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**Master programme in Economic Growth,
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Convergence Analysis: Sigma Convergence among Regions of Armenia

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Abstract: Despite being small-size and compact country – with only 200 kilometers stretch from far East to West – the economy of Armenia faces significant spatial differentiation in income levels and is characterized by high concentrations of population, economic and business activities in the capital city with peripheral regions lagging behind economic activity and wages. By using the data on monthly average wages of the Marzes (provinces) this paper seeks to empirically test the hypothesis of income level (wages) divergence in the country using the method of Sigma convergence. By estimating the trend line of the dispersion (coefficient of variation) in monthly average wages among the regions of Armenia I come to a conclusion that income levels between the regions of Armenia tend to converge over the analyzed time frame. This finding, however, should be interpreted with caution due to the revealed two sub-periods of divergence among the regions in wages.

Key words: Sigma convergence, regional disparities, income levels divergence, inequality.

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I. INTRODUCTION

1. Armenia at a Glance

Armenia is a former Soviet state which gained independence in 1991, reestablishing the country as The Republic of Armenia. It is situated in the Caucasus region at the border of Europe and Asia. Small and mountainous country it occupies only 29743 km² area with 3,08 million population (2008) and borders Azerbaijan to the east, Turkey to the west, Georgia to the north and Iran to the South. It is a presidential country with a multiparty parliamentary system. The official language of the country is Armenian

Over the past 12 years Armenia experienced double-digit numbers of GDP growth, paralleled with low inflation and characterized by small fiscal deficits and prudent monetary policies - although the prima facie high growth was mainly driven by construction, mining and services as well as by a big volumes of remittances and transfers from abroad (The World Bank: Country Brief-Armenia, 2008). As for 2008, according to the same source, the GDP of the county was 11,9 US billion dollars with the average annual growth of 6,8 %. The economy has been reforming since the disintegration of Soviet Union and is characterized as widely open to trade, capital, and technological investments.

2. The Aim of the Paper, Problem Definition and Research Questions

At a macro-level this paper deals with regional economic disparities and spatial inequalities – a phenomenon which is gaining more and more attention amid to the more integrated but meanwhile more congested and clustered world economy. At a micro-level this papers addresses unequal spatial development and regional disparities in Armenia, and seeks to empirically test the hypothesis on income level divergence between the regions of Armenia.

Broadly viewed, regional disparities and uneven spatial developments have been central themes in policy making and economic growth issues for many countries – both developed and developing, and either large or small. Interestingly, as Krugman (1991, p484) puts it, nighttime satellite observations of Europe “reveal little of political boundaries but clearly suggest a center-periphery pattern whose hub is somewhere in or near Belgium.” No matter the size and the state of the country’s (region’s) economy spatial inequalities seem to be holding a strong interest for policy makers, especially amid much more globalized and integrated world economy that we have today. Indeed, according to Organization for

Economic Cooperation and Development (How Regions Grow, 2009 p 21) “regional inequality increased between 1995 and 2005 in about 70 % of OECD countries”, and the gap between the urban and rural regions has increased during the same period. What deserves more attention, however, is the fact that the evidence of growing spatial inequalities occurs more among regions (country level) than among countries. For example in OECD countries, according to OECD (How Regions Grow, 2009, p 22) “Economic performance between 1995 and 2005 varied much more markedly across OECD regions than across countries.”

Moreover, with the features of more flexible and relatively easy “movable” production factors, not only does today’s global economy contribute to the increase of regional inequalities, but also undermines the impact that the country size had on regional inequalities and economic development. For example, Streeten argued that, larger countries exhibit larger inequalities by region than small countries (as cited in Felsenstein and Portnov, 2005), yet amid more flexible and globalized world this views are now reviewed, due to the ever growing evidence of spatial inequalities in small-size countries. This, however, does not imply that there is direct, linear relationship between country size and spatial inequalities. For example, on the one hand the smallness of the country might be associated with more homogeneous society with greater social consensus and solidarity (Felsenstein and Portnov, 2005), thus presumably leading to more focus of the policy makers in social cohesion and integration issues. Yet, from the other hand there are many small countries characterizing with well developed metropolitan core with the concentration of main economic activities as a one extreme and underdeveloped and lagging periphery as another.

Meanwhile, it is worthwhile to note that the disparities between regions can be redefined as actually disparities between individuals inhabiting there, since one of the basic measures of regional disparities is the differences in per capita GDP. Indeed, when trying to define spatial inequalities, we can actually start by decomposing the notion of regional disparity to the level when we can discuss interpersonal inequalities between regions, thus having a possibility to measure it and follow the trends over time. After all, as Kanbur and Venables (2005, p8) put it, one way to define spatial inequalities is to think that “inequality in economics comes from considerations of interpersonal inequality—how individuals differ from each other along dimensions such as income, consumption, education, and health..and consider its spatial dimensions”.

At a micro-level this papers is dealing with the phenomenon of unequal spatial development and regional disparities in Armenia. The purpose of this paper is to empirically test the hypothesis on income level (wages) divergence between the regions of Armenia. The

bulk of the literature on the post-Soviet economic developments of the country provides evidence significant differentiation of income levels between the regions of Armenia - where high development indicators are discussed mainly to be present in the capital Yerevan, leaving behind the other regions and periphery. To test the hypothesis of wages divergence I analyze the trends of wage dynamics across the Marzes (provinces) and the capital of the country starting from 1999 –since when the systematic data on regional level is available. For the purpose of this analysis I conceptualize regional disparities in Armenia terms of coefficient of variation of wages in the regions of the country.

3. Outline of the reminder of the paper

This paper is divided into six sections. Part I is the introductory section of the analysis where the brief overview of economic developments of Armenia is given, following the disintegration from Soviet Union. Part 5 of section I gives the initial picture of regional disparities in Armenia, where some examples of territorial inequalities are presented and the preliminary discussion of wage dynamics in the country is discussed. Part 6 of section I discusses factors contributing to the regional inequalities.

Section II reviews the related literature: Number of articles on related literature is discussed where some papers are presented discussing what was done in the field from methodological point of view. Articles discussing recent economic developments as well as general picture of regional disparities in Armenia are also discussed.

Section III presents empirical models and the data. Part 1 of section III discusses the applied theoretical framework: The “Core-Periphery” model is presented. Part 2 of section III deals with hypothesis: Null and Alternative hypotheses are presented. Part 3 of section III presents the applied methodology of Sigma convergence: The general concept as well as regression equations is given in this sub-section. Part 4 of this section briefly discusses data.

Section IV presents the results: Detailed table is provided with the data on average nominal wages of the Marzes, as well as corresponding calculations of Standard Deviation, Mean and Coefficient of Variation. Figure 1 plots the tendency of Sigma convergence over time.

Section V gives the thorough discussion of the findings: Sub-periods of divergence in average monthly wages across the regions is presented in the phone of overall convergence pattern.

Section VI concludes the analysis.

4. Overview of the country's post-Soviet economic history

Following mid 1970s, Soviet Armenia enjoyed the benefits that centrally planned Soviet economy provided: Namely, almost no unemployment, and narrow gaps between living standard when moving from one region to the other. From the other hand, however, there are many theorists who find the Soviet era and the socio-economic structure typical to the Soviet empire was “a deviation from the general human development framework formed during the last 200 years” (Tumasyan et al, 2002, p18). Indeed, taken into consideration the challenges and massive restructuring of the economies and governments that post Soviet countries experienced, one could argue that the economic transition of the countries towards market orientation and openness was delayed at least for some 70 years – the period of Soviet government. Indeed, as cited in Tumasyan et al (2002) the new system of socio-economic relations (e.g. the eradication of private property and abolishing business initiatives) introduced by Soviet Union was not a voluntary succession to the new rules, but rather was a system introduced by force and coercion by the Soviet government.

Nonetheless, during centrally planned Soviet times, Armenia was successful to develop a sound industrial sector, and supplied high precision machine tools, textile products, and many other manufactured goods to the other Soviet republics, meanwhile importing raw materials to feed the complex industrial system of the country.

Following the disintegration of the Soviet Union in 1991, Armenia was successful in implementing some economic reforms, introducing privatization, supplementing price reforms as well as complex fiscal policies. Yet the geopolitical properties, a tiny export base, prevalent monopolies in crucial business and economy sectors as well as the downturn in Russia have put Armenia in a vulnerable economic situation (CIA World Factbook: Armenia, 2010). These series of events, eventually would bring the country into poverty, and become massive structural challenge to overcome.

The first event disrupting Soviet Armenia's economy was the 1988 “Spitak” earthquake “which affected 40 percent of the territory of Armenia and about one-third of the population” (RA Interim Poverty Reduction Strategy Paper, 2001, P1), having had disrupted the function of economic activities in the country for upcoming years. Following years a wave of awareness of national identity raised in the former Soviet republics, under the light of more global and complex political developments, which ended with the disintegration of Soviet Union, and the appearance of newly former 15 nation states on the map. With the collapse of

Soviet Union the former trade and payments agreements between the countries was collapsed, putting the former Soviet republics in a very unfavorable economic situation.

As a consequence, in the upcoming years following the independence, Armenian economy underwent through a series of events characterized by a considerable reduction of production and sharp decline of real incomes resulting a huge fall in living standards and bringing poverty. According to Tumasyan et al, (2002, p vii) “in 1991-1993 economic decline was so deep, that continuing economic growth since 1994 was not sufficient to reach the 1990 output level: The average annual economic growth for 1990-2001 being still negative -2.9 percent”.

Following the disintegration from Soviet Union the economy of Armenia also experienced major structural changes. Previously known for its industry and high precision machinery production Armenia was a key supplier in a production chain of the Soviet Union. For example, according to Tumasyan et al (2002), in 1990 the largest branches of the industry were machinery and metal processing – 32,8 %, with light and food industries having 24,6 % and 13,2 %, respective weight. By 2001 the structure of industrial production by branches changed considerably, with machinery and metal processing industries having merely 2,8 % shares, whereas food industry gained 38,3% (Tumasyan et al, 2002). Table 1 below gives the dynamics of the structure of some industrial products by the branches of economy over the period 1995 -2003

Table 1 – Structure of Industrial Production by Branches (in percents of total)

Years	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total Industry	100	100	100	100	100	100	100	100	100
Machinery And Metal Working	13,5	9,3	6,5	4,7	3,1	3,7	4,6	4,2	4,8
Ferrous Metallurgy	0,1	0,4	0,02	0,1	0,1	0,1	0,1	0,1	0,0
Non Ferrous Metallurgy	8,7	4,3	3,5	5,4	6,0	10,6	13,7	16,8	21,7
Electric Power	16,2	22,1	26,9	33,5	32,0	30,2	28,3	24,3	19,5
Light Industry	6,6	1,7	1,5	1,7	1,3	1,3	1,4	1,2	1,1
Food Industry	21,8	33,4	36,8	38,3	39,4	38,5	37,1	37,1	37,6

Other	33,1	28,8	24,78	16,5	18,1	15,6	15,9	16,3	15,14
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Source: National Statistical Service of the Republic of Armenia (Statistical Yearbook of Armenia – Industry -various years -1995-2003)

By 2007 the biggest share of manufacturing industry belonged to the food industry – 47,7 % - metallurgical production comprising 25,5%, metal extractive industry – 28,4% and chemical industry account for 3,5% of total industrial output (The Council of Europe, Cemat National Report, Armenia, 2010).

Moreover, not only did economic output, living standards and some other socio-economic parameters declined in a newly formed Republic of Armenia, but also “the generated income was distributed very unequally...with high level of corruption in tax administration and budget expenditures facilitating the increase in inequality” (Tumasyan et al., 2002, p VII). Even worse, however, in terms of regional inequalities, some economic indicators pointed to the considerable inequalities of business activities in the Armenian regions, where in some Marzes unemployment rate substantially diverged from the average (Tumasyan et al., 2002). Table 2 below provides some data indicating that, especially following the first phase of transition, there was a considerable differentiation among Marzes in terms of unemployment.

Table 2: The Unemployment levels (%) of Armenia by Marzes from 1997-2000

Marzes	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Yerevan	11.1	7.4	11.0	12.2	10,8	-			7,6	6,2
Aragatsotn	2.0	2.1	2.5	2.3	2.0	-			1.9	2.1
Ararat	5.7	3.3	5.4	5.5	4.7	-	-	-	2.9	2.4
Armavir	7.8	3.9	8.4	8.7	6.3	-	-	-	3.2	2.4
Gegharkunik	6.7	3.7	7.4	7.6	6.3	-	-	-	4.3	4.6
Lori	13.4	14.7	17.1	17.0	15.7	-	-	-	17.2	17.5
Kotayk	10.2	8.9	10.8	11.0	8.3	-	-	-	5.4	5.7
Shirak	24.8	20.6	23.3	23.3	22.9	-	-	-	17.5	16.5
Syunik	16.2	17.8	19.3	20.8	20.5	-	-	-	17.7	16.2
Vayots Dzor	6.2	5.3	5.5	5.2	5.1	-	-	-	4.9	4.8
Tavush	7.3	6.6	7.6	7.8	6.8	-	-	-	6.4	7.6

Source: National Statistical Service of the Republic of Armenia (Marzes of the Republic of Armenia in figures –Labor Market -various years -1997-2008)

As seen from the table unemployment levels were considerably high in the “Earthquake Zone” –Lori and Shirak Marzes, where the 1988 earthquake affected the most, and in Syunik

Marz, which is a near border region and was affected by an armed conflict between Armenia and Azerbaijan.

However, due to the efforts in reforming the country's economy since the disintegration of Soviet Union Armenian economy witnessed rapid economic growth starting from early 2000s - paralleled with low inflation and prudent monetary policies - and characterized by strong real GDP growth. The rapid growth was attributable mainly to the recovery of the electric power supply (which was working with interruptions during the first years of transition), boom in agriculture and construction, the revival of domestic demand, and a massive international assistance program which made Armenia a major regional recipient of per capita donor funding (The World Bank report, November 2001). Nonetheless, the double-digit growth of the Armenian economy over the past 12 years is really impressive, and especially when comparing with the first phase of the transition, the real GDP growth in mid 2000s was significant: The average growth of real GDP for the period 1991- 1995 was -11,1%, for the periods 1996 – 2000 and 2001-2006 being 5,2% and 12.5 % respectively (IMF Working Paper, Iradian, 2007). Nonetheless, due to the fact the rapid growth of Armenian economy was greatly facilitated by remittances being flowed from abroad, as well as massive funds injected by major development agencies and governments the economic viability of the country is still raising some critical questions and the sustained double-digit GDP growth numbers observed during mid 2000s are not likely to sustain in a long term (IMF Press Release No. 05/123, 2005).

5. Regional disparities in Armenia: Preliminary Discussion

Regional disparities are vividly expressed in the country, where high development indicators are observed mainly in the capital Yerevan. Yerevan is the biggest economic, scientific, administrative, and cultural center of the country, also being the most important transportation and transit junction for all other regions (The Council of Europe, Cemat National Report, Armenia, 2010).

Small and compact, Armenia is a country occupying only 29743 km² area where the longest extension from north-west to south-east is 360 km, and from west to east - 200 km (NSSA -

Geography). Administratively the country is divided into 10 administrative regions (Marzes) with the capital Yerevan, former 11th Marz, now having community status with 12 administrative districts. Table 3 below gives the administrative division of the Republic of Armenia with regional centers:

Table 3 - The administrative division of RA and main characteristics as of 1 January 2009

Marz name	Marz center	Territory, km ²	Population number, ths. persons	Total number of communities
REPUBLIC OF ARMENIA		29743	3238.0	915
YERVAN CITY (Community)		227	1111.3	1
ARAGATSOTN	Ashtarak	2753	141.0	114
ARARAT	Artashat	2096	277.6	97
ARMAVIR	Armavir	1242	282.6	97
GEGHARKUNIK	Gavar	5348	240.9	92
LORI	Vanadzor	3789	281.7	113
KOTAYK	Hrazdan	2089	278.8	67
SHIRAK	Gyumri	2681	281.3	119
SYUNIK	Kapan	4506	152.9	109
VAYOTS DZOR	Yeghegnadzor	2308	55.8	44
TAVUSH	Ijevan	2704	134.1	62

Source: National Statistical Service of Armenia “Nomenclature for statistical regional units (NUTS) in Armenian”, 2010

A vivid indicator of regional disparities in a small country like Armenia might be the differences between the core and periphery in monthly average wages and employment. Despite being small and compact in size, the economy of Armenia is not homogenous and is characterized with high concentrations of population, economic and business activities in the capital city, as well as significant spatial differentiation in income levels. For example, when moving just 120 kilometers away from Yerevan – the capital and biggest economic center, to Vanadzor –the third largest city of the country – 47% decrease in monthly average salaries is

observable (see Table 4). Moreover, occupying only 227 km² area, which comprises only 0.8% territory share in the total area of Armenia, the capital Yerevan has very big shares in total national volume of correspondent branches of economy, services accounting for 90.0%, construction - 87.6%, retail trade – 84.5%, and industry - 49% of total national volumes (NSSA -Marzes of the Republic of Armenia in figures –2004-2008, Yerevan RA Capital, p195).

A little bit more statistics and the first hand picture of the regional disparities in the country will be complete: Out of total 1117600 (~1.1 million) employed people 436000 are employed in the country’s service sector (Yerevan has 90% of service jobs), and 127600 are employed in industry (Yerevan has 49% of industry jobs), amounting for the bulk of the total employment number in Armenia, when the share of Yerevan in Armenia’s total population number for 2008, was only 34.3% (NSSA – Marzes of the Republic of Armenia in figures -2004-2008, Yerevan RA Capital P193).

On the other hand, there is evidence indicating that the prima facie advantage of Yerevan over the other regions of Armenia needs more thorough consideration. This is due to the peculiarities of internal labor market in Armenia, where the rates of labor-force participation and employment are more favorable in the rural part of the country than in the urban (The World Bank, Armenia: Labor market dynamics, Vol. II). The same source reports that in the period 1996 – 2004 the unemployment rates in urban area were much higher than the rural unemployment rates, calling into question the seemingly favorable situation of the capital Yerevan. For 2004 labor force participation rates were favorable in rural areas - 72%, whereas urban areas had 53,8 % of the corresponding indicator (The World Bank, Armenia: Labor market dynamics, Vol. II).

Table 4 provides data with the monthly pays in a regional level and gives some preliminary picture of wage dynamics in the country. The data point that Yerevan as well as two Marzes have considerably high monthly average wages when compared to the rest of the Marzes. Wages in Yerevan come with bold fonts, as well as pays for Kotayk and Syunik Marzes, to indicate a divergence from general patterns of salary dynamics.

Table 4: Average nominal monthly wages of employees in Armenia (by regions)

1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Marzes
23777	26144	29682	31625	39124	49685	57414	69709	83226	99057	Yerevan
12265	13403	13553	17813	23157	30188	39295	48192	55223	64993	Aragatsotn

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15672	15754	15726	22147	27742	34614	46945	51084	58573	66141	Ararat
20023	21283	22713	24490	29645	36865	50999	59007	66368	77044	Armavir
12188	15067	15830	20600	27391	34735	43366	48786	57792	67316	Gegharkunik
12449	16465	19204	21551	26696	35662	42818	47974	56998	67194	Lori
18031	21407	24345	30918	39221	47198	55053	60897	68939	76611	Kotayk
12779	14567	15420	18504	23812	33261	41222	45880	55598	65064	Shirak
18724	23189	24943	28773	37749	50401	61467	74772	93014	103891	Syunik
12319	14063	15647	16519	23295	31124	40499	47336	55144	67888	Vayots Dzor
11635	13571	15191	17854	23213	31450	38351	44489	52390	61724	Tavush

Source: National Statistical Service of the Republic of Armenia (Marzes of the Republic of Armenia in figures –Labor Market -various years -1999-2008)

The reason I highlight these two Marzes in regional monthly-wage data is that the salaries in these two Marzes differ significantly from that of other Marzes in Armenia due to several reasons. For Syunik Marz it is mainly mining industry. It is the richest Marz of Armenia with useful minerals, such as non-ferrous metals (copper, molybdenum, zinc) and precious metals—such as gold and silver (National Statistical Service of Armenia, Marzes of Armenia in Figures, 2004-2008). Table 5 below summarizes the structure of industrial product of Armenia by Marzes, where the bulk of the mining industry – 84,3 is in Syunik Marz.

Table 5- The shares of Mine and Manufacturing industries in industrial product structure (2008 - with regard to total in percent)

Name of RA Marz	Total industry	Mine industry	Manufacturing industry
Yerevan	100	0,9	86,9
Aragatsotn	100	4,6	79,3
Ararat	100	1,0	85,6
Armavir	100	-	37,8
Gegharkunik	100	2,0	61,7
Lori	100	2,3	82,9
Kotayk	100	2,6	61,4
Shirak	100	2,7	72,0
Syunik	100	84,3	6,5
Vajots Dzor	100	0,5	77,0
Tavush	100	5,4	63,0

Source: The Council of Europe, Cemat National Report, Armenia, 2010

According to The Council of Europe (Cemat National Report, Armenia, 2010) the prevailing position of Syunik Marz in industry gives it GDP priority in the republic and some cities in this Marz such as Kapan, Kajaran, Meghri and Agarak are notable for their economic development. In the period 2000 – 2006, when Armenian economy showed rapid economic growth, characterized by strong real GDP growth, only Syunik Marz exceeded average national indicator (18.3% average annual growth), which however was attributable to the mining industry in the region.

Besides, Table 4 shows that starting from 2004 that Syunik Marz – a province with highest wages – catches up with Yerevan – the next high-wages region. This might be attributable to the fact that a considerable increase in output in mining industry was noticeable only after 2004, when a giant “Zangezur” mining plant was denationalized. Famous for its industrial power in Soviet times, Zangezur mining plant considerably reduced the industrial output after the disintegration of Soviet Union, and the production capacity and workforce never restored to the previous numbers. In 2004 “Zangezur copper-molybdenum plant” CJSC (ZCMP) – a major mining company in Syunik Marz - was created, and starting from 2005, molybdenum concentrate was no longer exported from Armenia: They started a complete processing cycle in the country and the final product was exported to the international markets (“Hayastan” – Economics and Finance Journal, 2005).

Yet this picture is changing due to the recent global economic crisis and associated decline in prices of non-ferrous metals in the international markets, and the long-time trend of Syunik Marz as a high wages region might change if the demand for its mining industry is not recovered to the previous levels.

Kotayk Marz enjoys the immediate proximity to Yerevan – the biggest economic center of Armenia. According to The Council of Europe (Cemat National Report, Armenia, 2010) the main area contributing to the economic advancement of the Kotayk Marz are investments in construction and rehabilitation of infrastructures and a ropeway in the mountainous area of Tsakhadzor – an internationally recognized ski resort with an altitude of 2900 meters and ropeway constructed by well-known Leitner company. The development of tourism and alpine skiing made Kotayk Marz famous resort area, especially for people from CIS countries, which makes high paying service-jobs available in the region. Besides, Kotayk’s crucial role in energy field (the thermal Power Station “Hrazdan”), as well as in food and beverages industry (Kotayk brewery, meat processing) make this region comparatively developed among other regions of Armenia.

This preliminary discussion of income differentiation in Armenia sheds light on some factors standing behind fluctuations in incomes among the regions. Still, in an empirical and academic fashion income differentiation among economies/regions is measured by the standard deviation of incomes levels in the concerned economies. To statistically test whether the Marzes converge in their wages levels or diverge we need to employ a method of Sigma convergence with the respective methods and formulas, all of which will be discussed below, under methodology section.

6. Factors contributing to regional inequalities

In a macro-level regional inequalities and uneven spatial development takes place for a number of reasons. Factors standing behind the regional disparities might be market and government failures, underdeveloped infrastructures, internal migrations or factor immobility as well as some positive and negative externalities coming with congestion and clustering – all of which contribute to the widening gaps between the economically developed cores and the periphery (Kanbur and Venables (2005).

Despite the outstanding GDP growth – 12,4 average annual % for the period of 2000-2008 (The World Bank, ICT at a Glance) –inequalities in regional development deepened in Armenia which can be attributable to the growing economic role and influence of capital Yerevan. As a result, especially during the last years, the gaps of living standards between Yerevan and Marzes increased considerably and continuously - reaching to the concerning scales, according to The Council of Europe (Cemat National Report, Armenia, 2010).

Besides, the differentiation of economic activities between the Marzes also deepens because the state does not have an explicit regional development programs to handle the regional inequalities. Tumasyan et al (2002) note that, it is chiefly due to economic and profit seeking motives that investment and businesses flow into any region of the country, and the government of Armenia has a little role as a decision maker in this regard. As a result, in parallel with the notable real GPD growth, the economic growth is concentrated in the country and centralized within certain industries as well as particular Marzes. For example it was only the small gem-processing branch of economy – with just a thousand employees working in Armenia's diamond industry - responsible for \$70 million in the total exports volumes of the country: That was as much as 30 percent of the 1999 manufacturing exports (The World Bank report, November 2001).

Among other factors contributing to the regional disparities in Armenia is the heavily concentrated and localized labor market which has its peculiarities due to the changes that the

country's economy faced within the past decade. According to the records in The World Bank report (Armenia: Labor market dynamics, Vol. II) the internal labor market in Armenia is not homogenous as a result of varying speeds of the reforms, unequal investments and different patterns of consumption among the regions, which contributed greatly to regional disparities in employment and unemployment.

II. REVIEW OF RELATED LITERATURE

There are many theoretical papers and researches analyzing regional inequalities and uneven economic development in an intra-state level. Kanbur and Venables (1995), approach the issue from economic geography perspective. Analyzing the evidence of spatial inequalities from China, Russia, South America, Africa, and some European countries they see common traits in all countries with high spatial inequalities: In that public infrastructure turns out to be the most important factor explaining the prevalence of inequalities in that countries. Felsenstein and Portnov (2005), review the notion that small countries do not experience significant regional inequalities due to their compact size and "smallness". Analyzing regional disparities in small European countries they try to see, following the trends in global economy, whether there are valid reasons to expect more regional integration in small-size countries than in large nation states.

Fujita, Krugman and Venables (1999), analyze regional disparities in the light of New Economic Geography. They analyze the notion of increasing returns, productive factors movements and transportation costs under the light of regional economics, bringing the spatial aspects of the economy into a focus. In that, their notion of economic geography – the study of where and why economic activity happens – brings a fresh insight to the studies of regional inequalities, through rediscovery of spatial dynamics in economics, where "regional and urban development hinges crucially on the role of increasing returns" (Fujita, Krugman and Venables, 1999, p2).

A large number of papers address the issues of spatial inequality and regional disparities in China, since the sharp changes in gross output followed by reformation era put some provinces and coastal areas in very favorable conditions, meanwhile making many other regions even worse in socio-economic terms. In that, studies in regional inequalities are numerous and sometimes contradicting. For example Chen and Fleisher (1996), with the use of Solow growth model and panel data comes to a conclusion that there is convergence of per

capita production across China's regions in a time span from 1978 to 1993. Keidel (2009), theoretically divides China into 7 regions and comes to a conclusion that there is divergence in rural income and consumption for both 1980–2005 and 2000–05 time periods. He also suggests that high regional disparities and resulting migration to more prosperous regions show that “inequality plays an important positive role in inducing economic actors voluntarily to move to more productive locations and activities as a mechanism for ensuring sustainable improvements in individual well-being” (Keidel, 2009, p 538).

Etherington and Jones (2009), on the other hand, review the notion of “new regionalism” - a paradigm which sees regions and city-regions as successful models of economic development. They come to a conclusion that the so called “city-regions” contribute to the divergence between regions, with a propensity to increase, rather than decrease regional disparities and uneven development.

At a micro-level several studies and researches have been also done on inequalities and socio-economic developments of Armenia after it gained independence in 1991. Particularly Tumasyan et al (2002) discuss the incidence of poverty in Armenia, following shortly after 1991, describing it as “a new phenomenon of the social-economic situation” in the country. In that, acknowledging that country's economic growth is the primary means to poverty reduction in Armenia, nevertheless, Tumasyan et al (2002) state that the reduction of poverty should be targeted by redistribution policies, pointing to the fact that by 2002 the bulk part of the country's gross output was produced or generated within few enterprises, thus meaning that they were owned by a small number of people.

Referring to the studies, showing that corruption, protectionism, and other structural challenges create favorable conditions for a small number of enterprises and people, meanwhile limiting the prospects of the development of others, they conclude that unequal distribution of income and inequalities in general are “due to a set of problems such as market's imperfection, management inefficiency, constraints of economic freedom and the existence of power elite monopolies and corruption” (Tumasyan et al (2002, p9). Interestingly, an analysis of the study results leads Tumasyan et al (2002) to conclude that redistribution policies in light of the smooth distribution of income is more important for the reduction of social polarization and poverty than economic growth is.

Economic Development and Research Center in Armenia (EDRC) has done another research in the area of unequal distribution and economic development in the country. In the paper “Modeling of Economic Policy, Income Distribution and Poverty” (EDRC, 2003) a set of tools and modeling is introduced, again under the light of the assumption that economic

growth of, course, is crucial for overcoming polarization and poverty, yet without reformed redistribution policies it is not attainable. Particularly, EDRC had come up with a set of macroeconomic models which explain the complex relationship between economic growth and poverty reduction and income distribution objectives in the country. For example, Macroeconomic Adjustment and Growth Model of Armenia (MAGMA), “allows to build a macroeconomic framework, which is used to derive income distribution of deciles’ groups (by branches of economy and type of income) and Gini coefficient and poverty incidence” (EDRC, 2003).

Nonetheless, the empirical part of this paper is more closely related to Rapacki and Próchniak (2009) paper where they test for real beta and sigma convergence in 27 transition countries in 1990-2005. Focusing on absolute beta and sigma convergence they do a thorough analysis of economic convergence of 27 ex-Socialist countries to find out if there is convergence or divergence among these transition economies within 15 year time-span. For the purpose of my analysis methodological approach applied in Rapacki and Próchniak (2009) paper is the best way to statistically test for the convergence or divergence among 10 regions of Armenia and the core and the capital Yerevan. Rapacki and Próchniak (2009) focus on two types of measures for convergence or divergence. Sigma convergence occurs when income differentiation between economies decreases over time. The other measure testing convergence/divergence between economies is Beta convergence, which takes place when less developed countries show faster characteristics of economic growth than more developed countries.

Meanwhile, it is possible to measure the dispersion of income in several ways. Most common means are standard deviation, the coefficient of variation or CV, and variation of per capita GDP levels between the discussed economies or regions. Vojinovich, Acharya and Prochniak, (2009) use the coefficient of variation of GDP per capita at purchasing power parity, to test for convergence of GDP per capita among ten European countries. They find that new joined and poorer member states of the European Union grew faster than the richer EU member states, which basically indicates to the Beta convergence.

Another paper which is testing for Beta convergence is that of de la Fuente (2002) where the analysis seeks to find out convergence patterns among Spanish regions. For analyzing convergence in Spanish regions de la Fuente adopts the consensus view in the convergence literature that “there is a negative partial correlation between growth and initial income (i.e. of beta convergence) both at the national and regional levels” (de la Fuente, 2002, p.571) . The main finding in that paper is that the spillovers in technology and the associated catch-

up, and the redistribution policies in employment across Spanish regions stand for successful reduction of regional inequalities in the country.

Meanwhile, perhaps the most important paper discussed in this literature review will be that of Paul Krugman (1991), where he builds a model which explains how some countries may endogenously develop to become regionally diverged economies with an industrialized core and an agricultural periphery. From the methodological point of view this model best approximates the economic reality of Armenia, where, we see a clear pattern of highly congested and concentrated metropolitan “core” and a “periphery” which lags behind with its socio-economic indicators.

In this model, Krugman (1991) suggests that this pattern of core-periphery that some countries develop is due to a set of variables, the most important of which are the transportation costs, economies of scale, and the share of the region’s manufacturing in national income. Indeed, above I referred to some numbers which clearly indicated towards the highly concentrated economic core in the country. In 2008 Yerevan, the capital and the largest city in the country had 90 % of services, 87.6 % of retail trade, and 84.5% of industry shares in total national volume of the mentioned branches of economy (NSSA – Marzes of the Republic of Armenia in figures -2004-2008 – Yerevan RA Capital, p195). In that, it seems that what Armenian economy undergoes in particular and what the core-periphery model describes in general is a vicious circle which reinforces itself through the established patterns of strong core-economy. Indeed, Krugman (1991), notes that to realize the economies of scale with simultaneously seeking to minimize transport costs, the manufacturers prefer to locate in the regions which have larger demand, yet where the demand is, is largely determined by where the manufacturing takes place.

III. EMPIRICAL MODELS AND THE DATA

In a macro-level, the theoretical foundation of my analysis will be New Economic Geography approach, which is basically the rediscovery of the space in economic analysis. In that, regardless of the choice of particular NEG methodology, in general economic geography

“seeks to relate the spatial distribution of production to a trade-off between agglomeration and dispersion forces in the presence of varying degrees of trade costs” (Potter, 2009, P1226). In that the general NEG model’s relevance to Armenian economy is straightforward – policy makers in Armenia face the same tradeoff: From the one hand there are the agglomeration forces and a fast growing metropolitan core, from the other hand, there is the need to boost the lagging regional economies and improve infrastructures.

Interestingly enough it is not always the case when agglomeration and concentration of production in few regions bring significant differences between regions in per capita incomes. As Porter (2009, p1228) notes “spatial concentration in core regions does not necessarily imply any differences in regional incomes per head between the core and the periphery”

Meanwhile, it is worthwhile to note that there number of variations in the New Economic Geography analyses with important distinctions such as static or dynamic methods. Potter (2009), notes that static models take the volume of production as fixed over time or see no long-run national growth and are very useful for understanding the dynamics of spatial discrepancies. Nonetheless long time national economic growth and increasing returns to production seem to be crucial for the economic prosperity of the country; hence New Economic Geography developed another, dynamic model, where long term economic growth and increasing returns are the basic presumptions.

1. Theoretical Framework: The “Core-Periphery” Model

Krugman (1991, p 483) defines economic geography as “a study of the location of factors of production in space”. A simple, but meanwhile illustrative model to describe regional discrepancies is “core-periphery” method which basically seeks to explore why do manufacturing and production become concentrated in a small number of regions, whereas others regions lag behind with relatively underdeveloped infrastructure and economy (Krugman, 1991).

This model, however, is not focusing much on the reasons standing behind for why industries are located in particular areas or regions. Rather, the model seeks to explain the patterns by which manufacturing in general ends up being concentrated in either one or in a few regions of a particular country, while leaving the other regions in a status of peripheral-economies as agricultural suppliers to the manufacturing core (Krugman, 1991). In that, the “core-periphery” model has limitation in explaining the economic reality of Armenia, since, the simplification that assumes only two sectors of economy, and considers only two regions is

far from reflecting the real economy. Yet, as we shall see in the upcoming analysis, the model successfully answers whether there will be regional convergence or divergence depending on the set of parameters that will be discussed below.

Besides, the “core-periphery” framework is well applicable for studying regional disparities in Armenia since it incorporates two assumptions that reflect the economic situation in Armenia. Firstly, the model assumes that other things equal, the favorable locations of production and economic activity will be “those with relatively large nearby demand, since producing near one's main market minimizes transportation costs” (Krugman, 1991, p 486). Considering the poor infrastructure and communications that the country has, this assumption is widely applicable for Armenian economy. For example, from 1999 to 2008 expenditures exceeded revenues¹ from freight transportation (Table 6), indicating towards ineffective infrastructures (in many cases remnants from Soviet era) which supposedly caused even greater concentration of production in the “core”.

Table 6 : Revenues and Expenditures from Freight Transportation (1999-2008)

	Total of Freight Transportation									
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Revenues	7522.7	7462.7	8066.8	8762.9	9610.8	16558.1	17974.5	20316.1	21672.0	29166.2
Expenditures	9846.4	9230.9	9484.8	8270.5	10744.7	27630.0	22309.1	26457.4	22857.6	29311.1

Source: National Statistical Service of Armenia, Statistical Yearbook of Armenia 2004 (p.346), 2009 (p.316) –Transport and Communication

That inefficient infrastructures tend to make firms and producers to concentrate nearby large demand seem to be further supported with the statistical data from the Marzes (regions) of Armenia. For example, for 2008 the “core’s” (Yerevan) share in the national structure of industrial output (Total=100) was 49.0. Other 10 regions together, occupying 99.2 % total territory share, and comprising 63.7% of the country population have only half of the total industrial output of the country (NSSA-Statistical Yearbook of Armenia 2009- Industry, p 250).

Secondly, in the core-periphery model, “circular causation”, defined by Myrdal (as cited in krugman, 1991), causes economic activates to concentrate close to large markets, but on the

¹ 2002 is exception

other hand, markets will tend to be concentrated in places where there is a high concentration of manufacturers production. This process of “circular causation” makes the population to concentrate in more favorable areas, and this process starts feeding on itself, making it “more desirable to live and produce near a concentration of manufacturing production because it will then be less expensive to buy the goods this central place provides” (Krugman, 1991, p486).

Indeed, Tumasyan et al (2002) note that there are trends of concentration of business activities in a certain region of the country, resulting a significant differentiation of economic activities between the Armenian regions. As a result, in some regions of the country the unemployment rate is below the national average, making the economically active “core” even more attractive in terms of employment and business opportunities.

The “core-periphery” method, which basically represents oversimplified version of a regional economy, is a powerful framework to model complex interaction of economic agents in a two-sector economy. The model considers two regions, where two kinds of production takes place: agriculture with the properties of constant-returns to scale, and manufacturing which is an increasing-returns sector and can be located in either region (Krugman, 1991).

Sure, the model is not fully representative of Armenian economy, where there are 10 regions and the capital, with manufacturing, agriculture and services, with considerably high shares of service sector of the economy. Yet, this framework will be applicable for studying convergence dynamics in the area making the complex real world economic activities traceable and simple.

2. Hypothesis

There are two conflicting forces in the “core-periphery” model, working towards either convergence or divergence, depending on which force is dominant in the regional dynamics (Krugman, 1991). The forces working towards regional convergence are free market and competition forces for the local peasant market. On the other hand, the forces working towards regional divergence are the “circular causation”, and “home market” effects: A self feeding process when economic activities tend to concentrate close to large markets, and markets tend to locate in places where there is a high concentration of manufacturers production. The important question to ask, in terms of convergence/divergence, is which forces dominate in the two region economy we are discussing.

Meanwhile, a very important assumption that the “core-periphery” model (Krugman, 1991) makes, assumes that:

Assumption : Workers tend to move to the region (Marz) which offers higher real wages.

Based on the assumption given above, and the convergence/divergence patterns briefly described, it is now pertinent to present the main reasoning of this analysis given in a form of null and alternative hypothesis:

Null Hypothesis: Over the concerned period income levels (wages) will tend to diverge between the Marzes ².

This scenario predicts regional divergence in income levels over the period 1999-2008 over time. Initially, when the Marzes in our two-region economy are equal in their numbers of workers, they offer equal wages. But the move of workers from one region to the other (due to “circular causation” “home market” effects) will lower the price indexes in one region (the “host” region) and raise them in the other (the region from where workers leave), thus raising real wages in “host” region relative to those in the other region (Krugman, 1991). Consequently then, this leads to the regional divergence in our two-region economy.

Following this logic regional divergence in income levels takes place in Armenia, because economies of scale and transport costs make the producers to concentrate their activities near the large markets. Thus, other things equal, following the “home market” effect “the wage rate will tend to be higher in the larger market” (Krugman, 1991, p 491). In our case the larger market, for sure, is Yerevan, our core and the higher wages there will contribute to the regional divergence in the country.

Nonetheless, there are forces other than economies of scale and transportation costs which make producers and manufacturing locate in less competitive environment. In our model economy where there are only manufacturing and agriculture competition for delivering the manufacturing goods to the peasant population will be one factor, forcing the manufacturing to locate where there is smaller manufacturing workforce. Indeed, following the competition forces we can expect convergence between region “as they move toward equality of worker/peasant ratios” (Krugman, 1991, p 490). From these assumptions, follows our alternative hypothesis:

² Here I refer to Yerevan as a Marz (even though it has a separate status) to avoid the complicated language in my hypothesis formulation.

Alternative Hypothesis: Regional convergence in wages levels in Armenia over the concerned period will occur.

Apparently, there is a trade-off, in the “core-periphery” model, “between proximity to the larger market and lack of competition for the local market” (Krugman 1991), and the question is which forces dominate in the concerned economy. From the one hand there is a proximity to the larger market – thus a potential to realize economies of scale, which leads to the concentration of the manufacturing activities and higher wages in the region, resulting regional divergence in the economy. From the other hand, the less competition for the local market in a small manufacturing workforce region can ensure that manufacturers might face less competition for the local peasant market than those workers in the region with more population. Thus, lack of competition will ensure still high wages in this less populous region, which eventually will lead to regional convergence in the economy.

3. Methodology: Sigma (σ) Convergence

In the core- periphery model we saw that the tradeoff between being located close to larger markets and locating where there is a less competition basically decides whether the regions will converge or diverge. This section will approach to the same question more empirically where the methodological background will be given to find out whether the Marzes in Armenia have converged or diverged over time.

Sigma convergence takes place when income differentiation between economies decreases over time. Since to test for convergence between Marzes of Armenia we actually need to track the dispersion of income levels between the regions, we can simplify things by measuring the standard deviation, variation, or the coefficient of variation (CV) of wages among regional economies (Vojinovich, Acharya and Prochniak, 2009). In my analysis I will use the coefficient of variation of wages in the regions of Armenia, which is represented by the following formula:

$$CV = \frac{\text{Standard Deviation}}{\text{Mean}} \quad (1)$$

In this formula the numerator is the standard deviation – the most common measure of absolute dispersion (Lyons, 1991).

Lyons notes that the method of coefficient of variation is widely applicable and “established as the most frequently calculated indicator of interregional disparities in the existing literature” (Lyons, 1991 p 474). As noted above, Sigma convergence takes place when differences in income levels between regional economies decrease over time. To statistically test whether or not Sigma convergence takes place Vojinovich et al (2009) suggest using the estimation of the trend line of the dispersion in income levels among the concerned economies, which is presented with the formula:

$$CV(y_t) = a_0 + a_1t + \varepsilon_t \quad (2)$$

Here y_t is the average monthly pays in the regions of Armenia, t is time with a span from 1999 to 2008 and ε_t is the error term. Our explained variable is the coefficient of variation of income levels among the Marzes of Armenia, while the independent (explanatory) variable is time. In order to verify if there is Sigma convergence we will have to follow the parameter a_1 in formula (2): If a_1 is negative then Sigma convergence exists (Vojinovich et al 2009).

It is worthwhile to mention that this method has certain limitations. Rapacki and Próchniak (2009), note that the method of estimation of the trend line of the dispersion in income levels is not always the best way to test for Sigma convergence. They note that it might be the case that differences in income levels may change non-linearly, and more importantly, not always does the method enable to identify the exact trends in income differentiation in particular years. Moreover, Lyons (1991) notes that by using the method of coefficient of variation we, of course, measure a relative dispersion (measuring dispersion relative to the mean).

An alternative method to test for convergence between the economies is Beta (β) convergence. Vojinovich et al (2009) explain the concept of Beta convergence as a process when less developed economies tend to grow faster than more developed economies, indicating that negative relationship exists between the initial income levels and its growth rate. Interestingly, Beta convergence gives information about the speed of convergence, but it is “a necessary but not the sufficient condition for Sigma convergence”, since it is possible for the economies to reveal Beta convergence but not to have Sigma convergence (Vojinovich et al, 2009, p 127).

Nevertheless, the purpose of this paper is to test whether or not income differentiation between economies decreases over time, and the methodology for testing it is Sigma

convergence. Besides, the Coefficient of Variation is probably the most widely used method of measuring disparities between regions and “It is not only a well-recognized statistic, but it is also a reasonably good measure of inequality” (Chen and Fleisher, 1996 p 146). Thus I will follow formulas (1) and (2), and the concept described above, where according to Wei, Yao and Liu (as cited in Chen and Fleisher 1996) higher values of coefficient of variation shows more income disparities and vice versa.

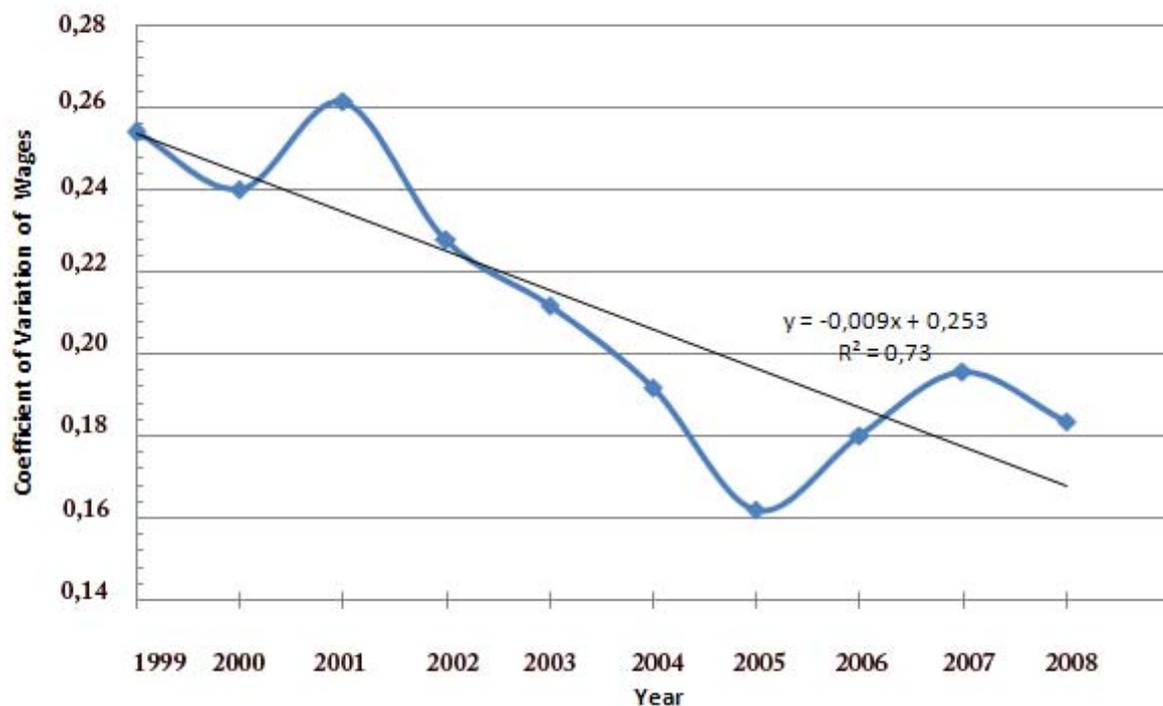
4. Data

I use data on average monthly wages of employees for the period 1999 -2008, provided by National Statistical Service of the Republic of Armenia. The National Statistical Service refers to nominal wages as “the gross remuneration of employees, taking into account taxes and other deduction defined by the RA legislation” (NSSA – Statistical Yearbook of Armenia 2009, p71).

IV. FINDINGS

The results of Sigma convergence in wages for Armenian Marzes and Yerevan are presented below. Table 7 gives the average monthly wage levels for the Marzes and the capitals Yerevan as well as the respective calculations for standard deviation, mean and the coefficient of variation, according to formula (1) presented above. Figure 1 supplements Table 7 by plotting the dynamics of coefficient of variation for average monthly wages, and the respective trend line for the period 1999 – 2008.

Figure 1 - σ convergence of average monthly wages in the regions of Armenia, 1999-2008



Source: Author's own calculations

Table 7 – Average monthly wages and respective calculations for Standard Deviation, Mean and Coefficient of Variation

MARZ	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Yerevan	23777	26144	29682	31625	39124	49685	57414	69709	83226	99057
Aragatsotn	12265	13403	13553	17813	23157	30188	39295	48192	55223	64993
Ararat	15672	15754	15726	22147	27742	34614	46945	51084	58573	66141
Armavir	20023	21283	22713	24490	29645	36865	50999	59007	66368	77044
Gegharkunik	12188	15067	15830	20600	27391	34735	43366	48786	57792	67316
Lori	12449	16465	19204	21551	26696	35662	42818	47974	56998	67194
Kotayk	18031	21407	24345	30918	39221	47198	55053	60897	68939	76611
Shirak	12779	14567	15420	18504	23812	33261	41222	45880	55598	65064
Syuink	18724	23189	24943	28773	37749	50401	61467	74772	93014	103891
Vayots Dzor	12319	14063	15647	16519	23295	31124	40499	47336	55144	67888
Tavush	11635	13571	15191	17854	23213	31450	38351	44489	52390	61724
St.DEV	3919,22	4251,28	5044,02	5190,74	6180,01	7241	7622,28	9797,39	12501,9	13612,92
MEAN	15442	17719,4	19295,8	22799,5	29185,9	37743,91	47039	54375,1	63933,18	74265,73
Sigma Conv	0,25	0,23	0,26	0,22	0,21	0,19	0,16	0,18	0,19	0,18

Source: National Statistical Service of the Republic of Armenia (Marzes of the Republic of Armenia in figures –Labor Market -various years -1999-2008). Sigma convergence and respective numbers are authors' calculations.

Figure 1 and the data presented in Table 7 reveal that the Marzes and Yerevan revealed Sigma convergence during 1999 – 2008. The negative slope of the trend line in Figure 1 shows that income differentiations between the regions of Armenia tend to decrease over time. Indeed, in the method section of this analysis, I presented formula (2):

$$CV(y_t) = a_0 + a_1t + \varepsilon_t$$

This equation of trend line was suggested by Vojinovich et al (2009), where they suggest that if a_1 is negative then Sigma convergence exists. Since in our case the parameter a_1 is negative (-0,009 in Figure 1) we reveal Sigma convergence in income levels in the country.

The results of the trendline analysis further reinforce our regression equation given in formula (2). The analysis reveals good statistical properties which further support the earlier statement that negative slope in the regression equation means decrease in income level differentiations. Particularly, highly significant R square (73%) of the trendline analysis indicates that the results are statistically significant – though the used statistical method is quite simple, and I don't have more indicators of significance level (such as p-value). Nonetheless, considering the good properties of R-square significance test -to determine the reliability and accuracy of the trend and forecast – I reject my Null Hypothesis of the income level (wages) regional divergence over time.

This finding somehow changes the prima facie notion of deep regional disparities which I discussed in the introductory part of my analysis. Nonetheless, as I proceed with the discussion of results, I will argue that although Marzes in Armenia reveal Sigma convergence in wages over time, yet the interpretation of this finding should not be univocal and should not have a possible meaning of absolute convergence.

V. DISCUSSION

Indeed, Figure 1 shows that the convergence process of wages is not linear, but rather, in some periods the regions of Armenia revealed divergence in wages. Sigma divergence is observed in two sub – periods: from 2000 - 2002 and 2005 – 2008.

The two sub –periods of Sigma divergence reveal some interesting dynamics of the internal labor market and wage characteristics of Armenia. In these periods the observed divergence of coefficient of variations of wages reveals correlation patterns with some other indicators of labor market dynamics (Table 8 below). Of particular interest is the 2000 – 2002

sub period which shows that all the indicators of labor market characteristics presented in Table 8 follow the same pattern: As the CV, the other numbers too, follow the pattern of U-shaped dynamics.

Table 8 – Some characteristics of labor resources³ of the Republic of Armenia*

Years	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
<i>CV of Wages Employed Population</i> ⁴	0,25	0,24	0,26	0,23	0,21	0,19	0,16	0,18	0,20	0,18
Employed in peasant farms	24,1	23,4	23	24,9	25,1	24,6	24,2	23,7	23,1	22,2
Economically active Pop. ⁵	63,9	61,4	58,7	62,7	61,4	58,6	57,7	55,9	54,5	54,1
Unemployed ⁶	7,2	7,2	6,1	6,8	6,2	5,6	4,7	4,2	3,8	3,4

* percent- as a percent of total labor resources

Source: National Statistical Service of the Republic of Armenia (Statistical Yearbook of Armenia – Employment -various years -1999-2008). CV of wages - author’s calculations.

The observed correlation (but not necessarily causation) between coefficient of variation of wages and the presented labor resource characteristics (especially that of Employed Population and Unemployment) reveal some interesting peculiarities of the Armenian labor market. For example, the observed association between the divergence in monthly average salaries between Marzes (CV of Wages) and the number of persons employed in the agricultural sector (Employed in peasant farms) might indicate that rural areas are still in more favorable conditions when it comes to the economically active and employed population ratios.

³ According to National Statistical Service of Armenia (2009) labor resources in the country are formed from able bodied population at working age (persons who are within age limits defined by national legislation as age of employment); working pensioners and working teenagers.

⁴ Employed population are both wage-earners and non wage-earners (irrespective whether this work is permanent, temporary, seasonal, occasional, or one-time) , who receive income with or without hiring workers, those who are temporarily not at work for some reasons (National Statistical Service of Armenia, 2009).

⁵ Economically active population includes all employed and unemployed population, who develop labor market (related to labor force supply) for production of goods and services (National Statistical Service of Armenia, 2009).

⁶ in accordance with the RA existing legislation-unemployed (officially registered) consist of capable and able-bodied jobless citizens who not receive pension established by legislation (excluding for pensions appointed at loss of the breadwinner), with the purpose of job placement are taken on the account in state service of employment, are ready to start to work and have received the status of the unemployed (National Statistical Service of Armenia, 2009)

Indeed, from Table 8 we see that the fall in the number of people employed in peasant farms is associated with the rise in the indicators of coefficient of variation. The tendency of the widening of the wage gaps between Marzes (CV) stops as the number of people busy in agriculture starts rising again in 2003, and regions start diverging in wage levels again when those working in peasant farms decrease in numbers again.

Due to the lack of data on the same parameters for 2009 and 2010 I cannot comment on the relationship between the concerned numbers after the end of our second sub – period of divergence. With data available for 2009 and 2010 it would be interesting to observe if the association between the number of workers in agriculture and the divergence of wages would follow the same patterns as we observe with the data we have now. Meanwhile, it is important to mention that this interpretation does not necessarily reveal causation between the concerned numbers and a further analysis is needed to reveal the character as well as the depth of this relationship.

However, this particular discussion seems to be in line with that of The World Bank report (Armenia: Labor market dynamics, Vol. II), where the analysis of urban – rural labor markets reveal that participation of labor force and employment rates in rural areas have been much more favorable than in cities. Interestingly enough, the same source from The World Bank reports that particularly significant differences between urban and rural unemployment rates were recorded in 2001; my analysis goes in line with this – in the first 2000 – 2002 sub – period the divergence between regions of Armenia reaches its peak in 2001. According to the census of The World bank, in 2001 the unemployment rate in urban areas was 48,4 %, while the rural unemployment was merely 17,4 % (The World Bank report, Armenia: Labor market dynamics, Vol. II).

Besides, two Marzes with unusual high wages in light of the average national salaries might have contributed greatly to the convergence process. The high wages in Syunik and Kotayk Marzes, as well as the basic reasons standing behind the difference, is discussed earlier in this paper. Meanwhile, it might be interesting to observe the convergence dynamics if these two Marzes were temporarily excluded from analysis.

Table 9 below summarizes calculations of Coefficient of Variation and the respective years. Meanwhile, it is worthwhile to mention that, according to Chen and Fleisher (2009) higher values of Coefficient of Variation indicate towards more serious income disparity, and vice versa.

Table 9 – Years and respective Sigma Convergence calculations with and without Syunik and Kotayk Marzes

Year	Coefficient of Variation of Wages	Coefficient of Variation of Wages (Without Syunik and Kotayk Marzes)
1999	0,25	0,27
2000	0,23	0,24
2001	0,26	0,26
2002	0,22	0,20
2003	0,21	0,17
2004	0,19	0,15
2005	0,16	0,13
2006	0,18	0,14
2007	0,19	0,14
2008	0,18	0,15

Source: Data for on nominal average wages necessary for calculations provided by National Statistical Service of the Republic of Armenia. Sigma convergences are authors' calculations.

It is noticeable from Table 9 that the exclusion of the two Marzes (with higher wages than the national average) changes the convergence pattern considerably. Yet more attention deserves the fact that the noticeable divergence in coefficient of variation numbers in Table 9 starts actually from 2005. This might be mainly attributable to the fact that the mining industry in Syunik Marz (thus the respective high wages) actually started to revive after 2004, when "Zangezur copper-molybdenum plant" CJSC (ZCMP) was created (previously state owned and operating with low volumes of production). It is also worthwhile to note that starting from the 1st January 2005, the ZCMP introduced a 5-10% raise in the salaries of its 2500 employees ("Hayastan" –Economics and Finance Journal, 2005). Hence, the resulting catch-up, and even surpass when compared to wages in Yerevan (Table 10).

Table 10 – The catch –up of Syunik Marz wages with that of Yerevan

1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Years
23777	26144	29682	31625	39124	49685	57414	69709	83226	99057	Yerevan

18724	23189	24943	28773	37749	50401	61467	74772	93014	103891	Syunik
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Source: National Statistical Service of the Republic of Armenia (Marzes of the Republic of Armenia in figures –Labor Market -various years -1999-2008)

Moreover, despite the convergence pattern in monthly average wages among the Marzes, the labor market in Armenia is not homogenous. As I discussed earlier in this paper the internal labor market is heavily concentrated and localized and varies considerably across the regions. More important, however, is the fact that employment rates vary between urban and rural workforce significantly. Considering the fact that during the first decade of the independence and up until mid 2000s labor force participation rate and employment levels have been more favorable in rural areas (The World Bank, Armenia: Labor market dynamics, Vol. II), the findings of the regional wage convergence should be interpreted with caution. Because the method of estimation of Sigma convergence in this analysis does not take into consideration population weights in the Marzes –some of which have very high ratios of rural population –the convergence/divergence patterns in monthly averages wages might have some degrees of distortion.

Indeed, the calculations of coefficient of variation of average monthly wages and the resulting Sigma convergence numbers are done using formula (1), according to which we divide standard deviation over the mean to get the corresponding results. However, this method does not take into consideration the population weight of the particular Marz - thus introducing a degree of distortion into the analysis of convergence dynamics. In that, Lyons (1991) differentiates between population weighted and unweighted coefficient of variation where the latter is more sensitive towards measuring the convergence/divergence patterns of the concerned economy. Particularly, population weighted coefficient of variation enables to track the widening disparity between concerned regions when they differ in key economic measures - such as value added –even if these measures per capita in region are one-half of that of the other (Lyons, 1991).

VI. CONCLUSION

At the beginning of this analysis I defined the main purpose of this paper to be the empirical test of the income level (wages) divergence hypothesis. My null hypothesis was built on the assumptions, widely discussed in the number of papers and academic journals, that disproportions of territorial development in the country tended to deepen over time in parallel to the rapid growth of the economy –described as a double-digit growth especially during mid 2000s (The Council of Europe – Cemat National Report, Armenia 2010; The World Bank –ICT at glance; Country Brief-Armenia (2008) etc). In that, the bulk of the growth accounting was actually attributable to the growth generated in capital Yerevan which led to the significant differentiation of life standards standards between Yerevan and the Marzes of Armenia.

The statistical test and the applied the trendline analysis provided with the results which I considered to be statistically significant to reject my null hypothesis. In this regard, it is important to mention the limitations of this analysis and encourage further discussion of the interpretation of results and methods applied.

First, it is worthwhile to mention that even though the coefficient of variation a widely used and applicable method of measuring the disparities between regions, still the use of monthly average wages in this analysis introduces some degree of distortion to the applied method. For example Vojinovich et al (2009) use the coefficient of variation of GDP per capita at purchasing power parity which can reveal more accurate results since it concedes also different weights of population in the regions concerned. Nonetheless, due to the lack of data on PPP adjusted per capita CDP numbers on a regional level, average nominal monthly wages were used instead.

Second, even though the applied method revealed good statistical properties – good R square (73%) – still relying only on R square statistics might have certain limitation when deciding the significance levels of the analysis. Thus, the used statistical method is simple, and some additional indicators of significance levels – for example p-value could have made the findings more valid. Still the due to the small and compact sizes of Armenia using the PPP adjusted per capita CDP numbers on a regional level would not reveal far better results since the amplitude of this indicator between Marzes is not great: The longest extension from north-west to south-east is 360 km and the price levels are deviating moderately.

Finally, the using of only the method of Sigma convergence has certain limitations when studying regional divergence. It is common to use also the method of Beta (β) convergence –

which explains the catching-up process of less developed economies due to the existing negative relationship between initial income levels and the growth rates of a particular economy. In that, a very important contribution of β -convergence analysis is that gives information about the speed of convergence. However, there are theoretical papers and researches which use the method of Sigma convergence without supplementing it with Beta convergence method - for example, Lyons' (1991) seminal work on interprovincial disparities in China.

Meanwhile, compared with other studies on recent economic developments of the country, this paper makes some fresh and innovative contribution to the understanding of the regional disparities and wage dynamics across the Marzes of Armenia. Since the country has been a major recipient of development funds and international aid, and considering the government policies towards technological investments and free trade – it is no surprise that there is a voluminous literature and research on various aspects of economic activities in Armenia, including the addresses of regional disparities in the country (Tumasyan et al – 2002; The World Bank publications –various years; IMF Cemat National Report, Armenia – 2010, etc). Yet the application of the method of estimating trend line of the dispersion in income levels, found in this analysis, make this paper contribute with a new insight to the existing literature. In that, it is pertinent to mention that the further research in this area might shed light on some questions that this paper did not answer – in some cases due to the short periods of observations of panel data (comprehensive data on regional level appears only after 1999 and extends until 2008 in National Statistical Service of Armenia accounts).

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