The growth of the working age population: differences between urban and rural regions across Europe

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1. Introduction

Population ageing will be the main demographic trend across Europe in the next decades. One of the consequences of population ageing is the slowing down of the growth or even decline of the working age population. This will reduce the future potential for economic growth. Even though population ageing is a general demographic trend across Europe, there are regional differences. Whereas some regions experience population decline, other regions succeed in continuing to grow. Population ageing affects the size of the working age population through cohort turnover, i.e. the replacement of relatively large older generations who retire by the inflow of relatively small young generations who enter the labour force. As a consequence cohort turnover has a negative impact on the size of the working age population. In addition to cohort turnover the size of the working age population is affected by international and internal migration. If young migrants move from one region to another, the sending regions experience a negative migration effect which reinforces the negative cohort turnover effect, whereas the receiving regions may compensate the negative cohort turnover effect by a positive migration effect. Since international migrants tend to concentrate in certain regions, those regions will benefit more from immigration than others. Thus migration may reinforce differences in growth potential across regions.

This paper analyses regional differences in the effects of migration and cohort turnover on changes in the size of the working age population at the NUTS 2 level. The aim is to determine what types of regions are most likely to be able to (partly) compensate a declining working age population by migration, and what regions are the most vulnerable ones. We examine whether regional differences in migration flows are related to urbanisation and regional differences in economic performance. To the extent that migrants tend to move from rural to urban regions and from weak to strong regions, differences in future economic growth may increase between competitive urban regions and underperforming rural regions may increase.

Although preferably migration and settlement patterns are studied at local levels, or not too large scale levels such as the NUTS 3 level, for studies including cross country comparisons this is often not possible because of missing data. Moreover, European wide regional policy instruments such as the Structural Funds and the Cohesion Funds aim to reduce regional disparities at NUTS 2 level. For this reason, we developed an urban-rural typology of NUTS 2 regions, based on the NUTS 3 urban-rural typology of Eurostat (Eurostat 2010). Section 2 describes the method for making the urban-rural typology. Section 3 examines cohort turnover, migration and mortality effects for urban, intermediate and rural NUTS 2 regions in Germany, France and the United Kingdom. Section 4 compares migration effects between competitive and underperforming urban regions, while section 5 discusses the main findings.

2. An urban-rural typology of NUTS 2 regions

In 2010 Eurostat published a new urban-rural typology for NUTS 3 regions (Eurostat, 2010). The classification was updated in 2012, but differences with the 2010 classification turn out to be very small. A NUTS 3 region is classified as predominantly urban if the share of the population living in rural areas is below 20%. Rural areas are defined on the basis of population density of grids of 1 km^2. A region is classified as intermediate if the share of population living in rural areas is between 20% and 50% and as predominantly rural if the share of population living rural areas is higher than 50%. One additional criterion is the size of urban centres. A region classified as predominantly rural becomes intermediate if it contains an urban centre of more than 200,000 inhabitants representing at least 25% of the population of the region and a region classified as intermediate becomes predominantly urban if it contains an urban centre of more than 500,000 inhabitants representing at least 25% of the population of the region.

Eurostat does not publish a similar urban-rural typology at the NUTS 2 level. The reason is that this would hide significant differences at a low regional level. For example, application of the above method at NUTS 2 level would lead to a considerably lower share of the population living in rural regions. Nevertheless an urban-rural typology of NUTS 2 regions would be useful since for many EU countries a lot of data on demographic flows that are available at the NUTS 2 level are not available at the NUTS 3 level. For that reason this paper develops an urban-rural typology for NUTS 2 regions. Our method is based on the Eurostat typology for NUTS 3 regions, but in order to avoid that the share of the population living in urban and rural regions based on a NUTS 2 classification would differ from the Eurostat classification, we developed a new criterion. Since we use the typology for demographic analyses, our main focus is on population size: we make a classification of the population in different types of regions rather than of the regions themselves. Thus we classify regions by the share of the population living in urban and rural areas rather than classifying the regions on the basis of territorial characteristics. For example, if a region includes a big city where most inhabitants of the region live surrounded by a large rural area where only few people live, a large share of the surface of the region has a rural nature, while most residents live in an urban environment. We classify such a region as urban. More precisely we could define an urban region as a region with a large share of the population living in an urban area. Since we are interested in the size and growth rate of the population, numbers of people living in urban and rural areas are relevant for our analyses rather than the surface of urban and rural areas.

For each NUTS 2 region we calculate the proportion of the population living in predominantly urban, intermediate and predominantly rural NUTS 3 regions. We classify a NUTS 2 region as predominantly urban if the difference between the percentages of the population living in urban and rural NUTS 3 regions exceeds a certain threshold. The threshold is determined in such a way that in each country the percentages of the population living in urban and rural regions at the NUTS 2 level is as close as possible to that at the NUTS 3 level. It turns out that the threshold for urban NUTS 2 regions equals 40 percent, *i.e.* if the percentage of the population living in urban NUTS 3 regions is at least 40 percentage points higher than the percentage living in rural NUTS 3 regions, the NUTS 2 region is considered as predominantly urban. Thus if in a given NUTS 2 region 60 percent of the population is living in urban NUTS 3 regions, whereas 10 percent is living in rural NUTS 3 regions, the NUTS 2 region is considered as urban. In contrast if 60 percent of the population is living in urban NUTS 3

regions whereas 30 percent is living in rural NUTS 3 regions, the NUTS 2 region is considered as an intermediate region. For rural regions the threshold equals 33 percent. Thus if the percentage of the population living in predominantly rural NUTS 3 regions is 33 percentage points higher than the percentage living in urban NUTS 3 regions, the NUTS 2 region is considered as predominantly rural region. One consequence of applying this criterion is that some NUTS 2 regions including big cities will be considered as intermediate rather than urban regions. Since we assume that people living in a big city should be considered as living in an urban area, and that a NUTS 2 region where a substantial share of the population lives in a big city should be considered as an urban region, we add a criterion for the classification of urban regions. We consider an intermediate NUTS 2 region as predominantly urban if it includes a city with more than 500,000 inhabitants and if the proportion of the population living in urban NUTS 3 regions exceeds that of living in rural NUTS 3 regions. Note that this additional criterion is similar to the criterion considering urban centres in the Eurostat typology. This criterion implies that 11 intermediate NUTS 2 regions will be classified as predominantly urban regions.

Based on our new classification of NUTS 2 regions, 50 percent of the EU population lives in an urban region and 25 percent in a rural region. Based on the urban-rural typology of NUTS 3 regions, 41 percent of the population lives in an urban region and 24 percent in a rural region. Thus the share of the population living in urban regions at the NUTS 2 level exceeds that at the NUTS 3 level. However, this does not affect the share of the population living in rural regions. More than 80 percent of the population living in a rural NUTS 3 region lives in a rural NUTS region. The difference between the share of the population living in urban regions according to the NUTS 2 and NUTS 3 classifications is caused by the criterion assuming that intermediate regions including a big city are classified as urban. Without that criterion the percentages of the population living in urban and rural regions would be almost equal based on the NUTS 2 and NUTS 3 classifications. Thus we may conclude that it is possible to develop an urban-rural classification at the NUTS 2 level without changing the classification of a substantial share of the population from rural to urban, or the other way around.

3. Cohort turnover, migration and mortality effects

The growth rate of the working age population depends on three components of change: cohort turnover, net migration, and mortality. The cohort turnover effect is the difference between the inflow of young persons and the outflow of older persons. The cohort turnover effect can be calculated for the total working age population (i.e. all persons aged 15 to 64 years) or for particular age categories within the total working age population. For example the cohort turnover effect can be calculated for the population aged 15 to 24 years, aged 25 to 34 years, etc. The size of the cohort turnover effect depends on the age distribution of the population. The age distribution depends on past demographic trends. For example, the number of persons aged 15 years, i.e. the inflow of the working age population, depends on the number of births 15 years ago. The outflow of the working age population. i.e. the number of persons aged 65 years, depends on the number of births 65 years ago. Thus the size of the cohort turnover effect depends on long-term demographic trends. Moreover the cohort turnover effect is affected by past migration. For example, the number of persons aged 15 years depends on the number of migrants aged 14 years who entered the region one year ago, the number of migrants aged 13 years who entered the region two years ago, etc. Whereas the cohort turnover effect depends on past demographic changes, the migration and mortality effects depend on current developments. The migration effect describes the effect of

current migration: the balance between the number of migrants aged 15 to 64 years entering the region this year and the number of migrants aged 15 to 64 years leaving the region this year. The size of the migration effect depends on both international and internal migration and on both in- and out-migrants. Generally net migration is relatively small compared with total in- and outflows. In Western European countries the mortality effect on the working age population is relatively small as only few people die before age 65 years. However, in many Eastern European countries mortality rates among middle-aged men are very high and mortality has a significant impact on the size of the working age population.

We estimate the cohort turnover effect for each region by comparing the age structure of the population in each region at two points in time. The effect of cohort turnover is calculated as the difference between entries and exits in a certain age group. For example, if we look at 5 year age intervals, we define the cohort turnover effect as the difference between the inflow of people in the age group 15-19 during the 5 year interval (i.e. people aged 10-14 years at the start of the interval) and the outflow of people aged 60-64 years. The effect of mortality is estimated from vital statistics. The effect of net migration is estimated as the difference between the age-specific changes in the size of the working age population and the cohort turnover and mortality effects. This implies that we cannot make a distinction between internal and international migration. At the national level the size of total net international migration can be calculated but for many EU countries we do not know who this is distributed across regions.

Figure 1 shows the percentage changes in the working age population in the largest three EU countries, France, Germany and the United Kingdom. The figure shows that whereas in France and the United Kingdom the size of the working age population has continued to grow in recent years, Germany experiences a decline, due to a negative cohort effect. In France the main source of the growth of the working age population is a positive cohort effect. If we compare the changes in the period 2005-2009 with those in the period 2000-2004 (not shown here) it turns out that the positive cohort effect in France has become smaller. In the near future the cohort effect will continue to decrease, since the relative large generations who are now in their forties and fifties will leave the labour force in the next two decades, and their size exceeds that of young generations. In the United Kingdom international migration has been an important source of the growth of the working age population in addition to the positive cohort effect. For the same reason as in France the cohort turnover effect will decrease sharply in the next decades. To the extent that migration will remain higher than in France, the United Kingdom would be less sensitive to the effect of population ageing than France. However, in the period 2005-2009 the migration effect was smaller than in the previous period. Thus the negative effect of population ageing on the cohort turnover effect has not been compensated by an increase in migration. In Germany the decline of the working age population is particularly strong in rural areas, where all three effects are negative. In the urban regions part of the decline caused by the cohort turnover and mortality effects is compensated for by a positive migration effect. Intermediate regions have a smaller negative cohort effect than urban regions, but since the migration effect is negative, the decline of the working age population is stronger than in urban regions. In France the migration effect in urban regions is smaller than in rural regions. This pattern differs across age groups as we will see below. The same applies to the United Kingdom.

The differences in mortality effects across countries and types of regions are relatively small. In Western European countries the mortality effect is considerably smaller than in Central and Eastern

European countries where mortality rates among middle-aged men are relatively high. In France, Germany and the United Kingdom the mortality effect has a negative impact of slightly over 1 percent on the growth of the working age population in a five year period. In Central and Eastern European countries the mortality effect ranges between 2 and 3 percent.

The size and direction of migration flows differ across age groups. Migration tends to be high among age groups 15-24 years (mainly students and young people entering the labour market), 25-34 years (labour migrants) and 35-44 years (mainly young families moving to another house or another environment to raise their children). Figure 2 shows the migration effects for these three age groups and compares them with the cohort turnover and mortality effects in France, Germany and the United Kingdom. Figure 2 shows that young migrants (15-24 years) move out of rural areas to urban regions. In addition the figure shows that in urban regions the cohort turnover effect for this young age group in all three countries is negative. The explanation is that relatively few families with young children live in urban regions. Thus the growth of the age group 15-24 years in urban regions is caused by migration rather than by cohort turnover. For the age group 25-34 years the cohort turnover effects are negative in all regions in the three countries. The explanation is the strong decline in the fertility rates in the 1970s and 1980s. In urban regions in the United Kingdom this decline is compensated by the positive migration effect. In urban regions in France and Germany the migration effect was positive as well, but smaller than the negative cohort turnover effect.

For the age group 35-44 years urban regions are not an attractive destination in contrast with intermediate and rural regions, at least in France and the United Kingdom. In both countries rural regions have a large inflow of migrants aged 35-44 years and for ages 45-64 years (not shown here) as well. This explains why the total migration effects in rural regions shown in figure 1 is relatively high in rural regions in France and the United Kingdom. For age groups 55-64 years (not shown here) we see in all three countries positive cohort effects due to ageing. For the age group 55-64 years the migration effects in urban regions are negative, and positive in intermediate and rural regions. Thus people at the end of their working career tend to move out of urban regions.

4. Differences between competitive and underperforming urban regions

In addition to the availability of schools and universities, one important reason for young migrants to move to urban regions is their economic attractiveness. Thus one may expect that economically strong urban regions may attract more migrants than underperforming regions. For this reason we compare migration effects between weak and strong urban regions. To compare economic performance across European countries and regions GDP per capita is often used as one of the indicators. A drawback of GDP per capita is that it is measured as total GDP divided by the resident population. Therefore, it does not take into account commuting. Several other indicators can be considered to measure economic performance of regions, for instance household income, employment, unemployment rates and expenditures on research and development (Martins Ferreira 2008; Dunnell 2009; Klimova and Zitek 2010). A ranking of different indicators, however, shows that regions may differ in their performance dependent on the indicator used. Instead of using different classifications based on different indicators, Klimova and Zitek (2010) assessed the economic performance of NUTS 2 regions using a composite variable based on a number of indicators taking into account the Europe 2020 strategy goals. Similarly, the European Commission suggested a set of indicators covering the domains of employment, innovation and research, economic reform, social

cohesion, the environment as well as the general economic background to show the potential of NUTS 2 regions to improve their economic competitiveness (Annoni and Kazovska, 2010). A measure that goes beyond economic performance is the European Competitiveness index (ECI). This index refers to the competitiveness of a region as the capability of an economy to maintain increasing standards of living for those who participate in it, by attracting and maintaining firms with stable or rising market shares (Huggins and Davies 2006). The competitiveness index is measured at NUTS 1 level and is based on a total of 36 indicators in five dimensions: creativity (mainly research and development employment and expenditure variables), economic performance (income and labour market variables), infrastructure and accessibility (motorway length, railway length, number of vehicles), knowledge employment and education (number of students in different types of education, education expenditures). The scores on the composite variable are indexed around the European average. In this paper we classify NUTS 2 regions as competitive if the NUTS 1 region they belong to has an ECI-score above 100. If the NUTS 1 region has an ECI-score below 100, we classify the region as underperforming.

In France 42 percent of the population lives in a competitive urban region and 7 per cent in an underperforming urban region. Thus 14 percent of the urban population lives in an underperforming region. In Germany 9 percent of the urban population lives in an underperforming region and in the United Kingdom 16 percent. Across the European Union one quarter of the population in urban regions lives in an underperforming region. Note that the share of underperforming regions among rural regions is considerably higher than among urban regions. On average in EU countries 71 percent of the population in rural regions lives in an underperforming region. Intermediate regions show a mixed picture. Almost half of the population of these regions lives in an underperforming region.

Figure 3 compares the migration, cohort turnover and mortality effects on the growth of the working age population between competitive and underperforming urban regions in France, Germany and the United Kingdom. The figure shows that in France and Germany the migration effect is positive in competitive urban regions only. In the United Kingdom underperforming urban regions have a positive migration effects, but this is clearly smaller than in competitive regions. If we compare different age groups (not shown here) it turns out that the differences for age groups 15-24 and 25-34 years are larger than for the older groups. One explanation may be that particularly these age groups migrate for economic reasons. These results imply that economic differences across regions may be expected to increase due to migration. Across Europe population ageing will lead to a decline in the growth rate of the working age population, but in competitive urban regions this will be compensated by positive migration effects.

5. Discussion

The growth rate of the working age population is an important source of structural economic growth. Population ageing has led to a decrease in the growth of the working age population in recent years in most European countries. Even though population ageing is a common trend across Europe there are considerable differences between different types of regions. To the extent that young migrants move from rural to urban regions the effect of population ageing may be reinforced in rural regions, whereas it may be compensated in urban regions. One problem in examining migration flows between regions is that detailed migration data at regional level are missing in many countries.

Because more population data are available at the NUTS 2 level than at the NUTS 3 level we developed a new urban-rural classification at the NUTS 2 level. The typology is based on the Eurostat typology at the NUTS 3 level. However we do not use the same criteria as the Eurostat typology because that would lead to an underestimation of the share of population living in rural regions. Our typology is aimed to classify the population living in urban and rural regions rather than to describe territorial characteristics of the regions. If a region includes a big city where the majority of the population lives and a large surface where only few people live, we define the region as urban because a large share of the population lives in an urban area even though a large share of the surface is rural.

The growth of the working age population can be attributed to three causes of change: cohort turnover, migration and mortality. In many urban regions migration has been the main source of the growth of the working age population. Young people move from rural to urban regions and young immigrants tend to settle in urban regions. In many urban regions the cohort turnover effect is small or negative at young ages. The explanation is that relatively few families with children live in urban regions. Many couples having children move from urban to rural or intermediate regions. As a consequence the migration effect is negative for people aged 35 or over in most urban regions, whereas the cohort turnover effect at young ages is positive in many intermediate and rural regions.

In the coming decades cohort turnover will lead to a reduction or even decline in the growth of the working age population. Migration flows within countries will reduce the effect of cohort turnover in urban regions but at the same time reinforce this effect in rural regions. Migration flows between European countries may contribute to the growth of the working age population in Western European countries but lead to a decrease in Eastern European countries. Migration flows from outside Europe will have a positive effect on the size of the working age population without negative effects in other European countries. If young, skilled migrants move from rural to urban regions, the differences in economic growth across regions may increase. Since young migrants tend to move to competitive rather than to weak urban regions, migration may be expected to increase rather than to reduce economic differences. However, as population will grow more strongly in regions with high economic growth, the share of the population living in wealthy regions may increase.

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Figure 1. Percentage change in working age population, 2005-2009

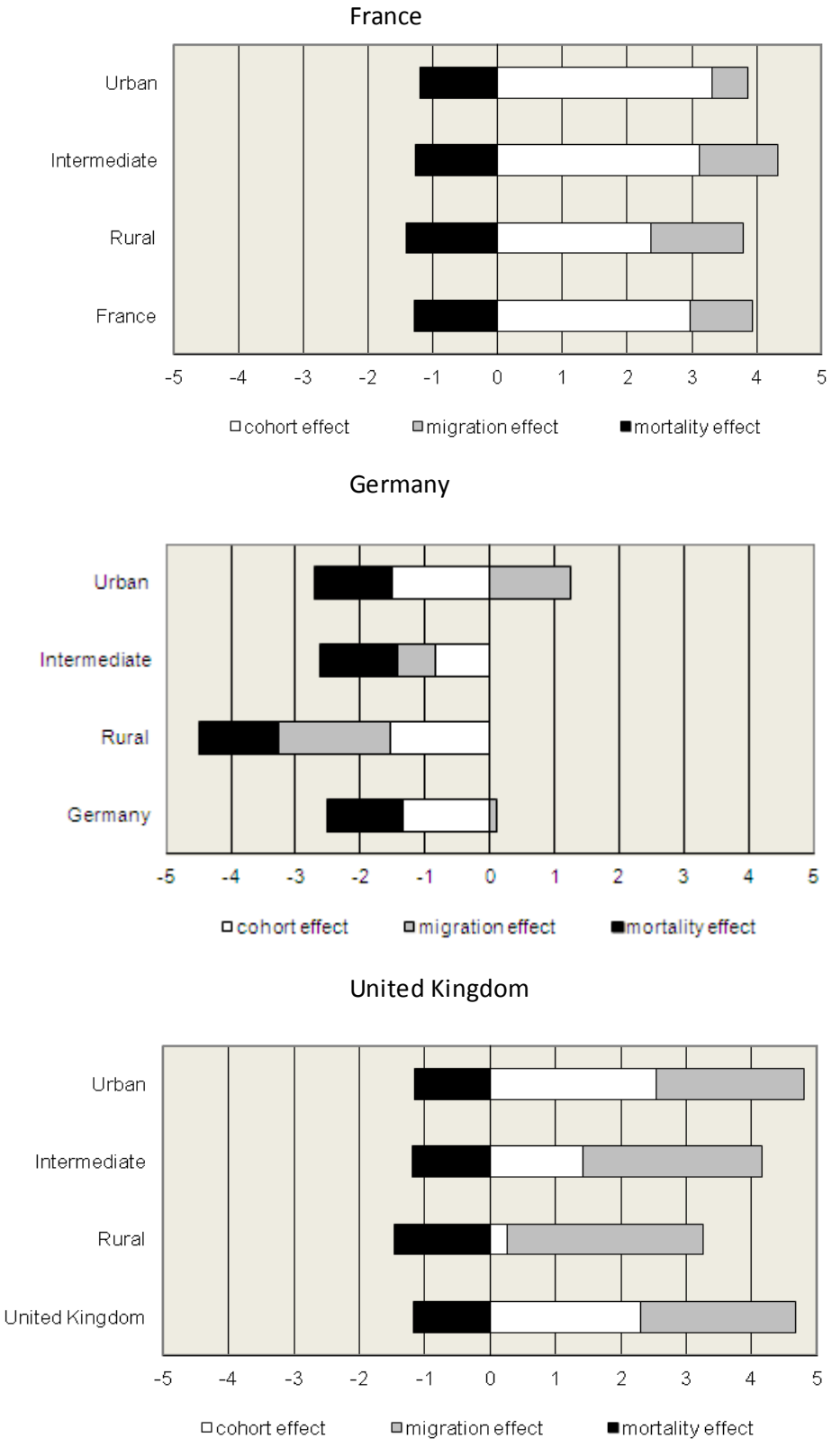

Figure 2. Cohort turnover, migration and mortality effects for age groups 15-24, 25-34, and 35-44 years, 2005-2009

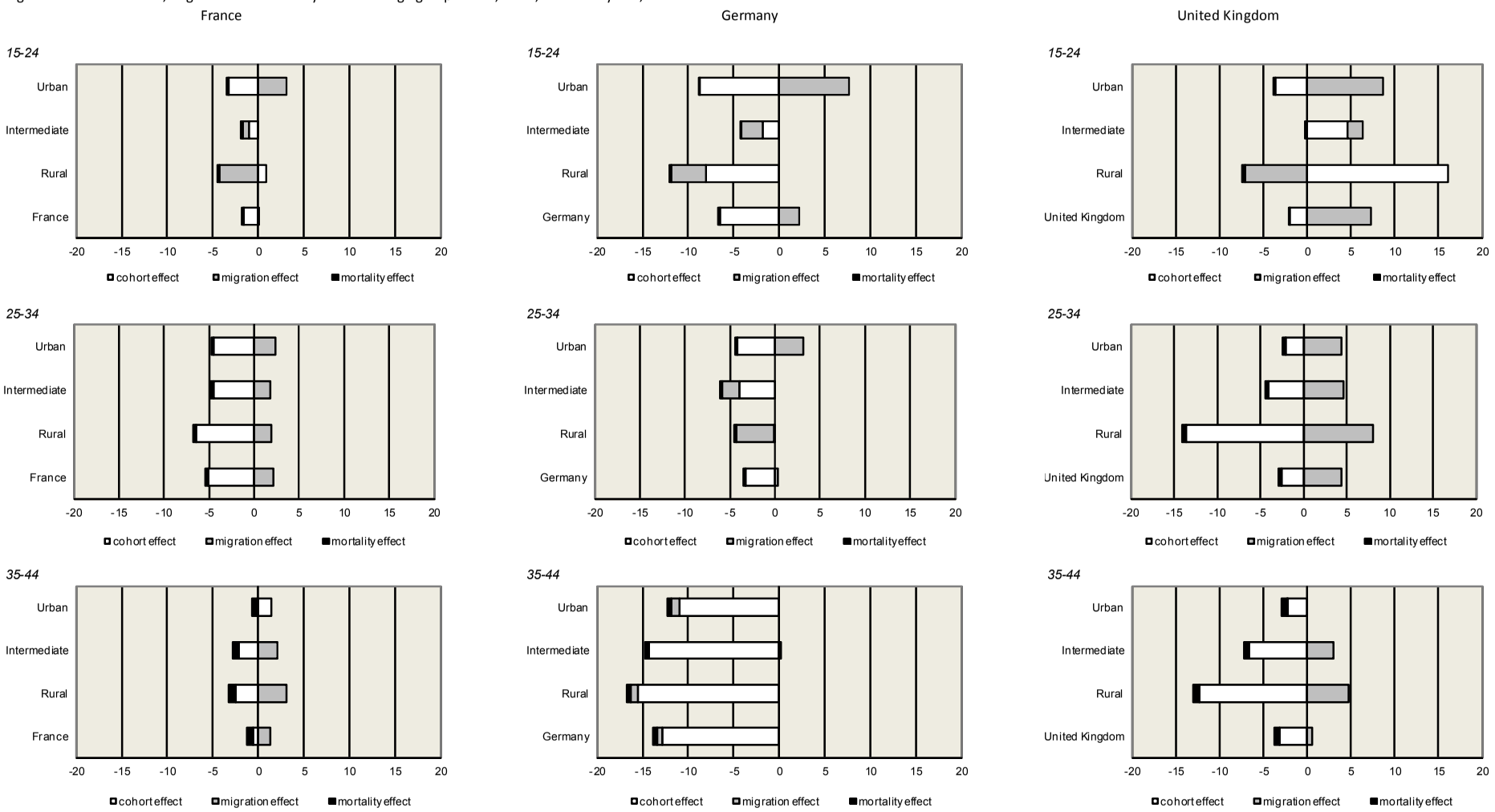

Figure 3. Percentage change in working age population in competitive and underperforming urban regions, 2005-2009