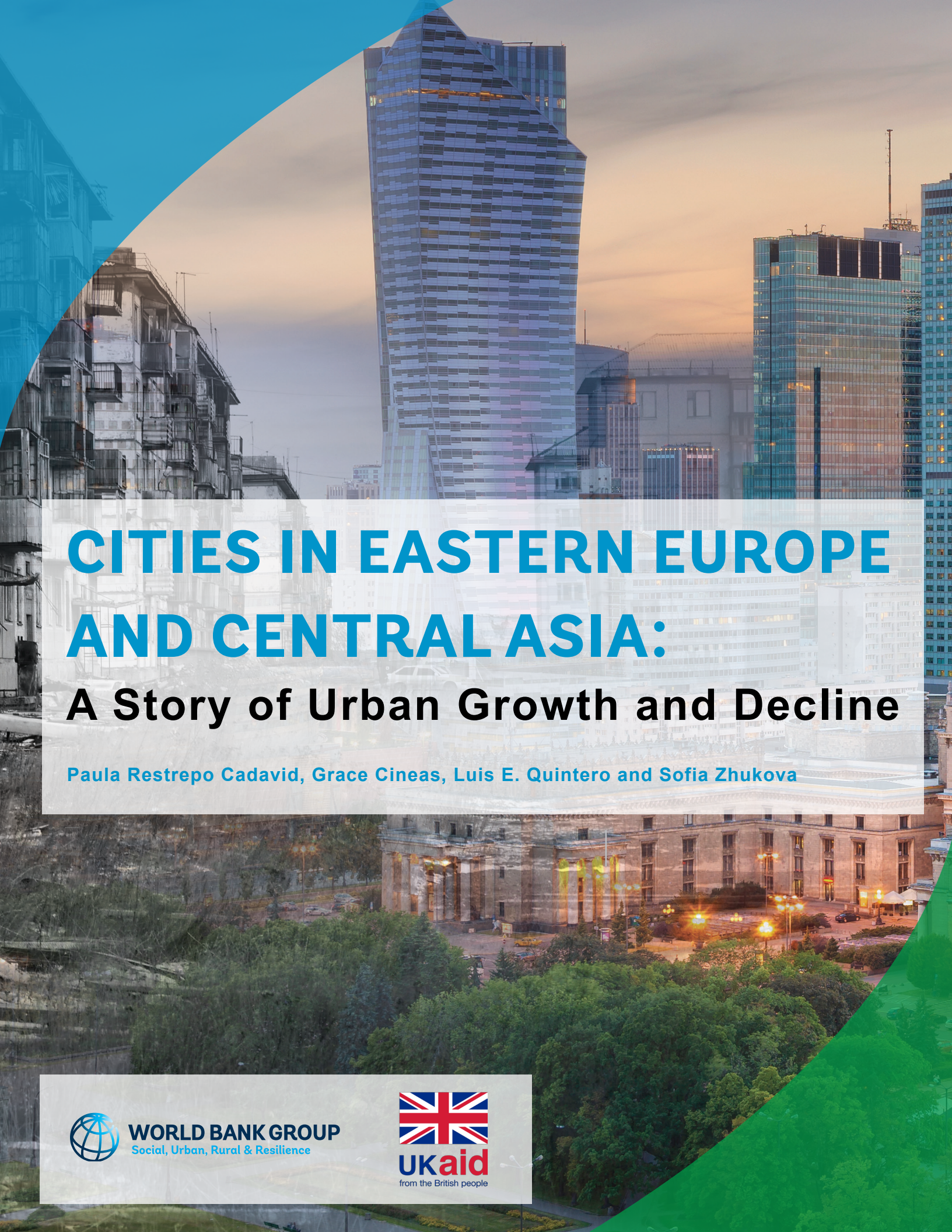

CITIES IN EASTERN EUROPE AND CENTRAL ASIA:

A Story of Urban Growth and Decline

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WORLD BANK GROUP
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Europe and Central Asia
Cities in Europe and Central Asia
A shifting story of urban growth and decline

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EUROPE AND CENTRAL ASIA

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LIST OF ACRONYMS

ECA	EASTERN EUROPE AND CENTRAL ASIA
EU	EUROPEAN UNION
GDP	GROSS DOMESTIC PRODUCT
GHSL	GLOBAL HUMAN SETTLEMENT LAYER
GVA	GROSS VALUE ADDED
KM	KILOMETER
NLS	NIGHTTIME LIGHTS
NTL	GLOBAL NIGHTTIME LIGHTS DATASET
NUTS	NOMENCLATURE OF TERRITORIAL UNITS FOR STATISTICS
RC	RADIANCE-CALIBRATED (NIGHTTIME LIGHTS)
TFR	TOTAL FERTILITY RATE
TOD	TRANSIT-ORIENTED DEVELOPMENT

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INTRODUCTION

JUSTIFICATION, OBJECTIVES, AND LIMITATIONS

Earlier World Bank studies[1] have found two contrasting urbanization patterns emerging in certain Eastern Europe and Central Asia (ECA) countries: a few cities are growing in population and are increasingly the hub of economic activity, while the large majority of cities are shrinking. These studies highlighted the need for further empirically-based studies to increase awareness of these trends as in-depth assessments revealed that national and local policies did not reflect the unique challenges associated with urban growth and decline. The need for a broader review of urban trends was also justified given the overall lack of documentation and thus lack of policy tools to address both urban population decline[2] and the potential implications of decline on overall economic performance and fiscal efficiency. As a result of these studies, it was clear that the empirical base for the broader ECA region needed to be expanded, and the mechanisms behind the growth and decline dynamics needed greater scrutiny.

This report assesses the widely held observation that countries in ECA are experiencing an unprecedented transformation of their urban systems. The report has two aims: **(i)** provide evidence of this transformation using demographic, economic, and spatial data at the city level, and **(ii)** to provide a framework for understanding this transformation. In so doing, the report also seeks to enhance understanding of the unique challenges associated with urban population decline, as well as briefly describe some of the policy tools available to better manage decline.

This report is organized in four sections. **SECTION 1:** provides an overview of the socio-economic context in which many ECA cities consolidated. This section reviews the key factors that shaped the urban systems of ECA, including a discussion of the implication of urbanizing under planned economies and a discussion of recent demographic trends (migration and fertility). It also discusses the contribution of the urban sector to ECA region's economy and the linkages between urbanization and economic development. **SECTION 2:** focuses on ECA's urban systems and describes emerging trends in population and economic density using the Cities in ECA database, among them the emergence of two opposing patterns in ECA's urban system: one of population growth and one of population decline. **SECTION 3:** takes a closer look at cities, comparing *winners to losers*[4], evaluating underlying factors that could explain the cities' relative position. Finally, **SECTION 4:** touches on the policy implications of the report's empirical findings, highlighting how other countries and cities have managed decline, and identifies potential areas for further research.

The report is based on a unique database of more than 5,000 cities in the ECA region (see Data description below). The report does not intend to provide country-specific or in-depth assessment at the sub-regional level; nor does it cover other areas of interest (firm-level analysis, household-level analysis) or provide in-depth analysis of policy implications. These are its limitations, but form the potential for follow-on research. However, the report is complemented by 16 country-level snapshots that describe in detail country-specific trends.

1 See Ukraine Urbanization Review *(2015)*; see also separate Urban Snapshots for Romania, Bulgaria, and Croatia

2 Lutz *(2010)*, 1

3 Winners are cities growing in population above the city growth average in a given country while losers are those growing below the city growth average.

DATA DESCRIPTION

The empirical analysis in this report is based on the Cities in ECA database – hereafter referred to as the cities database—comprising data from 5,549 cities in 15 countries of the Eastern Europe and Central Asia region[4], as defined by the World Bank Group, and from the United Kingdom (UK) and Germany for the purpose of benchmarking. Database information for each city is in three dimensions: demographic, spatial, and economic, as further outlined below.

The starting point to construct the Cities in ECA database was to obtain from each of the countries the list of official "cities" and these cities' population data. Population data collected for cities falls on or around three years: 1989, 1999, and 2010 (or the latest year available)—hereafter referred to as year 1, year 2, and year 3, respectively[5]. The official list of "cities" was geo-referenced and overlaid with globally-available spatial data to produce city-level indicators capturing spatial characteristics (e.g., urban footprint) and proxies for economic activity. City-level spatial characteristics, including urban footprints (or extents) for the years 1996, 2000, and 2010 and their temporal evolution, were obtained from the Global Nighttime Lights (NTL) dataset. City-level proxies for economic activity were also estimated based on the NTL dataset.

The Cities in ECA database also includes several variables which result from the intersection of other globally-available spatial data and the location of cities, or which further qualify cities' characteristics – based on their institutional or economic structure—using official data. Below is a description of some of these variables:

(i) **Location fundamentals** refer to a series of spatially-concentrated characteristics, which can support the concentration of population and economic activities. These could include natural advantages supporting the development of agricultural activities or spatial characteristics supporting the development of commercial activities—such as having access to navigable waterways. The database includes seven location fundamentals variables: land vegetation, average January temperature, total annual precipitation, percentage forest cover, distance to nearest coast, distance to nearest international border, and distance to closest border.

(ii) **Market potential** intends to measure the proximity of a city to nearby (national) markets as a city's market potential is determined by the network of cities to which it has access. A detailed description on how market potential is defined and calculated for the purpose of this report can be found on **Box 5** *(page 27)*.

(iii) **Monotowns** are cities whose economies are dominated by one or a few tightly inter-connected industries. The Cities in ECA database includes a dummy variable identifying 224 monotowns in Russia, the only country for which this information was readily available.

(iv) **Multi-city agglomeration** or **agglomerations** correspond to cities whose urban footprint extends beyond a single administrative entity. Agglomerations are identified by intersecting the cities' data with the urban footprints produced by the NTL dataset. There are a total of 352 agglomerations composed of 2,358 cities in the 17 countries studied. The remaining cities are referred to in this report as single cities, as their urban footprint is contained within a single administrative area. For more details, **please refer to Box 6**.

4 The Cities in ECA database contains data from cities in Albania, Belarus, Bulgaria, Moldova, Ukraine, Russia, Romania, Serbia, Georgia, Tajikistan, Kyrgyz Republic, Kazakhstan, Poland, Uzbekistan, and Turkey. Data from cities in Germany and the United Kingdom are also included for reference.

5 For 11 out of 17 countries, population data was available for years 1, 2, and 3. For the remaining six countries, population data was available only for years 2 and 3.

6 The NLS analysis presented in this study is based on a Global Night Time Lights Urban Extents and Growth Patterns Product developed by a World Bank team. This product uses Nighttime Lights (NLS) data produced by the Defense Meteorological Satellite Program (DMSP) - Optical Line Scanner (OLS) database and maintained by NOAA. NLS offers a versatile and global dataset at a relatively fine spatial resolution. The NTL dataset provides raw nighttime lights data (total brightness in raw nighttime lights for a given urban footprint) for all years between 1992 and 2012. Radiance-calibrated data, which addresses saturation issues found in the raw nighttime lights, is available for the years 1996, 1999, 2000, 2002, 2004, 2005, and 2010. The NTL inputs used in this report as a proxy for economic activity have also benefitted from inter-annual calibration to assure comparability across years.

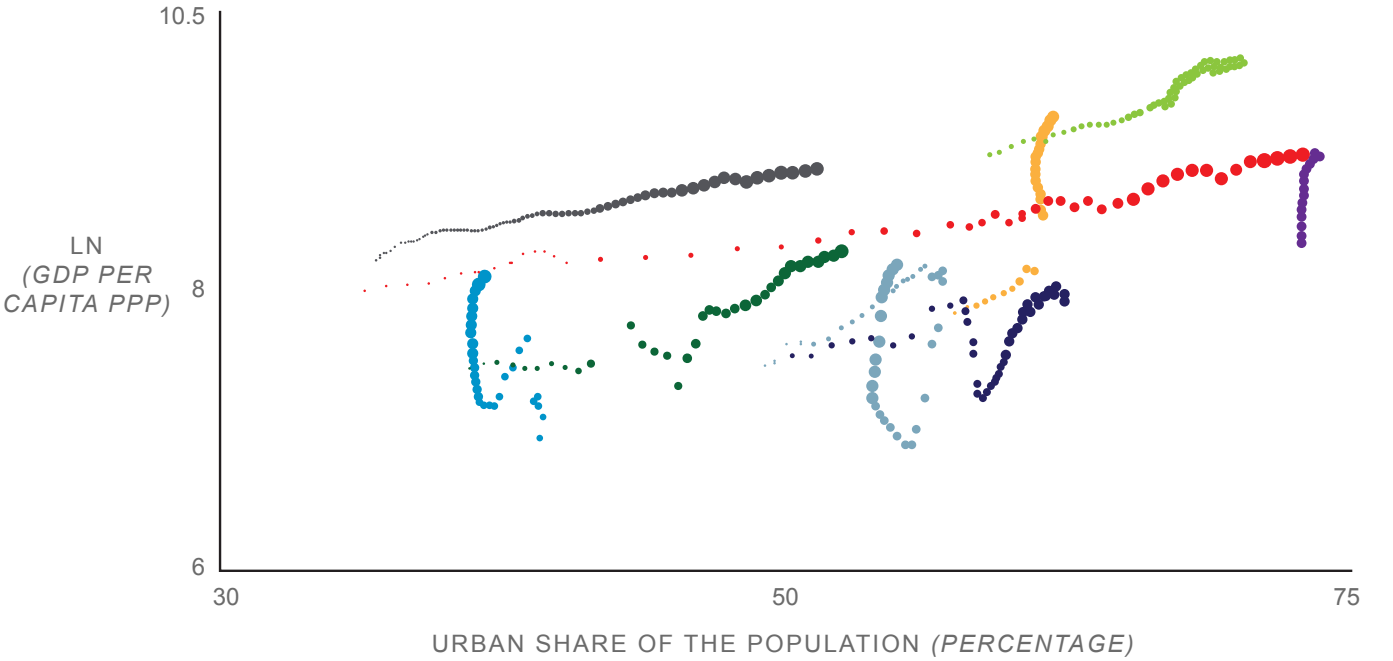
7 In Measuring Economic Growth from Outer Space, Henderson, et al. (2012) suggest that NTL can be used to form a robust composite metric of economic activity (when used alongside local data). In order to corroborate Henderson's results and its applicability in Europe and Central Asia, regressions were run between regional gross domestic product (NUTS 2 or NUTS 3) and raw nighttime lights (or radiance-calibrated nighttime lights) for 16 of the 17 countries in the cities database. These regressions estimated the relationship between regional gross domestic product and nighttime light intensity. The regressions were found to be positive and statistically significant for all countries; the coefficients ranged from 0.56 to 1.40. A regression was not conducted for Moldova, as regional gross domestic product data was unavailable.

EXECUTIVE SUMMARY

Cities in ECA play a fundamental role in the economies of their countries. They contribute roughly to 70 percent of the total economic output and approximately 70 percent of GDP growth for these countries. However, since the Global Financial Crisis, growth in ECA countries has been the slowest among all developing regions and is expected to remain weak. Given the close relationship between urban areas' economic performance and country economic performance, cities in ECA are, in principle, both a part of the (growth) problem and an active part of its solution.

ECA countries seem to perform better than the rest of the world given their level of urbanization. Across the world, there exists a strong positive relationship between a country's level of urbanization and its GDP per capita. Compared to the rest of the world[8], ECA is systematically performing better, with a GDP per capita that is much higher than its level of urbanization would suggest. However, an analysis of sub-regions within ECA reveals that this performance is driven by Central European countries (all members of the European Union) and that the performance of other sub-regions is not significantly different from the rest of the world. In fact, the relationship between urbanization and economic development has not been a linear one for many of the other sub-regions in the region *(e.g., Central Asia, South Caucasus, and Belarus, Ukraine, and Moldova)*.

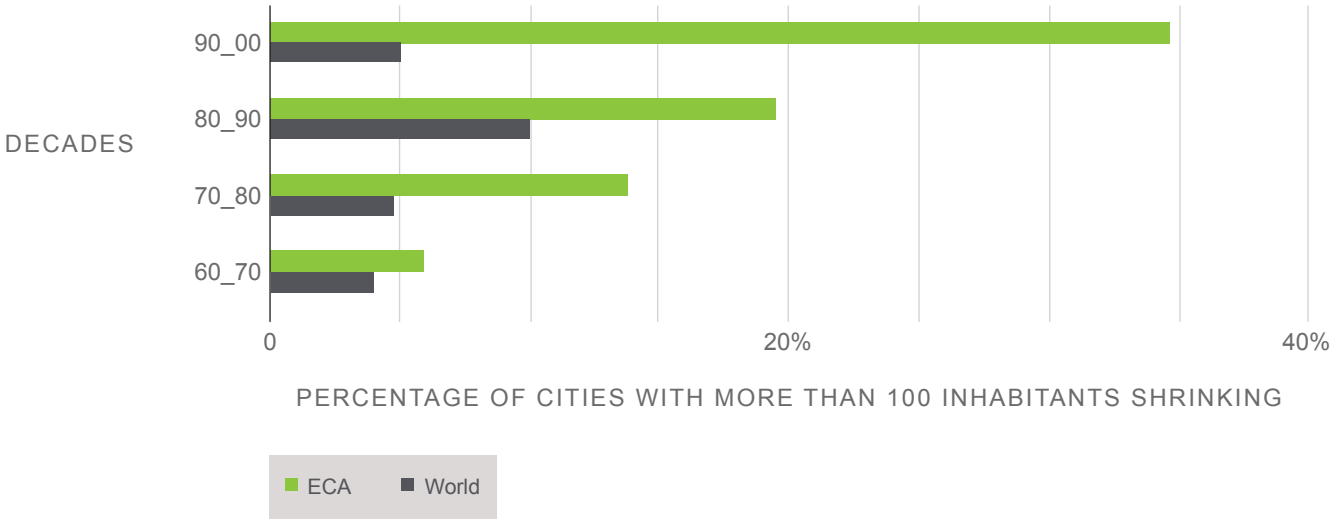
FIGURE 1: URBANIZATION LEVELS AND ECONOMIC DEVELOPMENT *(ECA SUB-REGIONS)*



Source: World Development Indicators (2017).

There are a few key factors that suggest urbanization in ECA is different. Earlier studies show that up to the year 2000, urban systems in the region had lower levels of population and economic concentration when compared to the rest of the world[9]. There was also evidence that the institutional setting *(planned economies)*, which supported the emergence and consolidation of cities in the region, was behind observed differences in spatial concentration. Population dynamics in the largest cities in ECA also differed from the rest of the world, as an increasing number of cities were shrinking in population **(see Figure 2)**. However, it is unclear whether these trends are primarily temporal in nature given the transition of ECA's urban systems from planned to market economies, the result of deeper structural forces, or a combination thereof.

FIGURE 2: PERCENTAGE OF CITIES WITH MORE THAN 100 INHABITANTS DECLINING ECA VS. WORLD



Source: Henderson, J. Vernon—World Cities Database (2003).

Important structural forces are shaping cities in ECA. As expected, urban population trends are strongly correlated with national demographic trends. With most of the region undergoing demographic transition, reinforced by out-migration, many countries have experienced an overall decline of their urban population. As a result, the region's cities are facing population declines in unprecedented numbers and scale. 61 percent of cities analyzed in this report declined in population between the year 2000 and 2010; 52 percent of cities' population growth variance was explained by national demographic trends alone. Given that change in national demographic trends is unlikely, the reality of urban population decline is likely here to stay. However, it is not clear whether these structural forces have had a related systematic impact on city economic performance.

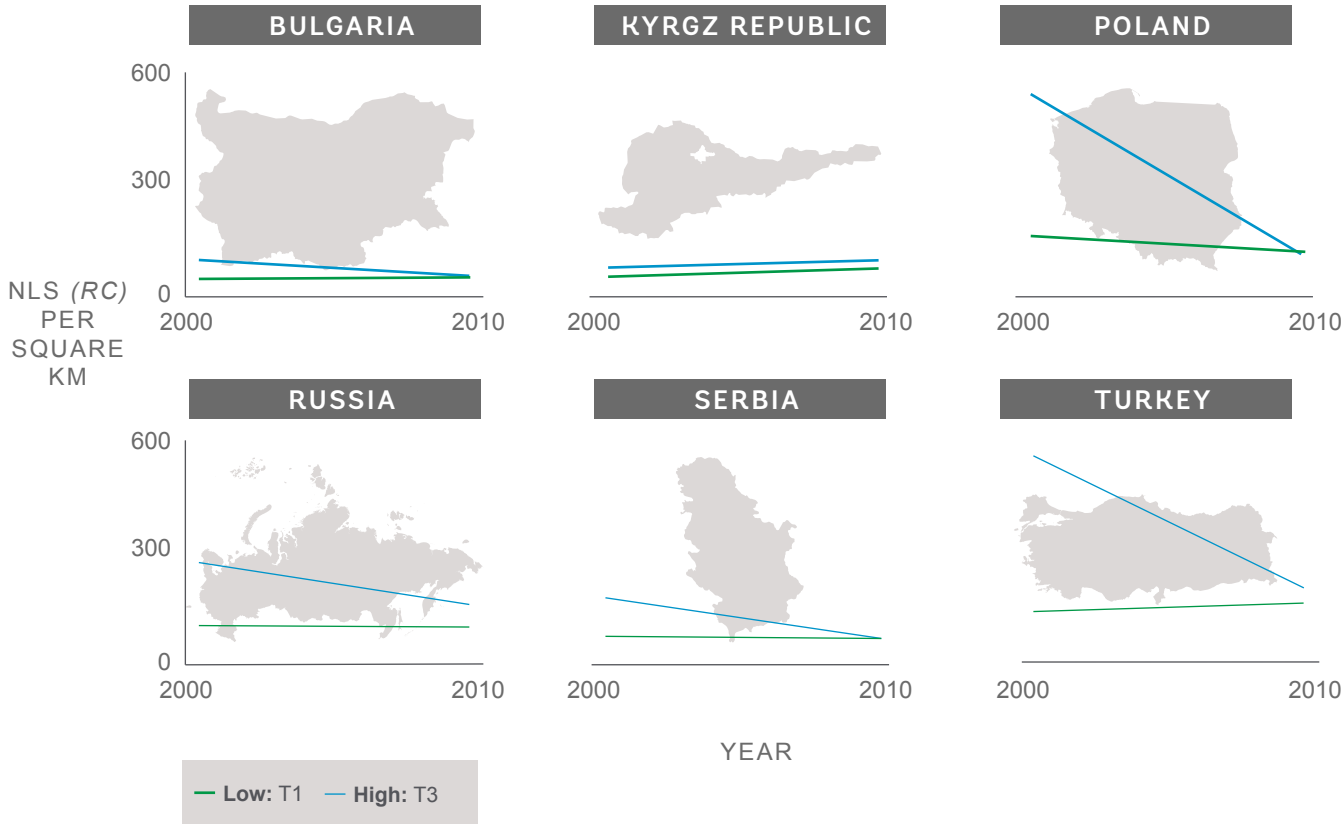
Over the past two decades, ECA's urban systems have experienced important shifts in population and economic density. In most countries, population and economic density is increasingly concentrated in fewer cities. Furthermore, concentration of economic density was found to be higher than concentration of population density, which suggests the existence of agglomeration economies. Finally, across all countries *(*with two exceptions[9]*)* there was convergence in city economic performance between 2000 and 2010[10] However, this convergence was achieved through a race to the bottom as high-performing cities became "less-productive" and not the other way around **(see Figure 3)**. Together, these trends suggest that ECA urban systems have been moving towards a new spatial equilibrium.

8 See both Henderson and Wang *(2007)* and Zubarevich *(2013)*.

9 The Krygyz Republic and the United Kingdom.

10 Measured using Nighttime lights per area as a proxy for economic activity.

FIGURE 3: PATTERNS OF LIGHT CONVERGENCE *(BY RC PER KM2 IN 2000)*



T1: lowest tertile of NLS per km2 in 2000; T3 highest tertile of NLS per km2 in 2000.

Source: Cities in Europe and Central Asia: Regional Database.

Under demographic transition, increasing population concentration has led some cities to grow but many to decline. In fact, while the population of the "average" ECA city has remained static over the past two decades, the overall picture is one of population growth and decline. Indeed, some cities are growing rapidly while others are declining sharply. With resultant reductions in local "labor forces," cities are increasingly competing to attract human capital with clear "winners" and "losers" emerging from this competition. The analysis suggests that these winners and losers have different attributes, and that a key set of factors influences city population growth. In particular, the findings indicate:

1. Bigger cities tend to grow more than their smaller peers.
2. Capital and secondary cities also have an advantage, although results are not consistent across countries or across model specifications.
3. Cities that surround agglomerations have higher population growth than the centers of agglomerations, which suggests a suburbanization trend.
4. The degree of economic specialization matters, with monotowns – cities that are dominated by one industry or economic sector – growing much less and declining much more than their peers.
5. The effect of a city's market potential on population growth/decline varies depending on the local context. Overall, having a higher market potential has a positive impact on city population growth, but the effect is reversed for cities located in countries or regions that are shrinking. This likely reflects the impact of "the competition effect" whereby smaller cities located near bigger ones end up losing population to them.

11 For more details please refer to the Data description section or to Box 6.

Declining cities are systematically underperforming compared to growing ones. Being a 'winner' or a 'loser' matters in terms of overall economic performance, with the average loser performing worse than the average winner both in terms of total output and in terms of productivity. However, the analysis also suggests that there is great variance even within this result, as many losers perform above or on par with winners. In contrast to what has been observed in other cities around the world *(e.g., Detroit, Cleveland)*, city population decline is not always linked to economic decline in the ECA region.

Population decline and growth both have important implications for city administration, infrastructure, and service delivery. Both growing and declining cities face uniquely challenging environments. Growing cities need to adapt local infrastructure to ensure that their growing population is well absorbed, manage peri-urban growth to avoid sprawl, and balance urban growth beyond administrative boundaries. They also need to foster agglomeration economies and limit congestion costs. In the ECA region, the tendency towards suburbanization—coupled, in some instances, with population decline in inner cities—suggests that there may be issues with the provision of housing or in adapting land-uses, which then leads to a sub-optimal allocation of human resources (and jobs) across space. There is also evidence that growing cities are increasingly operating as multi-city agglomerations, risking failures in coordinating public services that can hinder economic performance. While these are difficult challenges to address, they are similar to those faced by cities across the world, and there are a variety of recognized policy responses available. This, however, is not the case for declining cities.

City population decline comes with unique challenges as well as potential opportunities. Population decline can lead to fiscal imbalances as a city's revenue base erodes and the marginal cost of providing services increases. Given the durable nature of housing, population decline can lead to housing vacancy, a drop in housing prices, and urban blight. It also often leads to sprawl as population density declines at a faster rate than the urban footprint. But decline, if well managed, needs not lead to urban decay. For example, population decline can present an opportunity to reduce congestion costs. Unfortunately, many cities in the region continue to pursue population growth, rather than manage their decline. While shrinking cities are not a new phenomenon, the ECA region, given its unique demographic transition, is at a threshold moment. While this presents a challenge, it also presents an opportunity for the region to pilot policy options on smart decline.

National and local governments need to foster an environment that enables cities to thrive. This is particularly important in the context of forecasts for constrained economic growth for the ECA region. If well managed, growing and declining cities can yield economic growth and be centers of inclusion and job creation.

12 Measured using total NLS and NLS per km2 as proxies of economic activity and productivity, respectively.

13 See Ahrend *(2014)*.

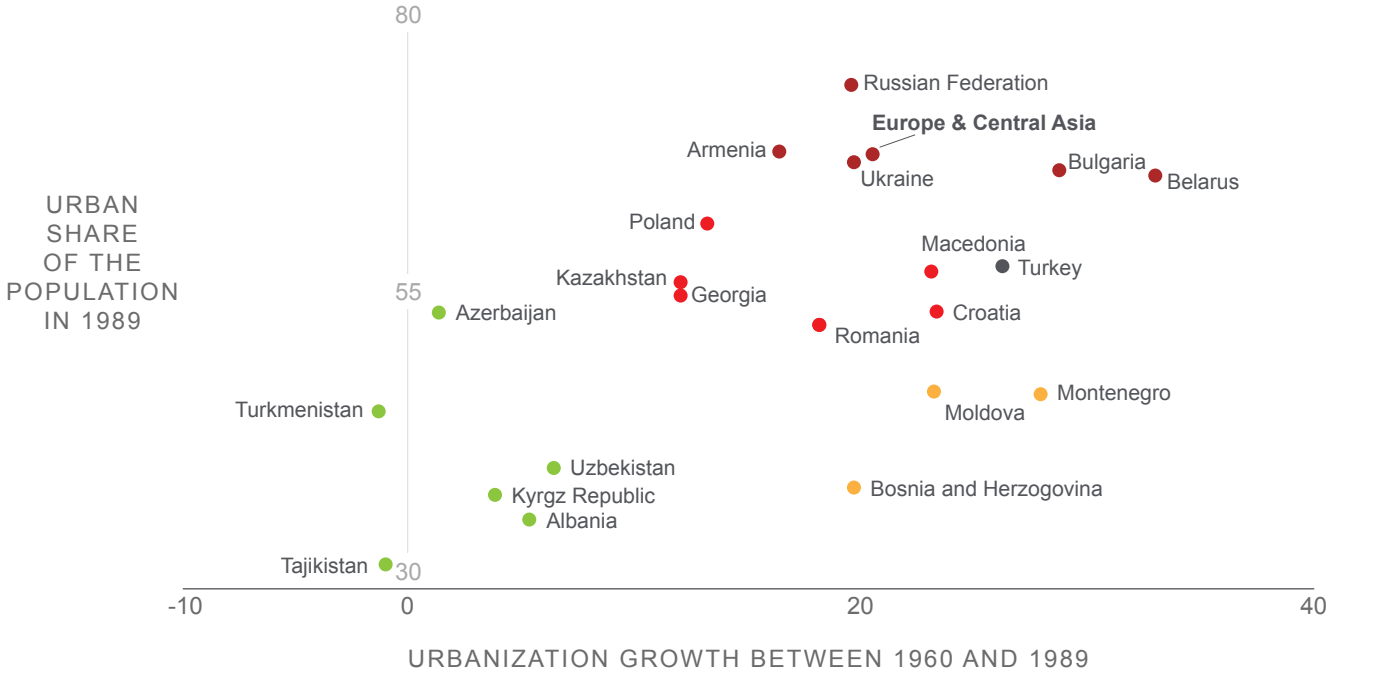
1. CITIES IN EASTERN EUROPE AND CENTRAL ASIA

This section provides an overview of the context in which many ECA cities emerged and consolidated. It discusses the economic implications of urbanizing under planned economies, and recent demographic trends with a focus on migration and fertility. This section also includes an overview of the linkages between urbanization and economic development, assessing whether the ECA region presents distinct features relative to the rest of the world.

URBANIZATION UNDER PLANNED ECONOMIES

An important phase of the ECA region's urbanization took place under planned economies. Between 1960 and 1989, it is estimated that ECA's cities grew by 190 million people. In fact, most of the countries in the region experienced high urbanization rates between 1960 and 1989, which means that their urban systems consolidated primarily under planned economies. By 1989, 63.8 percent of the population in the region lived in urban areas and more than half of ECA's countries had attained high urbanization levels *(as shown in Figure 4)*. However, these averages mask important heterogeneities: some countries in the region emerged from planned economies with their populations still predominantly rural. This is true of Albania, Kyrgyz Republic, Uzbekistan, and Tajikistan.

FIGURE 4: URBANIZATION OF ECA COUNTRIES BETWEEN 1960 AND 1989



Source: World Development indicators.

Under planned economies, non-economic factors were pivotal in shaping the distribution of economic activities across many of ECA's countries. In some cases, cities were founded in remote areas (with few location fundamentals to justify their existence) for the sole purpose of projecting control over vast territories *(e.g., USSR)*. In other cases, the growth of cities was largely influenced by centrally-imposed decisions.[14] Small settlements grew exponentially when the state granted them special "city status" or made them the headquarters of higher education institutions.[15] The growth of medium-sized cities was constrained when they were declared "closed-cities" for national security purposes *(as they were home to sensitive military, industrial, or scientific facilities.)* Cities were also often created and consolidated around one industry as discussed in **Box 1.**

BOX 1: MONOTOWNS

The term mono-functional city or monotown[1] refers to a city whose economic performance and employment is highly dependent on one or few industries. The mono-functional city approach was extensively used under the period of centrally-planned economies as an instrument for the implementation of industrialization and territorial management policies. These policies were heavily oriented towards the establishment of large-scale industries and associated infrastructure. During the 1950s-1970s, the narrow industrial specialization of these cities combined with large-scale infrastructure and intensive transport flows were features of the paradigm of 'territorial industrial complexes' implemented throughout the Soviet Union.

Monotowns can be found in all of the ex-Soviet countries, but have different definitions. In Ukraine, the official definition of monotowns indicates cities where the majority of the economically-active population works in enterprises focused on one or two economic sectors that also support a substantial part of the city's budget and social infrastructure. Based on this definition, 111 of the 456 cities in Ukraine are considered monotowns. Of these 111 cities, 32 are focused on coal extraction, 27 on the processing industry, 18 on agricultural centers, nine each on transport and on power engineering, seven on production of ore and non-metallic resources, six on chemicals and the oil refining industry, two on therapeutics, and one on art.

In Russia, a city is considered a monotown[2] if it meets the following conditions: more than 25 percent of employed people in the city/town work for the largest enterprise or for one of several enterprises of the same industry (or operating in the same market), or one industry accounts for more than 50 percent of the total production in the city/town. As of 2015, there were 319 monotowns in Russia, which corresponds to 30 percent of the cities in Russia and 12 percent of the total urban population.

Source:

1 Kuzmenko and Soldak *(2010)*
2 Ulyakina *(2012)*

The transition to market economies prompted important economic shocks that affected ECA's urban systems. Industries—many of which suffered from low productivity – were confronted with international competition. Mono-functional cities were found to be particularly vulnerable due to their narrow economic specialization. The fall of the Soviet Union also led to the disintegration of previously united territories, triggering massive population movement across countries[16] and leading to changes in cities' market potentials (particularly for those located on the borders).[17] It also eventually led to important changes in the region's economic integration, as many countries moved from USSR-centered markets to European Union-directed markets.

14 Coulibaly, et al. (2012).
15 For example, Uzhhorod town in Ukraine had 17,000 inhabitants at the end of WWII, but it grew significantly once it was granted city status *(1946)* and a university opened there. By 1989, it had more than 100,000 inhabitants.
16 People, previously unable to move because of Soviet-era restrictions, relocated to their ethnic or cultural homelands; see Coulibaly *(2012)* 5-16.
17 See Redding and Sturm (2008) on the costs of remoteness using evidence from German division and reunification. They find that, following the division of Germany, cities in West Germany close to the border with East Germany experienced a substantial decline in population growth relative to other West German cities.

The legacy of central planning and the transition policies that followed will likely continue to influence the trajectory of the region's urban areas for decades to come. While the passage to market economies brought the opportunity to move towards a more efficient allocation of economic activities across ECA countries, path dependence and policies implemented during the transition period, such as massive privatization of housing, reinforced barriers for internal mobility. In fact, there is empirical evidence to suggest that the urban economic and demographic shifts (growth and decline) in some countries after the fall of the Soviet Union would have been more pronounced if internal mobility was less constrained.[18] There is also evidence that in 2000, more than a decade after transition, countries that urbanized under planned economies had significantly lower levels of urban concentration (spatial gini) compared to the rest of the world.[19]

URBANIZATION UNDER DEMOGRAPHIC TRANSITION

Urbanization in ECA is also profoundly affected by the region's demographic transition. Over the last half century the global fertility rate has fallen sharply. Between 1950-1955, the average woman was expected to have about five children, the average declined to about 2.5 children by 2010.[20] ECA's fertility rates have historically been lower than global averages and have stood well below replacement level *(2.1 children)* for more than two decades. However, there is substantial heterogeneity in fertility rates across ECA countries. Countries in Central Asia and Turkey maintain fertility rates well above ECA's overall average as observed in **Table 1** below.

TABLE 1: AVERAGE FERTILITY RATES *(BIRTHS PER WOMAN)*

Sub-regions	1960-1989	1989-2000	2000-2014
Belarus, Moldova, Ukraine, Russia	2.25	1.61	1.36
Central Europe and Baltic Countries	2.16	1.54	1.39
South East Europe	3.26	2.22	1.72
South Caucus	3.24	2.15	1.78
Turkey	4.94	2.78	2.23
Central Asia	5.12	3.41	2.74
Eastern Europe & Central Asia	2.40	1.72	1.65
World	4.26	2.95	2.54

Source: World Development indicators. *(2017)*

Demographic trends at both national and urban levels differ drastically from those of the rest of the world. As observed in Figure 5, which includes all countries in the world and spans 1991 to 2011, there is a strong correlation between change in total population change and change in urban population. **Figure 5** shows how ECA *(in Green)* departs from the rest of the world: ECA countries present lower population and urban population changes when compared to the rest of the world, and are the only countries with a decline in both their total population and their urban population.

18 See World Bank *(2015)*.
19 See Henderson and Wang *(2007)*.
20 United Nations, Population Division.

FIGURE 5: URBAN AND TOTAL POPULATION GROWTH, ECA VERSUS THE WORLD

Source: World Development indicators. *(2017)*

Migration also plays a fundamental role in shaping national and urban demographic trends. ECA is uniquely positioned vis-à-vis the rest of the world as a major origin and destination of migrants, but the destination and scale of migration varies across sub-regions in ECA. For several decades, Western Europe has attracted a significant number of migrants from Central and Eastern Europe, although a wave of return migrants has been observed in countries with favorable economic performance (e.g., Poland).[21] Central Asian emigrants, on the other hand, have a history of migrating to Russia, with whom they have a stronger cultural and linguistic affinity and face lower institutional barriers for migrating. However, for the vast majority of countries, migration reinforces demographic transition **(see Figure 6)**.

21 Lutz *(2015)* 24.

FIGURE 6: NATURAL INCREASE AND NET MIGRATION BETWEEN 2000 AND 2010, ECA AND WESTERN EUROPE

Source: Cities in Europe and Central Asia: Regional Database and TransMonEE[22] Database (2015).

22 Transformative Monitoring for Enhanced Equity Database *(2015)*. See http://www.transmonee.org/index.html.

Together, natural population trends and migration are shaping ECA's urban systems. As expected, regional and national demographic trends are influencing ECA's cities. In fact, natural increase and migration rates at the national level, alone, explain 52 percent of ECA's city population growth variance (see Table 2). At the same time, ECA's population has been aging. Today, 15.6 percent of the population in ECA is older than 65 years, compared to 8.3 percent for the rest of the world. In countries like Ukraine, the fastest growing population group in urban areas is the 60+ cohort.[23] Demographic transition and aging pose important fiscal challenges at the national level **(see Box 2)** and at the city level **(see Box 7)**.

TABLE 2: MIGRATION AND FERTILITY'S IMPACT ON ECA CITY POPULATION 2000-2010

	City Population Growth 2000-2010
National Natural Increase Rate	0.395***
Rate	(60.20)
National Net Migration	1.331***
Rate	(68.87)
	-3.751
_cons	(61.97)
R^2	0.52
N	5,476
** p<0.05; *** p<0.01	

Source: Cities in Europe and Central Asia: Regional Database and TransMonEE Database (2015).

23 World Bank*(2015)*.

BOX 2: FISCAL IMPLICATIONS OF AN AGING POPULATION

The net effect of aging on fiscal balances is determined by the relationship between the variables of income and demand for public goods and services. An aging population changes the size of an economy as well as its saving and consumption profiles, which in turn affects the size and direction of fiscal revenues. In addition, the demand for public goods and services changes with a new age structure and new income levels in an economy. Public expenditures need to respond to this changing demand because governments have commitments to public education, old-age pensions, and health care benefits. Below is an analysis of the effects on both variables:

Some of the most important effects of aging on fiscal revenues are related to changes in the base of taxes on consumption and income. An increase in the number of elderly, who tend to consume a larger share of their income, may cause an increase in consumption taxes. Nevertheless, aging due to an increase in longevity can also cause changes in consumption patterns, while working-age individuals may reduce their consumption to save and prepare for their retirement period.

In addition, aging affects revenues from the tax on capital income. The capital to labor ratio could rise from the decrease in workers and increase in savings. Changes in capital income taxes, though, will depend on the extent to which the country is integrated into the global economy. In an economy *(similar to those in ECA)* where the price of factors is fixed by the country, the net impact on capital revenues may be ambiguous: return on capital will be reduced, but there would be an increase in capital per worker. However, an open economy will mean an increase in capital income, which will in turn bring more revenue from taxes.

The main impact of aging on public expenditures is the growing demand for public services, such as pensions and health care services. Pensions represent a big portion of public expenditures in ECA, and are set to rise for some Central European countries *(Czech Republic, Romania)* and some of the young ECA economies *(Turkey, Azerbaijan)*. Payroll contributions are normally the primary source of financing for pensions, but in most cases additional government revenues are needed to add to this financing. This poses a burden for aging economies, which need to find measures to increase the sustainability of pension systems, such as higher retirement ages and links between contributions and benefits.

The demand for health services and long-term care also increases in aging societies. Population aging will influence long-term care expenditures, since the share of the population in need of long-term care is likely to rise. In addition, individuals who might have left their work to become caregivers are pushed to return to the labor market because of working age population changes, and this responsibility will be transferred to government. Even though these purely demographic factors provide enough evidence, several non-demographic factors need to be taken into account to evaluate the full impact of aging on health care and long-term care. These include technological advances in medical science that can decrease the expenditures in this sector, and the fact that some elderly have lived healthier lives thus decreasing the need for health services at an older age.

Finally, public expenditures on education can potentially be a mitigating factor for fiscal stress. With the decline in fertility rates and fall in the number of students, there is a decrease in the need for education services. Still, it is not clear whether this will affect overall education spending for a country, since other factors, such as the increase in labor force participation, will expand the need for training programs and workers will need more flexibility to adapt to new technologies and longer working lives.

Source: Bussolo, et al. *(2015)*

URBANIZATION AND ECONOMIC GROWTH

Globally there exists a strong positive relationship between the level of urbanization of a given country and its GDP per capita. While causality between these two variables is hard, if not impossible, to establish, urban economic theory suggests that agglomeration economies are at the heart of this relationship. Agglomeration economies are thought to emerge with the growth of cities as the spatial concentration of both firms and workers gives rise to positive externalities. As firms and workers cluster together, they are able to share indivisible costs, match their skills/needs with greater ease, and learn from each other (knowledge spillovers). Together, these mechanisms lead to increasing productivity levels, and when aggregated, can contribute to a country's economic growth. For this reason, cities are often referred to as "engines of growth."

Given their level of urbanization, countries in ECA seem to perform better than the rest of the world. As observed in Table 3, ECA countries tend to have levels of GDP per capita that are significantly higher than predicted based on their levels of urbanization (a result is statistically significant at the 0.01-level). ECA's divergence can also be observed graphically in Figure 7 where most ECA countries (green dots) are above the fitted line. This systematic departure suggests that ECA countries are performing better relative to the rest of the world.

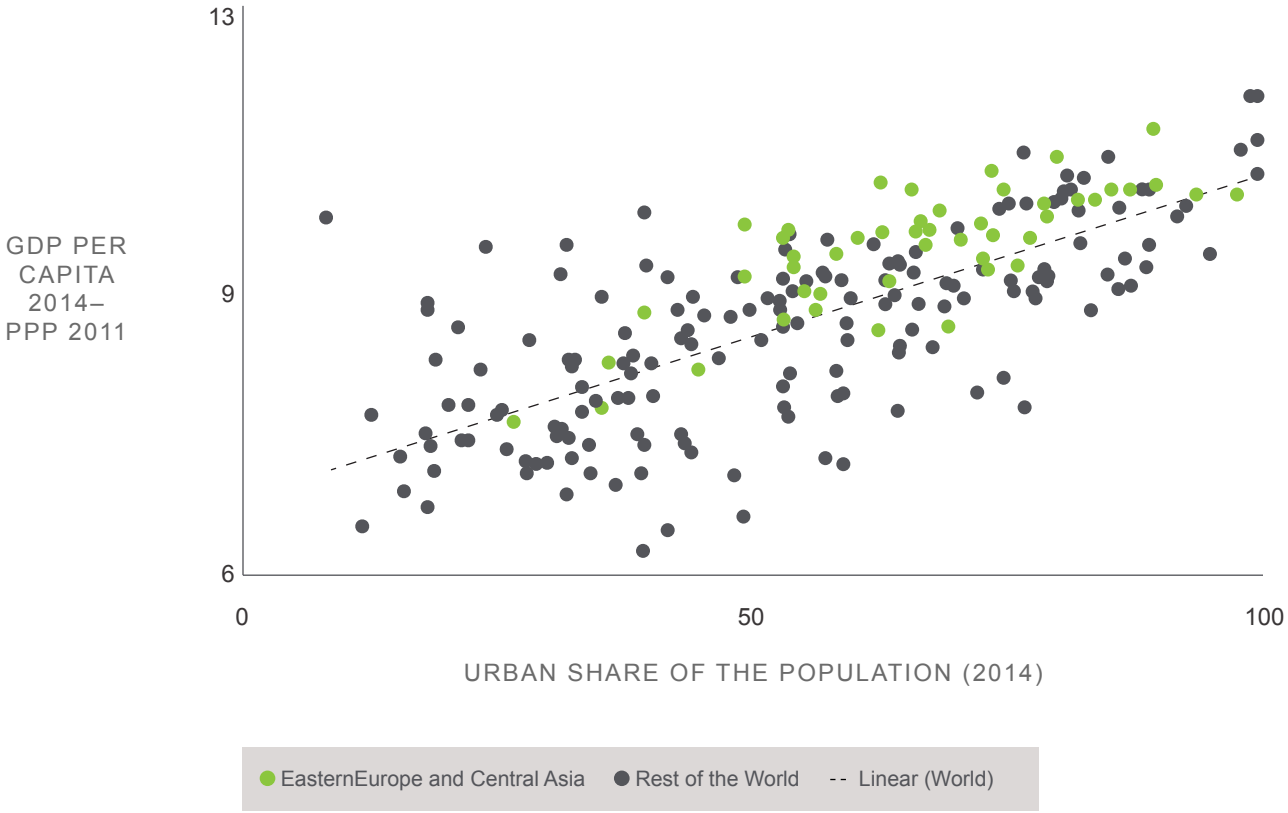
TABLE 3: GDP PER CAPITA AND URBANIZATION IN ECA AND THE WORLD

VARIABLES	(1) LN GDP PER CAPITA	(2) LN GDP PER CAPITA	(3) LN GDP PER CAPITA
Urban population share	0.0273*** (0.0023)	0.0263*** (0.0023)	0.0271*** (0.0024)
Urban population share^2	-0.0002*** (0.0000)	-0.0002*** (0.0000)	-0.0002*** (0.0000)
ECA		0.7963*** (0.1276)	
Russia			0.6420 (0.7909)
Belarus, Moldova and Ukraine			-0.3652 (0.4593)
South Caucus			-0.4914 (0.4594)
South East Europe			-0.0021 (0.3992)
Central Europe and the Baltics			0.6567** (0.2570)
Central Asia			-0.5119 (0.3582)
Turkey			0.4196 (0.7908)
Constant	7.9106*** (0.0860)	7.5581*** (0.0746)	7.6761*** (0.0744)
Observations	**4,796**	**4,796**	**4,796**
Number of Countries	**194**	**194**	**194**

*** p<0.01, ** p<0.05, *p<0.1

24 See Duranton and Puga *(2003)*.

FIGURE 7: URBANIZATION LEVELS AND ECONOMIC DEVELOPMENT



Source: World Development Indicators (2017)

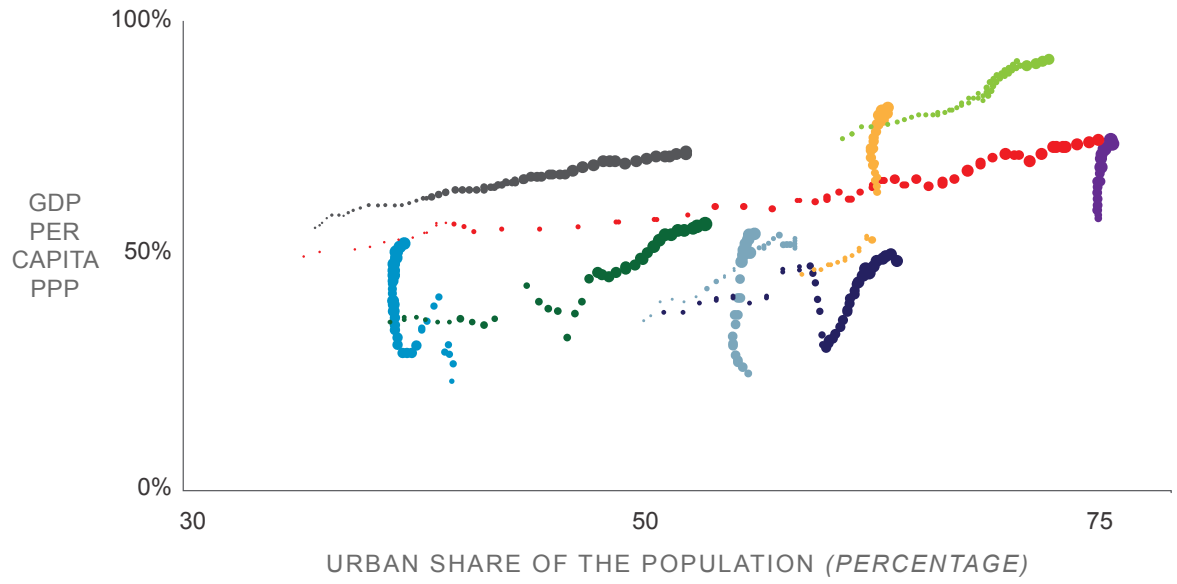
However, an analysis by sub-region reveals that Central European countries are driving the ECA region's over-performance.[25] The sub-region, which appears to be over-performing, is composed of Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic and Slovenia **(see Table 3)**. In fact, performing this analysis with sub-regional indicators reveals that the remaining sub-regions in ECA *(i.e., Central Asia, South Caucasus, South East Asia)* do not appear to depart systematically from the rest of the world.[26]

In fact, the relationship between urbanization and economic growth has not been a steady one for many ECA sub-regions. Figure 8 shows the evolution of GDP per capita over time compared to the urban share of the population from 1960 to 2015 *(the bigger the bubble size the more recent the year)*. Among ECA sub-regions, Turkey follows the most typical path and is similar to the rest of the world *(in grey)*. Russia and Central Europe and the Baltic countries have much more drastic relationships with an almost vertical movement – GDP per capita levels increase substantially with minimal changes in urbanization level *(although urbanization levels are already very high)*. A much more unstable relationship is observed in the case of the South Caucasus and Central Asia, as well as Belarus, Ukraine and Moldova.

25 This sub-region is composed of the following countries: Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, and Slovenia.

26 These results hold even when using comparable urban definitions – not the World Development Indicators, which use national definitions of urban areas. See Roberts *(2017)*.

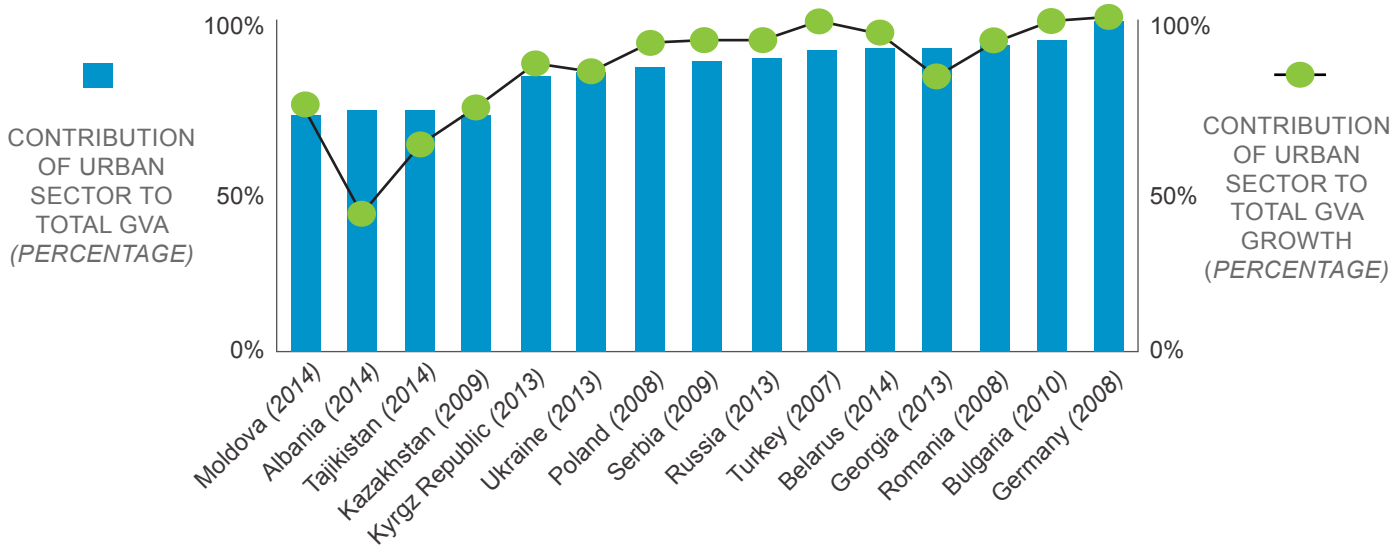
FIGURE 8: URBANIZATION LEVELS AND ECONOMIC DEVELOPMENT *(ECA SUB-REGIONS)*



Source: World Development Indicators (2017).

Across the region, urban sectors contribute substantially to the economies of ECA countries. According to estimates, urban-type economic sectors such as construction, manufacturing, and financial intermediation are responsible for more than 70 percent of ECA countries' GDP and contribute – except for a few cases – to more than 70 percent of their economic growth **(see Figure 9).**

FIGURE 9: URBAN-TYPE SECTOR'S CONTRIBUTION TO ECONOMIC GROWTH



Source: Author's calculation from UN Statistics Division – National Accounts Main Aggregates Database (2016)

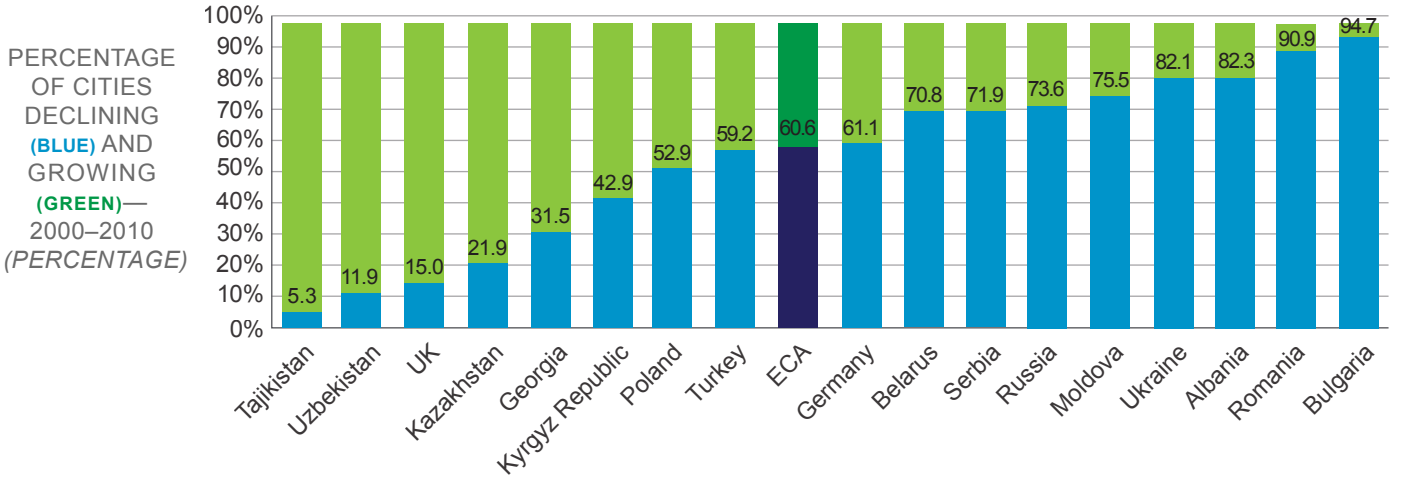
2. A SHIFTING STORY OF URBAN GROWTH AND DECLINE

As outlined in the previous section, there appear to be distinct factors that influenced the emergence and consolidation of cities in ECA compared to the rest of the world. To start, many countries in the region urbanized under planned economies, which likely led to sub-optimal distribution of economic activities across space. Furthermore, after a decade of transition to market economies, the region continued to feature lower levels of both population concentration and economic concentration compared to the rest of the world. In addition to these unique attributes, the region is experiencing unprecedented demographic challenges, with many countries facing urban population decline due to a combination of low fertility rates and out-migration. But how are cities in the region adjusting to these pressures? We address this question in this section by evaluating shifts in economic and population density in ECA between 2000 and 2010 using city-level data sets constructed specifically for this report.

OVER THE PAST TWO DECADES, ECA'S URBAN SYSTEMS HAVE EXPERIENCED IMPORTANT SHIFTS IN POPULATION DENSITY

ECA's cities are declining in population in unprecedented numbers and at an unprecedented scale. Between 2000 and 2010, 61 percent of cities in ECA declined in population, which represents a slight increase over the percentage of cities losing population in the first decade of transition *(59 percent)*. While population in the average ECA city has remained stagnant, declining cities lost an average of 11 percent of their population between 2000 and 2010. This, of course, masks large variations across and within countries—with some countries and cities seeing much larger magnitudes of decline. Divergent trends can also be observed for a subset of countries when comparing the first and second periods of transition. For instance, countries like Albania, Moldova, Russia, and Serbia have seen an increase in the share of cities undergoing decline. On the contrary, countries like the UK and Romania have seen both a decrease in the share of cities that are declining and an increase in the magnitude of decline **(refer to Appendix 1 for country-level statistics)**.

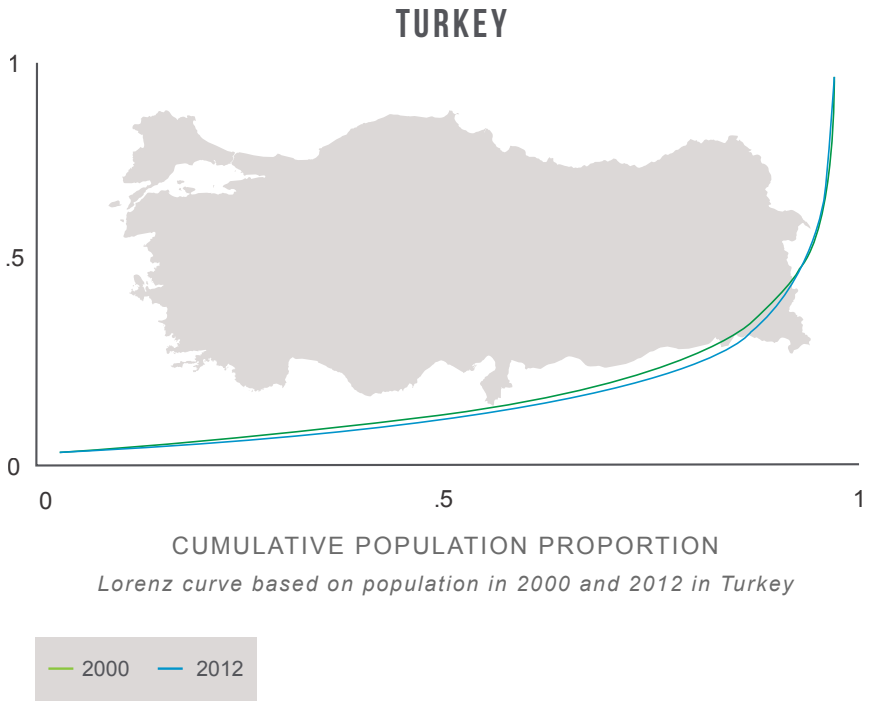
FIGURE 10: SHARE OF CITIES GROWING/DECLINING IN POPULATION BETWEEN 2000 AND 2010* *(BY COUNTRY)*



Source: Cities in Europe and Central Asia: Regional Database

Meanwhile, population is concentrating in a select number of urban centers. GINI coefficient indexes representing the distribution of urban population across cities have increased for most ECA countries over the past decade. This reflects how the urban population in ECA countries is concentrating in fewer cities. A country-by-country analysis reveals that even in countries in which city population decline is widespread, there are a select number of urban centers that are growing – some at rapid rates. **Figure 11** shows the concentration curve of urban population in Turkey in 2000 and in 2012. As observed, the concentration curve for Turkey is shifting towards the right – evidence of increased population in a smaller number of cities. Similar trends can be observed in other countries in the region such as in Kazakhstan and Russia **(refer to Table 4 for the full set of GINI coefficients)**.

FIGURE 11: INCREASING CONCENTRATION OF URBAN POPULATION IN A SUBSET OF TURKISH CITIES *(2000, 2010)*

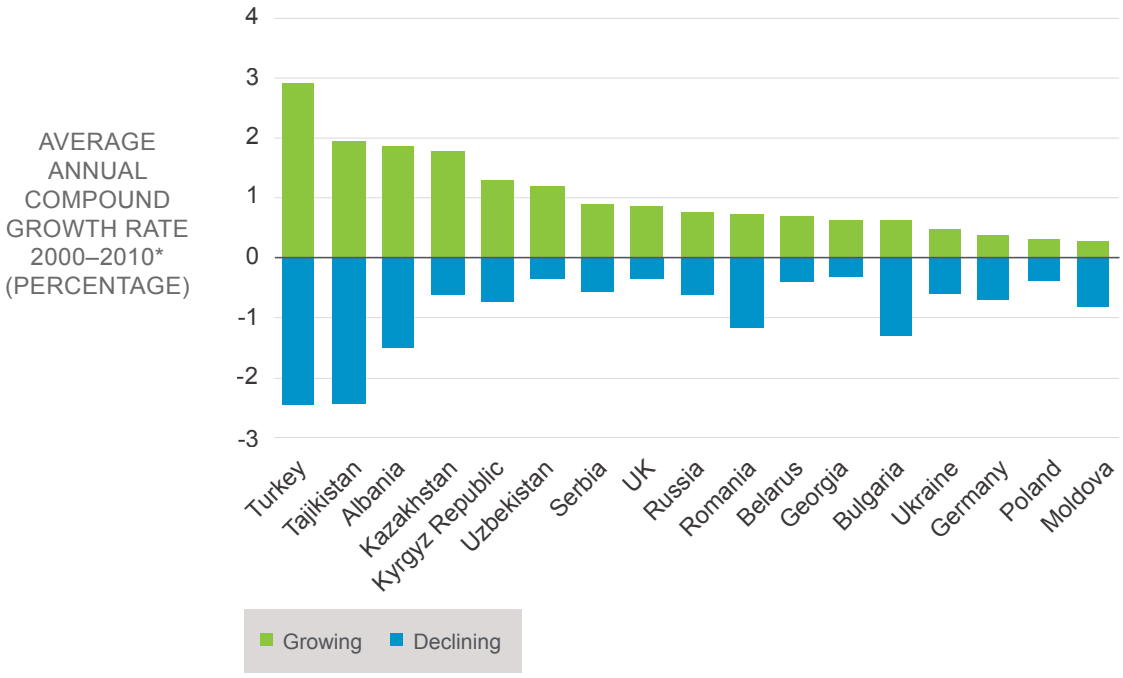


Source: Cities in Europe and Central Asia: Regional Database.

However, there are large variations in the share of growing and declining cities across ECA countries. As extremes, while a very small number of cities in Tajikistan are declining *(only 5.3 percent)*, nearly all cities in Bulgaria are declining **(94.7 percent - see Figure 10)**. Differences in the growth and decline patterns of urban systems in ECA are correlated to both fertility and net migration rates as discussed in Section 1. As expected, cities in countries with low fertility rates *(i.e., below replacement level)* and negative net migration rates are overwhelmingly declining in population; those in countries with either relatively healthy fertility numbers *(above replacement level)* and/or positive net migration rates tend to be growing. Across the region, Central Asian countries, as well as Poland and Turkey, seem to be less affected by city population decline, while countries like Bulgaria, Albania, and Romania have more than 80 percent of their cities declining.

The rate at which cities are growing/declining also varies substantially across countries. While the population of the average city in ECA has remained mostly stable over past decades, this masks large variations within ECA's urban systems. In fact, in some countries there is both a sharp decline in population among shrinking cities and a rapid increase among the growing ones. This is particularly true in countries like Tajikistan, Turkey, and Albania **(see Figure 12)**. In other countries, such as Kazakhstan, Uzbekistan, and Kyrgyz Republic, growing cities are rapidly absorbing population, while declining cities are not shrinking as fast. In a third set of countries, such as Romania, Bulgaria, and Moldova, growing cities are growing at slower rates when compared to the rest of the region, while shrinking cities are sharply declining. Although a stagnant population may not pose substantial challenges to local governments, a sharp decline or a sudden growth in population can generate substantial stressors for the financing of local infrastructure and the provision of municipal services. Furthermore, while the challenges of rapidly growing cities are often cited in literature *(e.g., housing affordability, infrastructure expansion, congestion)*, the challenges linked to population decline described in **Box 3** are less known.

FIGURE 12: AVERAGE ANNUAL COMPOUND POPULATION GROWTH/ DECLINE RATES OF GROWING/DECLINING CITIES

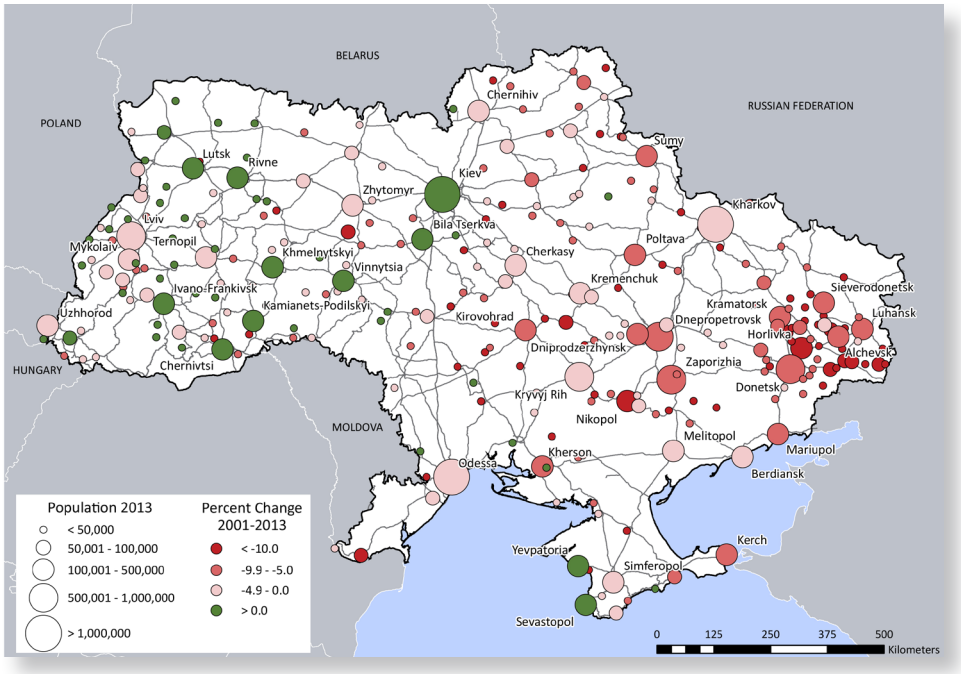


Source: Cities in Europe and Central Asia: Regional Database.

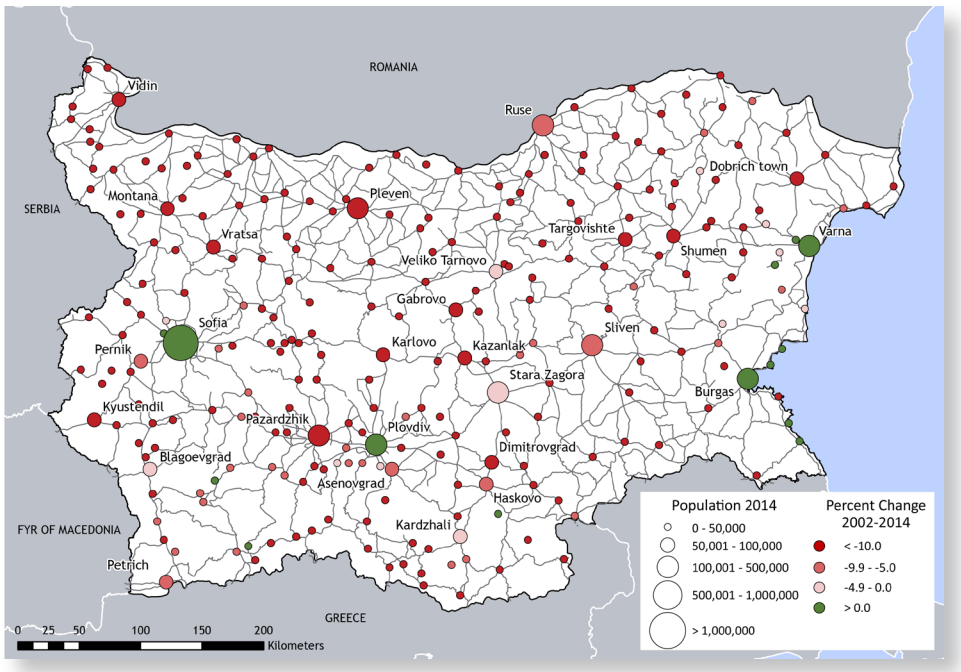
The degree by which cities are growing or declining also varies substantially within countries. Spatial divergences in growth and decline are particularly striking in some ECA countries **(see Figure 13 and Figure 14)**. This is particularly true for countries like Ukraine where most of the cities located in the West are growing in population while most of the cities in the East are declining *(a trend that began prior to the current conflict)*.[28] There is also a strong spatial concentration of growth and decline in Bulgaria, where growth is concentrated in major urban centers located along the coast *(Burgas and Varna)* and in the West *(Sofia and Plovdiv)* while outside of these four poles of growth cities are declining **(see Figure 13)**. Spatial-demographic shifts are also visible in countries like Moldova, Turkey, and Albania. In Albania, the fastest growing cities are in the Tirana-Durres corridor as well as a few cities along the Ionian Coast *(Vlore and Sarande),* while most of the cities in the southeast are declining. In Moldova, the capital Chisinau and the cities that surround it concentrate population growth while the remaining cities in the country are declining. In Turkey, small cities are mostly declining, while larger cities are growing.

FIGURE 13: SPATIAL TRENDS IN THE GROWTH/DECLINE OF CITIES IN UKRAINE *(TOP)* AND BULGARIA *(BOTTOM)*

UKRAINE



BULGARIA

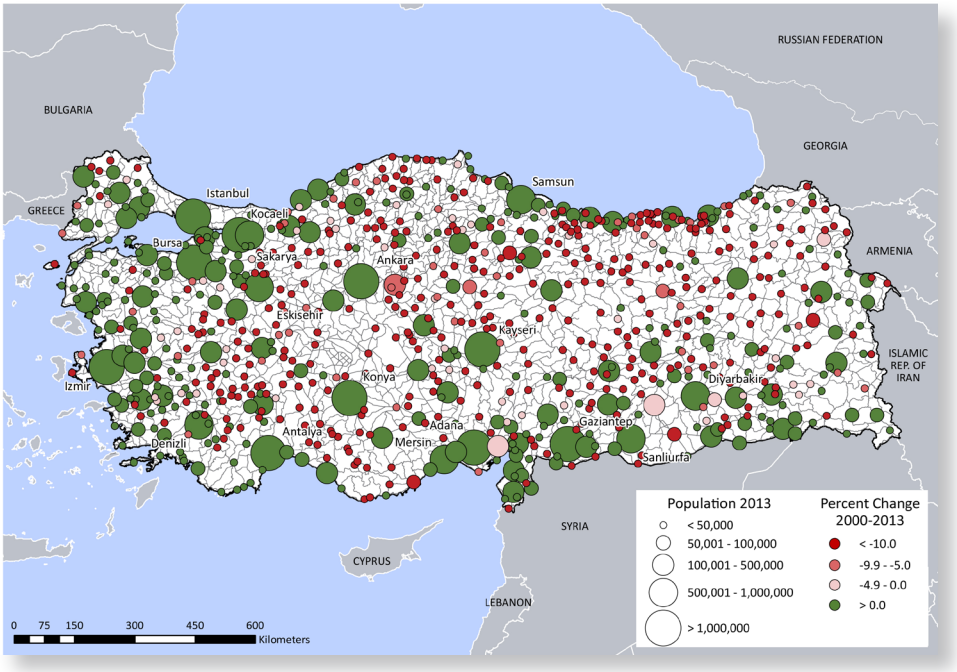


Source: Cities in Europe and Central Asia: Regional Database.

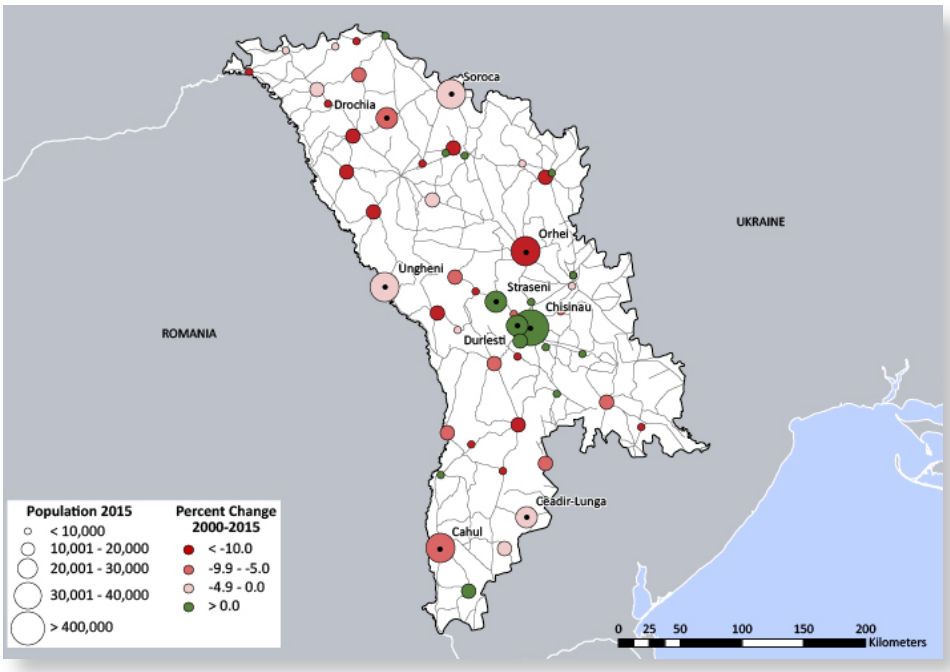
28 The spatial concentration of growth in the west and decline in the east of Ukraine may be explained by a 'catching-up' effect. After the fall of the Soviet Union, the western part of Ukraine was primarily rural while the east had already undergone urbanization. See World Bank *(2015)*.

FIGURE 14: SPATIAL TRENDS IN THE GROWTH/DECLINE OF CITIES IN TURKEY *(TOP)* AND MOLDOVA *(BOTTOM)*

TURKEY



MOLDOVA



Source: Cities in Europe and Central Asia: Regional Database.

BOX 3: CITY-LEVEL CONSEQUENCES OF URBAN POPULATION DECLINE

Cities can experience population decline for a multitude of reasons that include shifts in the global economy *(e.g., reductions in trade barriers or transport costs)* to other external shocks such as urban population decline and natural or anthropogenic disasters. Common examples of shrinking cities are Detroit, Cleveland, and Youngstown *(shifts in global economy and reduction of transport costs)*, Chernobyl *(nuclear disaster)*, and New Orleans *(Hurricane Katrina)*. In the same way that nations are affected by demographic transition **(Box 1)** there are city-level implications of population decline. The most common implications are: (i) increased fiscal imbalances at the city level; (ii) housing vacancy and urban blight; and (iii) shifts in population density patterns, which can affect service delivery. The following section discusses each of these implications in more detail:

Increased fiscal imbalances. Less people often means less municipal revenue. Less people can lead both to a decrease in demand for local goods and services and to less taxable income. It can also mean – depending on the design of the fiscal transfer system – a reduction in the allocation of inter-governmental transfers (as most transfer systems use per capita formulas).

The relationship between population decline and a decline in local municipal revenues depends on the revenue sources that feed local budgets. In the developed world, city revenues, which usually rely on own source revenues like income and housing taxes, are more vulnerable to demographic changes *(e.g., Detroit)*. In cities[1] whose revenue relies mainly on inter-governmental transfers, like those of most countries in ECA, the relationship between population and revenue decline depends on the design and efficiency of the transfer systems. If transfers are distributed based on built infrastructure *(i.e., hospital beds, number of teachers)*, but not strongly linked to demand *(i.e., patients, number of students)*, population decline will have a lesser effect on the decline of local budgets.

A decline in economies of scale and/or declining densities can also affect municipal expenditures. This is because some fixed costs cannot be adjusted to the decline in population, leading to an increase in the marginal cost per citizen of providing services. This is further described below *(service provision challenges)*.

Housing vacancy/urban blight. Due to the durable nature of housing, a decline in a city population generally translates into rapidly declining housing prices.[2] Without active demolition campaigns to manage housing stocks, it can takes decades, if not centuries, for housing supply to adjust to a decline in demand. This, in turn, leads both to a decrease in property values and an increase in housing vacancies. Both of these shifts can strongly impact municipal revenues if municipal revenues are highly dependent on property taxes.

In addition, there is evidence of housing vacancy producing a domino effect on property values and crime. A recent study in Philadelphia found that properties within 150 feet of an abandoned property experienced a loss of $7,627 in value, whereas those within 300-450 feet experienced a loss of $3,542.[3] A study[4] in Pittsburgh found that while foreclosure, alone, had no direct effect on crime, after a property became vacant, the rate of violent crime within 250 feet of the property was 19 percent higher than the rate in the area between 250 and 353 feet from the property. The higher rate based on proximity is evidence of the “broken windows theory,” which posits that signs of abandonment or disorder of a structure will encourage further abandonment or disorder. Thus, abandonment can leave fewer neighbors to monitor criminal activity. However, whether this leads to an overall increase in crime or a shift in crime hot spots within the city is unclear.

BOX 3: CITY-LEVEL CONSEQUENCES OF URBAN POPULATION DECLINE (CONTINUED)

Shifts in population density and increased per capita costs for service delivery. A decline in population without the implementation of active densification strategies generally leads to declining densities and as well as declines in economies of density (cost savings resulting from spatial proximity of suppliers and providers). Without active densification strategies, declining cities generally experience urban sprawl *(as their urban footprint declines slower than their population)*. A decline in population and density can translate into multiple challenges for the delivery of services, which benefit from economies of scale and/or economies of density. In the case of public transport, an important decline in density can make a previously feasible transport system *(i.e. subway)* unfeasible. Similar operational challenges emerge in the case of water supply, sanitation, and district heating. For instance, lower water consumption leads to longer water retention times and, consequently, to greater risk of bacterial growth. In district heating networks, vacant housing raises heat transport losses that affect the overall system's efficiency.

The consequences of population decline at the city level also depend on the characteristics of those who stay and those who leave. Below are three additional implications of urban population decline.

Decline in median incomes and increased concentration of poverty. The experiences of cities in the U.S. 'Rust Belt' suggest that the first to leave the city are those who have both transferable skills and economic resources to relocate. As such, the decline in population has generally been linked with an increase in poverty. In the U.S., the poverty rate in the 10 top declining cities is twice as high as the national average *(of 14 percent)*[5]. These cities' median income is also half of the national medium income.

City	Poverty rate	Percent change in population (1960-2012)	Median income
Detroit	36.2%	-57.3%	27,862$
Cleveland	32.6%	-54.7%	27,470$
Reading	37.3%	-10.2%	27,416$
Monroe	35.2%	-6.5%	29.051$
Dayton	32.5%	-46.1%	28.843$
Saginaw	36.9%	-47.6%	27,445$
Gary	35.9%	-55%	27,701$
Flint	38.2%	-48%	26,621$
Pontiac	34.0%	-27.6%	29,189$
Youngstown	33.8%	-59.8%	24,880$
US Average	**14.3%**	**+72.17%**	**52,762$**

Source: International Business Times, Lisa Mahapatra (2013)

BOX 3: CITY-LEVEL CONSEQUENCES OF URBAN POPULATION DECLINE (CONTINUED)

Shifts in spatial segregation within cities. Due to a lack of data disaggregated at the neighborhood level, very little empirical analysis has been done at the city level regarding spatial shifts. However, one study on Detroit suggests that urban decline can generate reverse gentrification processes. In Detroit, there was an inward contraction with middle-income households moving in and low-income households moving to border areas. Evidence suggests that this happens because the urban rich are more likely to leave after a negative citywide shock, and the urban poor, who are left behind, benefit as housing becomes more affordable and move into formerly middle-income neighborhoods.[6] A second study, analyzing urban decline in the U.S. 'Rust Belt' revealed that neighborhoods with the lowest housing prices *(prior to the shock)* were the ones that experienced the steepest declines in population, but that income fell more sharply in neighborhoods with middle-tier housing prices.[7]

These patterns would likely differ from those observed in less socially-segregated cities and/or in cities with high housing ownership rates *(restricting mobility)*, which is more common in ECA countries.

Aging. Declining population can also be linked to aging. This can happen either because youth *(more mobile and willing to move)* leave in search of opportunities elsewhere or because the overall population of the city is slowly transitioning *(decline in fertility)*[8]. In both cases, there are important consequences at the city level. Health services are likely to see an increase in demand while education services will undergo a decline in demand. With an aging population, urban transport patterns can also be affected as elders will likely commute less and have preference for certain transport modes.

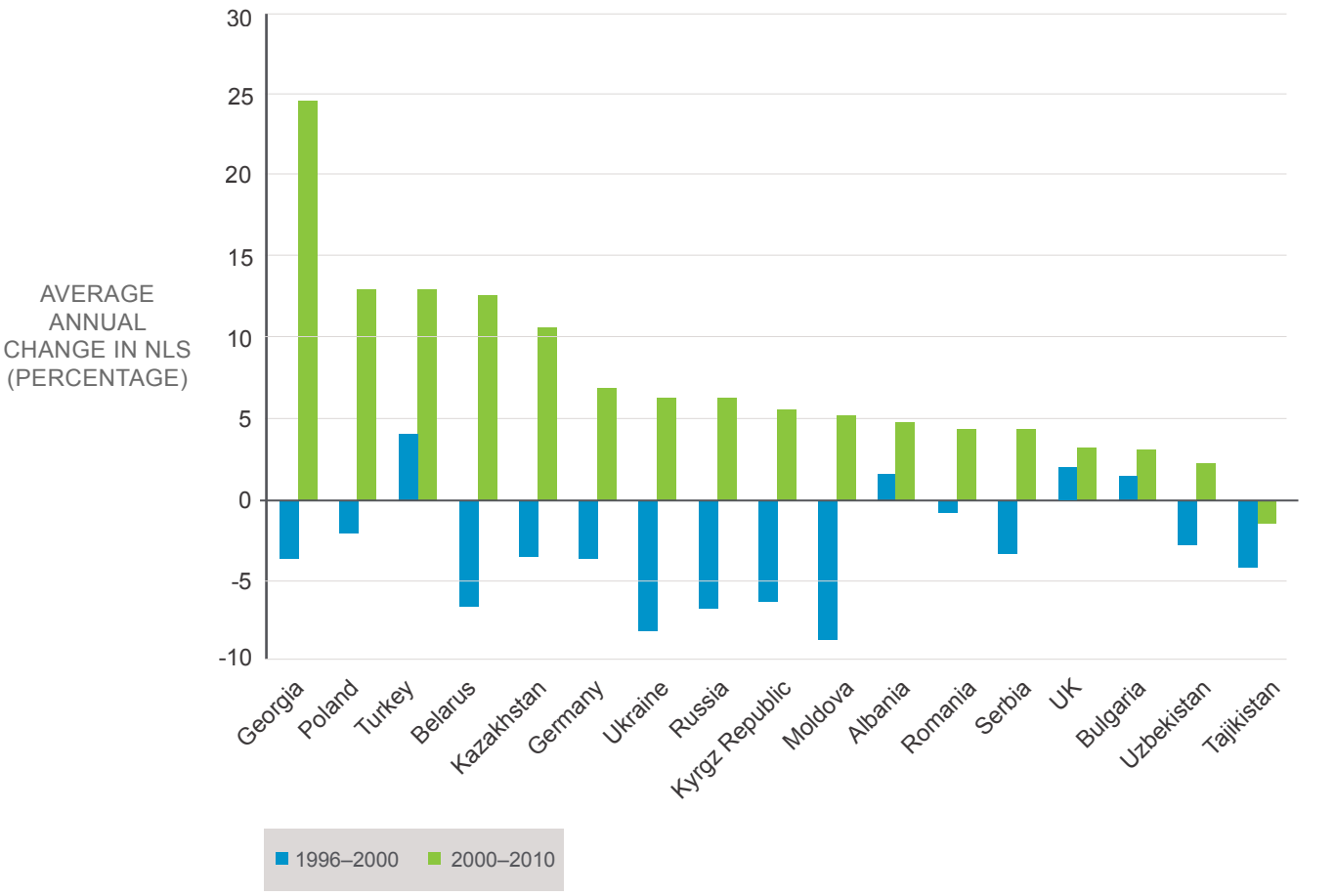
Source:
1 Scorsone *(2013)*
2 Glaeser and Gyourko *(2005)*
3 Temple University Center for Public Policy *(2001)*
4 Cui and Walsh *(2015)*
5 Mahapatra *(2013)*
6 Guerrieri, et al. *(2012)*
7 Hartley *(2013)*
8 World Bank *(2015)*

SHIFTS IN ECONOMIC DENSITY ARE ALSO VISIBLE ACROSS ECA'S URBAN SYSTEMS

In addition to population changes, over the past two decades ECA's urban systems have also experienced transformative shifts in economic density. Using Nighttime Lights *(NLS)* as a proxy for economic activity, we can observe and compare changes in economic density across and within ECA's urban systems **(for more details on the NLS product refer to the introduction; for more details on using NLS as a proxy for economic activity refer to Box 4).**

For most ECA countries, shifts in economic density differ between the first and second period of transition. In most ECA countries except Turkey, Albania, and Bulgaria, the average city underwent a decline in nighttime light intensity during the first period of analysis *(approximately 1996-2000)*. This trend was reversed during the second period of analysis in all countries except Tajikistan. Across all 17 countries, the largest gains in NLS between 2000 and 2010 were found in Georgia, Poland, Turkey, Belarus, and Kazakhstan **(see Figure 15)**. The observed changes in nighttime lights between the first and second periods of analysis are likely the result of economic shocks experienced by many cities in the region in the transition from a planned to a market economy.

FIGURE 15: AVERAGE CHANGE IN CITY NLS BETWEEN 1996-2000 AND 2000-2010 *(BY COUNTRY)*



Source: Cities in Europe and Central Asia: Regional Database.

BOX 4: USING NIGHTTIME LIGHTS (NLS) AS A PROXY FOR ECONOMIC ACTIVITY

Studies have increasingly shown a strong positive correlation between NLS growth and real GDP growth at the country level, and more recently at the regional/subnational level.1 Given the lack of available economic data at the subnational level, NLS provide a unique dataset that can be used as a base for assessing economic trends. For the purposes of this study and to test the validity of using NLS as a proxy for economic activity, we examined the relationship between NLS *(radiance calibrated)* and regional GDP for 16 of the 17 ECA countries analyzed *(Moldova does not produce subnational GDP data)*. For all 16 countries we found a positive and significant relationship between NLS and GDP levels. We also tested - by aggregating the full set of countries—the relationship between GDP growth and NLS growth at the subnational level and found it to be positive and statistically significant with a coefficient of 0.182 for NUTS 2 regression *(0.081 for NUTS 3)* and an R-square of 0.788 *(0.826)*.

	COUNTRY	L(NLS)	OBSERVATIONS	R2
(1)	Albania	1.24**(0.37)	12	0.80
(2)	Belarus	1.25**(0.28)	6	0.84
(3)	Bulgaria	1.17***(0.06)	140	0.72
(4)	Georgia	0.88*(0.36)	7	0.60
(5)	Germany	0.72***(0.02)	1,980	0.41
(6)	Kazakhstan*	0.50**(0.24)	28	0.13
(7)	Kyrgyz Republic	0.92***(0.15)	7	0.66
(8)	Poland	0.61***(0.03)	325	0.94
(9)	Romania	1.07***(0.07)	210	0.67
(10)	Russia	0.33***(0.03)	456	0.98
(11)	Serbia*	1.26***(0.22)	25	0.83
(12)	Tajikistan*	0.92***(0.02)	8	0.99
(13)	Turkey	1.40***(0.14)	52	0.74
(14)	UK	0.56***(0.04)	840	0.28
(15)	Ukraine*	0.85***(0.08)	135	0.50
(16)	Uzbekistan	1.01***(0.13)	39	0.95

Robust standard error in parentheses

*** p<0.01, ** p<0.05, * p<0.1

NLS are in logs

* Countries with asterisks at end of name use raw nighttime lights; remaining countries used radiance-calibrated nighttime lights

1 See both Henderson (2016) and Shi (2014).

Within countries, there is substantial heterogeneity in the spatial distribution of nighttime lights growth. For example, in Ukraine, there is a clear spatial divide in the distribution of nighttime lights with the NLS compound growth rates being much higher for cities in the west compared to cities in the east (see Figure 16). In Tajikistan, higher NLS growth rates are concentrated in the south around Dushanbe while the north experienced much lower NLS growth rates. In addition, the eastern part of Tajikistan has almost no lights, which reflects the very low population density in this area of the country. Albania displays a similar pattern, with higher growth in nighttime lights along the Durres-Tirana economic corridor and lower growth rates for cities in the south. Meanwhile, the eastern part of Albania remains largely undetected by nighttime lights except for the city of Korça.

FIGURE 16: GROWING LIGHTS IN THE WEST, DIMMING LIGHTS IN THE EAST (UKRAINE)

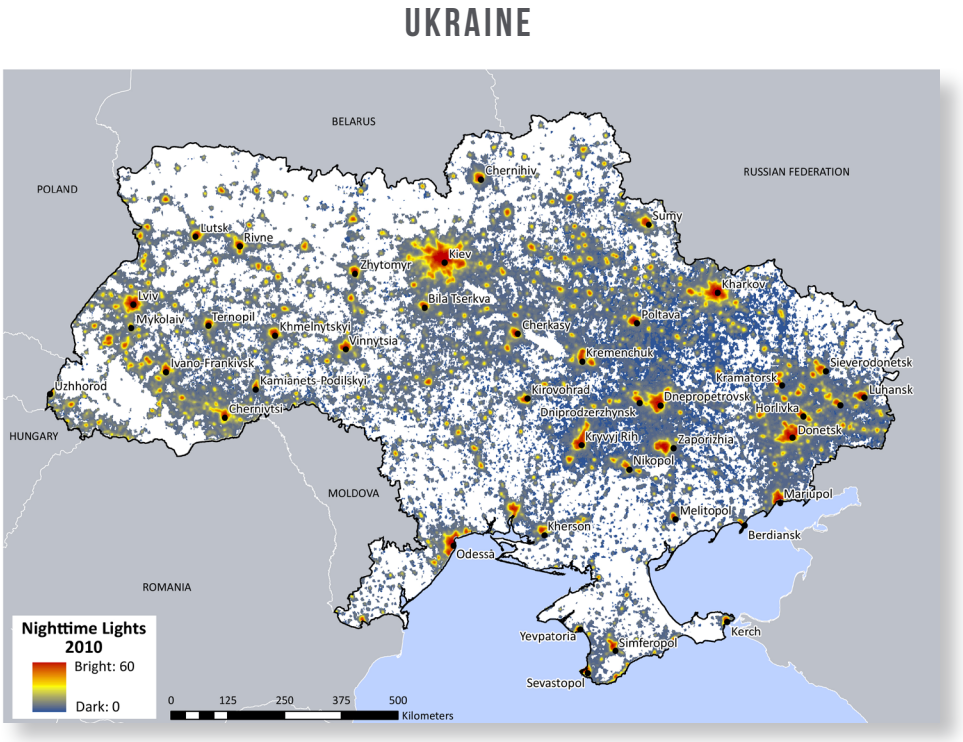
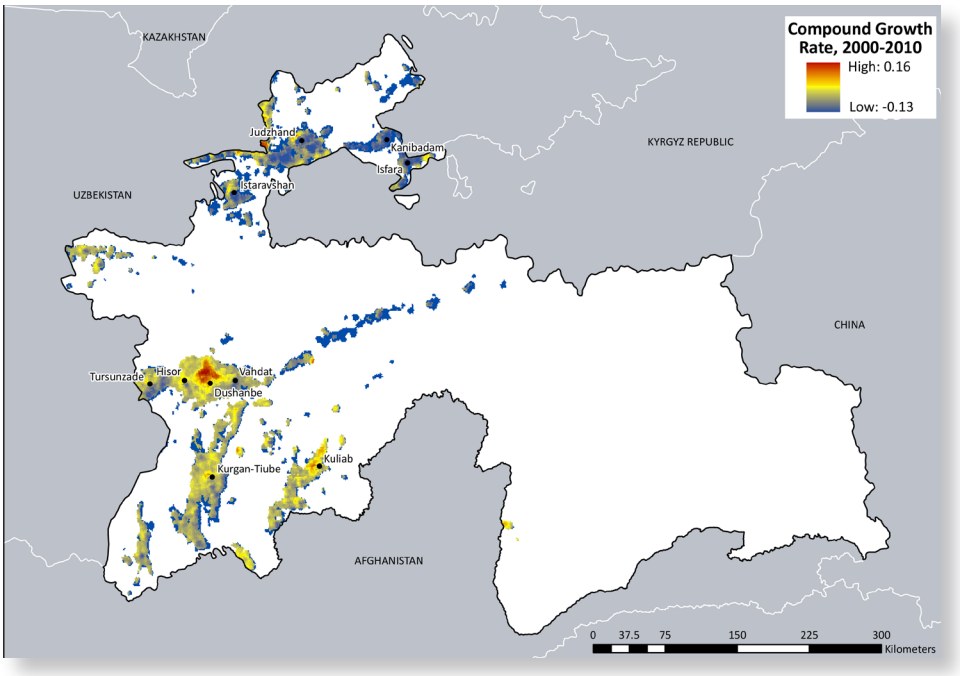
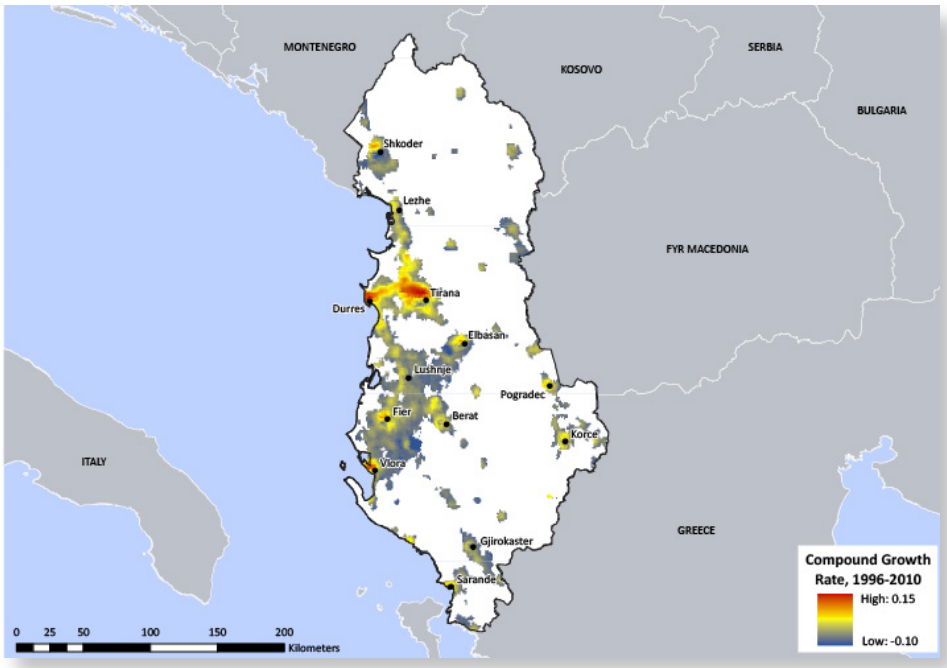


FIGURE 17: HETEROGENEITY IN THE DISTRIBUTION OF LIGHTS IN TAJIKISTAN *(TOP)* AND ALBANIA *(BOTTOM)*

TAJIKISTAN



ALBANIA



The NLS analysis also reveals an increasing concentration of NLS in a fewer number of cities. Using GINI coefficients, we find that economic activity, as proxied by NLS, is for the most part increasingly concentrated in fewer cities **(see Table 4)**. This is true for all countries analyzed *(between 2000 and 2010)* except for Belarus, Poland, Turkey, Romania, the UK, and Ukraine. Diverging trends can be observed between the first and second period in Kyrgyz Republic, Moldova, Serbia, and Uzbekistan - which experienced de-concentration during the first period of analysis *(1996-2000)* followed by increasing concentration during the second period *(2000-2010)*. There is also heterogeneity in the concentration of nighttime lights across the countries studied. As of 2010, the UK, Russia, and Turkey presented the highest GINI values; countries such as Poland, Belarus and Tajikistan were in the mid-range; and countries such as Romania, Kazakhstan, and Georgia presented the lowest concentration of nighttime lights.

TABLE 4: NLS AND POPULATION CONCENTRATION INDEX *(BY COUNTRY)*

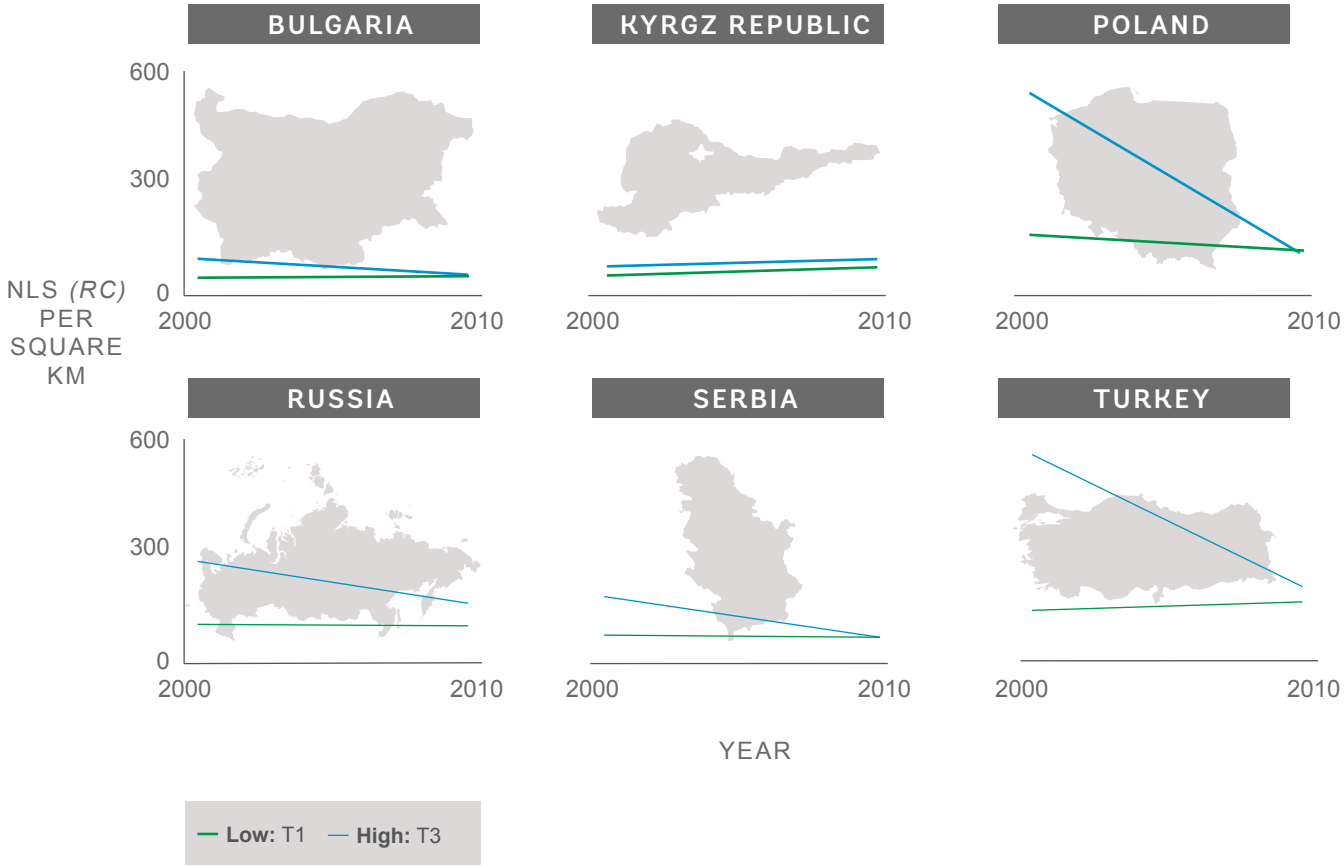
	CITY POPULATION GINI*			CITY POPULATION GINI TRENDS		CITY NLS GINI*			NLS GINI* TRENDS	
	1 (cen_1)	2 (cen_2)	3 (cen_3)	Trend (1-2)	Trend (2 - 3)	1 (rc1996)	2 (rc2000)	3 (rc2010)	Trend (1-2)	Trend (2 - 3)
Albania	0.696	0.718	0.756	+	+	0.770	0.783	0.814	+	+
Belarus		0.668	0.713		+	0.831	0.837	0.804	+	-
Bulgaria		0.628	0.680		+	0.768	0.776	0.782	+	+
Georgia	0.674	0.672	0.640	-	-	0.709	0.763	0.774	+	+
Germany		0.705	0.795		+	0.804	0.812	0.820	+	+
Kazakhstan	0.508	0.542	0.651	+	+	0.640	0.725	0.739	+	+
Kyrgyz Rep.	0.644	0.676	0.671	+	-	0.799	0.797	0.811	-	+
Moldova	0.656	0.708	0.688	+	-	0.775	0.768	0.787	-	+
Poland		0.712	0.735		+	0.854	0.856	0.799	+	-
Romania	0.622	0.630	0.641	+	+	0.679	0.695	0.685	+	-
Russia	0.608	0.629	0.758	+	+	0.756	0.795	0.834	+	+
Serbia		0.507	0.700		+	0.564	0.558	0.785	-	+
Tajikistan		0.610	0.629		+	0.671	0.706	0.796	+	+
Turkey		0.702	0.723		+	0.838	0.842	0.832	+	-
UK	0.817	0.803	0.808	-	+	0.847	0.845	0.841	-	-
Ukraine	0.737	0.735	0.744	-	+	0.834	0.891	0.814	+	-
Uzbekistan	0.674	0.652	0.650	-	-	0.826	0.817	0.820	-	+

Source: Cities in Europe and Central Asia: Regional Database.

Furthermore, across all ECA countries analyzed, the concentration of economic density is higher than the concentration of population density. We observe that the GINI coefficients for NLS concentration are higher than the coefficients for city population concentration **(see Table 4)**. This might be a reflection of agglomeration economies, which lead to increasing returns from increasing population densities.

But an analysis of productivity (using NLS per km2 as a proxy) suggests that convergence between initial "low performers" and "high performers" is occurring in most countries. We divided each country's cities into tertiles with T1 having the lowest values of NLS per km2 in 2000 and T3 having the highest values of NLS per km2 in 2000. Then we examined growth by tertile between 2000 and 2010. We found that across all countries, except the UK and Kyrgyz Republic, T1 and T3 were converging in values in 2010. However, findings are also suggestive of a convergence towards the bottom, with high-performing cities moving closer to low-performing ones. In the Kyrgyz Republic and the UK, the difference between tertiles is stable *(no divergence is observed)*.

FIGURE 3: PATTERNS OF LIGHT CONVERGENCE *(BY RC PER KM2 IN 2000)*



T1: lowest tertile of NLS per km2 in 2000; T3 highest tertile of NLS per km2 in 2000.

Source: Cities in Europe and Central Asia: Regional Database.

3. A CLOSER LOOK AT THE WINNERS AND LOSERS

In the previous section, we noted that population is increasingly concentrated in a fewer number of cities in the countries of the ECA region *(economic density is also increasingly concentrated in most countries)*. This, coupled with emerging demographic challenges, means that many cities in the region are competing for a limited labor force—with clear "winners" and "losers" emerging from this competition. In this section we take a closer look at the "winners" and "losers" to further understand which characteristics help determine whether a city is losing or growing in population, and more importantly, to assess whether there are city-level economic implications resulting from current demographic trends.

What is a winner and what is a loser? Over the years following transition, cities in ECA have gone through important demographic, spatial, and economic shifts. These shifts differ across and within countries. In this section, we will take a closer look at the urban systems in our sample of 17 countries to identify the main characteristics of cities that are "growing" in reference to their peers versus cities that are "declining." We refer to these cities informally as winners or losers. Winners, in our own interpretation are cities that perform better—in terms of attracting or retaining population—compared to the country's average. So, in some countries, such as Romania and Bulgaria winning may mean "losing less population than the average city," while in other countries, such as Tajikistan or Kyrgyz Republic, winning may mean, "growing more than the average city." Using a country-relative classification as opposed to an absolute growing/declining classification allows us to better understand the main trends emerging in ECA's urban systems. Furthermore, it reveals the determinants of city population growth/decline, which can provide useful insights for policy makers.

As expected, winners and losers have different attributes. Winners are—on average - larger and growing more both in terms of population and NLS intensity. They also have—on average—higher market potentials and score higher on their location fundamentals index. Winners also appear to be more productive in terms of NLS output per area. Capital cities and secondary cities are also predominantly winning **(refer to Box 6 for definitions)**. Losers, on the other hand, are mainly composed of "single" cities or smaller cities. Summary statistics for winners and losers, including whether differences in means are statistically significant **(indicated by ***)**, **can be found in Tables 5 and 6.**

TABLE 5: WINNERS AND LOSERS HAVE DIFFERENT ATTRIBUTES *(1)*

		GROWING	DECLINING	WINNERS	LOSERS
Population	Circa 2000	93,185	41,082***	86,411	40,159***
	Circa 2010	107,401	38,093***	97,523	37,594***
	% population change	11.98	-11.46***	8.42	-11.44***
NLS Lights	% change intensive♦	20.49	-3.17***	28.10	10.23***
	% change extensive♦♦	262.25	232.83	231.98	250.17
	% change NLS	84.81	63.24***	77.83	64.41***
	NLS (total, 2000)	15,537	4,197***	11,769	4,922***
	NLS (total, 2010)	18,412	5,236***	14,062	6,057***
Productivity	NLS per capita (2010)	0.14	0.13	0.12	0.14
	NLS per sq km (2010)	102.63	67.53***	87.92	72.00***
		GROWING	DECLINING	WINNERS	LOSERS
Market Potential	% change NLS per capita	67.08	79.79***	67.92	81.61***
	% change NLS per km2	-11.79	-16.02	-13.59	-15.43
	NLS (000s, 2010)	2.06	1.35***	1.79	1.49***
	Population (000s, circa 2010)	164.18	137.93***	152.21	144.65***
Location fundamentals index♦♦♦♦		51.67	48.89***	51.48	48.69***
Area change 2000-2010 (%)		269.48	228.19	214.69	262.08

NOTE: ♦ intensive means the change in NLS brightness in the city core; ♦♦ extensive means the change in NLS brightness in the expanded city area; *** Statistically significant difference in means *(95 percent confidence level)*; ♦♦♦♦ Location fundamentals index is created using average temperature in January, average annual precipitation, and distance to coast. The higher the index value, the "better" location fundamentals the city has.

Source: Cities in Europe and Central Asia: Regional Database.

A subset of characteristics appears to be crucial for a city's population to grow. To analyze the determinants of a city's population change, we constructed a model similar to Henderson and Wang *(2007)* and then tested it empirically using the Cities in ECA regional database. In particular, we were interested in understanding the relationship between the initial local market, market potential, and urban structure and observed levels of city population growth. Our local market and market potential values were estimated using two different instruments: population and NLS values **(for more details please refer to Box 5)**. To reduce the likelihood of omitted variable bias, we used six location fundamentals as controls: (i) distance to border, (ii) distance to coast, (iii) forest coverage, (iv) annual precipitation, (v) average temperature in January, and (vi) land vegetation. We also used country-fixed effects so that we compared each city to others within the same country. The use of country-fixed effects is consistent with the winners and losers definition previously described. The following section discusses, in particular, the characteristics that were statistically significant in explaining city population change. The complete model and regression results can be found in **Appendix 2**.

Bigger cities tend to grow more than their peers. Cities that were larger in 2000 grew more in population between 2000 and 2010 when compared to smaller cities. The same is true for cities that had higher NLS values in 2000. In our model, the initial level of population or lights is interpreted as the size of the local market. The bigger the size of a local market in 2000, the more it grew over the 2000-2010 period.

Market potential's effect on city population growth differs according to local circumstances. While previous studies suggest that there is a positive and significant relationship between market potential and city population growth, we find that this relationship is not always positive and depends on local circumstances. In particular, we find diverging trends in market potential when comparing cities located in regions and countries undergoing a strong demographic transition. Overall, market potential has a positive and significant effect on the growth of cities *(the higher the initial market potential the higher the population growth experienced in subsequent periods)*. However, this relationship is reversed in declining cities so that a higher initial market potential has a negative effect on the growth of the city's population in subsequent periods. Our interpretation is that when a city is already operating in an environment where the labor force is scarce, having a higher market potential also means higher competition for those scarce human resources. For instance, a city located close to *(but not functionally part of)* a large agglomeration is likely to lose population to this large agglomeration when labor is scarce **(refer to Box 5 for the definitions of agglomerations, agglomeration centers, and single cities)**.

Cities surrounding centers of agglomerations are growing much more than their peers. When controlled for initial population size, centers of agglomerations are not growing/declining more than single cities. Cities surrounding centers of agglomerations are growing *(significantly)* more than both single cities and the center of agglomerations. In fact, in most ECA countries, "surrounding cities" have the highest population growth rates - which is suggestive of suburbanization. In terms of distribution, as shown in **Table 6**, agglomeration centers are almost equally distributed between winners and losers *(and declining and growing cities)*, while surrounding cities are disproportionally winners and growing.

29 See Henderson and Wang *(2007)*.

BOX 5: DEFINITION OF MARKET POTENTIAL

A city's market potential is determined by the network of cities to which it has access; this analysis relied on a market potential indicator to measure that access to other cities *(markets)*. The market potential statistic we use in this analysis is based on gravity models that are used extensively in the trade literature *(Anderson, 2010)*. We calculate our market potential for city j in time t:

$$mp_{j,t} = \sum_{i}^{j-1} \frac{m_i}{d_{j,t}}$$

where,

- m indicates a measurement of market size *(we use population and NL alternatively)*
- $d_{j,i}$ indicates the distance between the target city j and other city i *(we use both linear and quadratic geodesic distance and linear and quadratic driving distance)*.
- J is the total number of cities in the country

Thus, the market potential for a city is the ratio between the sum of population *(or NLS)* of all the other cities in the country relative to the sum of travel time to those cities from the reference city. Therefore, high market potential would mean closeness to one or more large cities, while low market potential would suggest distance from large cities.

Source: Quintero and Restrepo-Cadavid *(2017 forthcoming)*.

TABLE 6: WINNERS AND LOSERS HAVE DIFFERENT ATTRIBUTES *(2)*

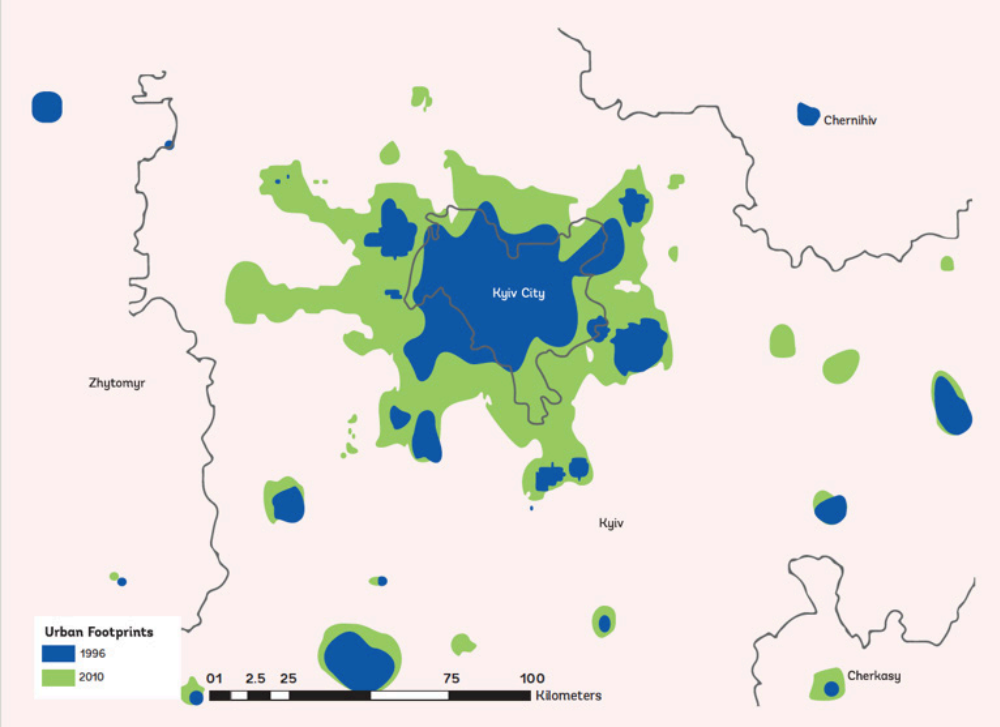
		GROWING	DECLINING	WINNERS	LOSERS	ALL
Intra-group dynamics	Single city (%)	40.7	61.83	47.01	59.02	53.27
	Surrounding agglomeration (%)	50.47	30.18	43.74	33.48	38.38
	Center of agglomeration (%)	8.83	7.99	9.25	7.50	8.36
Inter-group dynamics	Single city (%)	30.75	69.25	41.85	58.15	
	Surrounding agglomeration (%)	53.02	46.98	54.14	45.86	
	Center of agglomeration (%)	42.69	57.31	52.72	47.28	
Intra-group dynamics	Capital city (%)	0.70	0.06	0.64	0.03	0.31
	Secondary cities (%)	26.60	15.53	26.72	14.05	19.68
	Remaining cities (%)	72.70	84.41	72.64	85.92	80.01
Inter-group dynamics	Capital city (%)	88.24	11.76	94.12	5.88	
	Secondary cities (%)	52.20	47.80	61.54	38.46	
	Remaining cities (%)	35.44	64.56	41.56	58.44	
Monotowns (Russia) (%)		10.71	89.29	23.66	76.34	20.41

Source: Cities in Europe and Central Asia: Regional Database.

BOX 6:AGGLOMERATIONS AND SINGLE AND SECONDARY CITIES

Agglomerations are groupings of cities whose NLS urban footprint merge together and are considered one "functional urban area." It is likely that agglomerations function as a single city due to the proximity and interaction between their housing and labor markets. People might work in one city in the agglomeration and live in another city. Agglomerations develop often as a result of urban growth that occurs in-between cities. Nighttime lights can be used to trace the evolution of urban footprints *(extents)* of cities, which may merge and form agglomerations over time **(see Urban Footprints graphic below for the development of Kyiv's agglomeration between 1996 and 2010)**. We identified a total of 352 agglomerations comprising a total of 2,358 cities in the 17 ECA countries studied. Each agglomeration is composed, on average, of 6.7 cities. Among agglomerations, we differentiate the **centers of agglomerations**, which correspond to the largest city in the agglomeration, from the cities surrounding the centers of agglomeration, which we refer to as cities "**surrounding agglomeration**."

Single cities are cities that—contrary to agglomerations—have an urban footprint contained within a single administrative area. There are a total of 2,243 single cities in the Cities in ECA database.



Secondary cities are cities that fall in the top 20 percent of cities in a given country in terms of population size. The capital city is not included in this category. This definition allows for comparisons between countries with different urban systems *(overall city sizes and numbers)*.

Capital and secondary cities also appear to attract more population. Controlling for size, capital and secondary cities seem to grow more than their peers, although the mechanisms leading to this are not clear. One hypothesis might be that capital and secondary cities have unique characteristics beyond size that make them more attractive. For instance, it is possible that people prefer to reside in capital cities as they can have access to jobs that tend to be found in capital or secondary cities, or have access to certain amenities found there. This result is, however, neither robust to all specifications nor consistent across countries. For instance, in Russia the capital city *(Moscow)* has no advantages in terms of population growth when controlled for size.

The degree of economic specialization matters. We find that cities which are highly specialized in one economic sector, commonly referred to in the region as monotowns, underperform in relation to their peers. These results emerge from conducting empirical analysis about Russian cities.

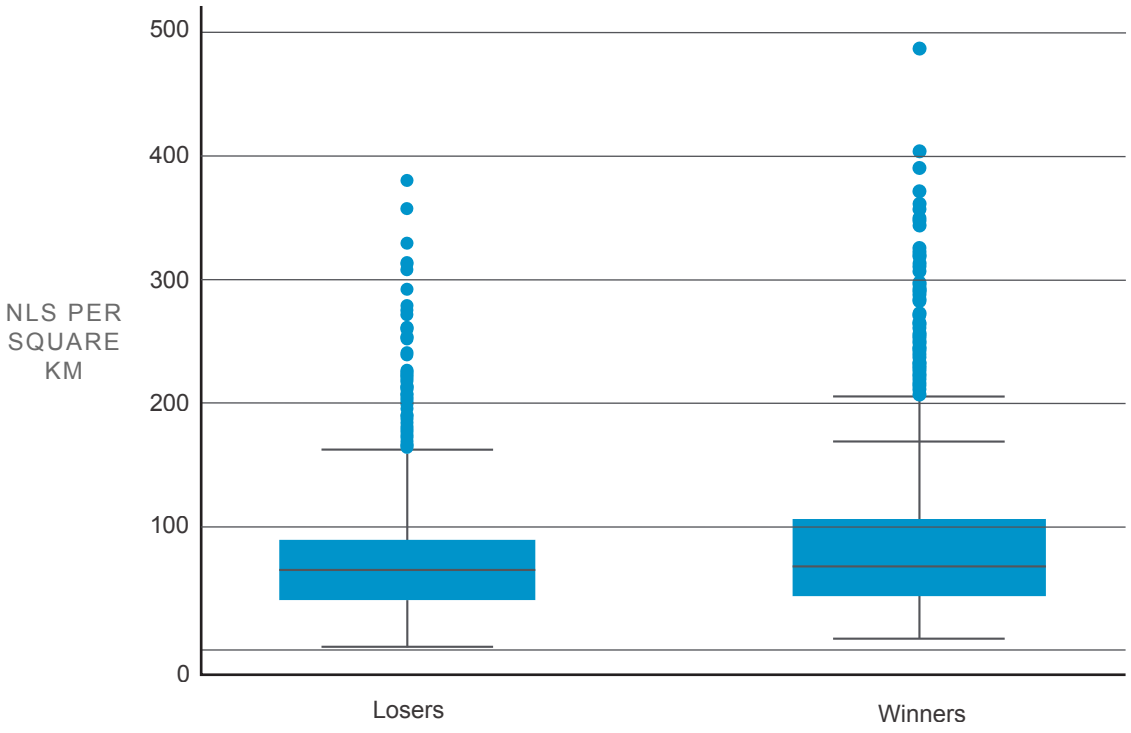
Some location fundamentals matter. Being close to the coast and having higher average temperatures *(in January)* are positively correlated with city population growth. The impact of location fundamentals on the growth of cities is varied. Coastal cities likely have greater access to international markets *(international market potential),* while the coast itself can also be considered a natural amenity. Average temperature can also be considered a natural amenity—with people having preferences for milder winters.

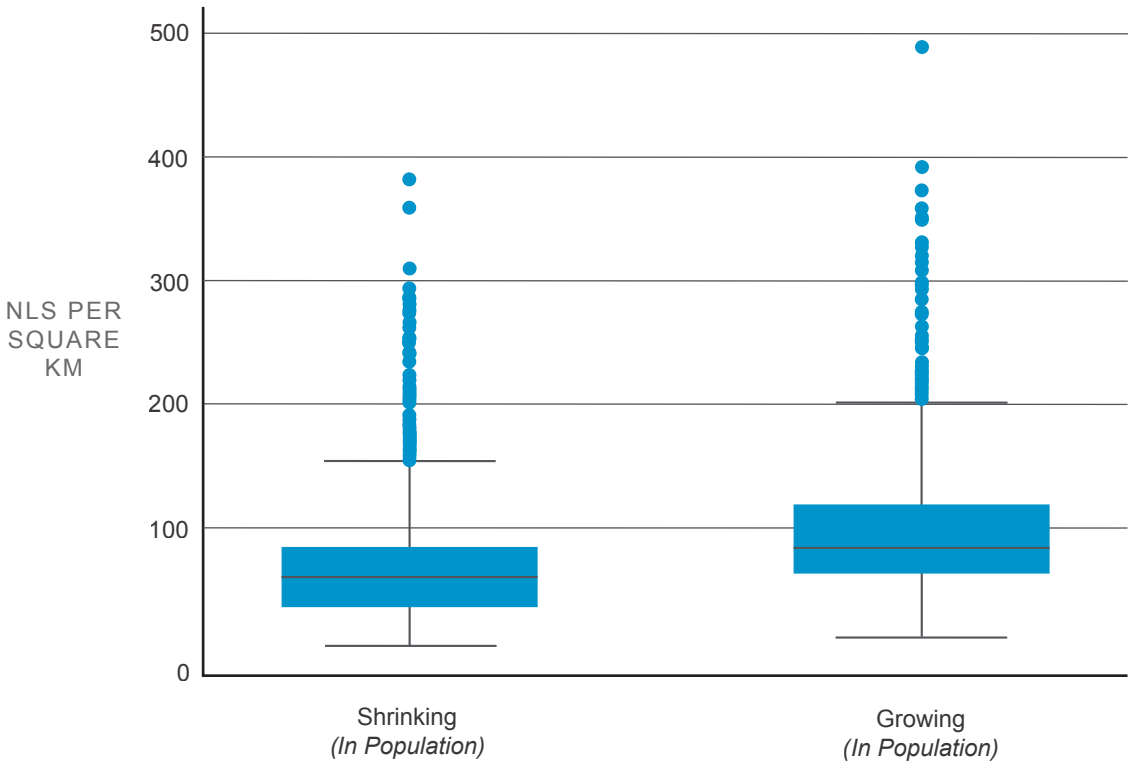
However, are losers or cities that are shrinking in population systematically performing worse than winners? As discussed in section 2, while there is clear evidence of increasing population and economic density, with people and economic activity *(NLS)* concentrating in fewer cities, there is also evidence of convergence in NLS per km2. This suggests that ECA's urban systems might be moving towards a new spatial equilibrium. However, a closer look at performance, comparing winners to losers *(and shrinking to growing cities)*, reveals that:

On average, indeed, losers or cities that are shrinking in population are performing worse than winning cities *(and growing cities)* both in terms of total NLS emitted and in terms of NLS per area.

However, there is considerable overlap in performance between winners and losers across both indicators **(see Figure 19)**. This means, that, while the average loser city is performing worse than the average winner city, a loser city can be performing better than a winning one. In other words, losers in terms of population are not necessarily losers in terms of economics. The same is true for winners.

FIGURE 19: BOX PLOT NLS PER KM2: LOSERS VS. WINNERS *(TOP)*; SHRINKING VS. GROWING *(BOTTOM)*





4. POLICY IMPLICATIONS AND FUTURE WORK

POLICY IMPLICATIONS

Overall, we observe that population and economic density are increasingly concentrated in fewer cities. While this was expected, and similar to what we observe in countries around the world, there is one unique trait that makes ECA different from other developing regions: demographic transition. National demographic changes fueled by a drop in fertility rates and out-migration are affecting urban systems. With a smaller labor force at hand, cities in ECA have been competing against each other to attract scarce human capital. Our observations suggest that there are clear winners and losers emerging from this competition.

While the "average" city in ECA has seen little population change between 2000 and 2010, the reality is one of *(population)* growth and decline. Winners and losers **(as defined in Section 3)** look different. Winners tend to be larger, have higher market potential, and also perform better on average in terms of total NLS and NLS per area. Conversely, losers tend to be smaller, have less attractive location fundamentals, and have higher levels of economic specialization *(e.g., monotowns)*. Results also suggest that attracting population is not only about size; being a capital or secondary city also appears to matter. However, these differences are neither consistent across countries nor robust to all specifications, so it is unclear what is behind this dynamic. Furthermore, results suggest that there are important suburbanization forces taking place, particularly in the case of multi-city agglomerations. Our findings indicate that being the center of the agglomeration has no effect on attracting population, but cities surrounding agglomerations are systematically attracting more inhabitants.

These trends have important policy implications. Growing and declining cities both face uniquely challenging environments. Cities experiencing population growth need to adapt local infrastructure to ensure that the growing population is well-absorbed and integrated into the city; manage peri-urban growth to avoid sprawl; and balance urban growth beyond administrative boundaries. The tendency towards suburbanization in ECA's cities—at times coupled with population decline in city centers - also suggests the existence of issues with housing provision and/or inefficient land-use in the cities' core leading to suboptimal allocation of human resources and economic activities across space. Finally, our results also suggest that many of the growing cities in ECA are increasingly organized into functional urban areas that have expanded beyond their administrative boundaries *(agglomerations)*. Cities operating within these multi-city agglomerations may fail to coordinate their administrative and service activities which may affect overall economic performance.[30]

City population decline has important implications at the national and local level. Population decline can often lead to fiscal imbalances, as the revenue base of cities is eroded while the marginal cost of providing services increases. Also, given the durable character of housing, decline can lead to housing vacancy, declining housing prices, and urban blight. Decline can also lead to declining population densities *(urban sprawl)*, which could in turn affect service delivery

30 See Ahrend *(2014)* for a study of OECD metropolitan areas which found that there are productivity costs associated with administrative fragmentation, which could be reduced with the establishment of metropolitan coordination arrangements.

(for further discussion please refer to Box 3). But as observed, population decline is not necessarily linked to economic decline, and in fact many declining cities are performing at levels similar to or beyond growing cities. This suggests that while many declining cities in ECA continue to focus their policy efforts on attracting a growing population[31], they should, given the regional context, shift their efforts to better manage their population decline. While shrinking cities are not a new phenomenon, the ECA region, given its unique demographic transition, is at an unexplored frontier. While this is a challenge, it also means that the region has an opportunity to pilot policy options on smart decline.

There is a role for the public sector both at the national and local level to respond to the aforementioned challenges. Governments can adjust their inter-governmental transfer systems to better reflect emerging trends for urban growth and decline and ultimately to incentivize greater efficiency in the use of scarce public funds. For instance, transfers to local governments are at times based on existing infrastructure *(e.g., number of hospital beds)* and not existing demand *(e.g., number of patients)*, which leads to inefficiencies in spending. In addition, national and local governments can review their planning practices and methods to ensure that they are able to fully accommodate an environment in which urban growth and urban decline co-exist. Furthermore, by being the direct providers of infrastructure and services, local and national governments can support the provision and adaptation of public infrastructure to better reflect local needs. In the case of declining cities, new infrastructure - and the feasibility analysis for different technical options - should take into consideration the potential need to downsize. Some examples of policy tools implemented by declining cities around the world can be found in **Box 7**.

Beyond this, national and local governments can create the right enabling environment for cities to thrive. This is particularly important in a context where constrained economic growth is forecast, as is the case of the ECA region. **As outlined in Section 1**, cities in ECA play a fundamental role in the economic development of their countries and, if well-managed, can be pillars of economic growth and centers for inclusion and job creation.

FUTURE WORK

As outlined in the Introduction, the purpose of this report was to review major demographic, spatial, and economic trends emerging in ECA's urban systems since the fall of the Soviet Union. As such, this report did not intend to identify specific local characteristics that may further explain observed trends nor review specific policy options that could support countries in better managing urban growth and decline. However, the findings of this report allow us to identify follow-up analytical work, which could both complement and expand this study.

A natural expansion to this work would be to further deepen the understanding of the mechanisms that allow certain cities to perform well—in terms of economic growth—and others to stagnate/decline. An analysis of poverty and sectorial implications of urban decline in ECA might also be warranted to fully quantify the consequences at both the national level and the city level *(e.g., poverty concentration and segregation)* linked to this phenomenon. Deepening the understanding of how cities in ECA contribute to economic development, and the role they can play in helping countries surpass current constrained growth outlooks, can be a second natural expansion of this work. A third area for further in-depth analysis would be in understanding migration and mobility patterns across and within cities, and assessing whether land and housing market distortions are playing a role in the sub-urbanization patterns observed in multi-city agglomerations. Finally, looking at more specific policy tools for managing population growth and decline could provide a better basis for policy dialogue going forward regarding urban development in the ECA region.

31 An in-depth analysis made for the Ukraine Urbanization Review revealed that declining cities urban plans continued to be aligned with national growth policies, and often propose the expansion of housing and urban areas. Findings also revealed that intergovernmental fiscal transfers *(up to 2014)* were creating perverse incentives.

BOX 7: POLICY OPTIONS FOR SMART DECLINE

Failure to address urban decline can be costly, and policymakers at both national and local levels need to find new approaches to engage residents, property owners, and businesses in a constructive dialogue about downsizing infrastructure and smart decline. Below are a number of policies being implemented by shrinking cities *(and in some cases national governments)* around the world. While there is not enough empirical evidence available to assess the benefits of the different policy options, they can serve as guidance as to potential tools that national and local governments may use to address declining population.

Adapting land use. Youngstown, in Ohio, and Flint in Michigan—two of the fastest shrinking cities in the United States—have implemented a number of policies aimed at achieving more efficient and adaptive use of urban land and tackling vacant properties and urban blight. In 2005, Youngstown, after experiencing a decline of over 60 percent of its population, designed one of the first urban plans in the world focused on smart decline. The plan aimed at providing services to the neighborhoods with the highest population densities, while converting vacant areas into green spaces in declining neighborhoods. The idea to make the city more livable by adding green spaces was well received; the city lost only 1,000 citizens since the plan was implemented. Flint followed a different approach through the creation of "land banks.[1]" The city established a regional land bank in 2002 with the aim of supporting the local authority in gaining control of vacant land and adapting its use. The regional land bank *(Genesee County Land Bank)* gained greater control over abandoned property by placing it in public hands. The special feature of this Land Bank is that it prevents the routine practice where speculators purchase foreclosed properties and profit on their resale before the new owners proceed to let the properties go into foreclosure again. Instead, the Land Bank 'bundled' properties to make them unattractive to speculators, and then transferred unsold properties to the Land Bank. By 2012, the Land Bank owned more than 8,000 parcels in Genesee County.

Examples of national policies for smart decline. Some countries have been conscious about the need to establish national-level policies and incentives to support cities in better managing population decline. In the case of Japan, the government recognized the need to better manage its aging and declining population. Among others, the Japanese government adopted national-level, medium-term strategies with policies that included the merging of local governments (the country went from having around 30,000 local governments to around 15,000); the implementation of the Vacant Land/housing Act to regulate land that was abandoned; and the setting of regulatory reforms, such as the Urban Renewal Law and Special Urban Renewal Acts *(2002, 2006, and 2016)*. In the case of Germany[2], the program "Stadtumbau Ost" was introduced in 2001 to address the decline of eastern German cities after unification. This program provided subsidies for the demolition of buildings. The funding scheme and program subsidies were attractive and almost all cities in Eastern Germany applied to the program, which eventually supported the demolition of a total of 350,000 apartments in the region. Funding for demolitions was only provided if comprehensive urban development plans were submitted; this supported the development of a strong focus on planning and the development of public-private partnerships that needed to be developed by local authorities and housing enterprises.

Densification and Transit-Oriented Development. Densification and Transit-Oriented Development. Transit Oriented Development *(TOD*) and densification-oriented policies can help cities deal with infrastructure and transport challenges that stem from a decline in population density. Prior to declining in population, Detroit, Michigan[3] was known for its low housing density and high dependence on private vehicles for commuting. The only mass public transport available was the Detroit People Mover, a fixed monorail system operating since 1987. By 2011, the system operated at only 10 percent of capacity, which greatly threatened its financial sustainability. In response to these dynamics, the city conducted a TOD assessment and identified investments *(e.g., Woodward Light Rail system)* aimed at densifying the downtown area and strengthening the development of transport corridors to connect the metropolitan region to the downtown area through public transport.

This is also the case in Toyama[4], a medium coastal city in Japan. Like many other Japanese medium cities, Toyama faces a declining and aging population and urban sprawl, at the same time. "This

BOX 7: POLICY OPTIONS FOR SMART DECLINE (CONTINUED)

demographic shift leads to declining tax revenues, which means that a once strong transportation infrastructure is becoming outdated and replaced by private cars. In turn, without access to convenient and reliable transportation, elderly residents face isolation and health problems associated with limited mobility". In addition, the city's public service delivery costs have significantly increased to cover the expanded low dense urban areas. As a result "Officials have developed a long-term strategy aimed at revitalizing public transportation, encouraging residents and businesses to relocate along the new light rail lines" *(the Rockefeller Foundation100 Resilient Cities)*, and revitalizing the city center to make it more vibrant and pedestrian friendly.

Finding new angles to increase city competitiveness. Many declining cities have tried to reorient their economic base by focusing on emerging economic sectors, such as technology, creative industries, and/or tourism. This approach was adopted in Bilbao, Spain[5]. Bilbao had to make an enormous effort to transform its economic base, which had been suffering since the 1980s with the decline of the steel and heavy metal industries. A dedicated agency, Bilbao Metropoli 30, was created to implement the strategic development plan for the city that aimed for a service-oriented economic base. One of the most well-known developments under this plan was the construction of the Guggenheim Museum. Under the plan, the city also invested in the regeneration of old factories, such as converting them into art centers, and supported the development of complementary tourism infrastructure, technology parks, and cluster associations to boost the consolidation of creative industries *(e.g., ICT cluster, design, furniture)*. After more than 20 years of decline, the population is now stable. Today Bilbao is one of the main economic centers in northern Spain. Manchester, United Kingdom[6], underwent a similar transformation following the decline of its manufacturing base between 1951 and 1981 and loss of 22 percent of its jobs. In 1988, the city, through the Central Manchester Development Corporation, refocused the redevelopment of the city towards supporting its consolidation as a cultural and knowledge hub in the UK.

Revitalizing inner cities through Private-Public Partnerships. Pittsburgh, Pennsylvania[7] also faced decline and suburbanization, with the inner city suffering from population loss, segregation, and poverty while the broader metropolitan region gained population. In the beginning of the 1980s, the city switched its strategy towards a diversified economic foundation through services with an emphasis on higher education (using Carnegie Mellon University as a magnet) and health care. The city also implemented a series of neighborhood-level investments using public-private partnerships *(e.g., the Three Rivers Stadium baseball stadium)*, which aimed at regenerating decaying areas and bringing jobs and people back to the city. The neighborhood-level investments were developed in close collaboration with the community so as to better reflect local needs and increase local ownership.

Flexible planning. The city of Dresden experienced severe economic decline after the fall of the Soviet Union and German unification. The city's economic crisis was followed by out-migration and decreasing birth rates leading to population loss 60,000 of its 500,000 residents left the city within one decade *(1989-1999)*. As a consequence, housing and office units became vacant and there was an oversupply of infrastructure in the city. In the year 2000, the city recognized the decline and shifted its urban plans, which previously focused on growth, towards supporting a compact-city model, which focused on reducing land consumption and developing an attractive city center.

1 U.S. Department of Housing and Urban Development Office of Policy Development and Research (2009)
2 Bernt, M, (2009)
3 Scorsone, E.A. (2017)
4 Rockefeller Foundation 100 Resilient Cities http://www.100resilientcities.org/cities/toyama/)
5 Swinney, P., Thomas, E. (2005)
6 Mace A. et al. (2004)
7 Pallagst, K. (2009)

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APPENDIX I

Country	Period	Total population change (annual)	Urban population change (annual)	Percentage of population living in shrinking cities	Percentage of cities losing population	Percentage of cities losing population (>30k)	Percentage of cities losing population (>100k)
Albania	1989-2001	-0.20	1.08	14.12	27.42	10.00	0.00
Albania	2001-2011	-0.55	1.65	47.25	82.26	60.00	0.00
Belarus	1989-2001	-0.16	0.47	-	-	-	-
Belarus	2001-2014	-0.39	0.22	26.87	70.80	43.33	21.43
Bulgaria	1989-2001	-0.87	-0.47	-	-	-	-
Bulgaria	2001-2013	-0.81	-0.42	67.66	94.70	91.11	55.56
Georgia	1989-2002	-0.67	-1.06	96.45	94.44	87.50	100.00
Georgia	2002-2014	0.20	0.35	6.92	31.48	0.00	0.00
Germany	1989-2001	0.40	0.40	-	-	-	-
Germany	2001-2014	-0.11	0.06	45.19	61.14	55.50	38.96
Kazakhstan	1989-1999	-0.62	-0.68	59.80	69.86	67.92	68.18
Kazakhstan	1999-2015	0.85	0.54	5.80	21.92	13.21	0.00
Kyrgyz Rep.	1989-1999	1.25	0.52	25.76	75.61	68.00	75.00
Kyrgyz Rep.	1999-2013	1.21	1.2	12.49	42.86	33.33	0.00
Moldova	1989-2000	-0.04	-0.17	74.97	55.77	80.00	100
Moldova	2000-2015	-0.16	-0.31	40.88	81.13	80.00	0.00
Poland	1989-2003	0.06	0.13	-	-	-	-
Poland	2003-2011	-0.04	-0.21	64.06	52.94	68.21	82.05
Romania	1992-2002	-0.51	-0.71	95.52	93.57	95.45	100.00
Romania	2002-2011	-0.93	-0.73	90.41	90.86	92.54	90.00
Russia	1989-2000	-0.01	0.004	50.15	65.19	54.51	50.92
Russia	2000-2010	-0.27	-0.23	42.15	73.61	63.04	48.17
Serbia	1991-2002	-0.09	0.43	50.9	46.37	55.00	60.00
Serbia	2002-2011	-0.36	-0.03	50.94	71.91	51.28	11.11
Tajikistan	1989-2000	1.75	0.02	-	-	-	-
Tajikistan	2000-2014	2.05	2.03	2.38	5.26	7.69	0.00
Turkey	1989-2000	1.61	2.73	-	-	-	-
Turkey	2000-2012	1.31	2.19	7.77	59.23	12.77	4.17
UK	1991-2001	0.29	0.36	21.33	28.24	28.62	29.41
UK	2001-2011	0.65	0.98	8.32	14.95	12.14	6.25
Ukraine	1989-2001	-0.43	-0.34	83.29	80.00	79.41	73.33
Ukraine	2001-2013	-0.59	-0.35	75.48	82.06	81.02	75.56
Uzbekistan	1990-2000	1.87	1.15	11.88	10.17	9.84	22.22
Uzbekistan	2000-2014	1.56	1.33	5.85	11.86	8.20	11.11

APPENDIX II

The models developed for this analysis are similar to the model developed by Henderson and Wang (2007). The models attempt to capture the role various indicators play on city-level population growth and decline in Eastern Europe and Central Asia. To this effect, we developed two models. In the first model, push and pull factors are captured in a measurement of a local market size and an outside market potential. With a logarithmic utility, the model provides a useful estimating equation:

$$\Delta p_j = \beta 1 \; y_j + \beta 2 \sum_k \frac{y_j^n}{d_{jk}^{\theta}} + fertility_c + natural\ growth_c$$

where fertility and natural population growth vary by country, yj are market size proxies that include a vector of local amenities and level of economic activity. Economic activity is captured using NLS. dji distance is a measurement of distance between dji. Driving distance is used, and other specifications are tested with geodesic distance for robustness.

In the second model, we allow the effect ($\beta 2 \sum_k \frac{y_j^n}{d_{jk}^{\theta}}$) (of the outside market effect to vary depending on the observed population dynamics (positive or negative population growth) in the previous period. In estimation, this is incorporated through an interaction term with an indicator function $I\{\Delta p > 0\}$, which refers to the lagged change in population.

$$\Delta p_j = \beta 1 \; y_j + \beta 2 \sum_k \frac{y_j^n}{d_{jk}^{\theta}} + \beta_3 \, I\{\Delta p > o\} \sum_k \frac{y_j^n}{d_{jk}^{\theta}} + fertility_c + natural\ growth_c$$

PRELIMINARY REGRESSION RESULTS

Table 1: All Pooled OLS–IV (NL)

	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV	(7) OLS	(8) IV
Market								
Local mkt	0.016* (9.91)	-0.005 (-1.16)	0.015* (9.63)	0.035* (7.36)	0.012* (8.13)	-0.017* (-3.40)	0.012* (8.09)	-0.011 (-1.89)
National mkt	-0.014* (-10.10)	0.045* (4.09)	-0.012* (-6.68)	-0.057* (-4.93)	-0.003* (-2.07)	0.084* (6.29)	-0.003 (-1.43)	0.069* (4.53)
Nat mkt xl {$\Delta countryp<o$}		-0.003* (-2.45)	-0.032* (-6.74)				0.000 (0.14)	-0.011 (-2.01)
Nat mkt xl {$\Delta regionp<o$}							-0.008* (-7.07)	0.043 (1.58)
Nat mkt xl {$\Delta p<o$}					-0.015* (-14.41)	-0.040* (-15.74)	-0.013* (-11.86)	-0.051 (-5.32)
Population Fundamentals								
nat. pop Δ	0.010* (31.91)	0.009* (12.87)	0.010* (31.43)	0.011* (15.59)	0.010* (31.85)	0.008* (10.12)	0.009* (27.79)	0.012* (4.24)
net migration	0.016* (13.51)	-0.019* (-2.92)	0.015* (11.95)	0.048* (6.86)	0.013* (11.79)	-0.031* (-4.09)	0.011* (9.28)	-0.012 (-0.96)
Urban Structure								
Center of Agglom	-0.026* (-3.56)	-0.030* (-3.16)	-0.023* (-3.23)	0.008 (0.67)	-0.024* (-3.44)	-0.025* (-2.40)	-0.023* (-3.33)	-0.019 (-1.58)
Secondary City in Country								
Location Fundamentals								
Pct Forest	0.000 (0.09)	-0.001* (-3.21)	0.000 (0.17)	0.001* (4.04)	0.000 (1.42)	-0.000 (-1.18)	0.000 (1.26)	0.000 (0.53)
Precipitation	0.000 (0.75)	0.000* (2.51)	0.000 (0.50)	-0.000* (-3.13)	-0.000 (-0.11)	0.000 (1.30)	-0.000 (-.087)	0.000 (1.39)
Temperature	0.0002* (4.99)	-0.004* (-3.35)	0.003* (5.47)	0.014* (8.25)	0.001* (2.97)	-0.008* (-5.25)	0.001* (2.94)	-0.005* (-2.37)
Land Usability	-0.000 (-0.70)	-0.002* (-4.74)	-0.000 (-0.65)	0.002* (4.84)	-0.000 (-0.82)	-0.002* (-4.95)	-0.0000 (-0.37)	-0.002* (-3.77)
Constant	-0.051* (-2.13)	0.131* (2.56)	-0.049* (-2.08)	-0.240* (-4.41)	-0.030 (-1.29)	0.214* (3.81)	-0.019 (-0.84)	0.107 (1.43)
Observations	2503	2496	2503	2496	2503	2496	2503	2496
R^2	0.415	—	0.416	—	0.460	—	0.470	—
Adjusted R^2	0.413	—	0.414	—	0.458	—	0.468	—

t Statistics in parentheses.
* $p < 0.05$.

PRELIMINARY REGRESSION RESULTS

Table 2: All Pooled OLS–IV (NL)–Secondary

	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV	(7) OLS	(8) IV
Market								
Local mkt	0.009* (4.91)	-0.026* (-3.91)	0.009* (4.69)	0.041* (6.00)	0.005* (2.98)	-0.034* (-4.81)	0.005* (2.76)	-0.024* (-2.98)
National mkt	-0.012* (-8.15)	0.059* (4.80)	-0.009* (-5.20)	-0.058* (-4.76)	-0.000 (-0.23)	0.085* (6.25)	0.000 (0.24)	0.069* (4.18)
Nat mkt xl {$\Delta country p<o$}			-0.003* (-2.47)	-0.034* (-6.84)			0.000 (0.20)	-0.007 (-1.33)
Nat mkt xl {$\Delta region p<o$}							-0.008* (-7.50)	-0.051* (-5.35)
Nat mkt xl {$\Delta p<o$}					-0.015* (-14.84)	-0.038* (-16.29)	-0.013* (-12.19)	-0.054* (-5.35)
Population Fundamentals								
nat. pop Δ	0.010* (31.26)	0.008* (11.43)	0.010* (30.78)	0.011* (15.20)	0.010* (31.16)	0.007* (9.53)	0.009* (26.98)	0.012* (4.17)
net migration	0.016* (13.45)	-0.024* (-3.47)	0.015* (11.88)	0.047* (6.75)	0.013* (11.68)	-0.029* (-3.89)	0.011* (9.09)	-0.008 (-0.62)
Urban Structure								
Center of Agglom	-0.030* (-4.17)	-0.042* (-3.91)	-0.028* (-3.83)	0.014 (1.02)	-0.028* (-4.11)	-0.037* (-3.29)	-0.028* (-4.04)	-0.032* (-2.41)
Secondary City in Country	0.044* (6.87)	0.123* (7.00)	0.044* (6.87)	-0.041* (-2.40)	0.047* (7.67)	0.127* (6.62)	0.049* (8.07)	0.096* (3.96)
Location Fundamentals								
Pct Forest	0.000 (0.20)	-0.001* (-3.23)	0.000 (0.29)	0.001* (3.95)	0.000 (1.58)	-0.000 (-0.82)	0.000 (1.42)	0.000 (0.74)
Precipitation	0.000 (0.55)	0.000* (2.46)	0.000 (0.30)	-0.000* (-3.03)	-0.000* (-0.36)	0.000 (0.97)	-0.000 (-1.17)	0.000 (1.53)
Temperature	0.002* (4.11)	-0.006* (-4.24)	0.002* (4.63)	0.014* (7.69)	0.001 (1.95)	-0.009* (-5.41)	0.001 (1.91)	-0.006* (-2.64)
Land Usability	0.000 (0.05)	-0.001* (-4.59)	0.000 (0.09)	0.002* (4.77)	0.000 (0.01)	-0.001* (-4.34)	0.000 (0.52)	-0.001* (-3.35)
Constant	-0.039 (-1.67)	0.183* (3.32)	-0.038 (-1.62)	-0.249* (-4.32)	-0.017 (-0.75)	0.230* (4.08)	-0.006 (-0.25)	0.114 (1.41)
Observations	2503	2496	2503	2496	2503	2496	2503	2496
R^2	0.426		0.427	—	0.472	—	0.484	—
Adjusted R^2	0.423		0.425	—	0.470	—	0.481	—

t Statistics in parentheses.
* $p < 0.05$.

PRELIMINARY REGRESSION RESULTS

Table 3: All Pooled OLS–IV (NL)—Secondary—Capital

	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV	(7) OLS	(8) IV
Market								
Local mkt	0.008* (3.95)	-0.029* (-4.15)	0.007* (3.71)	0.042* (5.63)	0.003 (1.85)	-0.044* (-5.68)	0.003 (1.70)	-0.033* (-3.93)
National mkt	-0.011* (-7.52)	0.054* (4.71)	-0.008* (-4.67)	-0.054* (-4.47)	0.001 (0.41)	0.092* (6.79)	0.001 (0.79)	0.077* (5.43)
Nat mkt xl {$\Delta countryp<o$}			-0.003* (-2.55)	-0.033* (-6.84)			0.000 (0.12)	-0.008 (-1.67)
Nat mkt xl {$\Delta regionp<o$}							-0.008* (-7.40)	0.030 (1.34)
Nat mkt xl {$\Delta p<o$}					-0.015* (-15.00)	-0.038* (-16.11)	-0.013* (-12.35)	-0.046* (-5.76)
Population Fundamentals								
nat. pop Δ	0.010* (31.08)	0.008* (11.84)	0.010* (30.59)	0.011* (15.35)	0.010* (30.93)	0.007* (8.97)	0.009* (26.83)	0.010* (4.15)
net migration	0.015* (13.34)	-0.020* (-3.17)	0.014* (11.75)	0.044* (6.53)	0.013* (11.52)	-0.031* (-4.31)	0.011* (8.96)	-0.015* (-1.48)
Capital City in Country	0.073* (2.43)	0.342* (5.72)	0.076* (2.51)	-0.197* (-2.92)	0.095* (3.26)	0.430* (6.02)	0.087* (3.04)	0.383* (5.30)
Urban Structure								
Center of Agglom	-0.032* (-4.40)	-0.049* (-4.70)	-0.029* (-4.06)	0.016 (1.23)	-0.031* (-4.44)	-0.048* (-4.15)	-0.030* (-4.33)	-0.039* (-3.21)
Secondary City in Country	0.049* (7.28)	0.136* (7.37)	0.049* (7.32)	-0.047* (-2.44)	0.054* (8.31)	0.159* (7.57)	0.055* (8.62)	0.128* (5.63)
Location Fundamentals								
Pct Forest	0.000 (0.15)	-0.001* (-3.14)	0.000 (0.24)	0.001* (3.85)	0.000 (1.53)	-0.000 (-1.12)	0.000 (1.38)	0.000 (0.31)
Precipitation	0.000 (0.50)	0.000* (2.22)	0.000 (0.24)	-0.000* (-2.84)	-0.000 (-0.44)	0.000 (0.87)	-0.000 (-1.24)	0.000 (1.01)
Temperature	0.002* (3.89)	-0.006* (-4.14)	0.002* (4.43)	0.014* (7.49)	0.001 (1.65)	-0.009* (-5.91)	0.001 (1.66)	-0.006* (-3.07)
Land Usability	0.000 (0.21)	-0.001* (-4.25)	0.000 (0.26)	0.001* (4.54)	0.000 (0.23)	-0.001* (-4.36)	0.000 (0.72)	-0.001* (-3.39)
Constant	-0.036 (-1.154)	0.171* (3.23)	-0.035 (-1.49)	-0.236* (-4.17)	-0.013 (-0.58)	0.255* (4.42)	-0.002 (-0.10)	0.161* (2.27)
Observations	2503	2496	2503	2496	2503	2496	2503	2496
R^2	0.427	—	0.429	—	0.475	—	0.486	—
Adjusted R^2	0.425	—	0.426	—	0.472	—	0.483	—

t Statistics in parentheses.
* $p < 0.05$.

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