

CENTRE FOR PLANNING AND ECONOMIC RESEARCH

**No 99**

**Deriving Labor Market Areas in Greece  
from commuting flows**

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April 2008

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## ABSTRACT

The paper examines the 2001 inter-municipal travel-to-work flows of Greece and delineates the country's labor market areas (LMAs) on the basis of the 15% commuting threshold. It finds that the LMAs of Athens (3.9 million inhabitants) and Thessaloniki (1.1 million) exceed the homonymous urban planning complexes by 8 and 15 times, respectively. These LMAs along with the LMAs of Patras (245 thousand) and Iraklion (233 thousand) host about half of the country's total population. Another thirty-eight clusters of municipalities and eight self-contained municipalities of 20-184 thousand inhabitants jointly host a quarter of the country's population. The picture is complemented by the presence of ten clusters of municipalities and 607 self-contained municipalities with smaller populations. Their dispersal resembles the contours of the country's idiosyncratic terrain and deviates from the 13 regional and 54 sub-regional administrative divisions employed by the national and EU authorities in order to engage in economic development interventions. This suggests that the employment, unemployment and social cohesion policy-initiatives have to be re-focused accordingly.

*Keywords:* Travel-to-work areas. Localities. Urban and micro-regional policy areas.

*JEL-Codes:* J49, R12.

### *Acknowledgements:*

Earlier versions of this paper were presented at KEPE meetings, the University of Thessaly, and the Conference of the Standing Committee on Regional and Urban Statistics (Europe Group) of the International Association for Official Statistics - International Statistical Institute. Thanks are due to the National Statistical Service of Greece for supplying the data and promptly answering the queries regarding their collection; as well as the participants in the above conference and seminars for comments and suggestions. I am also indebted to Prof. Martin Schuler of the École Polytechnique Fédérale de Lausanne for bringing me up to date on relevant issues prior to my involvement with the OECD's Working Party on Territorial Indicators in 2004. The usual disclaimer applies.

## 1. Introduction

The purpose of this paper is to consider the inter-municipal commuting flows recorded in the 2001 Census in order to determine the Labor Market Areas (LMAs) of Greece. Pieced together as aggregations of neighboring localities, the LMAs are generally delineated with the use of algorithms according to the daily travel flows from the place of residence to the place of work. Thus, unlike the conventional territorial divisions of administrative regions and districts (the boundaries of which are based on historical events, geographical factors, administrative conventions, custom, etc.), these *travel-to-work areas* or *basins/zones of employment* constitute territorial partitions on the basis of the economic interdependencies of localities. Consequently, they have gained considerable acceptance in the scientific community and governments as the appropriate territorial grid for diagnosing/analyzing regional disparities, engaging in policy interventions, relying on spillovers, etc. Indeed, considering the complexity and continuing restructuring of modern economic reality, the determination and periodic revision (after every census?) of a country's spatial functional areas is probably very much desired.

A number of studies have already employed disaggregated data in order to delineate and re-delineate the self-contained labor market areas of Great Britain (Smart, 1974; Ball, 1980; Coombes and Openshaw, 1982; Coombes et al., 1986; Office for National Statistics and Coombes, 1998; Coombes et al., 2005), Italy (Istituto Nazionale di Statistica, 1997), Denmark (Kristensen, 1998), the Netherlands (van der Laan, 1991; van der Laan and Schalke, 2001), a number of French regions (Schmitt and Henry, 2000) and Spanish regions (Casado-Díaz, 2000; Roca Cladera and Moix Bergadà, 2005; Royuela and Vargas, 2007), New Zealand (Papps and Newell, 2002). In the European Union, similar subsets and methods are used in order

to define the metropolitan and other urban travel-to-work areas.<sup>1</sup> The growing recognition for the possibilities of LMA statistics in offering insights with regard to the performance of regions, prompted Eurostat (the Union's principal statistical agency), in late 2007, to invite the member states to report all their LMAs.

In Greece, the need to empirically determine the country's travel-to-work areas and delineate the labor markets areas within which policies may be most effective has been persuasively articulated by Efstratoglou (2006). At about the same time (2005-2007) we were able to calculate approximately the Greek LMAs on the basis of the thirty largest commuting outflows from each municipality reported by the National Statistical Service of Greece (NNSG). (This fractional list of commuting outflows was the only relevant dataset that was available at the time.) The estimations conducted at the 15% commuting threshold indicated the presence of 677 urban, rural, and mixed travel-to-work areas. The findings were used in empirical analyses in order to help formulate economic development and social cohesion policy proposals (e.g., Prodromídis, 2008). However, the circulation in early 2008, by the NNSG, of the complete set of commuting flows has enabled the production of a more accurate determination of the country's travel-to-work areas. The revised calculations bring the number of travel-to-work-areas to 667.

The rest of the paper is organised as follows: Section 2 explains how the LMAs are determined, Section 3 supplies the results, and Section 4 concludes.

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<sup>1</sup> A recent account of the methodologies employed by international organisations, research networks and individual researchers for determining urban labor markets is provided by the OECD (2007).

## **2. The methodology used in the delineation of the LMAs**

As mentioned in the introduction, at the international level, statistical institutes, research consortiums, and individual researchers have already outlined the travel-to-work areas of several national capitals, as well as the local labor markets of a number of countries. This is done via an iterative process of aggregating/grouping in a consistent manner contiguous or nearby localities (wards or municipalities) according to daily commuting flows (or links) between the ‘core’ area and surrounding territories, and residence- and workplace-based self-containment criteria. However, the instruments employed in such calculations, such as the definitions of cores and surrounding areas, commuting directions, and the criteria for attaching together (or detaching) areas, vary considerably from one case to another (Casado-Díaz and Coombes, 2005). Among these, Eurostat employs an iterative process to identify the boundaries of the main urban travel-to-work areas by attaching to city-cores the surrounding municipalities that exhibit substantial commuting flows to the city-core (or to the iteratively enlarged core), and has tested the use of a narrow commuting threshold of 20%, as well as a wider commuting threshold of 15% (the latter being more demanding). In essence, if a relatively large share of a municipality’s employed residents (say, 15% or more) commute to the city-core, then the municipality is considered as sufficiently integrated with the core and is treated as a part of its travel-to-work area. Moreover, if other municipalities exhibit similar commuting patterns vis-à-vis the city-core or the iteratively enlarged core then these municipalities are treated as parts of the particular travel-to-work area as well.

In the present paper, we use the same building blocks and commuting data employed by Eurostat. However, we enhance the method by considering a two-way commuting (i.e., from the fringes to the core and vice-versa), which, despite

increasing the project's complexity provides a more complete picture of labor market linkages than a one-way commuting. Indeed, a two-way commuting is employed in both the UK self-containment algorithm and the North American labor market definitions. Additionally, we take the labor market delineation technique to the next logical step, and apply it throughout the country by examining not only the commuting patterns around the main urban centers, but across all 1034 Greek municipalities known as "demes" and "koinotetes".<sup>2</sup> Thus, we codify the commuting origins and destinations in a non-symmetrical interaction 1034 x 1034 matrix, and proceed to cluster them without contiguity restrictions.<sup>3</sup> In effect, a municipality (or an iteratively enlarged travel-to-work area) will be grouped with another municipality (or travel-to-work area) if either (a) 15% or more of its employed residents commute to the other municipality (or travel-to-work area), (b) 15% or more of all employed in

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<sup>2</sup> The building blocks are a source of concern considering that in the course of the administrative reform of 1997 (Law 2539/1997), over 5.5 thousand villages and small municipalities were amalgamated into the current 1034 municipalities on the basis of landscape morphology, natural resource, population and area size criteria, but with little or no consideration paid to the commuting patterns and interaction bonds. Thus, the extended municipalities were not set up as integrated labor markets. It follows that if the building blocks are not sufficiently unified (and a number of them may not be), our findings may underestimate the economic fragmentation of Greece, especially in rural areas. The next Census is scheduled to solicit data at the ward/parish level. Thus, it will be possible to probe the issue further, obtain a better understanding of the structure and extent of economic spaces in Greece, and formulate more suitable place-based policies.

<sup>3</sup> Hypothetically speaking, the imposition of such restrictions, while allowing the consideration of adjacent localities that may not be well linked (as contiguity does not necessarily translate to actual rail/motorway or direct and steady ferry connectivity), may prevent the consideration of detached or somewhat distant continental localities that are well linked and may exhibit substantial travel flows through the transportation network. Additionally, it is at variance with the commitment to exclusively rely on (and map) economic interactions. At any rate, only three non-contiguities are detected: Livadia, Kalentzion and Promahon, which are attached to the Thessaloniki, Patras and Serre travel-to-work areas, respectively.

the municipality commute from the other municipality (or travel-to-work area), or both (a) and (b).<sup>4</sup>

To facilitate the reader we report the constituent municipalities of individual LMAs in footnotes. The use of dotted underline denotes an area's inclusion in the Athens-Piraeus and Thessaloniki urban-planning complexes; the use of regular fonts denotes its integration to an LMA on the basis of the 20% commuting threshold; and the use of italics denotes its integration on the basis of the 15% threshold.

### 3. The LMAs

We find that the largest LMAs are located around Athens, Thessaloniki, and the urban centers of Patras, Iraklion, Larisa, Volos, and Ioannina. All encompass a number of urban and rural municipalities which are denoted in Map 1 with black and gray, respectively. In particular:

- The Athens travel-to-work area seems to consist of 120 municipalities,<sup>5</sup> occupies a surface of 3,608 square kilometers (2.7% of the country's land-surface) and, at the time of the Census hosted a population of 3.887 million inhabitants (35.6% of the

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<sup>4</sup> LMAs are not supposed to overlap. In our case, only two municipalities raise any concern regarding the broader travel-to-work area to which they ought to be attached: Avlis (to the LMA of Athens or to LMA of Halkis) and Dimitrios Ipsilantis (to the LMA of Kozani or to the LMA of Ptolemais). The issue is resolved in favor of their incorporation to the Athens and Kozani zones, respectively, on the basis of both (a) the relative sizes of the flows (for they join the Athens and Kozani LMAs on the basis of the 20% rather than the 15% threshold), and (b) the similarities displayed in terms of their male and female employment, unemployment, and non-participation patterns (i.e., better t-statistics and fits in a number of econometric regressions).

<sup>5</sup> Those comprising the prefecture of Athens, the prefecture of East Attiki, the prefecture of West Attiki (*Megara* is integrated on the basis of the 15% threshold); and the municipalities of Ag. Ioannis Rentis, Ampelakia, Drapetsona, Keratsinion, Koridallos, Nikea, Piraeus, Perama, Salamis (i.e., 16.1% of the Piraeus prefecture area, hosting 93.5% of its population); Dervenohoria, Inofita, Skimatarion, Tanagra (i.e., 15.6% of the area of the Central Greek prefecture of Boeotia, hosting 17.1% of its population); Avlis (i.e., 2.9% of the area of Central Greek prefecture Euboea, hosting 3.7% of its population).

country's population of 10.934 million). That is, 600 thousand more residents and about eight times the area of the homonymous urban-planning complex. This corresponds to 79.7% of the overall surface of the administrative region of Attiki, and 99.1% of the region's population (a small part of Central Greece and Euboea notwithstanding).

- The Thessaloniki travel-to-work area spans 45 municipalities,<sup>6</sup> occupies a surface of 4,228 square kilometers (3.2% of the country's surface) and, at the time of the Census, hosted a population of 1.090 million inhabitants (10.0% of the country's population). That is, 312 thousand more residents and 15-times the area of the homonymous urban-planning complex. This corresponds to 21.8% of Central Macedonia's surface and 58.1% of the region's population.
- The travel-to-work area of Patras hosted 245 thousand people,<sup>7</sup> and those of Iraklion 233 thousand,<sup>8</sup> Larisa 184 thousand,<sup>9</sup> Volos 154 thousand,<sup>10</sup> Ioannina 131

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<sup>6</sup> Namely, the municipalities of Thessaloniki, Ag.Athanasios, Ag.Pavlos, Ampelokipi, Assiros, Axios, Egnatia, Ehedoros, Eleftherion-Kordelion, Epanomi, Evosmos, Halastra, Halkidon, Hortiatis, Kalamaria, Kalindii, Kallithea, Koronia, Koufalia, Lagkadas, Lahanas, Menemeni, Migdonia, Mikra, Nea Efkarpia, Nea Mihaniona, Neapolis, Oreokastron, Panorama, Pefka, Pilea, Polihni, Sikee, Sohos, Stavroupolis, Thermaikos, Thermi, Triandria, Vasilika, Vertiskos (involving 83.5% of the Thessaloniki prefecture area, hosting 98.0% of its population); Gallikos, Livadia, Pikrolimni (involving 23.8% of the Kilikis prefecture area, hosting 16.8% of its population); Anthemous, Kallikratia (i.e., 11.0% of the Halkidiki prefecture area, hosting 13.1% of its population).

<sup>7</sup> Comprising the municipalities of Patras, Dimi, Erineos, Farre, Kalentzion, Larissos, Leontion, Messatis, Olenia, Paralia, Rion, Vrahneika (occupying a surface of 1,261 square kilometers, i.e., 38.5% of the Ahaia prefecture area, hosting 76.9% of its population).

<sup>8</sup> Comprising the municipalities of Iraklion, Ag.Varvara, Arhane, Gazion, Gorgolaini, Gouves, Episkopi, Hersonisos, Kastellion, Krousonas, Malia, Nea Alikarnassos, Nikos Kazantsakis, Temenos, Tetrahorion, Thrapsonon, Tilisos (occupying a surface of 1,198 square kilometers, i.e., 45.4% of the Iraklion prefecture area, hosting 80.1% of its population).

<sup>9</sup> Comprising the municipalities of Larisa, Ampelakia, Ampelon, Giannouli, Gonni, Kilas, Krannon, Makrihorion, Nesson, Nikea, Platikampos (occupying a surface of 1,668 square kilometers, i.e., 31.0% of the Larisa prefecture area, hosting 65.2% of its population).

thousand.<sup>11</sup> Taken together, they accounted for 8.7% of the country's population and occupied 5.4% of the land.<sup>12</sup>

Thirty-five travel-to-work areas and eight self-contained municipalities host populations ranging from 20 to 115 thousand inhabitants. These are:

- The travel-to-work areas of Hania (115 thousand people),<sup>13</sup> Rodos (Rhodes) (109 thousand),<sup>14</sup> Halkis (98 thousand),<sup>15</sup> Trikala (82 thousand people),<sup>16</sup> Kalamata (81 thousand),<sup>17</sup> Serre (80 thousand),<sup>18</sup> Kavala, Kerkira (Corfu), Kozani (74 thousand

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<sup>10</sup> Comprising the municipalities of Volos, Agria, Artemis, Esonia, Fere, Iolkos, *Karla*, Makrinitza, *Nea Aghialos*, Nea Ionia, Portaria (occupying a surface of 822 square kilometers, i.e., 31.2% of the Magnesia prefecture area, hosting 75.2% of its population).

<sup>11</sup> Comprising the municipalities of Ioannina, *Ag.Dimitrios*, Anatoli, *Anatolikon Zagorion*, Ano Pogonion, Delvinakion, Dodoni, Ekali, Evrimenes, *Kalpakion*, Mpizanion, Nisos-of-Ioannina, Pamvotis, Pasarona, Perama, *Pogoniani*, *Zitsa* (occupying a surface of 2,274 square kilometers, i.e., 41.4% of the Ioannina prefecture area, hosting 81.4% of its population).

<sup>12</sup> In particular, the Patras travel-to-work area hosted 2.2% of the country's population on 0.9% of the country's total land surface, the Iraklion travel-to-work area 2.1% of the population on 0.9% of the surface, the Larisa travel-to-work area 1.7% of the population on 1.3% of the surface, the Volos travel-to-work area 1.4% of the population on 0.6% of the surface, and the Ioannina travel-to-work 1.2% of the country's population on 1.7% of the country's surface.

<sup>13</sup> Comprising the municipalities of Hania, Akrotirion, Armeni, Eleftherios Venizelos, Fre, *Keramies*, *Mousouri*, Nea Kidonia, *Platania*, Souda, Therisos, Vamos (occupying a surface of 791 square kilometers, i.e., 33.3% of the Hania prefecture area, hosting 77.3% of its population).

<sup>14</sup> Comprising the municipalities of Rodos, Afantou, *Arhaggelos*, Ialisos, Kallithea, Kamiros, *Lindos*, Petaloudes (occupying a surface of 794 square kilometers, i.e., 29.2% of the Dodekanese prefecture area, hosting 58.1% of its population).

<sup>15</sup> Comprising the municipalities of Halkis, *Amarinthos*, Anthidon, *Dirfii*, *Lilantion*, *Nea Artaki* (occupying a surface of 757 square kilometers, i.e., 18.2% of the Euboea prefecture area, hosting 47.4% of its population).

<sup>16</sup> Comprising the municipalities of Trikala, *Estieotis*, *Faloria*, *Gomfi*, *Kallidendron*, Megala Kalivia, *Paleokastron*, *Pialii* (occupying a surface of 563 square kilometers, i.e., 16.6% of the Trikala prefecture area, hosting 61.5% of its population).

<sup>17</sup> Comprising the municipalities of Kalamata, Arfara, Aris, Messini, Thouria (occupying a surface of 526 square kilometers, i.e., 17.6% of the Messenia prefecture area, hosting 48.5% of its population).

people),<sup>19</sup> Lamia (73 thousand),<sup>20</sup> Corinth (71 thousand),<sup>21</sup> Agrinion (70 thousand),<sup>22</sup> Komotini (69 thousand).<sup>23</sup> These are indicated in Map 1 with dark and light purple, which denote the urban and rural parts, respectively.

- The travel-to-work areas of Xanthi, Drama (67 thousand),<sup>24</sup> Katerini (63 thousand),<sup>25</sup> Veria (61 thousand),<sup>26</sup> Alexandroupolis (56 thousand),<sup>27</sup> Karditsa,

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<sup>18</sup> Comprising the municipalities of Serre, Emmanuel Pappas, Lefkon, Promahon, *Skoutarion*, (occupying a surface of 659 square kilometers, i.e., 16.6% of the Serre prefecture area, hosting 41.3% of its population).

<sup>19</sup> Of these, the Kavala travel-to-work area consists of the municipalities of Kavala and *Filippi* (occupying a surface of 351 square kilometers, i.e., 16.8% of the Kavala prefecture area, hosting 52.4% of its population); the Kerkira travel-to-work area consists of the municipalities of Kerkira, *Ag.Georgios*, Ahillii, Feakes, *Mathrakion*, Paleokastrite, Parelii (occupying a surface of 283 square kilometers, i.e., 44.2% of the Kerkira prefecture area, hosting 66.5% of its population); and the Kozani the travel-to-work area consists of the municipalities of Kozani, Dimitrios Ipsilantis, Eani, Elimia, Ellispontos, *Velventon* (occupying a surface of 1,198 square kilometers, i.e., 33.3% of the Kozani prefecture area, hosting 47.9% of its population).

<sup>20</sup> Comprising the municipalities of Lamia, *Gorgopotamos*, *Stilis* (occupying a surface of 774 square kilometers, i.e., 17.4% of the Fthiotis prefecture area, hosting 43.1% of its population).

<sup>21</sup> Comprising the municipalities of Corinth, *Ag.Theodori*, *Assos-Leheon*, *Loutrakion-Perahora*, *Saronikos* (occupying a surface of 561 square kilometers, i.e., 24.4% of the Korinthia prefecture area, hosting 49.0% of its population).

<sup>22</sup> Comprising the municipalities of Agrinion, *Neapolis*, *Thestiis* (occupying a surface of 298 square kilometers, i.e., 5.5% of the Etolia-Akarnania prefecture area, hosting 31.7% of its population).

<sup>23</sup> Comprising the municipalities of Komotini, *Egiros*, *Maronia*, *Neon Sidirohorion* (occupying a surface of 922 square kilometers, i.e., 36.1% of the Rodopi prefecture area, hosting 61.8% of its population).

<sup>24</sup> Of these, the former comprises the municipalities of Xanthi, *Avdira*, *Vistonis* (occupying a surface of 475 square kilometers, i.e., 26.4% of the Xanthi prefecture area, hosting a 65.4% of its population); and the latter comprises the municipalities of Drama, *Nikiforos*, *Paranestion*, *Sidironeron*, *Sitagri* (occupying a surface of 1,935 square kilometers, i.e., 55.8% of the Drama prefecture area, hosting 65.8% of its population).

<sup>25</sup> Comprising the municipalities of Katerini and Paralia (occupying a surface of 120 square kilometers, i.e., 7.8% of the Pieria prefecture area, hosting 50.0% of its population).

<sup>26</sup> Comprising the municipalities of Veria, *Apostolos Pavlos*, *Dovras* (occupying a surface of 526 square kilometers, i.e., 25.0% of the Imathia prefecture area, hosting 43.0% of its population).

<sup>27</sup> Comprising the municipalities of Alexandroupolis and Trajanoupolis (occupying a surface of 807 square kilometers, i.e., 19.0% of the Evros prefecture area, hosting 37.8% of its population).

Map 1: The country's travel-to-work areas on the basis of the 15% in- and out-commuting ratios of those employed in 2001.



Tripolis (54 thousand),<sup>28</sup> Kastoria (50 thousand).<sup>29</sup> These are indicated in Map 1 with red and pink, which denote the urban and rural parts, respectively.

- The travel-to-work areas of Rethimnon, Arta (48 thousand),<sup>30</sup> Ptolemais (48 thousand),<sup>31</sup> Hios (46 thousand),<sup>32</sup> Mitilini (41 thousand),<sup>33</sup> and the island of Zakynthos (39 thousand).<sup>34</sup> These are indicated in Map 1 with dark and light brown, which denote the urban and rural parts, respectively.

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<sup>28</sup> Of these, the former comprises the municipalities of Karditsa, *Itamos*, Kampos, Mitropolis (occupying a surface of 497 square kilometers, 19.3% of the Karditsa prefecture area, hosting 45.1% of its population); and the latter comprises the municipalities of Tripolis, *Falanthos*, *Falesia*, *Korithion*, *Mantinia*, *Megalopolis*, Tegea, *Valtetsion* (occupying a surface of 1,582 square kilometers, i.e., 35.8% of the Arkadia prefecture area, hosting 58.9% of its population).

<sup>29</sup> Comprising the municipalities of Kastoria, Ag.Anargiri, Ag.Trias, *Aliakmon*, *Grammos*, *Ion Dragoumis*, *Klisoura*, *Korestiis*, Makedni, *Nestorion*, *Orestis* (occupying a surface of 1,270 square kilometers, i.e., 74.5% of the Kastoria prefecture area, hosting 93.0% of its population).

<sup>30</sup> Of these, the former comprises the municipalities of Rethimnon, Arkadion, Nikiforos Fokas, *Sivritos* (occupying a surface of 495 square kilometers, i.e., 33.1% of the Rethimnon prefecture area, hosting 60.6% of its population); and the latter comprises of the municipalities of Arta, *Filothei*, *Kompton*, Peta, Vlaherna, *Xirovounion* (occupying 441 square kilometers, i.e., 29.4% of the Arta prefecture area, hosting 64.5% of its population).

<sup>31</sup> Comprising the municipalities of Ptolemais, Ag.Paraskevi, Mourikion, *Vermion*, Vlasti (occupying a surface of 761 square kilometers, i.e., 21.1% of the Kozani prefecture area, hosting 30.2% of its population).

<sup>32</sup> Comprising the municipalities of Hios, Ag.Minas, Ionia, Kampohores, *Kardamila*, Omiroupolis (occupying a surface of 474 square kilometers, i.e., 52.2% of the Hios prefecture area, hosting 86.5% of its population).

<sup>33</sup> Comprising the municipalities of Mitilini and *Loutropolis-of-Thermi* (occupying a surface of 188 square kilometers, i.e., 8.7% of the Lesvos prefecture area, hosting 38.2% of its population).

<sup>34</sup> Comprising the municipalities of Zakynthos, *Alike*, *Arkadii*, *Artemisii*, *Elatiis*, *Laganas* (occupying a surface of 407 square kilometers).

- The travel-to-work areas of Egion (35 thousand),<sup>35</sup> Kilkis, Thebes (29 thousand),<sup>36</sup> Sparta (26 thousand),<sup>37</sup> Levadia, Kos (24 thousand),<sup>38</sup> Florina (23 thousand),<sup>39</sup> Nafpaktos (21 thousand people),<sup>40</sup> indicated in Map 1 with blue; and the individual municipalities of Pirgos (36 thousands),<sup>41</sup> Giannitsa, Amalias (32 thousand),<sup>42</sup> Argos (30 thousand),<sup>43</sup> Edessa (26 thousand),<sup>44</sup> Ierapetra (24 thousand),<sup>45</sup> Naousa, Orestias (22 thousand).<sup>46</sup> The latter exhibit rather low

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<sup>35</sup> Comprising the municipalities of Egion and Simpolitia (occupying a surface of 237 square kilometers, i.e., 7.2% of the Ahaia prefecture area, hosting 11.0% of its population).

<sup>36</sup> Of these, the former comprises the municipalities of Kilkis and Herson (occupying a surface of 475 square kilometers, i.e., 16.6% of the Kilkis prefecture area, hosting 33.7% of its population); and the latter comprises the municipalities of Thebes and *Platee* (occupying a surface of 495 square kilometers, i.e., 16.8% of the Boeotia prefecture area, hosting 23.1% of its population).

<sup>37</sup> Comprising the municipalities of Sparta, *Inous*, Mystras (occupying a surface of 518 square kilometers, i.e., 14.2% of the Lakonia prefecture area, hosting 27.5% of its population).

<sup>38</sup> Of these, the former comprises the municipalities of Levadia and *Chaeronia* (occupying a surface of 322 square kilometers, i.e., 10.9% of the Boeotia prefecture area, hosting 19.4% of its population); and the latter comprises the municipalities of Kos and *Dikeos* (occupying a surface of 129 square kilometers, i.e., 4.7% of the Dodekanese prefecture area, hosting 12.7% of its population).

<sup>39</sup> Comprising the municipalities of Florina and Perasma (occupying a surface of 362 square kilometers, i.e., 18.8% of the Florina prefecture area, hosting 42.3% of its population).

<sup>40</sup> Comprising the municipalities of Nafpaktos and *Antirrion* (occupying a surface of 211 square kilometers, i.e., 3.9% of the Etolia-Akarnania prefecture area, hosting 9.4% of its population).

<sup>41</sup> Occupying a surface of 171 square kilometers, i.e., 6.2% of the Ilis prefecture area, hosting 9.4% of its population.

<sup>42</sup> The former occupies a surface 209 square kilometers, i.e., 8.3% of the Pella prefecture area. At the time it hosted 22.1% of the prefecture's population. The latter occupies a surface of 252 square kilometers i.e., 9.1% of the Ilis prefecture area. At the time it hosted 17.2% of the prefecture's population.

<sup>43</sup> Occupying a surface of 138 square kilometers, i.e., 6.8% of the Argolis prefecture area, hosting 28.8% of its population.

<sup>44</sup> Occupying a surface of 322 square kilometers, i.e., 12.9% of the Pella prefecture area, hosting 17.8% of its population.

<sup>45</sup> Occupying a surface of 398 square kilometers, i.e., 21.8% of the Lasithion prefecture area, hosting 31.3% of its population.

<sup>46</sup> The former occupies a surface 301 square kilometers, i.e., 19.1% of the Imathia prefecture area, and at the time hosted 15.6% of the prefecture's population. The latter occupies a surface of 263 square

commuting ratios to/from the surrounding communities i.e., they appear self-contained, and are indicated in Map 1 with shades of dark and “tarragon” green.

The majority of local authority units are quite small in terms of population size.

(a) A small number of these form ten inter-municipal LMAs: the island of Siros (nearly 20 thousand people)<sup>47</sup> and the travel-to-work areas of Aliverion, Grevena (19 thousand),<sup>48</sup> Argostolion (18 thousand),<sup>49</sup> Hrisoupolis, Igoumenitsa (17 thousand),<sup>50</sup> Amfissa (15 thousand),<sup>51</sup> Lefkas (14 thousand),<sup>52</sup> Distomon (9 thousand),<sup>53</sup> Tinos (8 thousand).<sup>54</sup> They are indicated in Map 1 with dark and pale shades of orange.

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kilometers, i.e., 6.2% of the Evros prefecture area, and at the time hosted 14.7% of the prefecture’s population.

<sup>47</sup> Comprising the municipalities of Ermoupolis, Ano Siros, Posidonia (occupying 102 square kilometers, i.e., 4.2% of the Cyclades prefecture area, hosting 18.0% of its population).

<sup>48</sup> Of these, the former comprises the municipalities of Taminei, *Avlona*, *Distii* (occupying a surface of 510 square kilometers, i.e., 12.2% of the Euboea prefecture area, hosting 9.4% of its population); and the latter comprises the municipalities of Grevena, *Avdella*, *Kosmas Etolos*, *Filippeï*, *Theodoros Ziakas* (occupying a surface of 889 square kilometers, i.e., 38.7% of the Grevena prefecture area, hosting 59.7% of its population).

<sup>49</sup> Comprising the municipalities of Argostolion, Livathou, Omala (occupying a surface of 266 square kilometers, i.e., 29.4% of the Kefallinia-Ithaki prefecture area, hosting 48.1% of the prefecture’s population).

<sup>50</sup> Of these, the former comprises the municipalities of Hrisoupolis and Orinon (occupying a surface of 565 square kilometers, i.e., 27.0% of the Kavala prefecture area, hosting 11.9% of its population); and the latter comprises the municipalities of Igoumenitsa and Parapotamos (occupying a surface of 169 square kilometers, i.e., 11.1% of the Thesportia prefecture area, hosting 38.1% of its population).

<sup>51</sup> Comprising the municipalities of Amfissa and *Itea* (occupying a surface of 343 square kilometers, i.e., 16.1% of the Fokis prefecture area, hosting 39.1% of its population).

<sup>52</sup> Comprising the municipalities of Lefkas, *Sfakiote*, *Karia* (occupying a surface of 121 square kilometers, i.e., 34.0% of the Lefkas prefecture area, hosting 64.0% of its population).

<sup>53</sup> Comprising the municipalities of Distomon, *Antikira*, *Kiriakion* (occupying a surface of 285 square kilometers, i.e., 9.6% of the Boeotia prefecture area, hosting 7.0% of its population).

<sup>54</sup> Comprising the municipalities of Tinos and *Exombourgos* (occupying an area of 162 square kilometers, i.e., 6.7% of the Cyclades prefecture area, hosting 6.9% of its population).

(b) The rest of the local authorities exhibit low inward and outward commuting ratios. This suggests that most (mainly rural) municipalities are rather self-contained. In particular:

- 190 municipalities host populations ranging from 20 to 5 thousand inhabitants. These are indicated in Map 1 with a shade of medium “apple” green. They account for 14.9% of the country’s population and 30.3% of the land.
- 417 municipalities have fewer inhabitants. These are indicated in Map 1 with a light shade of green. They account for 9.0% of the country’s population and 38.3% of the land; and a good number of them are insular communities or communities that lie along the Pindos mountain-range and its Peloponnesian extensions that splits the mainland into east and west.

The shares of the above LMAs under (a) and (b) in terms of regional populations and the number of municipalities are provided in Table 1. Considering that the highest shares (proxies for low levels of labor market integration/interdependency) occur in the two insular Aegean administrations, Central Greece-Euboea, and Peloponnesos, it would appear that the feature of seclusion may be associated with the country’s fragmented terrain, and is prevalent in medium- and small-size islands, and the districts dispersed with both mountain-ranges and long inlets of water (i.e., the very environment that gave rise to the patchwork of city-states in classical antiquity).<sup>55</sup>

Obviously, this feature of spatial seclusion may have important implications regarding the degree of attractiveness of these localities to a number of industries, as well as the

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<sup>55</sup> This resembles J.H. von Thünen’s theory of concentric rings of settlements formed on a flat homogeneous land around a central city, which is adjusted to the idiosyncratic terrain of Greece, as the travel-to-work areas follow the contours of mountains (where the cost or energy of traversing them is higher), develop along transport corridors (where the cost of transport is lower), assume stripe-form shapes, and have little or no interaction with the surrounding areas lying further away. I am indebted to Prof. Helmut Maier of the Berlin School of Economics for bringing it to my attention.

effectiveness and spillover-potential of regional development policies. Additionally, it draws attention to the importance of the transportation network in facilitating traveling between localities and effecting the economic unification of the country.

There is not much evidence of labor market integration between major cities other than Athens and Piraeus (the port of Athens) or of transnational commuting. The latter is not surprising given that the statistics date to a period that Greece did not share common borders with other EU member-states. In short, the country's national borders were also EU borders, with all the limitations in trans-border commuting flows this entails.

TABLE 1

The regional distribution of LMAs and single municipalities with less than 20 thousand inhabitants (self-contained on the basis of the 15% in- and out-commuting ratios)

Region	Proportions in terms of:		Region	Proportions in terms of:	
	the number of municipalities	population		the number of municipalities	population
Attiki	7.3	0.9	Epiros	69.7	46.9
Crete	51.5	29.4	Western Greece	71.6	39.4
Central Macedonia	55.6	25.2	North Aegean Islands	77.8	57.5
West Macedonia	60.7	34.4	Peloponnesos	79.4	56.4
Ionian Islands	66.7	46.2	Central Greece-Euboea	81.1	54.7
Thessaly	67.3	36.0	South Aegean Islands	82.8	55.3
East Macedonia-Thrace	69.1	41.4			

Source: Own calculation based on the NSSG, 2001 population Census data.

#### 4. Conclusions

The daily commuting information solicited by those employed permits the determination of the country's labor markets across the 1034 municipalities, in a manner that was not previously possible. We analyze all two-way inter-municipal commuting flows at the 15% threshold. At the end of the iterative computation process we find that Greece contains 667 distinct travel-to-work areas. The largest are

situated around Athens (3.887 million inhabitants), Thessaloniki (1.090 million), Patras (245 thousand) and Iraklion (233 thousand), which taken together host 49.9% of the country's total population. There also exist thirty-eight smaller clusters of municipalities and eight self-contained municipalities hosting populations ranging from 20 to 184 thousand inhabitants, which jointly host 25.0% of the country's population. The remaining travel-to-work areas and self-contained municipalities are smaller.

The visual representation of these formations on a map reveals similarities to the broad geographic relief of the country (e.g., a good number of small self-contained localities are situated along the Pindos mountain-range), but diverges considerably from the morphological pattern of very dense or build-up areas, and the common patchwork of the NUTS level 2 and 3 administrative divisions (i.e., the 13 regions ("peripheries") and 54 prefectures ("nomes") employed by the national and EU authorities to design policy interventions. This suggests that economic life may not correspond to the presumed labor markets or territorial units of policy intervention of Greece or along the lines of the urban/rural divide. As a result, the survey areas for soliciting a good number of economic and social statistics may have to be re-calibrated, and the spatial dimension of employment, unemployment and social cohesion policy-initiatives to be re-focused accordingly.

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