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The Relationship Between the Global/Regional Rural Population Development and Agricultural Sector Development

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Abstract: Developments in the sphere of agriculture and rural areas are very closely linked. Countryside and its character are to a large extent influenced by the volume and especially by the structure of its settlement. An important role in shaping the character of the countryside and its settlement structure is undoubtedly, played by agriculture. Agriculture has always been a key factor affecting the settlement, economic, cultural and social fabric of rural areas. As the global, regional and local economies are transforming these days, there is a decline in the importance of agriculture as a key economic area. The decline in the share of agriculture in economy, accompanied by the reduction in the number of jobs in agriculture, subsequently leads to a significant reduction in the proportion of the population living in rural areas. Additionally, this decrease is accelerated by the growth of the attractiveness of urban and suburban areas due to the growing share of secondary and especially tertiary components of the global economy. An important role in this respect is played by the lifestyle changes and also the changing infrastructure and capacity of urban areas. This study analyzes the development of the rural population share of the total world population using selected regions and countries. The research analyzes the development of the rural population (or its share) in the context of the past several decades. The main emphasis is placed on identifying the differences existing between the various regions of the world and then on the influence of the GDP value development (including and after deduction of agricultural GDP), GDP/cap (including after deduction of the agricultural GDP/cap), GDP generated by agriculture, GDP/person working in agriculture, on the number and especially the share of the population living in rural areas. The analysis of the development of the rural population share of the total world population and in selected regions implies the following. The volume and particularly the structure of the world population over the past three decades have changed extremely (there was a significant decrease in the proportion of rural population in the total population and the growth rate dynamics of the rural population has significantly decreased). In particular, restructuring of the global economy which has led to a significant decline in importance of rural areas in terms of rural economic growth has proved to be the main determinant of this development. In this regard, there has been a significant reduction in agriculture which had for a long time constituted a major source of income and employment in rural areas. The results of individual analyses also show that the differences that exist between countries and regions in respect of the development of the rural population share of the total population are based on different economies and economic prosperity of individual countries or regions.

Key words: Rural areas, population, structure, volume change, regions, countries, differences, factors, influence development

INTRODUCTION

Agriculture and rural areas are very closely interconnected. Due to the fact that agriculture as an economic activity has a global character and is implemented on very large areas usually outside urban area, its link to the rural areas (where <95% of the land is found this number includes not only agricultural land but also forests and other land types) more than logical.

Agricultural activity takes place on >48 million square kilometers which represents >35% of the mainland area on the ground. In terms of economic activity

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(manufacturing, mining and services), agricultural sector is the most dependent on large expanses of available land resources of high quality (high demands on soil nutrients and fresh water supply). Farmland in the past represented and still represents a natural base for the development of human civilization.

In the countryside where most of the agricultural activities take place there currently live about half the world's population >3.5 billion people. The relationship between the rural development and development in agriculture is historically very long and significant (Luptak and Naxera, 2013). It is the rural areas where the very beginnings of human civilization developed. A very dynamic development of rural areas then occurred, especially with the advent of agriculture about 10,000 years ago. It was agriculture that largely determined the character of the cultural landscape and further development of settlements, villages and later also cities. For a very long period rural areas as such represented the main source of economic and population growth across the entire globe. It was a question of the ability of agriculture to provide sufficient food base for further development of human civilization. Even at the turn of the 18th and 19th centuries, the countryside had >90% of the world population and agriculture represented one of the most important sectors of the national economy in almost every country of the world.

The position of agriculture began to change over time with the advent of the industrial revolution when until then the prevailing national economic model AIS (Holub, 1972) (Agriculture Industry Services) or AIS was gradually replaced by the IAS Model (Industry Agriculture Service) or ISA this means that the dominant position of agriculture was broken in favour of industry.

With the gradual development of industrialization and the consequent development of the service sector, the importance of agriculture as the main economic activity began to decline much faster at present time when most countries in the world are dominated by the SAI or SIA (Service Industry Agriculture) Model of economy, the importance of agriculture is very limited. Agriculture currently accounts for 4-5% of global GDP value and the added value generated by the agrarian sector in the world represents about 2.4 trillion USD.

Despite the fact that the agrarian sector currently represents only a fraction of the value generated by the global economy, it is still necessary to accept the agrarian sector as a key component of the global economy within the meaning of further development, especially of rural areas. If we ignore its importance (which is impossible) in food production and also in the area of rural development and maintenance of the landscape, the importance of agriculture is still immeasurable, especially in its ability to offer a huge number of job opportunities.

In agriculture today whether voluntarily or involuntarily >1.3 billion economically active population are working this means that agriculture employs about 30-35% of the economically active population living on Earth (in this respect we particularly mean the population living in developing countries as in the developed countries "only" about 30 million people work in agriculture).

The volume of agrarian population that is the population which is directly dependent on agricultural activities is much greater. According to FAO estimates, it concerns >2.8 billion people (again, the vast majority of them live primarily in developing countries in this respect it is necessary to emphasize the fact that in a number of the least developed countries more than half of their population live in rural areas and are employed in agriculture) who are active farmers or are directly dependent on economic activity in agriculture (such as the retired parents of farmers or their children and partners).

It follows, therefore that agriculture continues to be a key activity for >40% of the world population. In this regard, it should be emphasized that >90% of these people live and work right in the countryside (FAO, 2011). The above facts indicate that a very strong link exists between the development of agriculture and development of the rural areas and their populations (Dorosh and Thurlow, 2012; Adesina, 2010; De Janvry and Sadoulet, 2010). With the declining importance of agriculture in different regions of the world, there is an abrupt shift of population from rural areas to urban areas (cities and suburbs) where there is a significant concentration of industry (about 25% of the world GDP value) and services (about 71-73% of the world GDP value).

As the development of industry and subsequently of the services gradually advanced, a very significant reduction in agriculture occurred, particularly in the developed world. To a limited extent the decline in agriculture was also reflected in the developing countries (in developing countries, it is necessary to distinguish the situation in the transitive countries, classical developing countries and the least developed countries of the world). As the industry and especially, the services began to continuously create new places, there has been a gradual transformation of the settlement structure of the population in the world.

Unlike agriculture industry and services have a largely point character that is they do not require deployment on large areas indeed, they prefer a very high degree of concentration of both its own capacity and demand and consumers in one place. With the advent of

the industrial revolution, we clearly see the growing importance of cities as major economic and setlement centres. While as early as the beginning of the 20th century only 10-15% of the population lived in the cities (Tellier, 2009), after the Second World War, it was about 20-25% and today in 2014 it is already >50% (World Bank, 2014).

An extreme transfer of population has occurred, especially in developed countries (Zinchenko, 2012), into towns in North America (about 80% of the local population) and Europe (75-80% of the local population). Very significant transfers of population into towns can also be seen in developing countries (Latin America >70%), Africa and Asia (>45% of the local population now live in cities and in a number of countries restrictions have to be imposed on the movement of inhabitants from rural to urban areas (World Bank, 2014).

A wide range of causes can be seen behind a radical decline in the share of rural population in the total population. The most important one is the decline in the share of agriculture in the total value of economic activities in the world as well as the lower growth rate of the added value generated by the agricultural sector compared to other sectors of the global economy. The generally lower level of income in agriculture and not least important the decline of jobs in the agricultural sector which is crucial to maintaining the rural settlement structure, also play their role. This applies in relation to both the developing and the developed countries of the world. It is important in this regard is to take also into account the size of the country and the population density. This is because, especially in those countries that have a large area, the dynamics of the rural population share decline is very high and dependent on how the economic power of developing urban and suburban areas is developing (Marsden *et al*., 1996).

MATERIALS AND METHODS

This study examines the development of the rural population's share of the total population in the world and selected regions and countries. The study analyses the development of the rural population (or its proportion) in the context of the past several decades (or from the perspective over the past 30 years from 1980-2012. Some reduction in the time series was necessary due to data availability). The main emphasis is put on identifying the differences existing between various regions of the world and then on the influence of the GDP development (including and after deduction of agricultural GDP), GDP/cap (including a deduction for the agricultural GDP/cap), GDP generated by agriculture, GDP/person working in agriculture, on the number and especially on the share of the population living in rural areas.

This study analyzes the development of the share of the rural population in terms of three different dimensions individual countries (179 countries Appendix I), selected regions (Appendix I and II) and then groups of countries (Appendix II and III). The study is focused mainly on the identification of differences existing between various regions (East Asia and the Pacific, Europe and Central Asia, European Union, Latin America and the Caribbean, the Middle East and North Africa, North America, South Asia and Sub-Saharan Africa) and groups of countries (High Income, Upper Middle Income, Middle Income, Lower Middle Income and Low Income Countries).

Dividing countries into groups was carried out through the methodology used by the World Bank (2014). The database is based on the analysis of the relationships existing between the proportion of the population living in rural areas on the one hand and the share of agriculture in GDP, the value of agricultural production, the value of agricultural production per worker, employment in agriculture, GDP, GDP per capita and total population on the other hand. Data included in the analysis represent a synthesis of time series provided by the World Bank (2014), the International Monetary Fund (IMF, 2014) and FAOSTAT (FAO, 2014).

Primarily, the analysis focuses on the relationship between the development of the share of rural population and the development in the value of the share of agriculture in GDP and the share of agricultural employment in total employment. In this respect, the main paradigm is based on the assumption that it is precisely the economic extent of agriculture (in the context of the economy as a whole) and its ability to generate jobs which represent the key determinants influencing the development of the share of the population living in rural areas in different countries and regions.

In respect to the methods that have been applied, this study uses elementary statistical calculations: the chain index or average growth rate calculated as a geometric mean of individual annual changes, the correlation between the selected variables on the one hand and the share of rural population on the other hand, elasticity or sensitivity of the proportion of the rural population to the percentage changes in variables. Elasticity in this regard is calculated as function elasticity that is the elasticity is calculated by means of a logarithmic regression. Individual regression functions were statistically significant at the alpha level of 0.05.

RESULTS AND DISCUSSION

Rural populations, their character and especially their share of the total population vary extremely when comparing different countries and regions of the world. While the highest proportion of the rural population in the world is found in Burundi (88.8%), the lowest proportion of the rural population in the total population is found in Puerto Rico (about 1%). Generally, it can be assumed that in developing countries the rural population proportion in the total population is higher than in developed countries.

The validity of this assumption is confirmed when we generally divide countries into groups according to, for example, income, etc. However, when we analyze each country separately, this assumption is valid only to a limited extent as shown by the above mentioned extremes Burundi vs. Puerto Rico both have a developmental character but the share of rural population to total population is extremely varied. Generally, at present the worldwide proportion of the rural population in the total population stands at about 47.45%.

One of the main factors influencing the volume and share of a population living in a rural area is agriculture this is particularly true in relation to developing countries and also to a limited extent in relation to developed countries. When we focus on extreme values, we see that among the countries of the world there are large differences in terms of the share of agriculture in GDP if we focus only on the utmost extremes, it can be demonstrated that countries with the highest share of agriculture in forming the GDP is Sierra Leone (about 56.7%) and by contrast, the country with the lowest share of Kuwait with 0.46%.

In general, it holds that the share of agriculture contributing to the world GDP is about 3.25%. There is a very strong correlation (0.97) between the development in agriculture and the share of rural population. In the years of 1980-2012 the share of agriculture in GDP in the world has reduced from 7.57-3.25% and there was also a reduction in the share of population living in rural areas from 60.63-47.45%.

On average, it is valid that when the value of the world agrarian GDP or the share of agrarian GDP in the total GDP value changes by 1%, the share of rural population is then reduced by 0.22 or 0.32%, respectively. The relationship between the two variables is inverted. The growth in the share of agricultural GDP generally increases the proportion of the population living in rural areas and vice versa. A detailed overview of the proportion of the rural populations in different countries of the world and then also of the share of agrarian GDP in total GDP for individual countries can be found in the Appendix I. The following graph illustrates the differences, some extreme that exist across the countries of the world (Fig. 1). The extreme distribution of the above values can be viewed in Table 1 and Fig. 2.

The above data indicate that there are extreme differences between individual groups of countries and regions. The data show that the highest proportion of people living in rural areas can be found in low-income countries and in the least developed countries generally in the following regions: South Asia, the Pacific, Sub-Saharan Africa, the Caribbean and East Asia. In these regions >50% of their population live in rural areas. The share of agriculture in GDP of these countries is very high and ranges from 3.6-28%.

By contrast, in developed countries particularly the members of OECD located mainly in North America and in Europe, the share of people living in the countryside is about 17 or 30%, respectively and the share of agriculture

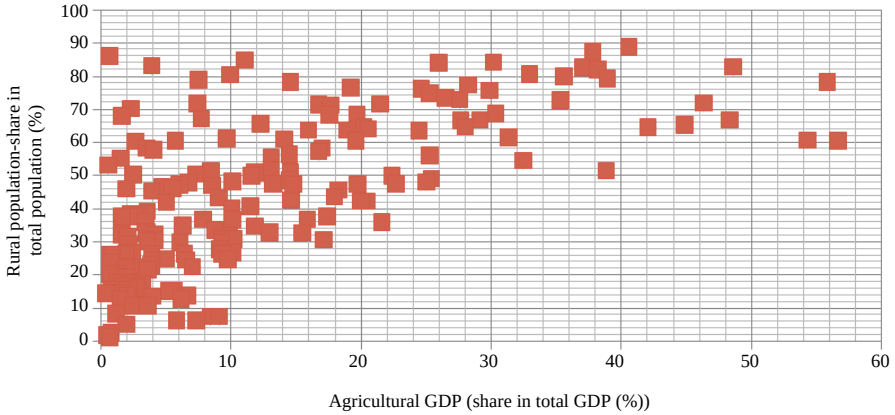

Fig. 1: Distribution of individual countries according to their agricultural GDP's share in total GDP value and the share of their rural population in total population

Table 1: Selected regions' and groups of countries' share of agricultural GDP in total GDP and rural population's share in total population

Year 2012	Agriculture (GDP %)	Rural population (total population %)
Low income	28,01481	71,80631
Least developed countries: UN classification	25,70914	71,03992
South Asia	18,30559	68,64726
Pacific island small states	14,18883	63,24425
Sub-Saharan Africa (all income levels)	14,40379	63,1875
Lower middle income	16,77939	61,06287
Caribbean small states	3,618991	56,84921
Small states	4,946084	54,2763
Low and middle income	10,45577	53,59916
Other small states	5,419113	52,36261
Middle income	10,01516	50,45114
World	3,250000	47,45163
East Asia and Pacific (all income levels)	4,296744	46,3885
Arab World	6,203995	42,81434
Upper middle income	7,803353	39,33078
Middle East and North Africa (all income levels)	6,593243	36,82234
Europe and Central Asia (all income levels)	1,949249	29,52986
European union	1,545382	25,84918
Euro area	1,678347	24,20728
High income: non-OECD	2,304294	22,66187
Latin America and Caribbean (all income levels)	5,321941	20,64487
OECD members	1,533319	19,99692
High income	1,441818	19,79423
High income: OECD	1,388372	19,17451
North America	1,245228	17,55668

World Bank (2014)

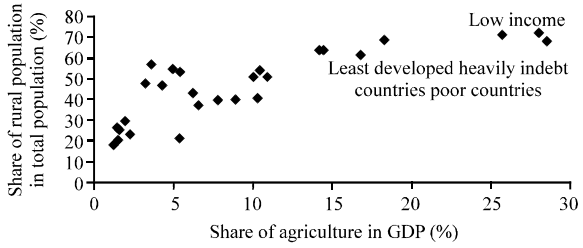

Fig. 2: Distribution of individual regions and groups of countries according to their agricultural GDP's share in total GDP value and the share of their rural population in total population

in GDP is very low in the range of about 2%. These sorted data indicate that the decline in the share of agriculture in GDP is usually accompanied by a significant reduction of the proportion of the rural population in the total population. In general, this trend can be confirmed for most countries of the world. As the structure of the world economy continues transforming, the transfer of population into urban areas is becoming faster.

In the years of 1980-2012 alone there was an increase in the world rural population from about only 2.68 billion people to 3.33 billion people (i.e., an average annual growth rate had reached about 1%) while in urban and suburban areas the population increased from 1.74 billion people to >3.69 billion people (average annual rate of population growth exceeded 2%). The above figures therefore indicate a significantly higher growth rate dynamics of the urban population as compared with the growth rate of rural population.

This extreme has been noticeable in recent years in developing and low-income countries where the population shift from rural to urban areas is increasingly more dynamic. An important role in this process of this dynamisation is played by a change in the structure of the economy when during the years of 1980-2012 the share of agriculture in GDP has reduced in developing countries (low income from 37.7-28%, lower middle income from 30.2-16.8% middle income from 22.29-10%; upper middle income from 201-7.8%) much more strongly than was the case in developed countries (from 4-1.44%).

Generally as the process of economic transformation becomes more dynamic and the share of agriculture in GDP is reducing, there is also a reduction in the proportion of the people working in agriculture in the total number of employees the result of this process is a significant reduction in the proportion of rural population.

This decrease is becoming dynamic along with the acceleration of economic transformation process, i.e. is dependent on the declining importance of agriculture as a sector contributing to GDP and providing the jobs.

The results presented in Fig. 2 show that it is the poorest countries of the world where agriculture and hence the proportion of the rural population still maintain high values within the observed indicators. By contrast, in developed countries it is valid that the more advanced the economy is the lower the share of agriculture in GDP

Table 2: Development of agricultural GDP's share in total GDP, employment in agriculture and rural population in selected groups of countries between 1980-2012

Parameters	Years	Agriculture (GDP %)	Employment in agriculture (total employment %)	Rural population (total population %)
World	1980	7,569893	48,50209	60,62762
Middle income	1980	22,29382	55,33561	69,16951
High income	1980	4,0717	8,49828	28,3276
Low income	1980	37,67682	73,34948	81,49942
Upper middle income	1980	20,11229	59,68737	66,3193
Lower middle income	1980	30,17217	58,02364	72,52955
World	2012	3,104334	33,21614	47,45163
Middle income	2012	10,01516	35,3158	50,45114
High income	2012	1,441818	3,480646	19,79423
Low income	2012	28,01481	64,62568	71,80631
Upper middle income	2012	7,803353	29,29835	39,33078
Lower middle income	2012	16,77939	43,12014	61,06287

World Bank (2014)

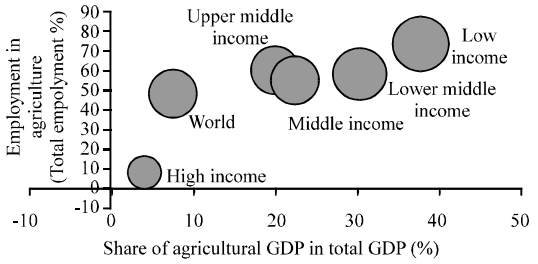

Fig. 3: Individual groups of countries selected characteristics (agricultural GDP share in total GDP, employment in agriculture and rural population in selected groups of countries) in 1980; researcher's data, World Bank (2014)

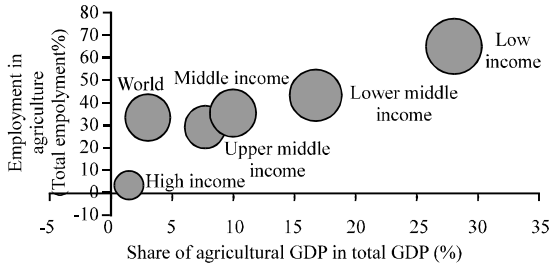

Fig. 4: Individual groups of countries selected characteristics (agricultural GDP share in total GDP, employment in agriculture and rural population in selected groups of countries) in 2012; researcher's data, World Bank (2014)

and the number of jobs in agriculture is also reduced. Subsequently, the proportion of the rural population is also reduced and it is more or less dynamically moved to the cities where there is a greater number of jobs and a significantly higher economic potential. Table 2 together with Fig. 2 and 3 provide a general overview of the development of the share of rural population in relation to the percentage of emplyees in the total working population and in relation to the share of agriculture in total GDP.

The data show clearly that in the world and thus in individual groups of countries some very significant changes took place during the past three decades. The percentage of people employed in agriculture has declined significantly (from 48.5-33%), the share of agriculture in GDP declined from 7.5-3.1% and consequently the proportion of rural population also decreased from 60.6-47, 45%. This trend concerned all surveyed groups of countries.

Figure 3 and 4 show that the difference between developed and poorest countries of the world has deepened and the analysis also indicates that transitive or newly industrializing economies tend to follow the trend of development in developed countries where in those regarded as middle income and upper middle income countries the transformation of their economies and societies in recent years has become more dynamic. This had subsequently led to a decline in the importance of agriculture in the economy and was followed by a massive influx of population into the cities.

In this respect, it is worth noting the extremely high increase in population living mainly in the big cities of over one million inhabitants. The process of transformation of the settlement structure is largely dependent upon changes in the economy. Appendix II provides a basic overview of the relations between the development of the share of rural population in the total population in various regions of the world on the one hand and the development of some other economic characteristics on the other. The analysis shows that there is generally a very strong correlation between the development of the population living in rural areas and the volume of jobs in agriculture and added value generated by agriculture.

The analysis also shows that the overall GDP growth or growth of GDP per capita which is much more

dynamic outside the agricultural sector, leads to a direct decrease in the proportion of people living in rural areas (strong negative correlation). From the above, therefore, follows that with the decline in the share of agriculture in GDP, there is a significant reduction of the rural population or its share of the total population. This trend is especially typical for East Asia and the Pacific, Europe and Central Asia, the European Union, Latin America, the Middle East and North Africa, North America and South Asia.

This trend does not include only Sub-Saharan Africa which however is specific by its extreme backwardness and extremely high rate of growth of its own population. Nevertheless, even in the case of this exceptional region it can concluded that the transformation of the economy and the decline in the share of agriculture in GDP over time lead to the growth of cities and urban agglomerations and thus lead to a significant increase in the number of people living in urban areas.

Appendix III provides an overview of the relationship between the proportion of rural population and the observed variables in individual economically and economically distinct groups of countries (according to the level of income per capita). The table contains data on the average growth rate of the monitored parameters and also data on the value of the correlation and elasticity characterizing the relationship between the development of the rural population share on the one hand and changes in the value of individual variables included in the analysis on the other.

The data generally indicate that it is the GDP share of agriculture and the proportion of jobs in agriculture (in the total GDP or in the total number of jobs in the economy) which have been in the long term increasing in most countries of the world (with the exception of those marked as low income lower and middle income) and thus, lead to a decline in the attractiveness of rural areas. The result is a gradual decline in the growth rate of the local population which is lower in the long term when compared with the growth rate of the population living in cities as a result of this development two phenomena occur.

The proportion of the population living in rural areas is declining and the existing structure of the population is rapidly aging. Given that the predominantly older generation (parents) remains in rural areas and the younger generation (their children) leaves for the cities, in most regions there are significant changes in terms of demographic structure. Especially, in developing countries, cities are getting younger and their population is growing dynamically while the rural areas have an aging population and an overall stagnation.

The data suggest that an important driver of these changes is the general economic growth (the main source of which lies outside the agricultural sector and rural areas), the growth of individual income per capita (nevertheless, the main source of economic activities is not the rural areas but cities and therefore, people form rural areas naturally migrate to urban and suburban areas). Generally, the growth of the economy (GDP and GDP/capita) has a negative impact on the proportion of the rural population (confirmed at the significance level of alpha is 0.05).

This trend is confirmed by the correlation coefficient values as well as by the values of the functional elasticity (by means of logarithmic regression). The trend is typical for most countries and regions of the world. Generally, the rural population or its share is most dynamically reduced in the case of a high income and upper middle income countries (from 295 mil. (28%) to 252 mil. (19.8%) or from 1,070 mil. (66.3%) to 940 mil. (39.33%).

In middle income countries there is an obvious significant stagnation in the growth of the rural population (from 2064-2470 mil.) which was shown by a particularly strong reduction of the share of the population in the total population (from 69.2-50.45%). The strongest dynamics of the physical growth of the rural population is shown by countries designated as lower middle income (from 993-1530 mil.) and especially the low income countries (from 320-608 mil.).

The consequence of this development is their totally unsuitable structure of the economy in which the primary sectors still play an important role particularly agriculture and hence also the extraction of mineral resources. Important factors inhibiting transfer of population to the cities is the high rate of the rural population growth, limited ability of the economy to create new jobs, especially in secondary and tertiary sectors and then also an extremely poor transport infrastructure. However, despite the growth of the physical number of rural residents, even in these countries it is possible to observe a considerable reduction in their share of the total population (from 72.5% in 1980 to 61% in 2012 or from 81.5-72%).

Through individual analyses the study focuses on a very topical issue which currently forms the development of the global economy and society. The results of the analysis of the development of the share of rural population in the total population of the world and selected regions implies the following. The volume and particularly the structure of the global population have changed extremely over the last three decades. The

number of people living on Earth has increased from about 4.4 to >7 billion. The population structure also underwent significant changes.

While at the beginning of the period observed in this study about 2.6 billion people lived in the countryside, at the end of the period it was already 3.33 billion people. Over the years, the dynamics of the rural population growth has decreased significantly. The result of this development was a decline in the share of rural population in the total population of the world from 60.6% to about 47.45%. In particular, restructuring of the global economy which has led to a significant decline in importance in terms of rural economic growth has shown to be a major determinant of the development in time (Jenicek, 2012).

In this regard, there has been a significant reduction in agriculture which had long constituted a major source of income and employment in rural areas. As the share of agriculture in the global economy fell (by more than half) and the volume of jobs in agriculture decreased in other words, the proportion of people working in agriculture in the total number of workers in the global economy has reduced there was a significant decline in the rural population growth and a substantial outflow of this population into urban and suburban areas.

The high dynamics of the transfer of population to urban areas was accelerated particularly by the economic growth coupled with the development of secondary and especially tertiary sectors of the global economy. The main accelerator of the transfer is the growth of the GDP/capita which is significantly higher in urban areas compared to rural areas (Jenicek, 2011). Regarding the differences existing between countries and regions, it can be said that they are substantial as shown by tables and graphs included in the text. Figure 5 summarizes these differences at the level of individual groups of countries.

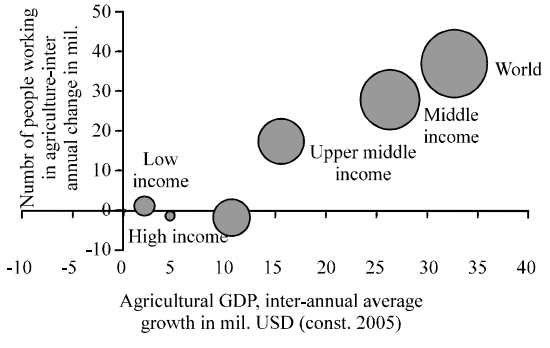

Fig. 5: Individual groups of countries and their selected characteristics; the size of bubble is equal to inter annual change of rural population (in absolute values) only in the case of high income countries the inter annual growth is negative (-2 mil. people a year)

CONCLUSION

The results show that the differences existing between countries and regions in the development of the rural population share are based mainly on differences in the economy (Jenicek, 2010a, b) and the economic prosperity of individual countries or regions. With the growth of non-agricultural GDP which is generated mainly in urban and suburban area agglomerations, these areas become significantly more attractive and the inhabitants are progressively moving in from the countryside.

The main obstacles to the transfer are the ability of these areas to generate employment and business opportunities, inadequate infrastructure, limited accommodation capacity (especially in developing countries) and further restrictions placed on the movement of people from rural to urban areas which exist in some areas of the world (e.g., China). At the present time, the most dynamic decline in the rural population share occurs especially in transition and industrializing economies.

In developed countries the decrease in the share of the rural population in the total population is less dynamic. A specific group of countries is represented by the countries designated as low Income and lower middle income. In these countries, it is also possible to see a significant decline in the proportion of rural population, however this decline is not as dynamic as in other countries, mainly because of the high rate of population growth (due to high fertility and increased life expectancy; Jenicek, 2010a, b), limited capacity of urban areas and then also because of the limited ability of the secondary and tertiary sectors to generate employment and other economic opportunities which are one of the main drivers of urban population growth and falling numbers in the population living in rural areas or a decline in the rural population share in the total population (Michaels *et al*., 2012).

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APPENDIX

Appendix I: Selected countries' share of agricultural GDP in total GDP and rural population's share in total population

Country name	Agriculture (GDP %)	Rural population (total population %)	Country name	Agriculture (GDP %)	Rural population (total population %)	Country name	Agriculture (GDP %)	Rural population (total population)
Burundi	40.582400	88.786	Egypt	14.46551	56.2978	Italy	2.008055	31.4200
Papua N. Gui.	37.796320	87.4276	Kiribati	25.27984	55.9338	Ukraine	9.250838	30.9170
Trinidad	0.616611	86.0208	Belize	13.06415	55.4102	Iran	10.216690	30.7736
Sri Lanka	11.050400	84.7882	Barbados	1.469692	55.0898	Mongolia	17.104470	30.6506
Malawi	30.166740	84.1518	Benin	32.44113	54.4408	Estonia	4.138690	30.4254
Uganda	25.945780	84	Aruba	0.512418	53.0342	Hungary	3.526911	30.0934
St. Lucia	3.866942	83.0308	Moldova	13.07437	51.6248	Suriname	9.256319	29.8800
Ethiopia	48.597030	82.7202	Liberia	38.83952	51.4366	Dominic. R.	6.050989	29.7938
Nepal	37.027190	82.6644	Bosnia	8.446774	51.1870	Cyprus	2.083345	29.2938
Niger	38.174550	81.8792	Turkmenistan	14.54883	50.9268	Turkey	9.075667	27.6682
Rwanda	32.951130	80.5716	Philippines	11.83748	50.8768	Malaysia	10.054000	26.6380
Samoa	9.893683	80.3088	St. Vincent	7.261989	50.3024	Czech Rep.	2.358841	26.5792
Cambodia	35.601660	79.808	Slovenia	2.457258	50.1002	Bulgaria	6.398129	26.3608
Solomon Is.	38.941060	79.0846	Nigeria	22.36186	49.7706	Oman	1.860883	26.3072
Swaziland	7.481057	78.7544	Guatemala	11.57119	49.7632	Algeria	9.299830	26.2940
Eritrea	14.528840	78.174	Tuvalu	25.39564	49.0248	Switzerland	0.731280	26.2184
Chad	55.840510	78.0802	Indonesia	14.44348	48.5524	Russia	3.867728	26.0032
Micronesia	28.212540	77.2876	China	10.08565	48.2244	Germany	0.837108	25.9262
Tonga	19.169830	76.4356	Cote d'Ivoire	24.97848	47.9974	Cuba	4.999046	24.8290
Afghanistan	24.606720	76.1446	Jamaica	6.71799	47.8440	Belarus	9.740781	24.5718
Kenya	29.876380	75.6026	Ghana	22.66489	47.4782	Colombia	6.520687	24.4344
Vanuatu	25.243430	74.7846	Fiji	13.22437	47.3726	Panama	3.886558	24.2166
Tajikistan	26.478960	73.392	Cameroon	19.71219	47.3420	Brunei	0.715125	23.6758
Tanzania	27.577970	72.7942	Honduras	14.77048	47.2750	Djibouti	3.855277	22.8390
Burkina Faso	35.335340	72.649	Romania	6.013533	47.1504	Spain	2.458646	22.4268
Comoros	46.320960	71.8328	Georgia	8.514952	47.0204	Peru	6.998631	22.4230
Lesotho	7.402774	71.6994	Kazakhstan	4.66551	46.4584	Libya	1.865156	22.0930
Guyana	21.455670	71.511	Azerbaijan	5.492057	46.1114	Mexico	3.559294	21.6134
Timor-Leste	16.718240	71.2708	Seychelles	1.913011	45.9878	Norway	1.171433	20.3540
Bangladesh	17.676950	71.1136	Albania	18.25606	45.5528	UK	0.653305	20.2368
Antigua	2.251214	70.1328	Slovak R.	3.861012	45.2712	Canada	1.906604	19.2304
Mozambique	30.326200	68.5268	Syria	17.93916	43.5358	Saudi Arabia	2.243294	17.5040
India	17.519950	68.34	Serbia	9.044022	43.2750	USA	1.245423	17.3750
Vietnam	19.669820	68.3218	Morocco	14.58119	42.5940	Jordan	3.132373	17.0494
St. Kitts and N.	1.549875	67.8912	Gambia. The	20.40361	42.2392	Korea. Rep.	2.639491	16.5314
Yemen. Rep.	7.700269	67.0924	Nicaragua	19.98683	42.1392	Netherlands	1.686129	16.4830
Madagascar	29.110480	66.7932	Croatia	4.989573	41.8886	Finland	2.713429	16.1824
Myanmar	48.351930	66.7782	Macedonia.	11.4613	40.5578	Bahamas.	2.097478	15.5524
Sudan	27.651860	66.6136	Angola	10.02262	40.0938	Un. Ar. Emir.	0.735224	15.3788
Thailand	12.269890	65.5092	Poland	3.537311	39.1554	Palau	5.576320	15.1372
Congo. DR.	44.862940	65.169	Portugal	2.260319	38.4228	Brazil	5.242793	15.1286
Lao PDR	27.980830	64.6762	Greece	3.372758	38.2934	Sweden	1.565895	14.6444
Kyrgyzstan	20.186620	64.5248	Botswana	2.937446	37.7474	Luxembourg	0.341605	14.3592
Mali	42.052010	64.4254	South Africa	2.565389	37.5724	France	1.968774	13.7422
Guinea	20.544680	64.056	Paraguay	17.36157	37.5644	New Zealand	6.584310	13.7140
Uzbekistan	18.924900	63.708	Ireland	1.576573	37.4880	Gabon	3.902191	13.5424
Bhutan	15.935170	63.6594	Sao Tome	15.84921	36.6880	Denmark	1.443202	12.9334
Pakistan	24.427660	63.4508	Cabo Verde	7.843176	36.6758	Lebanon	6.118655	12.6404
Togo	31.347120	61.493	Montenegro	10.1	36.5188	Australia	2.421653	10.6628
Namibia	9.633722	61.0364	Congo. Rep.	3.383118	35.9242	Chile	3.590826	10.6508
Zimbabwe	14.067520	60.8888	Armenia	21.5859	35.8364	Japan	1.165447	8.2706
Cen. African R.	54.317500	60.6478	Costa Rica	6.261848	34.8984	Uruguay	8.376802	7.3650
Grenada	5.702949	60.507	El Salvador	11.83492	34.7532	Argentina	9.087003	7.3594
Zambia	19.594930	60.3942	Tunisia	8.727136	33.4696	Venezuela	5.791330	6.3044
Sierra Leone	56.688520	60.3644	Bolivia	12.9522	32.7762	Iceland	7.306756	6.1656
Equatorial Gu.	2.610393	60.3126	Lithuania	3.50621	32.7706	Malta	1.918757	5.0246
Mauritania	16.971030	58.21	Dominica	15.45197	32.7024	Belgium	0.741843	2.4852
Mauritius	3.467060	58.1842	Latvia	4.137771	32.2880	Kuwait	0.461204	1.7324
Maldives	3.994421	57.7668	Austria	1.596088	32.1192	Puerto Rico	0.678635	1.0406
Senegal	16.725700	57.1324	Ecuador	9.869966	32.0166			

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Appendix II: Selected regions' characteristics related to rural population development

Country names	Series names	Year (2012)	Correlation 1980-2012
East Asia and Pacific	Rural population (total population %)	46.39	
East Asia and Pacific	Employment in agriculture (total employment %)	32.11	0.964688424
East Asia and Pacific	Agriculture (constant 2005 US$)	630 881 341 024.13	-0.996762354
East Asia and Pacific	Agriculture (DP %)	4.30	0.951880891
East Asia and Pacific	GDP (constant 2005 US$)	13 382 780 055 534.40	-0.997773363
East Asia and Pacific	GDP per capita (constant 2005 US$)	5 991.08	-0.995811351
Europe and Central Asia	Rural population (total population %)	29.53	
Europe and Central Asia	Employment in agriculture (total employment %)	9.01	0.960707563
Europe and Central Asia	Agriculture (constant 2005 US$)	352 630 673 041.42	-0.88086779
Europe and Central Asia	Agriculture (GDP %)	1.95	0.987375154
Europe and Central Asia	GDP (constant 2005 US$)	17 443 734 647 424.90	-0.943411885
Europe and Central Asia	GDP per capita (constant 2005 US$)	19 467.45	-0.93336292
European Union	Rural population (total population %)	25.85	
European Union	Employment in agriculture (total employment %)	5.10	0.96805393
European Union	Agriculture (constant 2005 US$)	216 694 674 711.14	-0.963671719
European Union	Agriculture (GDP %)	1.55	0.983340865
European Union	GDP (constant 2005 US$)	14 630 194 143 541.50	-0.975534302
European Union	GDP per capita (constant 2005 US$)	28 937.35	-0.973427447
Latin America and Caribbean	Rural population (total population %)	20.64	
Latin America and Caribbean	Employment in agriculture (total employment %)	15.92	0.668045927
Latin America and Caribbean	Agriculture (constant 2005 US$)	164 121 077 944.27	-0.962189721
Latin America and Caribbean	Agriculture (GDP %)	5.32	0.975140502
Latin America and Caribbean	GDP (constant 2005 US$)	3 637 175 440 421.73	-0.956378431
Latin America and Caribbean	GDP per capita (constant 2005 US$)	5 976.68	-0.918390482
Middle East and North Africa	Rural population (total population %)	36.82	
Middle East and North Africa	Employment in agriculture (total employment %)	1.60	0.991392696
Middle East and North Africa	Agriculture (constant 2005 US$)	139 268 461 396.62	-0.972883498
Middle East and North Africa	Agriculture (GDP %)	6.59	0.051928906
Middle East and North Africa	GDP (constant 2005 US$)	2 070 744 783 347.27	-0.924477231
Middle East and North Africa	GDP per capita (constant 2005 US$)	5 238.19	-0.803279959
North America	Rural population (total population %)	17.56	
North America	Employment in agriculture (total employment %)	1.60	0.934717575
North America	Agriculture (constant 2005 US$)	139 268 461 396.42	-0.972680311
North America	Agriculture (GDP %)	1.25	0.856457406
North America	GDP (constant 2005 US$)	15 491 572 207 916.90	-0.986742075
North America	GDP per capita (constant 2005 US$)	44 422.42	-0.970404501
South Asia	Rural population (total population %)	68.65	
South Asia	Employment in agriculture (total employment %)	47.08	0.968482675
South Asia	Agriculture (constant 2005 US$)	238 438 558 687.37	-0.97109587
South Asia	Agriculture (GDP %)	18.31	0.988144422
South Asia	GDP (constant 2005 US$)	1 684 779 724 700.49	-0.92429455
South Asia	GDP per capita (constant 2005 US$)	1 021.54	-0.922119328
Sub-Saharan Africa	Rural population (total population %)	63.19	
Sub-Saharan Africa	Employment in agriculture (total employment %)	-	N/A
Sub-Saharan Africa	Agriculture (constant 2005 US$)	153 188 683 993.85	-0.948846801
Sub-Saharan Africa	Agriculture (GDP %)	14.40	0.566270978
Sub-Saharan Africa	GDP (constant 2005 US$)	908 830 003 906.20	-0.912751094
Sub-Saharan Africa	GDP per capita (constant 2005 US$)	996.29	0.022203541

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Appendix III: Selected groups of countries' characteristics related to rural population development

Country names	Series names	Year (1980)	Year (2012)	Growth rate	Elasticity	Correlation
High income	Agriculture per worker (constant 2005 US$)	8 880.87	25 237.65	1.03	-0.34	-0.94
High income	Agriculture (GDP %)	4.07	1.44	0.97	0.28	0.97
High income	Agriculture (constant 2005 in mil. US$)	365 190.94	550 748.97	1.01	-0.77	-0.96
High income	Employment in agriculture (total employment %)	8.50	3.48	0.97	0.36	0.99
High income	GDP (constant 2005 in mil. US$)	18 967 323.35	40 881 118.43	1.02	-0.41	-0.99
High income	GDP per capita (constant 2005 US$)	17 889.77	31 450.88	1.02	-0.53	-0.99
High income	Population (total in mil.)	1 060.23	1 299.84	1.01	-1.70	-1.00
High income	Rural population in mil.	295.34	252.64	1.00	2.24	0.98
High income	Rural population (total population %)	28.33	19.79	0.99		
High income	Urban population (total %)	71.67	80.21	1.00	-3.15	-1.00
Low income	Agriculture per worker (constant 2005 US$)	271.03	367.16	1.01	-0.34	-0.85
Low income	Agriculture (GDP %)	37.68	28.01	0.99	0.28	0.93
Low income	Agriculture (constant 2005 in mil. US$)	37 357.18	92 540.98	1.03	-0.14	-0.98
Low income	Employment in agriculture (total employment %)	73.35	64.63	1.00	1.00	1.00

Appendix III: Continue

Country names	Series names	Year (1980)	Year (2012)	Growth rate	Elasticity	Correlation
Low income	GDP (constant 2005 in mil. US$)	111 202.79	359 393.19	1.04	-0.11	-0.95
Low income	GDP per capita (constant 2005 US$)	283.86	424.57	1.01	-0.24	-0.80
Low income	Population (total in mil.)	391.75	846.48	1.02	-0.16	-1.00
Low income	Rural population in mil.	319.27	607.83	1.02	-0.18	-1.00
Low income	Rural population (total population %)	81.50	71.81	1.00		
Low income	Urban population (total %)	18.50	28.19	1.01	-0.30	-1.00
Lower middle income	Agriculture per worker (constant 2005 US$)	497.61	937.90	1.02	-0.26	-0.98
Lower middle income	Agriculture (GDP %)	30.17	16.78	0.98	0.25	0.99
Lower middle income	Agriculture (constant 2005 in mil. US$)	166 932.42	451 555.86	1.03	-0.17	-0.98
Lower middle income	Employment in agriculture (total employment %)	58.02	43.12	0.99	0.61	0.96
Lower middle income	GDP (constant 2005 in mil. US$)	761 581.97	3 077 068.40	1.04	-0.12	-0.96
Lower middle income	GDP per capita (constant 2005 US$)	555.26	1 227.40	1.03	-0.21	-0.93
Lower middle income	Population (total in mil.)	1 371.57	2 506.99	1.02	-0.27	-1.00
Lower middle income	Rural population in mil.	993.69	1 529.73	1.01	-0.37	-1.00
Lower middle income	Rural population (total population %)	72.53	61.06	0.99		
Lower middle income	Urban population in mil.	376.36	975.44	1.03	-0.17	-1.00
Lower middle income	Urban population (total %)	27.47	38.94	1.01	-0.49	-1.00
Middle income	Agriculture per worker (constant 2005 US$)	508.45	1 045.33	1.02	-0.43	-0.98
Middle income	Agriculture (GDP %)	22.29	10.02	0.98	0.31	0.98
Middle income	Agriculture (constant 2005 in mil. US$)	414 692.31	1 143 918.93	1.03	-0.32	-0.99
Middle income	Employment in agriculture (total employment %)	55.34	35.32	0.99	0.64	0.97
Middle income	GDP (constant 2005 in mil. US$)	3 278 955.48	13 387 103.56	1.04	-0.22	-0.96
Middle income	GDP per capita (constant 2005 US$)	1 097.86	2 733.41	1.03	-0.33	-0.94
Middle income	Population (total in mil.)	2 986.68	4 897.58	1.02	-0.61	-1.00
Middle income	Rural population in mil.	2 064.82	2 469.97	1.01	-1.36	-0.91
Middle income	Rural population (total population %)	69.17	50.45	0.99		
Middle income	Urban population (total %)	30.83	49.55	1.01	-0.65	-1.00
Upper middle income	Agriculture per worker (constant 2005 US$)	514.70	1 130.59	1.02	-0.65	-0.98
Upper middle income	Agriculture (GDP %)	20.11	7.80	0.97	0.42	0.97
Upper middle income	Agriculture (constant 2005 in mil. US$)	248 717.27	692 616.31	1.03	-0.53	-0.99
Upper middle income	Employment in agriculture (total employment %)	59.69	29.00	0.98	0.71	0.99
Upper middle income	GDP (constant 2005 in mil. US$)	2 517 998.43	10 310 178.63	1.05	-0.36	-0.97
Upper middle income	GDP per capita (constant 2005 US$)	1 559.02	4 312.81	1.03	-0.49	-0.95
Upper middle income	Population (total in mil.)	1 615.12	2 390.60	1.01	-1.22	-0.99
Upper middle income	Rural population in mil.	1 071.13	940.24	1.00	2.34	0.74
Upper middle income	Rural population (total population %)	66.32	39.33	0.98		
Upper middle income	Urban population (total %)	33.68	60.67	1.02	-0.86	-1.00
World	Agriculture per worker (constant 2005 US$)	811.46	1 176.18	1.01	-0.45	-0.98
World	Agriculture (GDP %)	7.57	3.10	0.97	0.22	0.97
World	Agriculture (constant 2005 in mil. US$)	810 572.57	1 779 007.83	1.02	-0.32	-1.00
World	Employment in agriculture (total employment)	48.50	33.22	0.99	0.45	0.95
World	GDP (constant 2005 in mil. US$)	22 366 944.49	54 603 475.05	1.03	-0.25	-1.00
World	GDP per capita (constant 2005 US$)	5 039.11	7 751.88	1.01	-0.51	-0.99
World	Population (total in mil.)	4 438.67	7 043.90	1.01	-0.50	-1.00
World	Rural population in mil.	2 679.44	3 330.45	1.01	-0.95	-0.95
World	Rural population (total population %)	60.63	47.45	0.99		
World	Urban population in mil.	1 740.06	3 688.17	1.02	-0.32	-1.00
World	Urban population (total %)	39.37	52.55	1.01	-0.84	-1.00

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