Refinement of the OECD regional typology: Economic Performance of Remote Rural Regions

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Abstract

To account for differences among rural and urban regions, the OECD has established a regional typology, classifying TL3 regions as predominantly urban (PU), intermediate (IN) or predominantly rural (PR). This typology has proved to be meaningful to better explain regional differences in economic and labour market performance. However, it does not take into account the presence of economic agglomerations if they happen to be in neighbouring regions.

Remote rural regions face a different set of problems than rural regions close to a city, where a wider range of services and opportunities can be found. This paper suggests a refinement of the current typology to include a criterion on the accessibility to urban centres. The results show a clear distinction between remote rural regions and rural regions close to a city in terms of declining and ageing population, level of productivity and unemployment.

This extended typology, which includes a measure of distance from cities for the population living in a rural area, is applied to North America and Europe. Our aim is to extend it in the future to the other OECD countries and evaluate the feasibility to apply a similar method to non OECD countries.

Introduction

The different geography of each territory is very important when conducting analysis of regional economies and comparing areas across countries. To account for differences among rural and urban regions, the OECD has established a regional typology, classifying TL3 regions as predominantly urban (PU), intermediate (IN) or predominantly rural (PR), (OECD 2009 a). This typology, based essentially on the percentage of regional population living in urban or rural communities, has proved to be meaningful to better explain regional differences in economic and labour market performance (OECD 2009 b). However this typology does not take into account the presence of economic agglomerations if they happen to be in neighbouring regions. For example, a region is classified as rural or intermediate regardless its distance from a large urban centre where labour market, access to services, education opportunities and logistics for firms can be wider.

Remote rural regions face a different set of problems than rural regions close to a city, where a wider range of services and opportunities can be found. This paper suggests a refinement of the current typology to include a criterion on the accessibility to urban centres. The results show a clear distinction between remote rural regions and rural regions close to a city in terms of declining population, level of employment and output.

This *extended typology* is applied to TL3 regions of North America and Europe, following the methodology suggested by the Directorate General for Regional Policy of the European Commission (Dijkstra and Poelman 2008). The OECD regional typology has been extended to include a criterion of

distance measured by the driving time needed for a certain percentage of the population of a region to reach a populated centre of at least 50 000 inhabitants. The resulting classification consists of five types of regions: Predominantly Urban (PU), Intermediate Close to a city (INC), Intermediate Remote (INR), Predominantly Rural Close to a city (PRC) and Predominantly Rural Remote (PRR).

A clear distinction between rural regions close to a city and remote rural regions is apparent for what regards population dynamics, where the latter show a stronger decline and ageing. Other results suggest that the remoteness of rural regions is highly significant on the regional outflows of working age population, confirming that this extended typology captures the economic distance from market and services (OECD 2010). In the case of Canada and Mexico the former distinction can also be found while comparing employment rates. The comparison on the economic performance of rural regions close to a city and remote rural regions is here limited to the dynamics of population and employment rates. However, results from the European countries at NUTS3 territorial level indicate that, on average, remote rural regions show also lower economic performance.

In the paper we first show the application of the extended typology in North American and European TL3 regions, and then we summarize the results based on the different types of regions. The annex contains the details of the methodology and the needed data to extend this method to other countries. Our aim is to complete the extended typology, by applying it to the other OECD countries (Japan, Korea, New Zealand and Australia) and then to evaluate the feasibility to apply a similar method to non OECD countries.

Extended typology in North America and Europe

The OECD regional typology classifies regions as Predominantly Urban (PU), Intermediate (IN) or Predominantly Rural (PR) on the basis of the share of regional population living in local rural areas and on the existence of important urban centres where at least 25% of the regional population resides. The extended regional typology reclassifies the regions within the PR and IN categories by considering the driving time of at least 50% of the regional population to the closest populated centre with more than 50 000 inhabitants. For North America the threshold for the driving time is set equal to 60 minutes, while for Europe is equal to 45 minutes. The result is a typology containing five categories: Predominantly Urban (PU), Intermediate Close to a City (INC), Intermediate Remote (INR), Predominantly Rural Close to a City (PRC), and Predominantly Rural Remote (PRR).

According to the OECD regional typology 74% of the TL3 regions in North America are rural. Once the extended typology is applied, more than half of the rural regions become remote rural regions (260 regions). In Canada, 74% of rural regions are reclassified as remote, while in the United States only 25% . In terms of population, of the around 150 million inhabitants of rural regions in North America, 17% resides in remote rural regions. However, this percentage varies among the three countries, 57% of the population resides in remote rural regions in Canada, 27% in Mexico and only 11% in the US (Table 1 and Figure 1).

Compared to North America the percentage of rural regions in Europe is significantly smaller. Indeed, following the OECD typology, only 35% of the European regions are classified as PR. The country with highest concentration of rural regions in Europe is Ireland, where 88% of the regions are classified as PR; it is followed by Sweden, Finland and Greece, with 86%, 85% and 77% of PR regions, respectively. However, countries like the Netherlands and Luxembourg do not have any region classified as PR. After applying the extended typology, 14% of European regions are classified as remote rural regions In terms of the population, only 5% of the population in the OECD European countries lives in PRR regions (Table 1 and Figure 1).

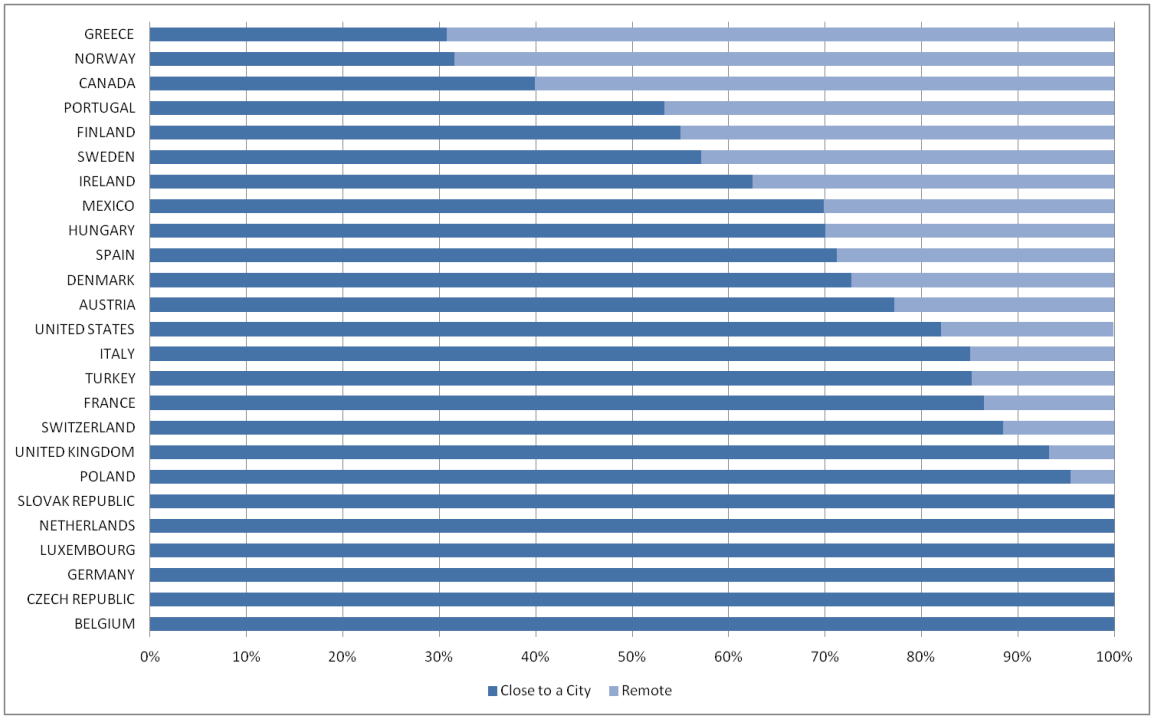
Table 1. Percentage of the population by extended typology

Country	PU	INC	INR	PRC	PRR	Total
AUSTRIA	23%	31%	0%	35%	11%	100%
BELGIUM	83%	14%	0%	2%	0%	100%
CANADA	48%	19%	0%	20%	13%	100%
CZECH REPUBLIC	11%	84%	0%	5%	0%	100%
DENMARK	29%	28%	0%	24%	19%	100%
FINLAND	26%	9%	4%	42%	20%	100%
FRANCE	35%	48%	0%	13%	4%	100%
GERMANY	56%	26%	0%	18%	0%	100%
GREECE	36%	24%	0%	5%	35%	100%
HUNGARY	17%	42%	0%	22%	19%	100%
ICELAND	.	.	.	.	.	.
IRELAND	28%	0%	0%	45%	27%	100%
ITALY	52%	36%	3%	6%	3%	100%
MEXICO	47%	17%	0%	26%	9%	100%
NETHERLANDS	85%	15%	0%	0%	0%	100%
NORWAY	12%	35%	5%	4%	45%	100%
POLAND	23%	29%	2%	45%	1%	100%
PORTUGAL	52%	24%	2%	6%	15%	100%
SLOVAK REPUBLIC	11%	63%	0%	25%	0%	100%
SPAIN	48%	36%	2%	8%	6%	100%
SWEDEN	21%	30%	0%	29%	20%	100%
SWITZERLAND	41%	45%	4%	3%	6%	100%
TURKEY	47%	25%	0%	22%	5%	100%
UNITED KINGDOM	70%	27%	1%	2%	0%	100%
UNITED STATES	43%	20%	0%	33%	4%	100%

The extended typology has a negligible effect on the number of intermediate regions in Mexico and none effect in the United States. In Canada around 20% of the intermediate regions become remote intermediate. Also in terms of the population the effect is quite limited, the largest being in Canada where 7% of the population in intermediate regions resides in remote intermediate regions, while in Mexico the percentage of people living in this type of regions is 2% (Table 1).

Consistent with the results for North America, the extended typology has a negligible effect on the number of intermediate remote regions in Europe: less than 2% of European regions are classified as INR, while less than 1% of the European population lives in this type of region. The countries with highest concentration of INC regions are the Czech Republic (85%) and the Slovak Republic (62%). The European population living in INC represents 32% of the total.

Figure 1. Percentage of regions by remoteness criteria



The regions in North America and Europe by the extended typology are shown in Figure 2. Considering the limited number of remote intermediate regions, the rest of the analysis will focus only on four categories: PU, INC, PRR and PRC.

Figure 2. Extended Typology North-America

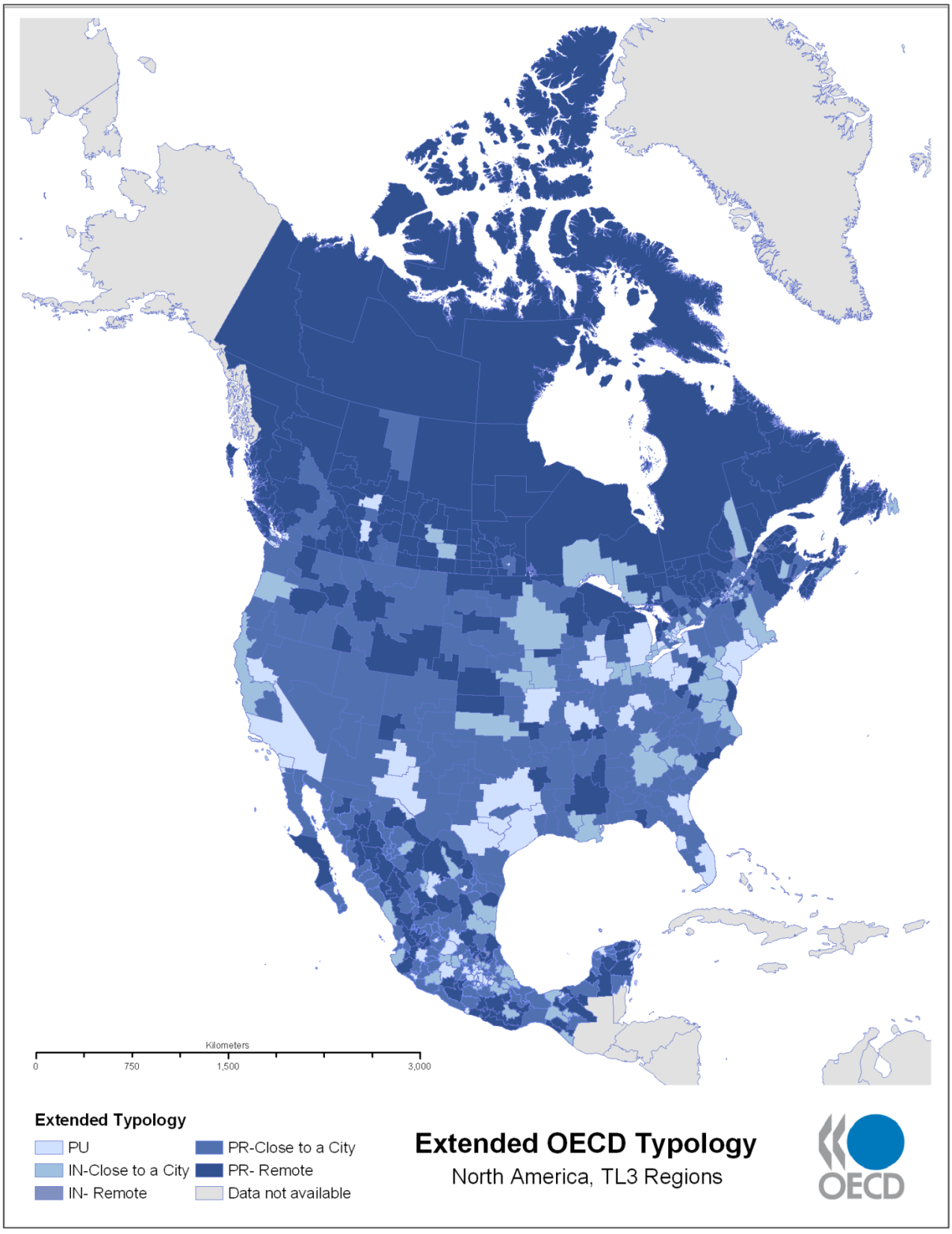
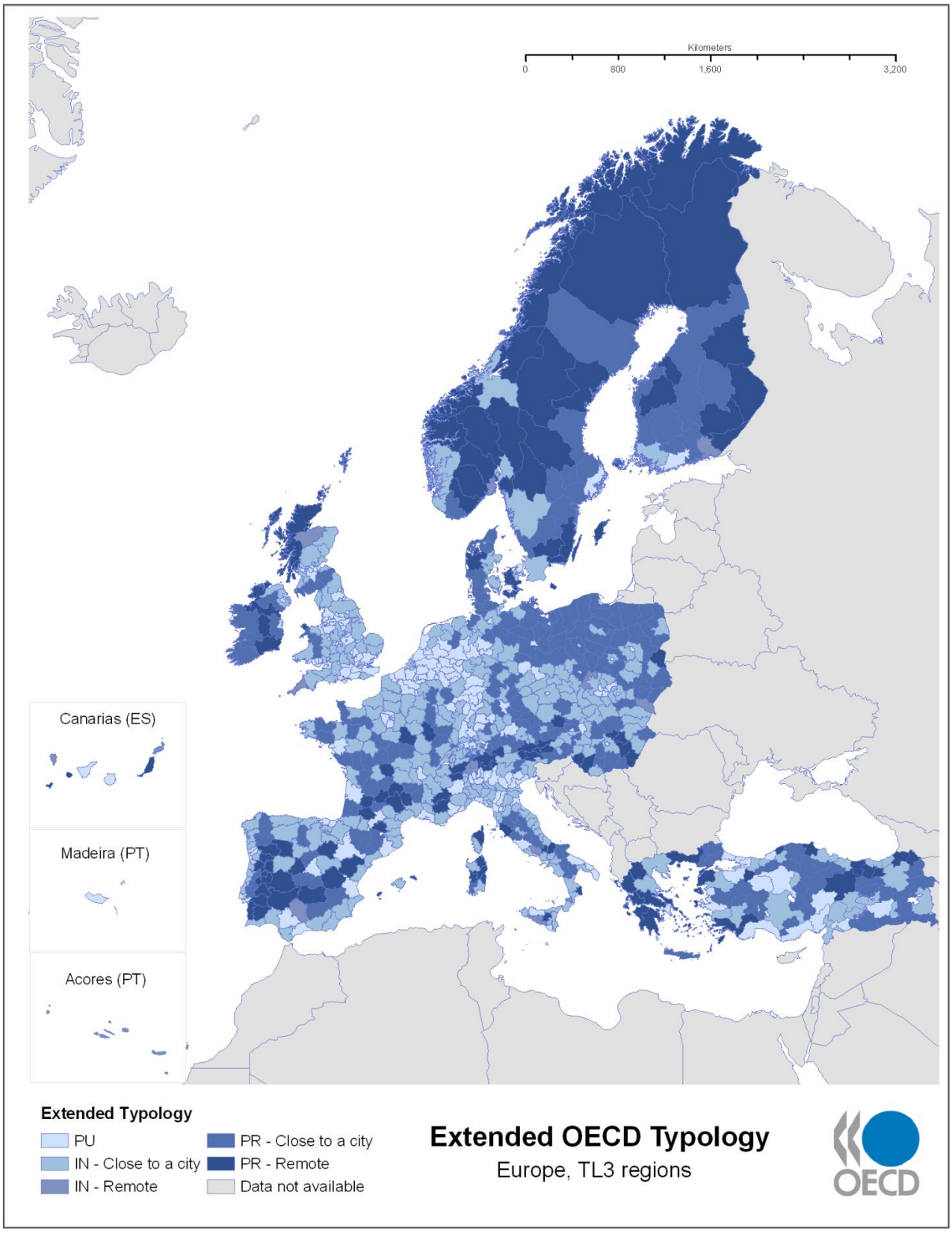


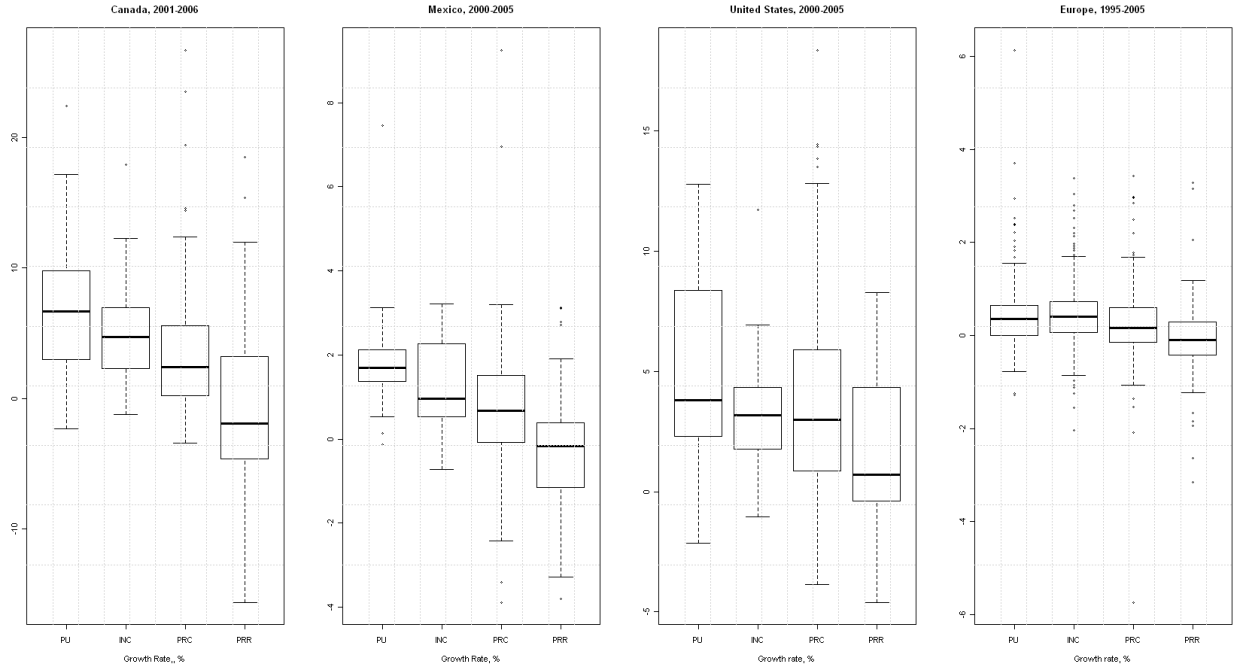
Figure 3. Extended Typology Europe



Regional performance of rural regions

The analysis of remote rural regions in Mexico shows that this group of regions is significantly worse off in employment opportunities and, on average, is the only group of regions affected by negative population growth. While the population growth rate between 2000 and 2005 in the PRC regions was 0.7%, it was equal to -0.2% in PRR and the e medians of the two populations also differ[1]. Over the same years, the population grew at a rate of 1.5% in PU regions and 1.1% in IN regions in Mexico (Figure 4). For what concerns the employment rate, it was equal to 52.7% in PRR and 56.4% in PRC (Figure 5).

Figure 4. Population growth rate in North American regions by extended regional typology



The effects of remoteness can also be seen on the dynamics of the population in the United States. Population growth rates tend to significantly differ between PRR and PRC (Figure 4). On average, the population growth rate of regions close to a city is two times higher than the one of remote regions (3.7% compare to 1.4%). Moreover, the PRR class includes the region with lowest growth rate in the US, Salina (Kansas) (-4.6%), while the PRC class includes the region with the highest rate, Las Vegas (Nevada) (18.36%).

The results for the United States show that PRR and PRC seem to have a different behaviour regarding the population dynamics. However, this is not the case for employment. In terms of employment, remote rural regions and rural regions close to a city do not differ. The first group displays on average a slightly higher employment rate (higher median) and the dynamics of the employment in the last years are quite similar (Figure 5). Moreover, the results of non-parametric tests for the employment rate show that both PRR and PRC regions come from the same distribution.

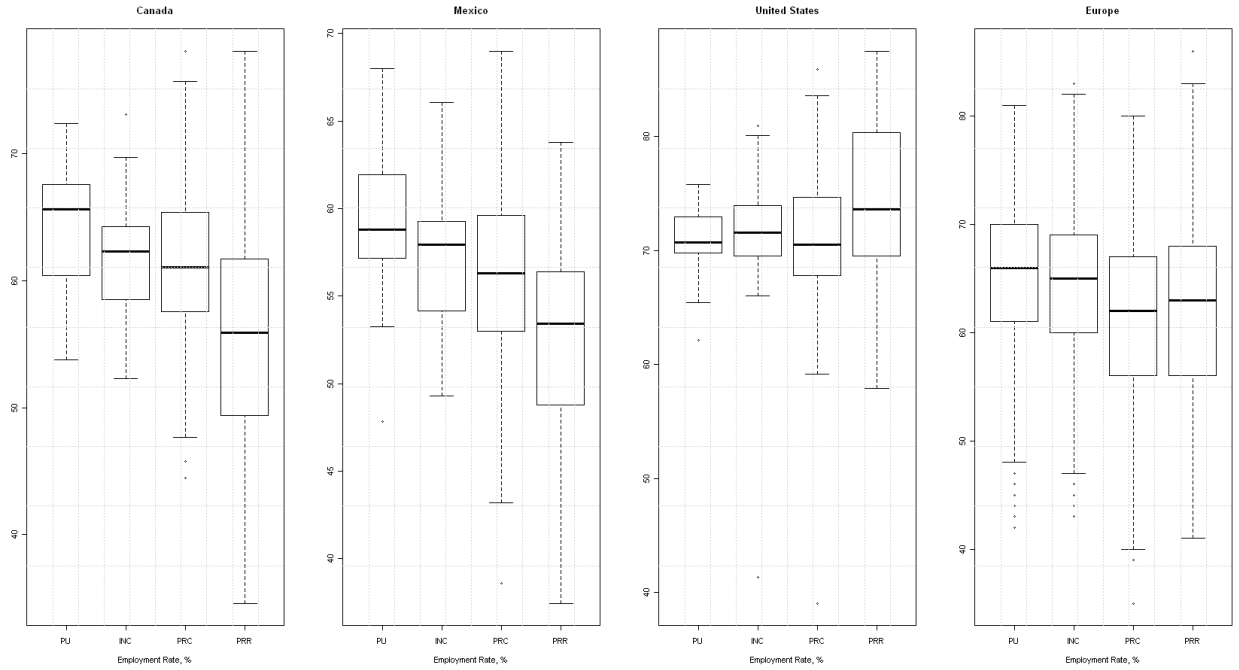
[1] Respectively, 0.68 and -0.17%. According to a Wixocon test of normality the two distributions are different.

The dynamics of the population in Canada show a clear difference between PRR and PRC regions. It can be seen that not only PRC tend to have higher growing rates, but a significant amount of PRR regions have negative growing rates (Figure 4). The difference between these two groups of regions can also be seen in terms of the employment rate, where the PRR have on average a smaller employment rate (Figure 5). However, this group of regions is also characterized by the biggest range between the minimum and maximum rates. Moreover, it includes the regions with the smallest and the biggest employment rate.

The dynamics of the population of European regions, based on the extended typology, seem to be similar to the ones from North American regions: on average, PRR tend to have the smaller growing rates. However, in the case of Europe, we can appreciate that the distributions of the population growing rates tend to be more similar among each others. All these distributions are also characterized by a significant amount of outliers. In terms of the employment rates, we can notice that both PU and INC regions show a better performance, on average, than PRC and PRC. However, we can observe that PRR regions not only show one of the biggest ranges between minimum and maximum employment rates, but they also seem to perform better than PRC.

This analysis should be extended to other variables besides the population dynamics and employment rates to capture a region's potential. Inter-regional labour mobility shows that remote rural regions display larger net outflows than the other types of regions (OECD 2010). Therefore the mix results obtained on employment rates should be further investigated using other measures of the functioning of regional labour markets.

Figure 5. Employment rates in North American regions by extended typology

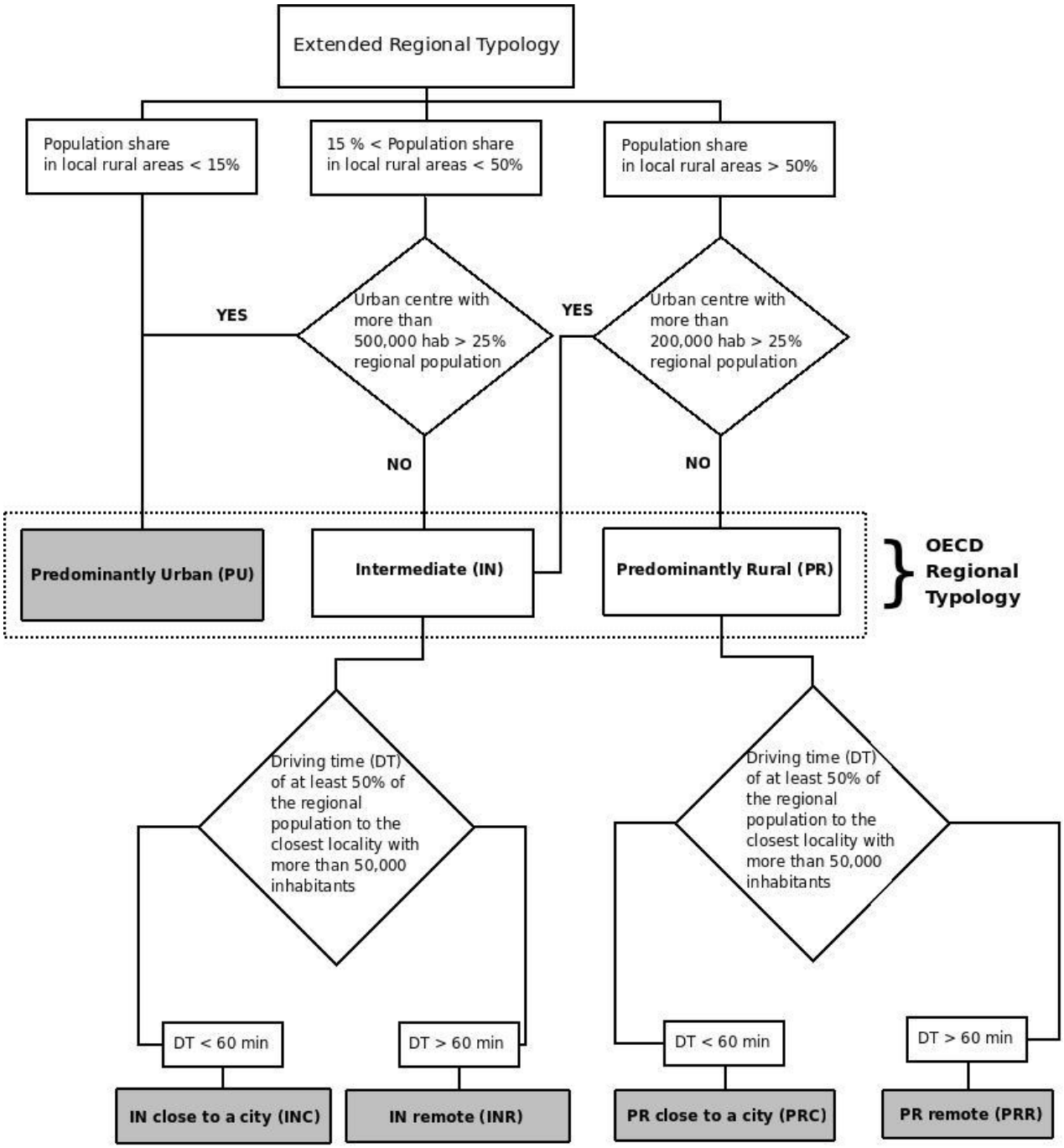


The previous results on Canada, Mexico, the United States and Europe show that there is a high degree of heterogeneity within the group of regions currently classified as rural. Hence, a more robust classification that maximizes the heterogeneity between groups of regions and minimizes it inside of them could provide a better understanding of the regional performance. The results may depend on the

thresholds of the parameters (driving time and size of urban centre), hence some sensitivity tests have been carried out as discussed in the Annex.

This extended typology, which classifies regions as PU, IN, PR close to a city and PR remote, can be adopted as alternative to compare OECD regions. Therefore the next step is to apply it to the remaining OECD countries, on the basis of the available data inputs (in particular country road network, a map containing the distribution of population and a map containing populated centres with at least 50 000 inhabitants). The way forward includes the evaluation of how this extended typology can be applied to non OECD countries and whether some parameters should be changed to better identify specific characteristics of rurality in non OECD countries.

Annex Methodology



The accessibility analysis used to build the typology for North America was carried by the OECD following the methodology proposed by the Directorate General for Regional Policy of the European Commission. The details of this analysis are explained in the following paragraphs. For further information on the methodology used to build the typology for Europe, please refer to Dijkstra and Poelman (2008).

In a first step, based on the share of population living in local rural areas within each region regions are classified as Predominantly Urban (PU), Intermediate (IN) or Predominantly Rural (PR). An additional criterion is based on the size of the urban centres contained in the TL3 regions. A region previously

classified as PR (IN), becomes IN (PU) if it contains an urban centre with at least 200 000 (500 000) inhabitants representing 25% of the regional population. These three categories are known as the OECD regional typology. In a second step, the OECD regional typology is extended by considering the driving time of at least 50% of the regional population to the closest populated centre with more than 50 000 inhabitants. This only applies to the IN and PR categories, since by definition the PU regions include highly populated localities. The result is a typology containing five categories: PU, INC, INR, PRC, and PRR.

Accessibility Analysis

In order to identify a region as remote it is needed to perform an accessibility analysis. This type of analysis quantifies the driving time needed for a certain percentage of the population of a region to reach a populated centre. A region is considered to be remote if at least 50% of its population needs to drive 60 minutes or more to reach a populated centre with more than 50 000 inhabitants. Due to the lack of data, Hawaii, Alaska and Puerto Rico have been excluded from the accessibility analysis applied to the United States. The main inputs of the accessibility analysis are:

- A map containing the distribution of the population
- A road network
- A map containing populated centres with at least 50 000 inhabitants
- The analysis can be further refined by considering some additional factors that affect the driving time. This implies the use of a Digital Elevation Model (DEM) and an Urban Areas map.

Distribution of the population

In order to count the number of people living within each TL3 region, it is necessary to know how the population is distributed along the territory. This information is usually represented by a population density map in a raster format. Since this type of map was not available for Mexico, it has been created using data at the locality level from the 2005 census (INEGI). Rural localities were only available as a point feature class, while urban localities were available as both point and polygon feature class. Hence, the population density map was built using the rural localities as point feature class and the urban localities as polygon feature class. To do so, it has been assumed that the rural localities were concentrated and uniformly distributed around their coordinates. In the case of the United States, the population density map was created using tract data from the 2000 Census, while for Canada this map was created using block data from the 2006 census. Population density was then calculated by dividing the population in each tract and block by its corresponding area.

For the three countries, the population density maps were rasterized. To do so, a first raster map of the population density was created using a 100 m grid. From this map, a second map was created using a 1 km grid. This technique reduces the bias caused by the interpolation carried out while assigning a value to the grid's cells. As a result, a map of the population density in raster format was obtained, where every cell corresponds to the population by square kilometre. It is important to bear in mind that this is an approximation of the real distribution of the population, which is based on the assumptions previously mentioned.

Road Network

The road network is used to compute the driving time needed to reach urban centres. In the case of Mexico, the road network provided by INEGI includes many types of roads classified according to their number of lanes and structures. To simplify the composition of the network, and to deal with the absence of some interconnections, three main types of roads were chosen: Paved Roads, Non-Paved Roads and Paths. Despite this dataset being quite complete, there were certain issues that had to be overcome before using it in the accessibility analysis. In the first place, not all the roads were connected to the network. Moreover, some pieces of the network were completely isolated. In the second place, since the localities are represented as a point feature class, they were not connected to the network. To tackle these problems, the network was cleaned up by removing the isolated segments and a new set of segments to join the network to the localities was created. In the case of the United States, the road network used for the analysis comes from the National Transportation Atlas Database. For practical reasons, only national highways were considered for the analysis. The national highways dataset is composed by 174 540 observations, including interstate, freeways, expressways, and other minor arterials. In the case of Canada, the road network was obtained from Statistics Canada and it was classified in three types of segments: highways, roads, and connecting streets.

Populated Centres

For Mexico, populated centres were obtained from the urban localities dataset provided by the INEGI while for the United States and Canada, these data came from the 2000 Census Gazetteer files and the North American Atlas, respectively. Once these datasets were filtered, there were 195 populated centres with at least 50,000 inhabitants in Mexico, 662 in the United States and 52 in Canada.

Additional factors

The driving time to reach a populated centre can be influenced by several factors, in particular, the driving speeds, the traffic around urban areas and the slope of the roads. To take into account these three factors, a slope and a density index were computed for the three countries.

The slope index is a proxy for the influence of the terrain. The slope of terrain was calculated using a digital elevation terrain model. The resulting slope values were reclassified in three intervals: 0% - 5%, 6% - 11%, and more than 11%. For the first interval, the slope index takes a value equal to 1, while for the second and third intervals it takes the values of 1.2 and 1.5, respectively.

The density index is a proxy for the congestion around urban areas. This variable assigns a value to each road segment depending on the type of road it belongs to, and whether the segment is inside of an urban polygon. In the case of Mexico, for every segment outside an urban polygon the density index takes a value equal to 1; for segments within an urban polygon, the density index takes a value of 1.5 if the segment belongs to a paved road, 1.8 if the segment belongs to a non-paved road, and 2 if the road belongs to a path or if it belongs to one of the segments created to join the localities to the network. In the case of the United States, two main types of roads have been identified from the national highways dataset: Principal arterials and Minor arterials. Principal arterials include interstate highways, freeways and expressways, while minor arterials include minor and major collectors as well as local roads. To simplify the analysis, it was assumed that no traffic is found outside urban areas, while the traffic in urban areas has a bigger effect on minor arterials than on the principal ones. A weight equal to 1 was given to all road segments outside an urban area, while Principal and Minor arterials within an urban area respectively received weights equal to 1.5 and 2. The same type of weighting was used for Canada, where the highways received a value equal to 1.5, while the roads and connecting streets received a value equal to 2.

Since the speed limits in Mexico often change within the same type of road, choosing a value for every type of road was not an easy task. Following the recommendations provided by the Ministry of Communications and Transport to foreigners driving in Mexico, the following values for each type of road were selected: 100 km/ h for the paved roads, 50 km / h for the non-paved roads and the segments joining localities to the network, and 30 km / h for the paths. In the US, speed limits are defined by each State, mainly depending on the land use. However, speed limits may change depending on the time of day and the type of vehicle. For practical reasons, only day time limits for non-truck vehicles have been used, taking into account whether a highway segment belongs to an urban or a rural area. In the case of Canada, the speed limits are defined according to type and location of the road. Indeed, segments of highways located in rural areas have a maximum speed limit of 100 km/h, while the rest of highway segments are limited to 80 km/h. Connecting streets have a limit of 50 km/h.

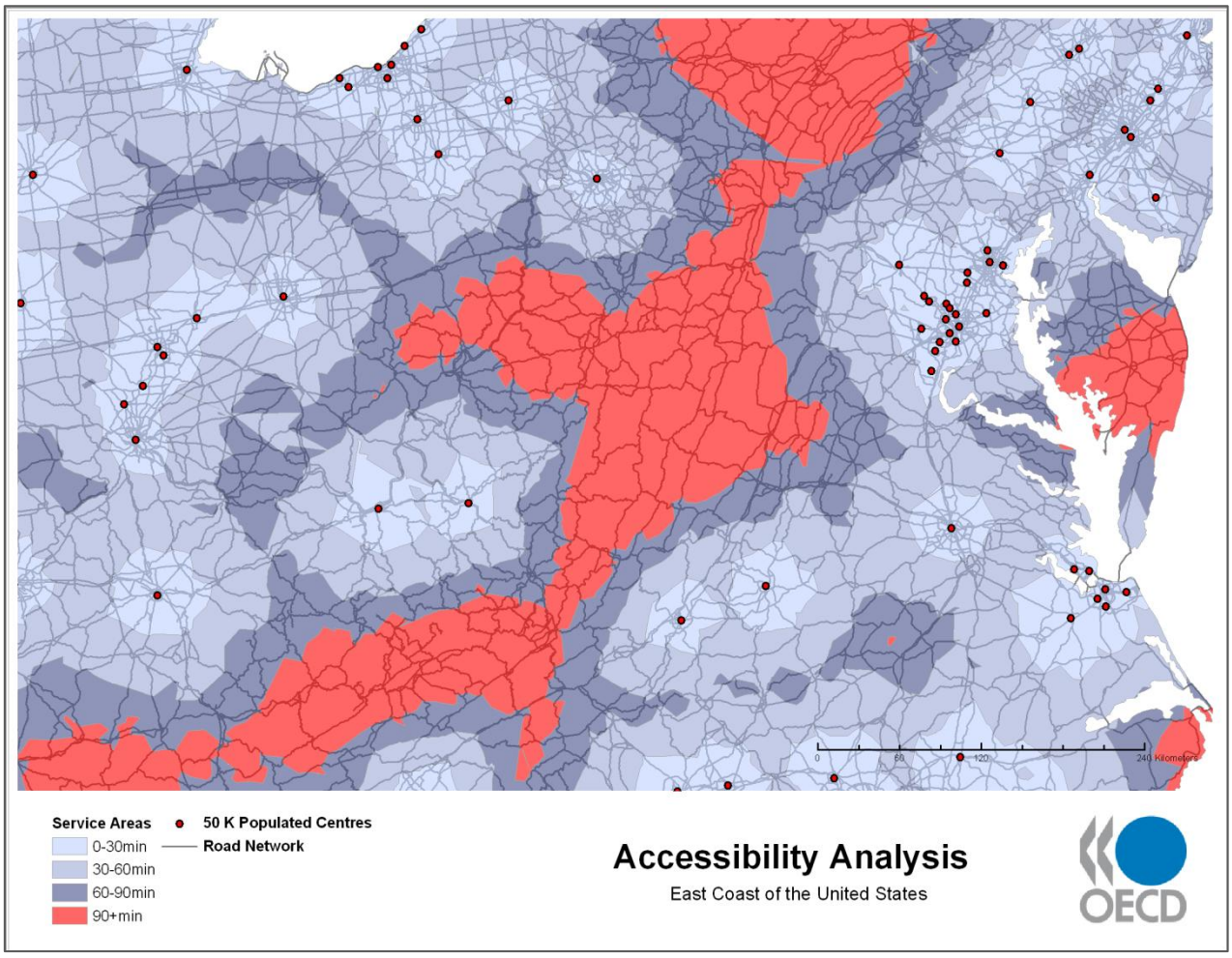
Finally, the road network was intersected with the slope and urban polygons layers to create a road network where every segment has a specific value assigned for the slope of the terrain and a value to indicate if the segment belongs to an urban polygon. From this layer, the crossing time of every segment in the network can be calculated as follows:

$$CT_i = \frac{(Distance\ of\ the\ segment * slope\ index * density\ index)}{\left(Speed\ limit * \frac{1000}{60}\right)}$$

Service Areas

To carry on with the accessibility analysis, once the density population map and the road network were ready, it was necessary to define the service areas surrounding every populated centre with at least 50 000 inhabitants. A service area is a region that encompasses all accessible roads. The size of a service area depends on the time needed to access a certain point, in this case a populated centre. For instance, a 60-minute service area for a specific locality includes all the roads in the network that can be reached from that locality within 60 minutes. In Figure 6, the service areas, the localities with more than 50 000 inhabitants and the road network are shown for the east-coast of the U.S. The service areas are represented by the concentric rings around the localities. These service areas were calculated for different time frames: 30 minutes (yellow), 60 minutes (orange) and 90 minutes (red). In this map, the service areas are represented by blue concentric polygons surrounding the cities (red points). Light blue polygons represent a 30 minutes service area, while medium blue and dark blue represent respectively 60 and 90 minutes service areas.

Figure 6. Elements for the accessibility analysis



Using the service areas a region can be classified as remote (or close to a city) by calculating the percentage of people living within a specific time frame. For the current analysis it has been considered a 60-minute time frame, and a percentage of population of 50%. Hence, if less than 50% of the population lives within the 60-minute service area, the region was considered to be remote.

The results obtained from this analysis depend on the parameters used to model the accessibility to the localities, i.e. the crossing time, the size of the localities and the time frame. Initially, two sizes for the localities had been considered: 50 000 and 100 000 inhabitants. However, based on the definition of a locality, 50 000 was considered to be a more adequate size. Since cities are composed by localities, using a bigger size may exclude localities within big cities or metropolitan areas.

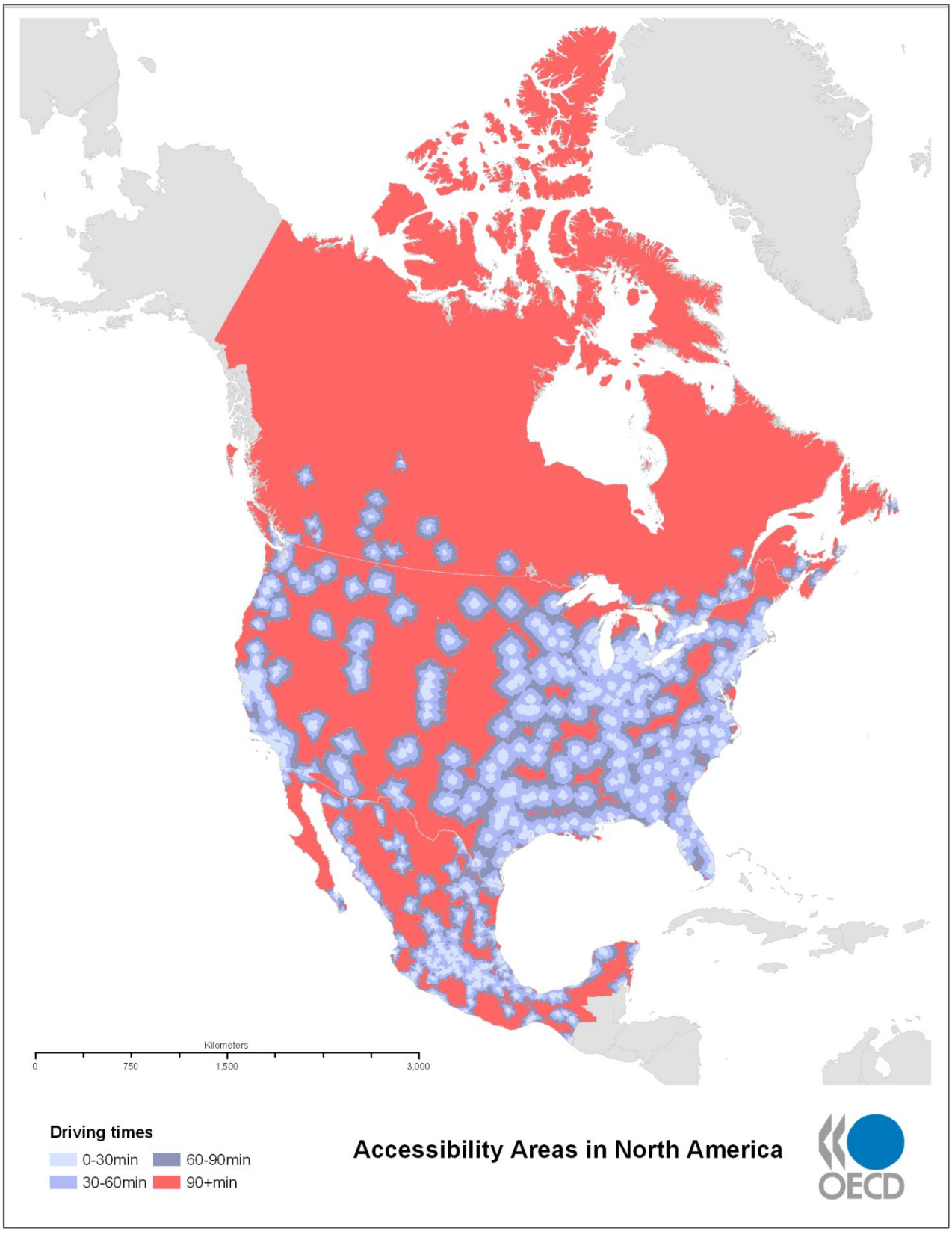
Regarding the time frame used for the analysis, the three thresholds shown in Figure 6 were considered. Since a 30-min drive is common in big countries like Mexico, the United States and Canada, it was decided to focus on the other two time frames. It can be seen that the classification of regions is significantly affected by the choice of the time frame. Table 2 shows that for a 60-minutes time frame in Mexico, 63 regions are classified as remote, while for a 90-min time frame only 38 regions fall in the category. The decrease in the number of regions is proportional to the decrease in the population for each

class. Using a time frame of 90 minutes reduces the percentage of people living in remote areas by almost a half. Nevertheless, the distributions of the employment and population growth rate variables, for the 60-min and 90-min time frames seem to be quite similar. Similarly, in the case of the United States, when using a 90 minutes the percentage of inhabitants in remote areas is reduced by half, while the number of regions classified as "Remote" is also significantly reduced, going from 32 to 19 regions. This is also the case for Canada. For this reason, it was decided to only consider the results of a 60-min time frame.

Table 2. Number of regions and percentage of population by typology based on 90 minutes of driving time, Mexico

		Close to a City		Remote		Totals	
	OECD Typology	**N. of regions**	**Population**	**N. of regions**	**Population**	**N. of regions**	**Population**
Canada	IN	33	98%	2	2%	35	100%
	PR	99	61%	124	39%	223	100%
	PU	30	100%	-	0%	30	100%
	Total	**162**	**88%**	**126**	**12%**	**288**	**100%**
Mexico	IN	29	98%	1	2%	30	100%
	PR	107	85%	38	15%	145	100%
	PU	34	100%	-	0%	34	100%
	Total	**170**	**94%**	**39**	**6%**	**209**	**100%**
U.S.	IN	21	100%	0	0%	21	100%
	PR	112	95%	19	5%	131	100%
	PU	25	100%	0	0%	25	100%
	Total	**158**	**98%**	**19**	**2%**	**177**	**100%**

Figure 7. Service areas for 30-min, 60-min and 90-min time frames, North America



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