

## Measuring regional economies

By Vincenzo Spiezia

In recent years, regional development issues have returned to the policy agenda of many OECD countries. There are at least three reasons for this. First, higher integration driven by institutional processes (*e.g.* European Union, World Trade Organisation) and economic trends (*i.e.* globalisation) is eroding national borders and creating competition along regional lines in the world market. Second, the persistence of significant regional disparities challenges countries' capacity to promote economic growth while ensuring social cohesion. Finally, economic growth appears increasingly driven by the higher productivity of firms and workers concentrated around a small number of regional poles.

The renewed interest in regional issues has generated a new demand for statistical indicators at the sub-national level. Policy makers are interested in assessing differences in economic performances between regions or the concentration of economic activities in certain areas of their countries.

The rationale for these developments does not always have a straight answer. This is why for some years the OECD has been carrying out statistical work on the measurement of regional economies.<sup>1</sup>

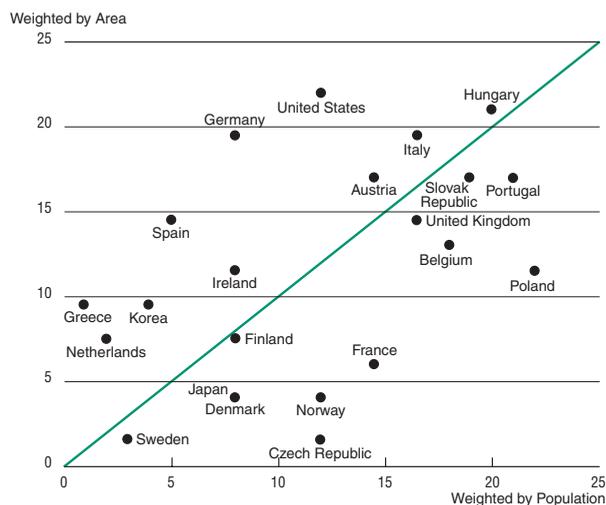
### Making meaningful comparisons among very different regions

The main problem with economic analysis at the sub-national level is the very unit of analysis, *i.e.*, the region. The word "region" can mean very different things both within and between countries. For instance, the smallest OECD region (Concepcion de Buenos

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Chart 1. Ranking of OECD countries based on regional disparities (micro regions): weighted by population and by area; 2000



Source: OECD Territorial Database.

1. The work is led by the Working Party on Territorial Indicators composed of international experts from the Statistical Offices of OECD Member countries.

Aires, Mexico) has an area of less than 10 square metres whereas the largest region (Nunavut, Canada) is over 2 million square metres. Similarly, population in OECD regions ranges from about 400 inhabitants in Balance ACT (Australia) to more than 47 million in Kanto (Japan).

To address this issue, the OECD has established a classification of regions within each Member country (OECD, 2001), based on two territorial levels. The higher level (Territorial Level 2) consists of about 300 macro regions while the lower level (Territorial Level 3) is composed of more than 2300 micro regions.<sup>2</sup> This classification – which, for European countries, is largely consistent with the EUROSTAT classification<sup>3</sup> – facilitates greater comparability between regions at the same territorial level. Indeed, these two levels, which are officially established and relatively stable in all Member countries, are used by many as a framework for implementing regional policies.

A second issue concerns the different “geography” of each region. For instance, in the United Kingdom one could question the relevance of comparing the highly urbanised area of London to the rural region of the Shetland Islands, despite the fact that both regions belong to the same territorial level. To take account of these differences, the OECD has established a Regional Typology according to which regions have been classified as Predominantly Urban, Predominantly Rural and Intermediate (OECD, 1995). This typology, based on the percentage of regional population living in rural or urban communities, enables meaningful comparisons between regions belonging to the same type (see box “The OECD Regional Typology”).

Although these two classifications – Territorial Levels and Regional Typology – are useful in comparing regions both within and across countries, further problems arise regarding specific issues of analysis. In particular, recent OECD work has focused on territorial disparities and geographic concentration.

## How to measure territorial disparities?

Regional policies are often assessed against their effects on regional disparities. Theoretically, inequality indexes – such as the Gini coefficient – provide an appropriate measure of territorial disparities. There are, however, a

2. Level 0 indicates the territory of the whole country while Level 1 denotes groups of macro regions.

3. [http://europa.eu.int/comm/eurostat/ramon/nuts/splash\\_regions.html](http://europa.eu.int/comm/eurostat/ramon/nuts/splash_regions.html)

number of problems arising from the application of inequality indexes to the issue of territorial disparity.

Firstly, inequality indexes are constructed for the analysis of income inequality between individuals rather than disparities between regions. While it is relatively straightforward to compare personal income among individuals, it is more difficult to measure disparities in, for example, Gross Domestic Product (GDP) per capita among regions. To deal with this, there are at least three possible measures of territorial disparity.

- The first considers the differences in GDP per capita among regions, *i.e.*, each region is considered as an “individual”. This implies giving the same importance to all regions. In practice, however, policy makers may be more concerned by low GDP per capita in a populous region than in a region with few inhabitants.
- The second possibility is, therefore, to weight regions by population. This method, however, does not take into account the “geography” of regions. In particular, since rural areas are less populated than urban areas, an index weighted by population would systematically underrate disparities between rural and urban regions.
- A third option is, therefore, to weight regions by their area (ideally, only inhabitable area, *i.e.*, excluding desert, glaciers, etc. but this information is not available for all regions).

### The OECD Regional Typology

The OECD Regional Typology is based on two criteria. The first identifies rural communities according to their population density. A community is defined as rural if its population density is below 150 inhabitants per square kilometre (500 inhabitants for Japan because its national population density exceeds 300 inhabitants per square kilometre). The second classifies regions according to the percentage of population living in rural communities. Thus, a region is classified as:

Predominantly Rural, if more than 50% of its population lives in rural communities;

Predominantly Urban, if less than 15% of the population lives in rural communities;

Intermediate, if the percentage of population living in rural communities is between 15 and 50%.

## The Adjusted Territorial Gini Index

The measurement of territorial disparity raises problems that are similar to those encountered in the analysis of income inequality with grouped data.

First, the level of aggregation is crucial. This point can be illustrated with reference to a common measure of inequality, the Gini Index. The chart below plots the cumulative regional distribution of GDP against the corresponding distribution of population. The curve defined by these two distributions is called the "concentration curve". With no disparity, GDP per capita would be the same in all regions so that the concentration curve would be a straight line (*i.e.* the green line). Therefore, the larger the distance between the green line (no disparity) and the actual concentration curve, the higher the degree of concentration. The Gini Index is based on this idea and measures inequality as the area between the green line and the actual concentration curve. The chart below depicts the concentration curve associated with the same regional distribution of GDP and population when data are available for macro regions (continuous black line) or micro regions (dotted black line). Since the area defined by the concentration curve based on macro region is smaller than the corresponding area for micro regions, the Gini Index based on macro regions systematically underestimates the degree of territorial disparity. This observation shows the index to be unsuitable for international comparisons when the geographic level of regional data differs significantly between countries.

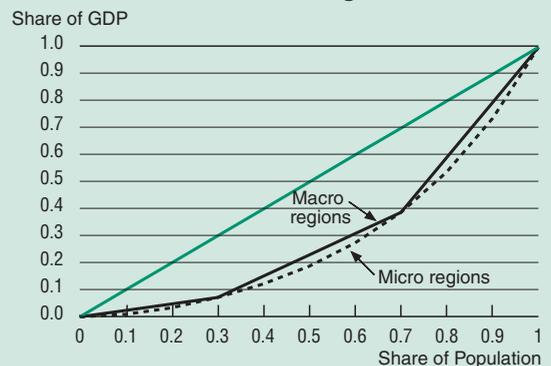
Two strategies seem appropriate to minimise the downward bias due to grouped data. The first is to use data at the lowest level of aggregation available, *i.e.* Territorial Level 3 or micro regions. The second is to

construct the concentration curve as if the variable analysed was continuous and to assume a uniform distribution within each region (Lerman, R.I. and S. Yitzhaki, 1989).

A second problem is that, while the Gini Index based on individual data ranges between zero and one, the index is always below one when the data are grouped. In particular, the larger the regions, the lower its maximum value tends to be. This also shows that as the size of regions varies between countries, the Gini Index is unsuitable for international comparisons.

The Adjusted Territorial Gini Index corrects for this bias by dividing the Gini coefficient by its maximum value in each country. The index resulting from this correction has two properties (Deltas, G. (2003)): the bias is very small and its direction cannot be signed (*i.e.* disparities are not systematically underestimated).

**Regional disparities in macro and micro regions**



These three indicators generally give quite different results. For instance, disparity in OECD countries varies significantly according to whether the regional disparity index – the Gini coefficient – is weighted by population or by area (see Chart 1, where countries with higher disparities appear in the upper area of the chart). For example, regional disparities in the United States are much higher when the index is weighted by area than by population whilst the opposite is true for Poland. This suggests that one should be cautious when assessing regional disparity, whether within or between countries. As it is difficult to choose "the best" index of regional disparity, the measure employed should vary according to the purpose of the analysis.

The second problem arises from disparity indexes being very sensitive to levels of geographic aggregation. One reason is that, as the size of regions increases, territorial differences tend to be averaged out and disparities to decrease. A second reason is that, because of the way the index is constructed, it tends to underestimate territorial disparities when regions are large. To minimise the "error" due to different regional sizes, the OECD has therefore developed an Adjusted Territorial Gini Index (see box "The Adjusted Territorial Gini Index").

This index provides a correction for different levels of geographic aggregation. However, it cannot completely eliminate the differences arising from the use of different

territorial levels because, when data are available only for macro regions, differences between micro regions are unknown. This problem is illustrated in Chart 2, which ranks selected OECD countries based on disparities in GDP per capita in macro and micro regions, respectively. For some countries (Greece, Denmark, Ireland, Slovak Republic, Hungary and Italy), the territorial level has little or no impact on regional disparity. However, in most countries the measurement of disparities is significantly affected by the level of geographic aggregation. For instance, regional disparities in Portugal are much higher for micro regions than for macro regions whereas the opposite is true for the Czech Republic.

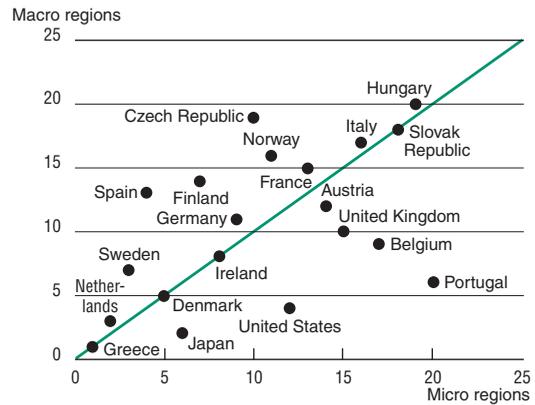
As regions are defined by administrative boundaries, it may not be possible to use the preferred territorial level. A possible solution is to use “functional regions” as defined by the patterns of workers’ commuting (OECD, 2002a). Since data based on functional regions are not available for all Member countries, the OECD has estimated the impact of commuting on regional disparity in GDP per capita. If workers live in one region and work in another, GDP per capita will be overestimated in those regions with a net inflow of commuting workers and underestimated in those with a net outflow. Chart 3 shows the percentage of regional differences in GDP per capita due to commuting. In quite a number of countries, the impact is considerable.

A final issue is how to evaluate the observed regional disparities. Differences between regions may be due to several reasons, *e.g.*, a low level of infrastructure or a high unemployment rate, each having different policy implications.

To make this distinction, territorial disparity in GDP per capita can be explained as the result of underlying disparities in three components: average labour productivity, employment rates and activity rates. Each component can be regarded as an indicator of the determinants of territorial disparity in GDP per capita. Average labour productivity is a proxy for the productivity of the regional production system; employment rate is an indicator of the effective functioning of the local labour market; activity rate summarises the characteristics of the regional labour force. Chart 3 also shows the contribution of each of these components to territorial disparities in GDP per capita in 18 OECD countries (OECD, 2003a).

On average, disparities in labour productivity seem to be the main determinant, accounting for about 54% of the

**Chart 2. Ranking of OECD countries based on regional disparities (weighted by population): macro and micro regions; 2000**



Source: OECD Territorial Database.

disparity in GDP per capita. Territorial differences in commuting and activity rates account for 19 and 17%, respectively, while the remaining 10% is due to differences in employment rates.<sup>4</sup> These findings suggest that a primary objective of any policy aimed at reducing disparities in GDP per capita should be to decrease regional differences in productivity.

### How to measure geographic concentration?

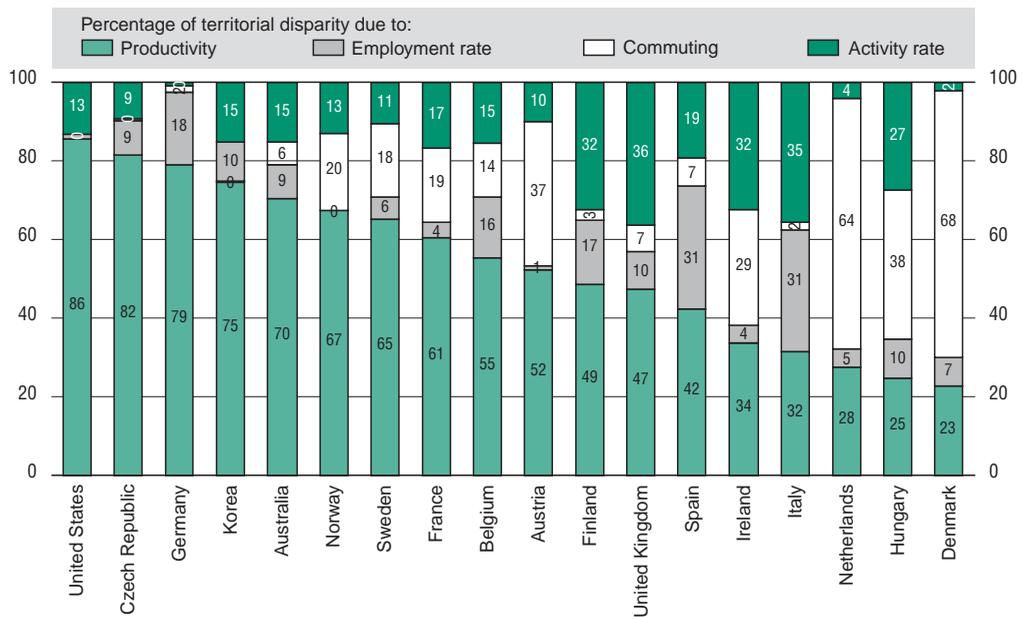
Concentration is probably the most striking feature of the geography of economic activity. In all OECD countries, production tends to be concentrated around a small number of urban areas, industries are localised in highly specialised poles, and unemployment is often concentrated in a few regions.

Although much research has been devoted to this issue, there seems to be little agreement on which statistical indicator best measures geographic concentration. Furthermore, from the OECD perspective the issue is complicated by the problem that the available indexes are not well suited to international comparisons.

A widely used measure of geographic concentration is the concentration ratio, *i.e.* the ratio between the economic weight of a region and its geographic weight. Taking unemployment as an example, the concentration

4. In the United States, the impact of commuting is none as in this country regions are defined by workers’ commuting patterns.

Chart 3. Percentage of territorial disparity in GDP per capita due to disparity in productivity, commuting, employment and activity rates; 2000



Source: OECD Territorial Database.

ratio is calculated by ranking regions by their level of unemployment and dividing the share of national unemployment of the first “n” regions by their share of national territory, *i.e.* their area as a percentage of the total area of the country. The larger this ratio, the higher the geographic concentration.

This method, however, is unsuitable for international comparison because the measure of geographic concentration crucially depends on “n”, the number of regions arbitrarily chosen for the comparison. As an example, consider the geographic distribution of

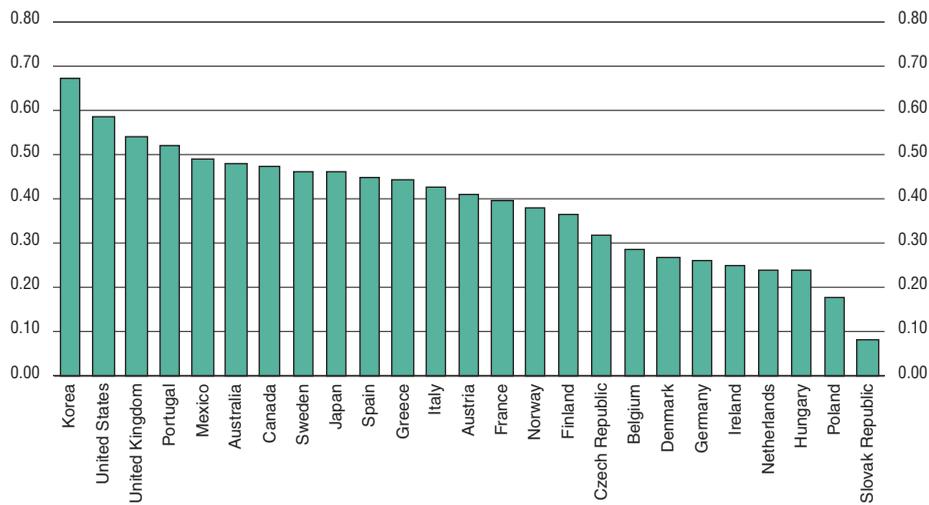
unemployment in two countries as reported in the table below. If the concentration ratio is measured according to the first region, unemployment appears more concentrated in Country 1 than in Country 2. However, if the concentration ratio is based on two regions, then unemployment in Country 1 turns out to be as concentrated as in Country 2. Finally, the ranking is reversed when the concentration ratio is based on three regions.

To overcome the limitations of the concentration ratio, the OECD has developed a new indicator, the Adjusted Geographic Concentration index (AGC) (Spiezia V. (2002)).

### Concentration ratios

Region	Country 1			Country 2		
	Unemployment (as % of total)	Area (as % of total)	Concentration ratio	Unemployment (as % of total)	Area (as % of total)	Concentration ratio
1	40	20	2.0	30	20	1.5
2	20	20	1.5	30	20	1.5
3	20	40	1.0	30	20	1.5
4	20	20	1.0	10	40	1.0

**Chart 4. Geographic concentration of unemployment**  
Concentration index; 2000



Source: OECD Territorial Database.

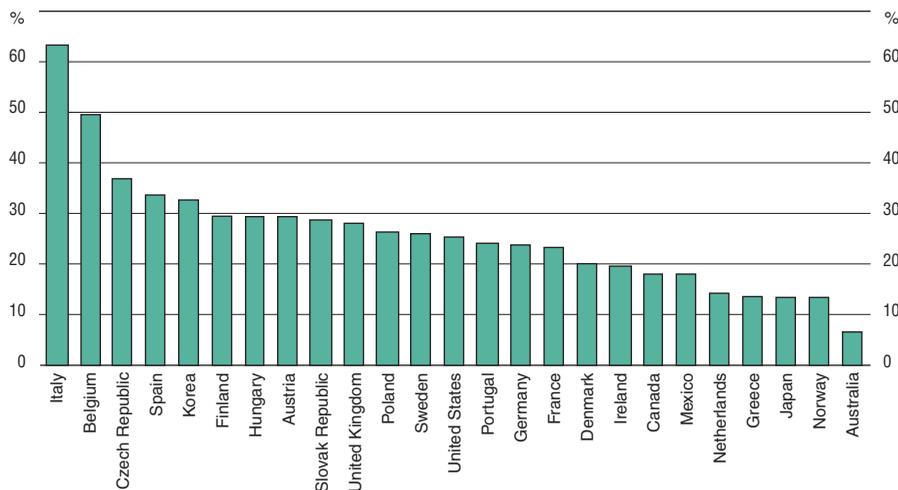
The AGC compares the economic weight and the geographic weight over all regions in a given country and is constructed to account for both within- and between-country differences in the size of regions.

Chart 4 shows that unemployment is fairly concentrated in OECD countries. On average, the concentration index equals 0.39 but there appears to be large differences between countries, with the index going from 0.67 in

Korea (the highest rank) to 0.08 in the Slovak Republic (the lowest rank).

Concentration of unemployment is the result of two factors: concentration of the labour force and regional differences in unemployment rates. To appreciate this point, assume that the unemployment rate is the same in all regions. In this case, the geographic concentration of unemployment would simply reflect the geographic concentration of the

**Chart 5. Percentage of geographic concentration in unemployment due to regional differences in unemployment rates; 2000**



Source: OECD Territorial Database.

labour force. On the contrary, if the labour force density (*i.e.* labour force/area) were the same in each region, then the geographic concentration would be entirely due to regional differences in unemployment rates.

Chart 5 shows the percentage of geographic concentration of unemployment due to regional differences in unemployment rates. The impact of territorial disparity appears considerable: in half of the countries, over 25% of geographic concentration of unemployment is due to territorial disparities in unemployment rates. It exceeds 30% in Korea, Spain and the Czech Republic and reaches 49% in Belgium and 63% in Italy.

## The way forward

The increasing relevance of regional issues has generated a new demand for statistical indicators at the sub-national level. However, measurement of regional economies is a difficult and delicate matter. Erroneous interpretations of indicators of regional disparities or geographic concentration may result in misleading policy recommendations to national and local governments. In order to have meaningful results, one should be clear about the hypotheses and the limits of different indicators and be aware that regional boundaries vary significantly both within and between countries.

The work carried out by the OECD represents a significant contribution in this direction. Its Territorial Classification and Regional Typology establish a common framework for the international comparisons of regions. However, the choice of “the best” measure of regional economies depends very much on the purpose of the investigation. In this respect, the comparative approach of the OECD represents a unique asset in that it permits the statistical measurement of regional economies to be matched with the demand from policy makers.

The ongoing work is focused on the identification of the determinants of regional performances in OECD countries. Regional differences in GDP per capita can be explained as the results of differences in infrastructures, industry specialisation, skills, social capital, innovation, ageing and geographic location. The aim of this work is to identify the comparative advantages of each region and provide policy makers with a set of key indicators for the design and the assessment of regional policies. The results of this ongoing work will be presented on the OECD site as they become available and published in the first issue of the “OECD Regions at a Glance” at the end of 2004. ■

## Glossary

**Gini Index:** the most popular index of inequality. It ranges between 0 (no inequality) and 1 (maximum inequality). Elaborated for the analysis of inequalities between individuals, it is not suitable for international comparisons of disparities between regions.

**Adjusted Territorial Gini Index:** the index of territorial disparity elaborated by the OECD to deal with the specific problems arising from the application of the Gini Index to regional data. It ranges between 0 (no disparity) to 1 (maximum disparity).

**Concentration ratios:** a common measure of geographic concentration based on the ratio between the economic weight of a region and its geographic weight. It is not suitable for international comparisons because it is affected by within- and between-country differences in the size of regions.

**Adjusted Geographic Concentration Index:** the index of geographic concentration elaborated by the OECD to control for the effect of differences in the size of regions. It ranges between 0 (no concentration) and 1 (maximum concentration).

**Community:** the smallest sub-national unit of the population census surveys in OECD countries. Population density at the community level is used as the basis for the OECD Regional Typology.

**Regional Typology:** the regional typology elaborated by the OECD to permit meaningful comparisons between regions with similar characteristics. Based on the percentage of population living in rural communities, the typology classifies regions as Predominantly Urban, Predominantly Rural and Intermediate.

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## Further Information

The OECD documents below can be accessed under Publications and Documents at: [www.oecd.org/gov/territorialindicators](http://www.oecd.org/gov/territorialindicators). Access to key regional indicators from the Territorial Database as well as to the working papers by the OECD Working Party on Territorial Indicators is also provided through the website.

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