will be distributed neutrally among the poor.
Source: own calculation

If the GDP growth per capita could reach 1% annually the equivalent income of a poor household, in average, would reach the social minimum in 15 years and if GDP growth per capita could reach 5-6% annually the period would be 3 years (Table 4). The estimation shows only average time and as every average value it can prove to be too optimistic for part of the population.

Regional differences in GDP level and growth as well as local poverty differentiations are barriers in common poverty reduction is. (In Poland there is a fundamental three-tier territorial division of the country, the entities of which are: a commune (gmina), a county (powiat) and a voivodship (wojewodztwo) -the data for the regional GDP and regional Watts index are available for the request). Despite general poverty reduction the highest Watts index values were shared in this period by the same voivodships.

Even rough analysis of real GDP and Watts index data show the possibility of the relation between GDP growth and poverty. Econometric model estimation (for both non-effect and with fixed cross-section effect models) discovers statistically significant negative relation between real GDP per capita and Watts index (Table 9).

Table 5. Relationships between real GDP and poverty (Watts index) and lower/upper relative polarization indices

Dependent variable: Watts Index						
Independent variable	**Model: none effects**					
log(real GDP(-1))	Coefficient (p-value)	Criteria			Durbin-Watson Statistic	R-squared
		Akaike info	Schwarz	Hannan-Quinn		
	-0.164 (0,0000)	-3.979	-3.926	-3.958	0.468	0.559
	Model: fixed cross-section effects					
	Coefficient (p-value)	Criteria			Durbin-Watson Statistic	R-squared
		Akaike info	Schwarz	Hannan-Quinn		
	-0.376 (0,0000)	-5.165	-4.711	-4.981	1.550	0.901
Dependent variable: lower relative polarization indexfor income of the poor						
Independent variable	**Model: fixed cross-section effects**					
log(realGDP)	Coefficient (p-value)	Criteria			Durbin-Watson Statistic	R-squared
		Akaike info	Schwarz	Hannan-Quinn		
	-0.390 (0,0000)	-3.267	-2.855	-3.100	1.532	0.603
Dependent variable: upper relative polarization indexfor income of the poor						
Independent variable	**Model: fixed cross-section effects**					
log(realGDP)	Coefficient (p-value)	Criteria			Durbin-Watson Statistic	R-squared
		Akaike info	Schwarz	Hannan-Quinn		
	0.269 (0,0030)	-1.577	-1.165	-1.410	1.486	0.268

Method: Pooled Least Squares; total pool (balanced) observations: 96
Source: own calculation

The panel model estimation results suggest real GDP growth effects statistically significantly the shape of income distribution among the poor (Table 5). It explains the shift of lowest income households to the middle of the distribution thus explaining improvement of financial situation of the poorest (parameter value -0.376). Estimation results are not as good for a model of the upper relative polarization index. The GDP growth is statistically significant for explaining the shift of poor households from the middle to the upper end of distribution (the real GDP parameter is significant at 5%) but the criteria of model adjustment to the data are visibly worse than for the model of the lower relative polarization index.

The GDP growth factors

Development of economics theory has broaden the set of GDP growth factors. Starting from capital, labor and exogenous technological progress in classical approaching through substituting labor by human capital ,exogenous technological progress by endogenous one, to introducing macro – and microeconomics policies (IMF and World Bank recommendations) and finishing at institutional constrains of economy.

Do the GDP growth factors directly influence poverty? The suggested answer originates from the panel model estimation results. The evaluation criterion is the statistical significance of given factor in each model, a sign of the factor parameter indicating its negative or positive relationship, additionally criteria of model adjustment to the data. Considering each factor at first the validity of the variables designed for its representing are tested for their significance for GDP growth in voivodships and then weather they influence poverty.

Investments

As expected both private and public investments influence the real GDP level as well as industrialization (real industrial output per capita) – Table 6. They also significantly influenced lowering of poverty level. Private ones effected stronger then public (bigger the absolute value of the parameter, -0,126 comparing with -0,093 and slightly better model adjustment).

Table 6. Relationships between investments and real GDP, and poverty (Watts index), and industrialization (real industrial production per capita)

Dependent variable: log(real GDP)						
Independent variable	**Model: fixed cross-section effects**					
log(real private investments (-1))	Coefficient (p-value)	Criteria			Durbin-Watson Statistic	R-squared
		Akaike info	Schwarz	Hannan-Quinn		
	0.167 (0,0000)	-2.907	-2.453	-2.72	0.943	0.953
log(real public investments (-1))	0.176 (0,0000)	-3.453	-2.999	-3.269	1.301	0.972
Dependent variable: Watts index (poverty level)						
Independent variable	**Model: fixed cross-section effects**					
log(real private investments (-1))	Coefficient (p-value)	Criteria			Durbin-Watson Statistic	R-squared
		Akaike info	Schwarz	Hannan-Quinn		
	-0.126 (0,0000)	-4.431	-3.977	-4.248	1.111	0.794
log(real public investments (-1))	-0.093 (0,0000)	-4.402	-3.947	-4.218	1.342	0.788
Dependent variable: Watts index (poverty level)						
Independent variable	**Model: fixed cross-section effects**					
growth rate of real private investments	Coefficient (p-value)	Criteria			Durbin-Watson Statistic	R-squared
		Akaike info	Schwarz	Hannan-Quinn		
	0.069 (0,0000)	-2.991	-2.579	-2.824	0.637	0.412
Dependent variable: log(real industrial production per capita)						
Independent variable	**Model: fixed cross-section effects**					
log(real private investments)	Coefficient (p-value)	Criteria			Durbin-Watson Statistic	R-squared
		Akaike info	Schwarz	Hannan-Quinn		
	0.284 (0,0000)	-1.631	-1.219	-1.464	0.965	0.938
log(real public investments (-1))	0.157 (0,0000)	-2.026	-1.572	-1.843	1.711	0.959

Method: Pooled Least Squares; total pool (balanced) observations: 96
Source: own calculation

Industrialization

Industrialization of the voivodship measured by the real industrial output per capita is a crucial factor influencing GDP growth as well as poverty reduction (Table 7). It also influences the poor household structure. The higher industrialization the lower percentage of employees'

and social beneficiaries' households among poor ones what simultaneously rises the percentage of poor pensioners' households. The level of industrialization explains the shift of lowest income households to the middle of distribution and slightly weaker the shift of poor households from the middle to the higher deciles of distribution (the criteria of model adjustment to the data are worse and the parameter value is smaller than previously). Industrialization improves mainly the economic situation of low-income households (households with incomes below a median).

Table 7. Relationships between industrialization (real industrial production per capita) and real GDP, and poverty (Watts index), characteristics of the poor, and shifts in income inequality across the poor

Dependent variable: log(real GDP)						
Independent variable	**Model: fixed cross-section effects**					
log(realindustrial production (-1))	Coefficient (p-value)	Criteria			Durbin-Watson Statistic	R-squared
		Akaike info	Schwarz	Hannan-Quinn		
	0.473 (0,000)	-3.427	-2.973	-3.244	1.188	0.972
Dependent variable: Watts index (poverty level)						
Independent variable	**Model: fixed cross-section effects**					
log(realindustrial production (-1))	Coefficient (p-value)	Criteria			Durbin-Watson Statistic	R-squared
		Akaike info	Schwarz	Hannan-Quinn		
	-0.249 (0,0000)	-4.377	-3.923	-4.194	1.468	0.783
Dependent variable: percentage of poor employee households						
Independent variable	**Model: fixed cross-section effects**					
log(realindustrial production (-1))	Coefficient (p-value)	Criteria			Durbin-Watson Statistic	R-squared
		Akaike info	Schwarz	Hannan-Quinn		
	-0.075 (0,0056)	-4.495	-4.040	-4.311	1.861	0.789
Dependent variable: percentage of social beneficiary households in the poor households						
Independent variable	**Model: fixed cross-section effects**					
log(realindustrial production (-1))	Coefficient (p-value)	Criteria			Durbin-Watson Statistic	R-squared
		Akaike info	Schwarz	Hannan-Quinn		
	-0.057 (0,0000)	-6.037	-5.583	-5.854	2.473	0.749
Dependent variable: percentage of poor pensioner households						
Independent variable	**Model: fixed cross-section effects**					
log(realindustrial production (-1))	Coefficient (p-value)	Criteria			Durbin-Watson Statistic	R-squared
		Akaike info	Schwarz	Hannan-Quinn		
	0.159 (0,0000)	-4.548	-4.094	-4.364	1.967	0.664

Table 7. Relationships between industrialization (real industrial production per capita) and real GDP, and poverty (Watts index), characteristics of the poor, and shifts in income inequality across the poor

Dependent variable: log(real GDP)						
Independent variable	**Model: fixed cross-section effects**					
Dependent variable: lower relative polarization indexfor income of the poor						
Independent variable	**Model: fixed cross-section effects**					
log(realindustrial production)	Coefficient (p-value)	Criteria			Durbin-Watson Statistic	R-squared
		Akaike info	Schwarz	Hannan-Quinn		
	-0.236 (0,0000)	-3.082	-2.669	-2.914	1.508	0.522
Dependent variable: upper relative polarization indexfor income of the poor						
Independent variable	**Model: fixed cross-section effects**					
log(realindustrial production)	Coefficient (p-value)	Criteria			Durbin-Watson Statistic	R-squared
		Akaike info	Schwarz	Hannan-Quinn		
	0.246 (0,0080)	-1.602	-1.190	-1.435	1.499	0.286

Method: Pooled Least Squares; total pool (balanced) observations: 96
Source: own calculation

Human capital

The usage of human capital by the economy is represented in the research by employment rates by an educational level. Higher employment rates go together with GDP growth and poverty reduction except for the employment rate of workers with primary education (Table 8). The parameter of employment rate of primary educated workers is statistically insignificant in both models – for GDP growth and Watts index. Regretfully it does not matter if the worst educated household heads have a job or not – their employment contributes neither to GDP growth nor to improvement of their own household income situation which could reduce poverty.

A lack of relatively-well-paid jobs for the worst educated seems to be a significant barrier for GDP growth to reduce poverty. The higher percentage of poor households where the head is primary or uneducated the smaller chance for GDP growth to reduce poverty.

This barrier does not exist for the basic vocational education. The economy needs such workers and their employment reduces poverty (parameter of vocational educated households is statistically significant in both model – for GDP growth and Watts index). Additionally the comparison of Watts index model adjustment to the data proves the employment of the vocational educated explains best poverty reduction.

Table 8. The relationship between an employment rate by educational level and real GDP and poverty (Watts index)

Dependent variable: log(real GDP)						
Independent variable	**Model: fixed cross-section effects**					
employment rate by educational level (number of lags)	Coefficient (p-value)	Criteria			Durbin-Watson Statistic	R-squared
		Akaike info	Schwarz	Hannan-Quinn		
Tertiary(-1)	0.016 (0.0000)	-2.878	-2.424	-2.694	1.016	0.951
Post-secondary(-1)	0.019 (0,0000)	-3.141	-2.687	-2.957	1.287	0.963
General secondary (-1)	0.0134 (0,0000)	-3.216	-2.762	-3.033	1.349	0.965
Basic vocational (-1)	0.014 (0,0000)	-3.012	-2.557	-2.828	1.237	0.957
Primary(-1)	-0.003436 (0.4914)	----------	----------	--------	----------	----------
Dependent variable: Watts index (poverty level)						
Tertiary(-1)	-0.010 (0.0000)	-4.097	-3.643	-3.913	1.131	0.713
Post-secondary(-1)	-0.010 (0,0000)	-4.292	-3.837	-4.108	1.385	0.763
General secondary(-1)	-0.007 (0,0000)	-4.231	-3.777	-4.048	1.260	0.749
Basic vocational (-1)	-0.010 (0,0000)	-4.604	-4.150	-4.420	1.702	0.827
Primary(-1)	-0.0015 (0.5852)	----------	----------	--------	----------	----------

Method: Pooled Least Squares; total pool (balanced) observations: 96
------- values of statistics for diagnostic tests are presented only in a case of a significant coefficient
Source: own calculation

Efficiency in farming

From two variables implemented in the research: procurement of crops per 1 ha of agricultural land and procurement of milk per 1 ha of agricultural land , only procurement of crops proved to be statistically significant for poverty reduction even more then for GDP growth (Table 9). Despite being statistically significant low Watts index model adjustment to the data proves the low relevance of efficiency in farming (little better for procurement of crops) for poverty reduction in voivodships. This result is also supported by insignificance of procurement of crops in the model of the percentage of poor farmer households in total poor households.

Table 9. The relationship between procurement of crops/milk per 1 ha of agricultural land and real GDPand poverty (Watts index) as well as the percentage of poor farmer households in total poorhouseholds

Dependent variable: log(real GDP)						
Independent variable	**Model: fixed cross-section effects**					
log(procurement of crops per 1 ha of agricultural land)	Coefficient (p-value)	Criteria			Durbin-Watson Statistic	R-squared
		Akaike info	Schwarz	Hannan-Quinn		
	0.095 (0,0121)	-1.999	-1.586	-1.831	0.583	0.884
log(procurement of milk per 1 ha of agricultural land)	-0.036 (0.7952)	----------	----------	--------	----------	----------
Dependent variable: Watts index (poverty level)						
Independent variable	**Model: fixed cross-section effects**					
log(procurement of crops per 1 ha of agricultural land)	Coefficient (p-value)	Criteria			Durbin-Watson Statistic	R-squared
		Akaike info	Schwarz	Hannan-Quinn		
	-0.061 (0.0076)	-2.995	-2.583	-2.828	0.586	0.414
log(procurement of milk per 1 ha of agricultural land)	0.019 (0.8163)	----------	----------	--------	----------	----------
Dependent variable: Percentage of poor farmer households in total poor households						
Independent variable	**Model: fixed cross-section effects**					
log(procurement of crops per 1 ha of agricultural land)	Coefficient (p-value)	Criteria			Durbin-Watson Statistic	R-squared
		Akaike info	Schwarz	Hannan-Quinn		
	-0.007 (0.1452)	----------	----------	--------	----------	----------
log(procurement of milk per 1 ha of agricultural land)	0.017 (3653)	----------	----------	--------	----------	----------

Method: Pooled Least Squares; total pool (balanced) observations: 96
------- values of statistics for diagnostic tests are presented only in a case of a significant coefficient
Source: own calculation

Innovations

Regretfully the variables describing innovations in industry available in local data bases proved to be statistically insignificant in both GDP growth and Watts index models. It does not mean innovations are not relevant for GDP growth but their impact can be investigated basing on different data than offered by the Central Statistical Office of Poland. The problem with the data arises when in a voivodship of lower industrialization one big high-tech company is established, a share of its turnover in total turnover for a whole voivodship occurs to be very high (up to 30%) while in highly industrialized voivodships such the share is always much smaller what does not mean these voivodships are not innovative.

The Gdp Growth And Surplus Of Income Over Consumption

The GDP growth rising household income should generate saving possibilities. The estimation results of the models of consumption spending share (as a %of income) on real GDP show the GDP growth stimulates saving only among the non-poor (the real GDP parameter is significant at a level of 1%) - Table 10. Contrary among the poor where the income increase encourages consumption to rise, not savings (positive parameter sign by real GDP indicates the increase in the consumption share when GDP rises). Probably it results from two reasons: a general low consumption level among the poor and copying of consumption pattern from well-off households.

Table 10. The relationship between real GDP and percentage of consumption expenditure (as % of income) by poor and non-poor households

Dependent variable: Percentage of consumption expenditure (as % of income) - poor households						
Independent variable	**Model: fixed cross-section effects**					
Log(real GDP(-1))	Coefficient (p-value)	Criteria			Durbin-Watson Statistic	R-squared
		Akaike info	Schwarz	Hannan-Quinn		
	0.324 (0.0445)	-4.505	-3.917	-4.267	1.911	0.805
Dependent variable: Percentage of consumption expenditure (as % of income) - poor households						
Log(realGDP(-1))	-0.218 (0.0000)	-4.980	-4.526	-4.797	1.410	0.805

Method: Pooled Least Squares; total pool (balanced) observations: 96
Source: own calculation

Indirect Effects Of Gdp Growth On Poverty Via Labor Market

The GDP growth influence on poverty via a labor market has been investigated by mediation models. The Sobel test (and two further modifications of it : Aroian and Goodman tests) results enable mediation effects evaluation for variables describing labor market it means such hypotheses are tested : Are the indirect effects of real GDP on poverty (measured by the Watts index) via such variables like: unemployment rate, employment in sections, salaries in sections (every variable was regarded as mediator) significantly different from zero Mediation effect parameter values were estimated in panel models (fixed cross-section effect models). The equations of models are presented under tables with the Sobel test results (Table 11-21).

Mediation effect test results verified the following hypotheses on GDP growth influence on poverty via labor market: The GDP growth is pro poor because it reduces unemployment of low skilled workers, it changes the unemployment structure by unemployment duration, it means growth reduces a percentage of the long-term unemployed and rises a fraction of the short–term unemployed, it reduces personal inactivity caused by conviction of impossibility to

find work, it creates demand for labor in sections where low-skilled workers can find jobs; in such sections both employment and salaries raise, and lastly, it rises professional activity of women.

Unemployment

The research question: Does the real GDP level lower unemployment among the elementary and vocational educated workers thus reduce poverty (measured by the Watts index)? Unfortunately test results give the negative answer (Table 11).

Unemployment among basic vocationally educated households

Higher economic activity level reduces unemployment of vocationally educated people (*a* parameter is negative and statistically significant) but vocationally educated people employment does not significantly influence poverty. *Z* value of test statistics is much bigger then critical value : -1,96 what means the hypothesis : the indirect influence of real GDP on poverty (Watts index) via unemployment rate of vocationally educated workers (mediator)is significantly different from zero cannot be rejected.

This conclusion has to be explained in the context of the former results. The panel model test results in Table 8 show vocationally educated people employment rate significantly explains poverty reduction but Sobel test (Table 11) implies the employment of these workers is not a significant mediator through which poverty is reduced by GDP growth. The two conclusions taken together suggest hidden skill values among workers with basic vocational education. People with better vocational education are employed and their income reduces poverty (the same conclusion can be drawn from the change in the income distribution pattern) when worse qualified workers remain unemployed. The higher economic activity in a voivodship the higher employment rate among the worse qualified but their wages are low and their incomes do not reduce poverty (no statistical significance). Further wage and salary mediation effect results support this suggestion (see Table 16-17).

Unemployment of primary educated household heads

Sobel test results point out the relationship opposite to expected: the higher real GDP level lowering unemployment rate among primary educated household heads (a =-0.219161, s_a =0.014233) leads to higher overall poverty. The influence is not very strong but statistically significant (*z* statistics is positive and significant at 5%). It seems income from work obtained by the worst educated does not compensate the loss of social benefits which are suspended when they are employed.

At this stage, we may conclude that lowering of unemployment rate of primary educated household heads did not reduce the poverty in the period 2005 – 2011.

Table 11. A test of whether the indirect effect of the real GDP on poverty (the Watts index) via the unemployment rate by educational level (mediator) is significantly different from zero

Mediator: Unemployment rate by educational level	Coefficient ---------- Std. Error	Tests	z- test statistic	p-value
Basic vocational	a =-0.147835	Sobel test	-1.21095363	0.22591318
	s_a =0.00833	Aroian test	-1.20904475	0.22664565
	b =0.374708	Goodman test	-1.21287158	0.22517892
	s_b =0.308711			
Primary	a =-0.219161	Sobel test	2.28497892	0.02231406
	s_a =0.014233	Aroian test	2.28028098	0.02259103
	b =-0.407673	Goodman test	2.28970601	0.02203836
	s_b =0.176439			

The mediation model covers two panel data models estimated by OLS, N=96
Unemployment rate by educational level = α + a*log(real GDP(-1)) and
Watts index = α + b* unemployment rate by educational level + d*log(real GDP(-1))
s_a = standard error of a;s_b = standard error of b

Unemployment structure by unemployment duration

Higher economic activity positively influenced the unemployment structure by unemployment duration (Table 12). The fraction of people being unemployed longer than a year decreased (*a* =-1.093477, s_a =0.06027), while the percentage of shorter job searching people raised (the parameters *a* are positive and significant in short-term unemployment models). Long-term unemployment reduction by GDP growth did not significantly reduce poverty (*z* statistics is significant only at 10%). The considerably poverty reduction was linked only with the shift in the unemployment structure in a direction to higher share of very short-term unemployment (unemployed over 1- 3 months).

Related to GDP, we may conclude that the growth of GDP does not reduce poverty significantly by lowering long-term unemployment but only by causing the unemployed to change jobs quickly (friction unemployment, it means 1–3 month unemployed).

Table 12. A test of whether the indirect effect of the real GDP on poverty (the Watts index) via the unemployment structure by duration of unemployment (mediator) is significantly different from zero

Mediator: Unemployed persons by duration of unemployment	Coefficient ---------- Std. Error	Tests	z- test statistic	p-value
More than 24 months	a =-1.093477	Sobel test	-1.79404082	0.07280665
	s_a =0.060271	Aroian test	-1.79134833	0.07323742
	b =0.076076	Goodman test	-1.79674548	0.07237604
	s_b =0.042197			
6-12	a =0.266801	Sobel test	2.50429214	0.01226967
	s_a =0.02514	Aroian test	2.49385917	0.01263627
	b =0.255434	Goodman test	2.51485714	0.01190806
	s_b =0.099118			
3-6	a =0.319125	Sobel test	-0.07309538	0.94173022
	s_a =0.020192	Aroian test	-0.0729495	0.9418463
	b =-0.009396	Goodman test	-0.07324214	0.94161343
	s_b=0.128543			
3 months and less	a =0.319338	Sobel test	-3.62283758	0.00029139
	s_a =0.02436	Aroian test	-3.61314093	0.00030251
	b =-0.369437	Goodman test	-3.63261272	0.00028057
	s_b=0.098003			

The mediation model covers two panel data models estimated by OLS, N=96
Unemployed persons by duration of unemployment = α + a*log(real GDP(-1)) and
Watts index = α + b* Unemployed persons by duration of unemploymentpracy + d*log(real GDP(-1))
s_a = standard error of a;s_b = standard error of b

Causes of personal inactivity

Prostration of finding job possibilities diminishes hope for material situation improvement. The higher real GDP the lower percentage of inactive due to this cause (a =-0.022438, s_a =0.006049) but it does not contribute significantly to poverty reduction (z statistics is insignificant) – Table 13.

Table 13. A test of whether the indirect effect of the real GDP on poverty (the Watts index) via personal inactivity caused by conviction of impossibility to find work(mediator) is significantly different from zero

Mediator	Coefficient ---------- Std. Error	Tests	z- test statistic	p-value
Percentage of inactive persons due to conviction of impossibility to find work	a =-0.022438	Sobel test	-1.61592759	0.10610997
	s_a =0.006049	Aroian test	-1.57035386	0.11633281
	b =0.754965	Goodman test	-1.66571431	0.09577033
	s_b =0.42054			

The mediation model covers two panel data models estimated by OLS, N=96
Percentage of inactive persons due to conviction of impossibility to find work = α + a*log(real GDP(-1)) and
Watts index = α + b* Percentage of inactive persons due to conviction of impossibility to find work + d*log(real GDP(-1))
s_a = standard error of a;s_b = standard error of b

Labor demand in sections where low educated workers could find jobs

Among economy sections for which the Central Statistical Office of Poland gathers data there are few which can be assumed low educated workers to be employed. These would be : agriculture (including forestry, hunting and fishing), processing industry, construction, retail trade (including car garages), transportation and storage as well as accommodation an gastronomy. Two hypothesis on the indirect impact of GDP growth via employment and via wages and salaries in above sections on poverty were tested.

Employment in sections

GDP growth reduces poverty very strongly via employment rise in construction (very high absolute values of *z* statistics). The strong influence is also via employment in accommodation and gastronomy. Contrary retail trade employment contributes weakly to poverty reduction (*z* statistics is significant at 10% only). Employment in agriculture and manufacturing proved to be statistically insignificant (Table 14).

Table14. A test of whether the indirect effect of the real GDP on poverty (the Watts index) via employment by sections (mediator) is significantly different

Mediator: employed persons by sections	Coefficient ---------- Std. Error	Tests	z- test statistic	p-value
Agriculture	a =-0.323909	Sobel test	0.38345826	0.70138001
	s_a=0.064388	Aroian test	0.37614098	0.70681209
	b =-0.016248	Goodman test	0.39121991	0.69563469
	s_b=0.042249			
Manufacturing	a=0,137854	Sobel test	-1.22406226	0.22092874
	s_a=0,053125	Aroian test	-1.15897907	0.24646472
	b =-0,069933	Goodman test	-1.30150524	0.19308557
	s_b = 0,050736			
Construction	a= 1,535060	Sobel test	-6.62566389	0,0
	s_a= 0,07442	Aroian test	-6.61869203	0,0
	b = -0,207549	Goodman test	-6.63265782	0,0
	s_b = 0,029665			
Trade	a = 0,577149	Sobel test	-1.87618686	0.06062963
	s_a = 0,052952	Aroian test	-1.86857096	0.06062963
	b =-0,096086	Goodman test	-1.88389665	0.05957896
	s_b = 0,050449			
Transportation	a =0.015262	Sobel test	0.87064496	0.38394804
	s_a=0.0152367	Aroian test	0.78070512	0.43497595
	b = 0.030955	Goodman test	1.001124	0.31676686
	s_b=0.01758			
Accommodation and catering	a=0.905696	Sobel test	-3.94249614	0.00008064
	s_a=0.08019	Aroian test	-3.92899559	0.0000853
	b=-0.131027	Goodman test	-3.95613682	0.00007617
	s_b=0.031144			

The mediation model covers two panel data models estimated by OLS, N=112.
The first is log(employment in section) = α + a*log(Real GDP).
The second is Watts index = α + b*log(employment in section) + d*log(real GDP)
s_a = standard error of a;s_b = standard error of b

Wages and salaries

The test results of indirect impact of real GDP growth on poverty (Watts index) via wages and salaries point at the strongest influence of wage and salary rise in retail trade then in construction. Much weaker was the one in manufacturing (Table 15).

Table15. A test of whether the indirect effect of the real GDP on poverty (the Watts index) via average real wages and salaries by sections (mediator) is significantly different from zero

Mediator: Average real wage and salary by sections	Coefficient ---------- Std. Error	Tests	z- test statistic	p-value
Manufacturing	a=0.661045	Sobel test	-1.94007695	0.05237034
	s_a=0.029065	Aroian test	-1.93821799	0.05259663
	b=-0.169815	Goodman test	-1.94194128	0.05214421
	s_b=0.087211			
Construction	a=0.901268	Sobel test	-3.46450359	0.00053121
	s_a=0.049612	Aroian test	-3.46450359	0.00054127
	b=-0.17147	Goodman test	-3.46957279	0.00052129
	s_b=0.048585			
Trade	a=0.638899	Sobel test	-4.26656922	0.00001985
	s_a=0.044677	Aroian test	-4.25709779	0.00002071
	b=-0.23834	Goodman test	-4.27610416	0.00001902
	s_b=0.053318			
Accommodation and catering	a =0.615642	Sobel test	-1.23700415	0.21608554
	s_a=0.071636	Aroian test	-1.22888403	0.21911529
	b =-0.044847	Goodman test	-1.24528739	0.21302613
	s_b=0.035877			

The mediation model covers two panel data models estimated by OLS, N=96. The first is log(average real wage and salary in section) = α + a*log(real GDP(-1)). The second is Watts index = α + b* log(average real wage and salary in section) + d*log(real GDP(-1)), for s_a = standard error of a;s_b = standard error of b

Wage and salary importance was also investigated by testing whether wages and salaries are a channel through which GDP growth shapes income distribution across the poor (Table 16 and 17). The results find only statistically significant but not strong influence of real GDP via the wage and salary rise in manufacturing and construction on income situation improvement among the poorest – such households were shifted to the middle of distribution. Unfortunately GDP growth did not stimulate significantly via wages and salaries the shift of poor households toward the upper part of distribution (only for salaries in manufacturing *z* statistics is significant at 10% only).

Table16. A test of whether the indirect effect of the real GDP on lower relative polarization index via average real wages and salaries by sections (mediator) is significantly different from zero

Mediator: Average real wage and salary by sections	Coefficient ---------- Std. Error	Tests	z- test statistic	p-value
Manufacturing	a = 0.661045	Sobel test	-2.11804146	0.03417156
	s_a = 0.029065	Aroian test	-2.11601482	0.03434355
	b = -0.455503	Goodman test	-2.12007393	0.03399981
	s_b= 0.214124			
Construction	a = 0.901268	Sobel test	-2.07362081	0.03811454
	s_a= 0.049612	Aroian test	-2.07052698	0.03840302
	b = -0.262106	Goodman test	-2.07672855	0.03782662
	s_b= 0.125574			
Trade	a = 0.638899	Sobel test	-0.27496195	0.78334547
	s_a= 0.044677	Aroian test	-0.27429238	0.78385994
	b = -.0376234	Goodman test	-0.27563645	0.78282731
	s_b= 0.136806			
Accommodation and catering	a= 0.615642	Sobel test	-0.73749399	0.460822
	s_a= 0.071636	Aroian test	-0.73258747	0.46381008
	b= -0.065917	Goodman test	-0.74250044	0.45778419
	s_b= 0.08905			

The mediation model covers two panel data models estimated by OLS, N=96. First model is: log(average real wage and salary in section) = α + a*log(real GDP(-1)) and the second is Lower relative polarization index= α + b* log(average real wage and salary in section) + d*log(real GDP(-1)); for s_a = standard error of a;s_b = standard error of b

Table 17. A test of whether the indirect effect of the real GDP on upper relative polarization index via average real wages and salaries by sections (mediator) is significantly different from zero

Mediator: Average real wage and salary by sections	Coefficient ---------- Std. Error	Tests	z- test statistic	p-value
Manufacturing	a =0.661045	Sobel test	1.75395402	0.07943839
	s_a =0.029065	Aroian test	1.75227115	0.07972719
	b = 0.809176	Goodman test	1.75564175	0.0791496
	s_b= 0.45997			
Construction	a =0.901268	Sobel test	0.06521578	0.9480022
	s_a=0.049612	Aroian test	0.0651172	0.94808069
	b = 0.017919	Goodman test	0.06531482	0.94792334
	s_b= 0.274763			
Trade	a =0.638899	Sobel test	0.89773984	0.36932426
	s_a=0.044677	Aroian test	0.8955615	0.37048701
	b = 0.273043	Goodman test	0.89993416	0.36815529
	s_b= 0.303545			
Accommodation and catering	a=0.615642	Sobel test	0.01096735	0.9912495
	s_a=0.071636	Aroian test	.01089385	0.99130814
	b= 0.002087	Goodman test	0.01104236	0.99118965
	s_b= 0.190292			

The mediation model covers two panel data models estimated by OLS, N=96. First model is: log(average real wage and salary in section) = α + a*log(real GDP(-1)) and the second is Upper relative polarization index = α + b* log(average real wage and salary in section) + d*log(real GDP(-1)); for s_a = standard error of a;s_b = standard error of b

What we can conclude is that the GDP growth reduces poverty mainly by a rise of employment in construction and accommodation and gastronomy; and by a wage and salary rise in retail trade and construction. If GDP growth is to be pro-poor it must generate an employment increase as well as a wage and salary rise in construction (men usually work there) and a wage and salary rise in retail trade where women usually work.

Professional activity of women

Does the GDP growth reduce poverty rising professional activity of women? The test results answer positively but also show a negative aspect (Table 18). The real GDP growth lowers poverty much stronger via a men employment rise than via a women employment rise (absolute values of *z* statistics comparison). This difference for the age group up to 29 can be explained by lower professional activity of women because of bringing–up small children but such a big difference for the age group 30–39 implies much smaller women income impact on poverty reduction than men income. The above presented conclusions support also the following recommendation – the retail trade salaries mostly shared by women would have to rise substantially to contribute to poverty reduction. The GDP growth reduces poverty

equally by women and men only in age group 40–49. Unfortunately higher economic activity in voivodships does not significantly influence employment of both women and men in the age group above 50 (real GDP *a* parameters of employment model indicators are statistically insignificant). Conclusion we can derive is that the GDP growth influences poverty reduction via improving professional activity of women but women earnings influence poverty reduction much less then men earnings.

Table18. A test of whether the indirect effect of the real GDP on poverty (the Watts index) via employment by sex and age (mediator) is significantly different from zero

Mediator: Employment rate by sex and age	Coefficient ---------- Std. Error	Tests	z- test statistic	p-value
Men	a =37.16767	Sobel test	-3.65367836	0.00025851
15-29	s_a =2.7621	Aroian test	-3.64436885	0.00026805
	b =-0.003485	Goodman test	-3.66305957	0.00024922
	s_b =0.000918			
Men	a =25.92379	Sobel test	-4.65785935	0.0000032
30-39	s_a =2.320237	Aroian test	-4.64252158	0.00000344
	b =-0.005314	Goodman test	-4.67335013	0.00000296
	s_b =0.001037			
Men	a =30.80949	Sobel test	-3.65601329	0.00025617
40-49	s_a =2.3252	Aroian test	-3.64643188	0.00026591
	b =-0.004146	Goodman test	-3.66567063	0.00024669
	s_b=0.00109			
Men	a =23.74598	Sobel test	-1.30857664	0.1906778
more than 50	s_a =1.981231	Aroian test	-1.30409932	0.19219972
	b =-0.001793	Goodman test	-1.31310039	0.18914912
	s_b=0.001362			
Women	a=25.62758	Sobel test	-2.17573435	0.02957513
15-29	s_a =2.545834	Aroian test	-2.16557203	0.03034391
	b =-0.002322	Goodman test	-2.18604108	0.0288126
	s_b=0.001042			
Women	a =27.71606	Sobel test	-2.83419499	0.00459413
30-39	s_a =2.95111	Aroian test	-2.819704	0.0048068
	b =-0.002622	Goodman test	-2.84891172	0.00438691
	s_b=0.000882			
Women	a =37.27541	Sobel test	-3.34389763	0.0008261
40-49	s_a=2.354807	Aroian test	-3.33754106	0.00084523
	b =-0.003729	Goodman test	-3.35029066	0.00080727
	s_b=0.001090			
Women	a =17.45417	Sobel test	0.02259088	0.98197662
more than 50	s_a=1.737636	Aroian test	0.02247976	0.98206526
	b =0.0000354	Goodman test	0.02270367	0.98188665
	s_b=0.001567			

The mediation model covers two panel data models estimated by OLS, N=112. First model is Employment rate by sex and age = α + a*log(Real GDP) and the second one is: Watts index = α + b* employment rate by sex and age + d*log(real GDP); for s_a = standard error of a;s_b = standard error of b

Indirect Effects Of GDP Growth on Poverty Via Redistribution at The Community ("Gmina") Level

By means of mediation models we derive three hypotheses; first is community ("gmina") own revenue is raised by GDP growth *(a primary administrative unit in Poland is called "gmina")*; second is higher own revenue implies higher spending on social assistance (expenditure on: social welfare house, care and education facilities, benefits and aid in kind, care services, social assistance center, adoptive and care center, foster families); and third is higher community spending on social assistance contributes to poverty reduction.

The test results for above hipotheses (Tables 19 – 21) confirm strongly (the high significance of *z* statistics) poverty reduction by GDP growth via redistribution at the community level.

Table19.A test of whether the indirect effect of the real GDP on gmina's real expenditure on social assistancevia gmina's real own revenue (mediator) is significantly different from zero

Mediator	Coefficient ---------- Std. Error	Tests	z- test statistic	p-value
gmina's real own revenue per capita	a =1.35069	Sobel test	2.85562124	0.00429527
	s_a =0.058639	Aroian test	2.85297517	0.0043312
	b =0.417926	Goodman test	2.85827469	0.00425951
	s_b =0.145223			

The mediation model covers two panel data models estimated by OLS, N=112. First is Log(gmina's real own revenue per capita) = α + a*log(Real GDP); and the second is Log(gmina's real expenditure on social assistance per capita) = α + b* log(gmina's real own revenue per capita+ d*log(real GDP); for s_a = standard error of a;s_b = standard error of b

Table20. A test of whether the indirect effect of the real GDP on poverty (Watts index) via gmina's real expenditure on social assistance(mediator) is significantly different from zero

Mediator	Coefficient ---------- Std. Error	Tests	z- test statistic	p-value
gmina's real expenditure on social assistance per capita	a =0.941756	Sobel test	3.25437581	0.00113642
	s_a =0.086123	Aroian test	3.24204341	0.00118676
	b =0.101655	Goodman test	3.26685002	0.00108751
	s_b =0.029821			

The mediation model covers two panel data models estimated by OLS, N=112. First is Log(gmina's real expenditure on social assistance per capita) = α + a*log(Real GDP); and the second is Watts index = α + b* log(gmina's real expenditure on social assistance per capita) + d*log(Real GDP); for s_a = standard error of a;s_b = standard error of b

Table21. A test of whether the indirect effect ofgmina's real own revenueon poverty (Watts index) via gmina's real expenditure on social assistance(mediator) is significantly different from zero

Mediator	Coefficient ---------- Std. Error	Tests	z- test statistic	p-value
gmina's real expenditure	a =0.654823	Sobel test	-2.80040177	0.0051039
on social assistanceper	s_a =0.057226	Aroian test	-2.79040234	0.00526426
capita	b =-0.087704	Goodman test	-2.81050948	0.00494631
	s_b =0.030366			

The mediation model covers two panel data models estimated by OLS, N=1112; Log(gmina's real expenditure on social assistanceper capita) = α + a*log(gmina's real own revenue per capita); andWatts index = α + b* log(gmina's real expenditure on social assistanceper capita) + d*log(gmina's real own revenue per capita); for s_a = standard error of a;s_b = standard error of b

V. CONCLUSION

The results obtained from the estimation of panel data and mediation models prove economic growth (measured by the real GDP) significantly influenced lowering poverty and stimulated the pro-poor changes in income distribution in the period of 2005-2011.

The growth factors however worked differently. Investments both in private and public sectors reduced poverty but private ones proved to influence stronger. The level of industrialization also mattered. The scope of poverty reduction by growth proved to be limited also by the level of human capital employment. The level of employment of low and un-skilled workers was insignificant for growth. It was also insignificant for the reduction in poverty. It is a disquieting result because it indicates the households which main member is unskilled remain poor even when the main member works. Growth did not create the possibility of being promoted to the non-poor group. On the other side the employment of skilled workers positively influenced both GDP growth and poverty reduction.

Next investigated factor – efficiency in agriculture – reduced poverty but it was not an important stimulus of growth. Unfortunately savings among the poor were not positively influenced by GDP growth. Relatively low income growth encourages poor households to increase consumption instead of savings.

The research points at the areas of the positive GDP growth impact, for example, growth significantly reduced poverty through an increase in employment and wages in construction but as well it reveals barriers in poverty reduction, for example: poverty reduction requires wages to increase - not employment - in retail trade, while growth generally rises employment in this section, not necessarily wages; incomes of working women reduce poverty to much less extent than incomes of working men, it means that incomes of low-skilled women are considerably lower than incomes of low-skilled men; growth does not create enough jobs for persons in age of 50 plus).

The GDP growth reduces poverty very strongly through redistribution at the local level (at the community ("gmina") level); growth rises community revenue thus enables rising social assistance.

Concluding, the high percentage of poorly and low educated – low and unskilled workers - proves to be the biggest barrier to make GDP growth pro-poor in Poland. The economy does not offer enough jobs for such workers and their wages stay low keeping these people the working-poor. The poverty reduction strategy cannot relay basically on growth itself. Social allowances are necessary for the low- skilled poor because growth is not in favor of them. The results prove the necessity of creating such education system which gives job skills for those who do not want to study.

The regulations of foreign direct investment in retail trade should be reconsidered in Poland. Retail trade remains one of the sectors of biggest foreign capital inflow and creates big amount of jobs for low-skilled workers but unfortunately low wages make these workers the working-poor.

Recalling the main question of this research, Can economic growth be considered pro-poor in Poland? The answer is yes but only pro the skilled (with at least vocational level of education), living in bigger cities, mostly poor men, not poor women; and definitely not pro the poor older than 50.

The paper shows that the definitions of pro-poor growth offered in the literature are too narrow. The approaching suggested by the paper reflects better the complicated nature of pro-poor growth.

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