

## Determining the Labour-Market Areas of Cyprus from the 2001 Commuting Flows †

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### Abstract

The article utilises the 2001 inter-municipal travel-to-work flows in Cyprus and for the first time delineates the country's labour market areas (LMAs) on the basis of the 25% commuting threshold (the average used by EU member states in such studies). The findings suggest that the country consists of five economically integrated areas of over 40 thousand inhabitants as well as 26 somewhat isolated clusters of communities or individual communities that collectively host 14 thousand people (2% of the country's population). Situated on mountainous terrain or along a meandering part of the buffer zone established in the wake of the 1974 Turkish invasion, most of these communities are incorporated into the main LMAs at the (lower) commuting threshold of 20%. The resulting spatial formations bear a rough resemblance to the country's administrative districts. Overall, the findings enhance our understanding of how the country functions at the sub-national level, which, in turn, permits the formulation of better-targeted economic policy interventions.

**Keywords:** travel-to-work areas, regional and sub-regional economics.

**JEL-Codes:** J49, R12

### 1. Introduction

The purpose of this article is to determine the Labour Market Areas (LMAs) of Cyprus on the basis of disaggregated commuting data solicited in the 2001 Census. As the reader may know, the LMAs are defined as territorial formations (zones) in which the bulk of the economically active or employed resident population work within the same area. Hence, in

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keeping with analyses carried out in 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) and other EU and OECD countries (OECD, 2007), the article employs an iterative process (algorithm) to aggregate/group together localities according to the daily travelling flows between the place of residence and the place of work.

Recasting a country's localities in spatial formations in line with the functional linkages that they exhibit is bound to advance the understanding of how an economy operates at the sub-national level in a manner that may not be possible through the conventional territorial partitions (counties, cantons, administrative districts, provinces, regions, etc.). This is especially true in cases where the conventional partitions represent a mixture of geographical factors, historical memory and relics of commercial life from previous centuries, administrative contingencies, political/electoral considerations, geometry or chance. Consequently, LMAs are gaining considerable acceptance by the scientific community and governments as a more appropriate territorial grid for (i) measuring and studying sub-regional economic life and social phenomena or indices, (ii) diagnosing and analysing territorial disparities, (iii) engaging in public-transportation planning and policy interventions regarding local unemployment, education, job mobility, (vi) relying on spillovers or multiplier effects, etc. Indeed, as we shall see in the conclusions, the identification of the country's LMAs may be very useful in the preparation and implementation of a number of economic and other policies.

In 2007, Eurostat, the EU's principal statistical agency, invited the member states to identify their LMAs and to supply brief reports regarding the building blocks and criteria employed for putting them together. Belgium, Denmark, Germany, Estonia, Finland, France, Greece, Italy, the Netherlands, Portugal, Slovakia, Sweden, and the UK turned in their submissions.<sup>1</sup> The majority opted to rely on resident employment and commuting figures drawn at the municipal level, and to treat the municipalities and communities that exhibited substantial flows of incoming or outgoing workers as parts of a distinct travel-to-work area,

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<sup>1</sup> Additionally, Hungary supplied a partial one, and Poland committed itself to work towards preparing one.

i.e., as parts of the same LMA:<sup>2</sup> In essence, if a relatively large share of a municipality's employed residents (say, 25% or more) commute to another municipality or a large share of those employed in a particular municipality commute from another municipality, then the two municipalities are considered sufficiently integrated and taken to constitute a unified travel-to-work area. Additionally, if other municipalities or communities exhibit similar commuting patterns vis-à-vis the said municipalities or a travel-to-work area, then these are treated as parts of the (successively enlarged) travel-to-work area, as well. However, much like the determination of the building blocks, the choice of commuting thresholds is left to the discretion of member states. Hence, depending on the computational capabilities and what is deemed appropriate in each case, the criterion for grouping together localities fluctuates considerably across the EU, ranging from 15% to 35% (25% being both the average and the most frequent choice). Likewise, in some member states the aggregation procedure is made conditional on contiguity (only adjacent localities are grouped together) whereas in other member states there is no such restriction (detached or somewhat distant localities that are well linked via the transportation network are grouped together on the basis of commuting flows). In general, the instruments employed seem to vary considerably among the EU states, thus blurring the impact of geographical, climatic and transportation features or idiosyncrasies. Lastly, as the aforementioned calculations and brief reports are prepared for internal use by agencies with different degrees of extroversion, several of these approaches are not publicised. If they were, perhaps they might be appreciated more, their motivation and differences might be better understood, comparisons could be made by trying each other's methodology, and collaboration and standardisation might follow. With this in mind, the present article supplies a detailed version of the brief regarding Cyprus.

## **2. The territory and the regional organisation of Cyprus**

Situated in the eastern Mediterranean, the island of Cyprus covers an area of 9.25 thousand square kilometres. Of this, the northern and eastern parts

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<sup>2</sup> Germany used districts (an intermediate level of administration between the local authority unit and the state), and the UK used very small area units analogous to wards. On the whole, Greece and Finland averaged the smallest LMAs (with 16.7 and 27.6 thousand inhabitants, respectively) and the Netherlands the largest (480.8 thousand inhabitants).

(some 35.2% of the country's surface) are under Turkish occupation.<sup>3</sup> Inevitably, this artificial division is replicated in the 2001 commuting patterns under examination.<sup>4</sup> Another 2.6% of the land is administered by the UN (buffer zone) and 2.7% is retained by Great Britain in the form of two military bases. As commuting among the two latter areas and government-controlled areas is for the most part allowed, the travel-to-work patterns observed in the western, southern and central parts of the island are more likely to be associated with distances, the configuration of the land, and the characteristics of the transportation network.

The government-controlled part of the island is dominated by the Troodos mountain-range, surrounded by narrow coastal strips on three sides and the plain of Mesaoria in the east, stretching up to the neutral zone. It is home to about 689.6 thousand people (2001 Census) living in five administrative districts (Famagusta, Larnaka, Limassol, Nicosia, Pafos) named after the principle urban centres (see Table 1).<sup>5</sup> In the tourist season visitor population figures go up by 2.5 million.<sup>6</sup>

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<sup>3</sup> Since 1974, despite a host of UN resolutions calling for the unconditional withdrawal of foreign troops from the island and the safe return of the refugees to their homes, e.g. UN General Assembly resolutions 3212 (XXIX) of 1974, 3395 (XXX) of 1975, 31/12 of 1976, 32/15 of 1977, 33/15 of 1979, 37/253 of 1983.

<sup>4</sup> In 2003, a year prior to the Cyprus accession to the EU, Turkish authorities eased restrictions at six crossings of their choice; and an additional crossing requested by the Cypriot government in the vicinity of Ano and Kato Pírgos (a practical exclave whose residents could benefit from a more direct route to the capital) is currently negotiated. As citizens of the Republic living in the occupied territories seek employment and health benefits in government-controlled areas, and displaced inhabitants on both sides of the buffer zone can visit their birthplaces, it is reasonable to assume that commuting patterns may have changed somewhat since 2003.

<sup>5</sup> Parts of the districts of Larnaka, Nicosia and Famagusta (the city of Famagusta included), along with the entire district of Kerynia have been occupied by Turkey since 1974. Demographic developments in the occupied territories are rather murky due to ongoing colonisation (estimated at 1-1.5 hundred thousand) in contravention of the Geneva Convention (Geneva Conventions Protocol of 1977).

<sup>6</sup> The average stay is 9-10 nights.

TABLE 1

*The population and LMA building blocks across the Rep. of Cyprus (2001)*

Districts	Population in government-controlled areas	399 localities classified in terms of resident participation			
		(a) Inhabited		(b) Uninhabited, yet attracting workers from other localities	
		Residents engage in paid work	Municipalities	Communities	No resident engages in paid work, no inflow of commuters
Nicosia	273,642	8	97		1
Pafos	66,364	4	104		
Limassol	186,553	5	102		2
Larnaka	115,268	3	51		
Famagusta	37,738	3	6		
Kerynia ( <i>entirely under Turkish occupation</i> )					

Sources: 2001 Census.

### 3. The LMAs

To delineate the country's LMAs we turn to the incoming and outgoing commuting figures from the country's 399 localities that are either inhabited or attract workers from other localities, and proceed to group them without contiguity restrictions as follows:<sup>7</sup> If 25% or more of a locality's employed residents commute to another locality (or cluster of localities) or if 25% or more of those employed in a locality commute from another locality (or cluster of localities), then the places in question are taken to constitute an LMA.

This way we find (Table 2) that Cyprus contains two LMAs inhabited by some 2-3 hundred thousand people each (a-b), three LMAs inhabited by some 40-100 thousand (c-e), one LMA inhabited by 5-6 thousand (f), four LMAs numbering 1-2 thousand residents (g-h), and twenty-one with fewer than 6 hundred residents (h-i). In particular:

<sup>7</sup> Of these, the mountainous communities of Kissousa, Kouka (in the administrative district of Limassol) and Milia (in the administrative district of Pafos) are inhabited by very few people (single digits) who do not seem to engage in paid work. As a result, these places are not included in the travel-to-work calculations.

- a) The Nicosia travel-to-work area consists of eight municipalities and 92 communities that belong to the homonymous administrative district,<sup>8</sup> as well as parts of the Larnaka and Limassol administrative districts,<sup>9</sup> hosting about 280.1 thousand inhabitants. On its edges, a small number of other communities with a collective population of about 1.6 thousand appear simultaneously connected both to the Nicosia and to neighbouring travel-to-work areas.<sup>10</sup>

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<sup>8</sup> Namely, the municipalities of Nicosia (Lefkosia)\*, Agios Dometios\*, Aglantzia\*, Egkomi, Idalion, Lakatamia, Latsia, Strovolos, and the communities of Agia Marina, Agia Varvara, Agii Trimithias, Agios Epifanios-in-Orini, Agios Epifanios-in-Solea, Agios Georgios-in-Kafkallou, Agios Georgios-in-Solea\*, Agios Ioannis-by-Malountas, Agios Ioannis of Selemani\*, Agios Sozomenos, Agios Theodoros-in-Solea, Agrokipia, Akaki, Alampra, Alithinou, Alona, Anagia, Analiontas, Ano Deftera, Ano Koutrafas, Anthoupolis, Apliki, Arediou, Askas, Astromeritis, Denia\*, Episkopio, Ergates, Evrihou, Farmakas, Fikardou, Flasou, Fterikoudi, Galata, Gerakies, Geri\*, Gourri, Kakopetria, Kaliana, Kalo Horio, Kalopanagiotis\*, Kampi, Kambia, Kampos, Kannavia, Kapedes, Kato Deftera, Kato Moni, Katidata, Klirou, Kokkinotrimithia, Korakou, Kotsiatis, Lagoudera, Linou, Livadia, Limpia, Lithrodontas, Malounta, Mammari\*, Margi, Mathiatis, Meniko, Mitsero, Moutoullas, Nikitari, Nisou, Oekos, Orounta, Palehori-in-Morfou, Palehori-in-Orini, Paleometoho, Pedoulas, Pera, Pera Horio, Peristerona, Platanistasa, Polistipos, Politiko, Potami, Potamia, Psimolofou, Saranti, Sia, Sinaoros, Skouriotissa, Spilia, Temvria, Tsakistra, Tseri, Vizakia, Xiliatos, inhabited by 276,385 people at the time of the Census. (Asterisks denote the localities that are partly occupied by Turkey.)

<sup>9</sup> Namely the municipality of Athienou\*, the communities of Kornos, Mosfiloti, Petrofani, Pirga in the Larnaka administrative district (pop. 3,547), and the community of Prodrimos (pop. 141) in the Limassol administrative district. (The asterisk denotes a locality that is partly occupied by Turkey.)

<sup>10</sup> In particular: (i) The communities of Agia Irini (Nicosia administrative district) and Handria (Limassol administrative district) (pop. 254) exhibit high commuting flows with both (a) and (b); (ii) Agia Anna, Delikipos, Psevdas (Larnaka administrative district) (pop. 1,284) exhibit high commuting flows with both (a) and (c); (iii) Milikouri (pop. 39) (Nicosia administrative district) exhibits high commuting flows with both (a) and (d); and (iv) Agios Theodoros-in-Tilliria\* (pop. 27) (Nicosia administrative district) with both (a) and (f). (The asterisk denotes a locality that is partly occupied by Turkey.) In an effort to produce neatly arranged spatial units without overlaps, when encountering a locality that exhibits commuting flows that exceed the threshold with two LMAs, most analysts tend to assign it to the LMA with the highest flow. The drawback to this practice is that potentially important information regarding commuting, employment as well as spillovers from/into the second LMA is obscured. Obviously, this runs against the initial intent to delineate LMA formations after the main interrelations in order to implement better-targeted policy initiatives. In addition, in our study of Cyprus, we observed cases of (a) equal-sized commuter flows from/to different LMAs, and (b) equal-sized inflow from one LMA and outflow to the other LMA. By presenting separately the areas that are linked to two LMAs, important information is preserved with little or no increase in the level of complexity. In any event, the overall number of Cypriot LMAs is not altered.

- b) The Limassol travel-to-work area consists of five municipalities and 94 communities that belong to the homonymous administrative district,<sup>11</sup> as well as parts of the Larnaka and Pafos administrative districts,<sup>12</sup> hosting about 195.8 thousand inhabitants. On its edges a small number of other communities with a collective population of about 1.2 thousand appear simultaneously connected both to this and to other travel-to-work areas.<sup>13</sup>
- c) The Larnaka travel-to-work area consists of two municipalities and 25 communities that belong to the homonymous administrative district,<sup>14</sup> as well as a part of the Famagusta administrative district,<sup>15</sup> and hosts about 92.6 thousand inhabitants. On its edges, a small number of other communities with a collective population of about 5.2 thousand

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<sup>11</sup> Namely, the municipalities of Limassol (Lemesos), Mesa Gitonia, Agios Athanasios, Germasogia, Kato Polemidia, and the communities of Agios Amvrosios, Agios Dimitrios, Agios Georgios, Agios Ioannis, Agios Konstantinos, Agios Mamas, Agios Pavlos, Agios Theodoros, Agios Therapon, Agios Thomas, Agios Tihon, Agridia, Agros, Akapnou, Akrotiri, Akrounta, Alassa, Alektora, Ano Kivides, Ano Platres, Ano Polemidia, Anogira, Apesia, Apsiou, Arakapas, Armenohori, Arsos, Asgata, Asomatos, Avdimou, Dierona, Doros, Episkopi, Eptagonia, Erimi, Fasoula, Fini, Finikaria, Gerasa, Gerovasa, Ipsonas, Kalo Horio, Kantou, Kapilio, Kato Kivides, Kato Milos, Kato Platres, Kellaki, Kilani, Kolossi, Korfi, Lania, Lemithou, Limnatis, Lofou, Louvaras, Malia, Mandria, Mathikoloni, Monagri, Monagroulli, Moni, Moniatis, Mouttagiaka, Omodos, Pahna, Palodia, Paramali, Paramitha, Parekklesia, Pelendri, Pentakomo, Pera Pedi, Pirgos, Pissouri, Platanistia, Potamiou, Potamitissa, Prastio-in-Avdimou, Prastio-in-Kellaki, Sanida, Sikopetra, Silikou, Sotira, Souni-Zanakia, Spitali, Trahoni, Trimiklini, Tserkezi, Vasa-in-Kellaki, Vasa-in-Kilani, Vikla, Vouni, Zoopigi, inhabited by 195,808 people at the time of the Census.

<sup>12</sup> Namely the communities of Kalavastos, Lagia, Mari, Melini, Tohni, Zigi in the Larnaka administrative district (pop. 1,730), Praetori, Filousa-in-Kelokedara, Agios Nikolaos, Vretsia in the Pafos administrative district (pop. 150).

<sup>13</sup> In particular: (i) The communities of Agia Irini (Nicosia administrative district) and Handria (Limassol administrative district) (pop. 254) exhibit high commuting flows with both (a) and (b); (ii) Kidasi, Kouklia, Mamonia, Souskiou (Pafos administrative district) (pop. 718) exhibit high commuting flows with both (b) and (d); (iii) Amiantos, Klonari (Limassol administrative district) (pop. 239) with both (b) and localities in (h).

<sup>14</sup> Namely, the municipalities of Larnaka and Aradippou, and the communities of Alaminos, Alethriko, Anafotida, Anglisides, Aplanta, Avdellero, Dromolaxia, Kalo Horio, Kellia, Kiti, Kivisili, Klavdia, Kosi, Livadia, Mazotos, Meneou, Menogia, Oroklini, Perivolia, Pila, Skarinou, Softades, Tersefanou, Troulloi\*, Xilotimvou, inhabited by 90,612 people at the time of the Census. (The asterisk denotes a locality that is partly occupied by Turkey.)

<sup>15</sup> Namely the community of Ahna (pop.1,952).

appear simultaneously connected both to this and other travel-to-work areas.<sup>16</sup>

- d) The Pafos travel-to-work area consists of three municipalities and 73 communities that belong to the homonymous administrative district,<sup>17</sup> and hosts about 59.6 thousand inhabitants. On its edges, a small number of other communities with a collective population of about 8 hundred appear simultaneously connected both to this and other travel-to-work areas.<sup>18</sup>
- e) The Paralimni travel-to-work area consists of three municipalities and five communities belonging to the Famagusta administrative district,<sup>19</sup> as well as a part of the Larnaka administrative district,<sup>20</sup> and hosts about 40.7 thousand inhabitants. On its west, the community of Ormidia (Larnaka administrative district) with a population of about 4.0 thousand appears simultaneously connected both to this and the Larnaka travel-to-work area.
- f) The Polis travel-to-work area consists of one municipality and 18 communities belonging to the Pafos administrative district,<sup>21</sup> as well as

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<sup>16</sup> In particular: (i) Agia Anna, Delikipos, Psevdas (Larnaka administrative district) (pop. 1,284) exhibit high commuting flows with both (a) and (c); and (ii) Ormidia (pop. 3,960) (Larnaka administrative district) with both (c) and (e).

<sup>17</sup> Namely, the municipalities of Pafos, Geroskipou, Pegia, and the communities of Ahelia, Agia Marina-in-Kelokedara, Agia Marinouda, Agia Varvara, Agios Dimitrianos, Agios Georgios, Agios Ioannis, Akoursos, Amargeti, Anadiou, Anarita, Ano Arodes, Ano Panagia, Armou, Asprogia, Axilou, Drousia, Drimou, Eledio, Empa, Episkopi, Falia, Fasoula,, Fiti, Galataria, Giolou, Hlorakas, Holetria, Holi, Houlou, Inia, Kallepia, Kannaviou, Kathikas, Kato Akourdalia, Kato Arodes, Kedares, Kelokedara, Kissonerga, Kili, Konia, Kritou Marottou, Kritou Tera, Lapithiou, Lasa, Lempa, Letimvou, Mamountali, Mandria, Marathounta, Mesa Horio, Mesogi, Miliou, Nata, Nikoklia, Pentalia, Pitargou, Polemi, Psathi, Salamiou, Statos-Agios Fotios, Stavrokonnou, Stroumpi, Tala, Tera, Theletra, Thrinia, Timi, Trahipedoula, Tremithousa, Trimithousa, Tsada, inhabited by 59,536 people.

<sup>18</sup> In particular: (i) Milikouri (pop. 39) (Nicosia administrative district) exhibits high commuting flows with both (a) and (d); (ii) Kidasi, Koukolia, Mamonia, Souskiou (Pafos administrative district) (pop. 718) exhibit high commuting flows with both (b) and (d); and (iii) Agios Isidoros, Ano Akourdaliou, Androlikou, Evretou, Karamoullides (Pafos administrative district) (pop.89) with both (d) and (f).

<sup>19</sup> Namely, the municipalities of Paralimni, Agia Napa, Derinia, and the communities of Aheritou, Avgorou, Frenaros, Liopetri, Sotira, inhabited by 35,789 people.

<sup>20</sup> Namely, the community of Xilofagou (pop.4.957).

<sup>21</sup> Namely, the municipality of Polis, and the communities of Agia Marina-in-Hrisohou, Argaka, Filousa-in-Hrisohou, Gialia, Goudi, Hrisohou, Kios, Kinousa, Lisos, Makounta,



a part of the Nicosia administrative district,<sup>22</sup> and hosts a population of about 5.5 thousand inhabitants. On its edges, a number of other communities with a collective population of about 2 hundred appear simultaneously connected both to this and to other travel-to-work areas.<sup>23</sup>

- g) The communities of Ano and Kato Pirgos in the Nicosia district, edged between areas controlled by Turkey and the UN-buffer zone, are home to about 1.2 thousand people. On the other side of the mountain, the community of Pigenia (Nicosia administrative district), with a population of about 1 hundred, appears simultaneously connected both to Ano and Kato Pirgos and to the Polis travel-to-work area.
- h) Twenty-four relatively isolated, mostly-mountainous communities forming a ring around the Limassol travel-to-work area, collectively host 7.1 thousand people.<sup>24</sup> More than half of this population lives in the communities of Kiperounta (Limassol administrative district), Kofinou, and Ano and Kato Lefkara (Larnaka administrative district). A couple of other localities, situated in the Limassol district, with a population of about 2 hundred, are simultaneously connected to localities forming the ring and to the Limassol travel-to-work area.<sup>25</sup>
- i) Three relatively isolated, mountainous communities (Kilinia, Lemona, Simou), situated in different parts of the Pafos administrative district, collectively host about 3 hundred people.

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Meladia, Nea Dimmata, Neo Horio, Pelathousa, Peristerona, Pomos, Skouli, Steni, inhabited by 5,445 people.

<sup>22</sup> Namely, the community of Pahiammos (pop.97).

<sup>23</sup> In particular: (i) Agios Theodoros-in-Tilliria\* (pop. 27) (Nicosia administrative district) exhibits high commuting flows with both (a) and (f); (ii) Agios Isidoros, Ano Akourdaliou, Androlikou, Evretou, Karamoullides (Pafos administrative district) (pop.89) with both (d) and (f); and (iii) Pigenia (pop.123) (Nicosia administrative district) with both (f) and (g). (The asterisk denotes a locality that is partly occupied by Turkey.)

<sup>24</sup> Moving from east to west, these are: (i) the cluster of Kofinou, Agios Theodoros-in-Larnaka, Maroni, Psematismenos, Hirokitia, Kato Dris, Vavla, (Kato and Ano) Lefkara, Vavatsinia, Ora-Agii Vavatsinias, Odou (in the Larnaka administrative district), Lazanias (in the Nicosia administrative district); (ii) the cluster of Kiperounta, Dimes (in the Limassol administrative district); (iii) the cluster of Paleomilos, Tris Elies, Kaminaria (in the Limassol administrative district); (iv) Arminou, Mesana (in the Pafos administrative district); (v) Dora (in the Limassol administrative district), Mousere, Ano Arhimandrita (in the Pafos administrative district).

<sup>25</sup> In particular: (i) Amiantos (pop. 222) exhibits high commuting flows with both (b) and Kiperounta; and (ii) Klonari (pop.17) with both (b) and Ora-Agii Vavatsinias.

TABLE 2

*The LMAs of the Rep. of Cyprus at the 25% commuting threshold (2001)*

(a) Population in	(i) the travel- to-work area	(ii) part that overlaps with the travel-to-work area of				
		Nicosia	Limassol	Larnaka	Pafos	Polis
Nicosia	280,073					
Limassol	195,808	254				
Larnaka	92,564	1,284				
Pafos	59,567	39	718			
Paralimni	40,743			3,960		
Polis	5,542	27			89	
Kiperounta	1,497		222			
Ano and Kato Pírgos	1,150					123
Ora-Agii Vavatsinias	357		17			
(b) Population in other communities						
Kofimou	1,311		Kaminaria		93	
Ano and Kato Lefkara	1,039		Vavatsinia		85	
Agios Theodoros-in-Larnaka	599		Tris Elies		63	
Maroni	521		Lemona		59	
Hirokitia	508		Mesana		50	
Dora-Mousere	184		Vavla		48	
Psematismenos	179		Ano Arhimandrita		42	
Simou	171		Kilinia		42	
Dimes	164		Lazanias		33	
Odou	156		Paleomilos		31	
Kato Dris	114		Arminou		26	

Sources: Own calculations based on the 2001 Census figures.

Their outlines (Map 1) tell of the close association between economic fragmentation on one hand, and the configuration of the land or man-made constraints on the other. Indeed, as the cost of traversing mountains or barbed-wire fences and minefields increases, *ceteris paribus* commuting is bound to decrease if not eclipse altogether. Along the Troodos mountain range and the buffer zone commuter flows thin out, and LMA boundaries form. Additionally, economic activity in a good number of mountainous communities and Ano and Kato Pírgos appears self contained.

Obviously, if the yardstick were modified, a different set of partitions and functional areas might emerge. For instance, the use of a lower commuting threshold affects the amalgamation of localities into larger formations on

the basis of fewer commuters traversing the mountainous or other terrains. This results in the creation of larger functional areas and a less diverse map of economic spaces. As a matter of fact, by employing the commuting threshold of 20% (the second most popular threshold among EU member states), the community of Lazanias is incorporated into the Nicosia LMA; Maroni, Dora-Mousere and Ano Archimandrita into the Limassol LMA; Kofinou, the two Lefkara communities, Agios Theodoros-in-Larnaka, Ora-Agii Vavatsinias, Kato Dris and Vavatsinia into the Larnaka LMA; Polis, the two Pirgos communities, Simou, Lemona, Mesana, Kilinia and Arminou into the Pafos LMA; Kiperounta and Dimes are connected to both Lefkosia and Limassol LMAs; Hirokitia and Psematismenos to both the Limassol and Larnaka LMAs. Consequently, the economy may be described as comprising (Map 2):

- (a) Five travel-to-work areas that bear a rough resemblance to the country's administrative districts. Of these, the Nicosia LMA extends beyond the southern confines of the homonymous administrative district into the Larnaka administrative district, the Limassol LMA extends beyond the eastern and western confines of the homonymous administrative district into the Larnaka and Pafos administrative districts, the Pafos LMA extends beyond the eastern confines of the homonymous administrative district into the Nicosia administrative district, the Paralimni and Larnaka LMAs extend beyond the confines of the respective Famagousta and Larnaka administrative districts into each other's district.
- (b) Five, rather secluded communities: Kaminaria, Tries Elies and Paleomilos near the Troodos peak, Odou and Vavla along the mountain's south-eastern crest. Consequently, some element of the tie between economic fragmentation and the landscape is preserved.<sup>26</sup>

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<sup>26</sup> To offer a measure of comparison we turn to the island of Crete, which is also situated in the eastern Mediterranean basin (1.38 times larger than the area in question), inhabited by a slightly smaller population (0.86 in terms of size, also polled in 2001). The application of the same (20%) commuting threshold yields 49 LMAs and self-contained municipalities or small communities (Prodromidis, 2008), i.e., nearly five times the number of functional areas found in Cyprus. In view of the disproportionality, it would seem that Cyprus constitutes a less fragmented (or a rather more unified) economic territory.

#### 4. Conclusions and some policy implications

The daily commuting information obtained from employed persons permits the determination of the country's LMAs across the 399 municipalities and communities in a manner that was not previously possible. We analyse all two-way inter-municipal commuting flows at both the 25% and 20% thresholds. The iterative computation process at the former threshold suggests that Cyprus contains five large LMAs, situated around the major cities of Nicosia, Limassol, Larnaka, Pafos, Paralimni. Taken together, these host 98% of the country's total population. There also exist 26 smaller clusters of communities and self-contained communities. However, most of these integrate into the major LMAs if the lower threshold of 20% is considered.

The exercise brings to the fore the role of the transportation network in effectively linking the distinct towns and villages into larger and better-integrated economic areas in order for them to prosper. (Indeed, the transportation network makes it easier for residents to commute, find jobs or more jobs, trade, form synergies, exploit resources, and develop competencies that create jobs and reduce unemployment.) It goes without saying that its improvement and expansion may increase the country's economic and social cohesion, thus reducing the need to devise a large number of territorially differentiated policy interventions.

The exercise also allows us to take a fresh look at the economy as it truly is (i.e., a collection of clusters and communities) without preconceptions that the constituent micro-regions must fit into the inherited regional administrative framework. The visual representation of these spatial formations on a map reveals broad similarities to the geographic relief of the country, and a good deal of overlapping with the territorial partitions employed by the authorities to design policy. On the other hand, the deviations suggest that economic life may not wholly correspond to the presumed labour markets or territorial units of policy intervention of Cyprus. As a result, the survey areas for soliciting and supplying a good number of economic and social statistics may have to be re-drawn, the spatial dimension of employment, unemployment and social-cohesion policy initiatives to be accordingly re-focused, and the expectation of how they spill over space to be revised. In the same spirit, it would be useful if analysts and policy advisers on such issues considered rezoning the data that they use along the lines of LMAs rather than administrative districts, in order to obtain more appropriate controls or a better sense of the country's economic spaces. This may not be particularly difficult considering that the identification numbers of those surveyed by the

Statistical Service (individuals, families etc.) incorporate the municipal and community codes.

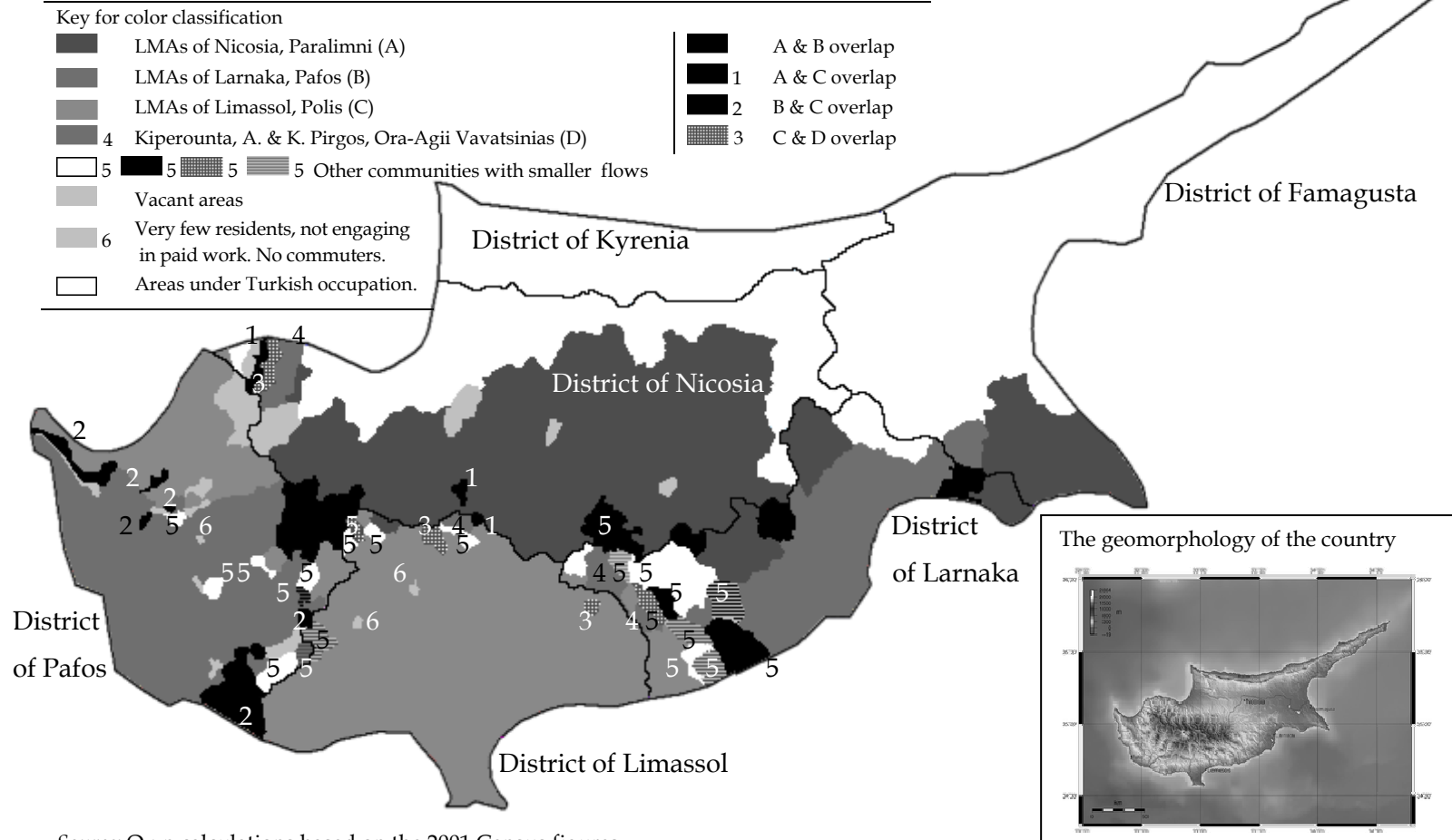
In practical terms, the identification and delineation of a country's LMAs (a) enables the formation of better-targeted economic policy interventions (especially interventions regarding employment, unemployment, participation, wages, and the like) as the impact and territorial breadth of the said interventions will be easier to anticipate and exploit. Additionally, it (b) may be very useful in building cases for attracting private investment, especially if the age and skill profile of the LMA's resident workforce (not of the particular community in which the plant is to be located) meets the needs of the prospective investor.

The discovery of a high level of inter-locality commuting may also imply: (i) reduced pressure for dense residential construction in any one of the LMA's localities (and, hence, reduced need to build more schools in the area, pipe more water from other places, etc.); and (ii) that more can be achieved with less public and private investment as the needs of a fairly large population can be accommodated by fewer facilities (e.g., hospitals, job-centres, malls) as long as these are strategically planted/dispersed. On the other hand, it would be reasonable to expect the spread of crime and epidemics from one place to another, within the aforementioned commuting belts. As a result, it might make a lot of sense if the prevention and treatment of such phenomena were assigned to authorities that were responsible at the LMA level (even if the constituent localities belong to different administrative districts). By contrast, reliance on the coordination of two authorities set up in different administrative districts (with each of these authorities adopting different policies in different territories (LMAs) under its purview) appears to be more cumbersome.

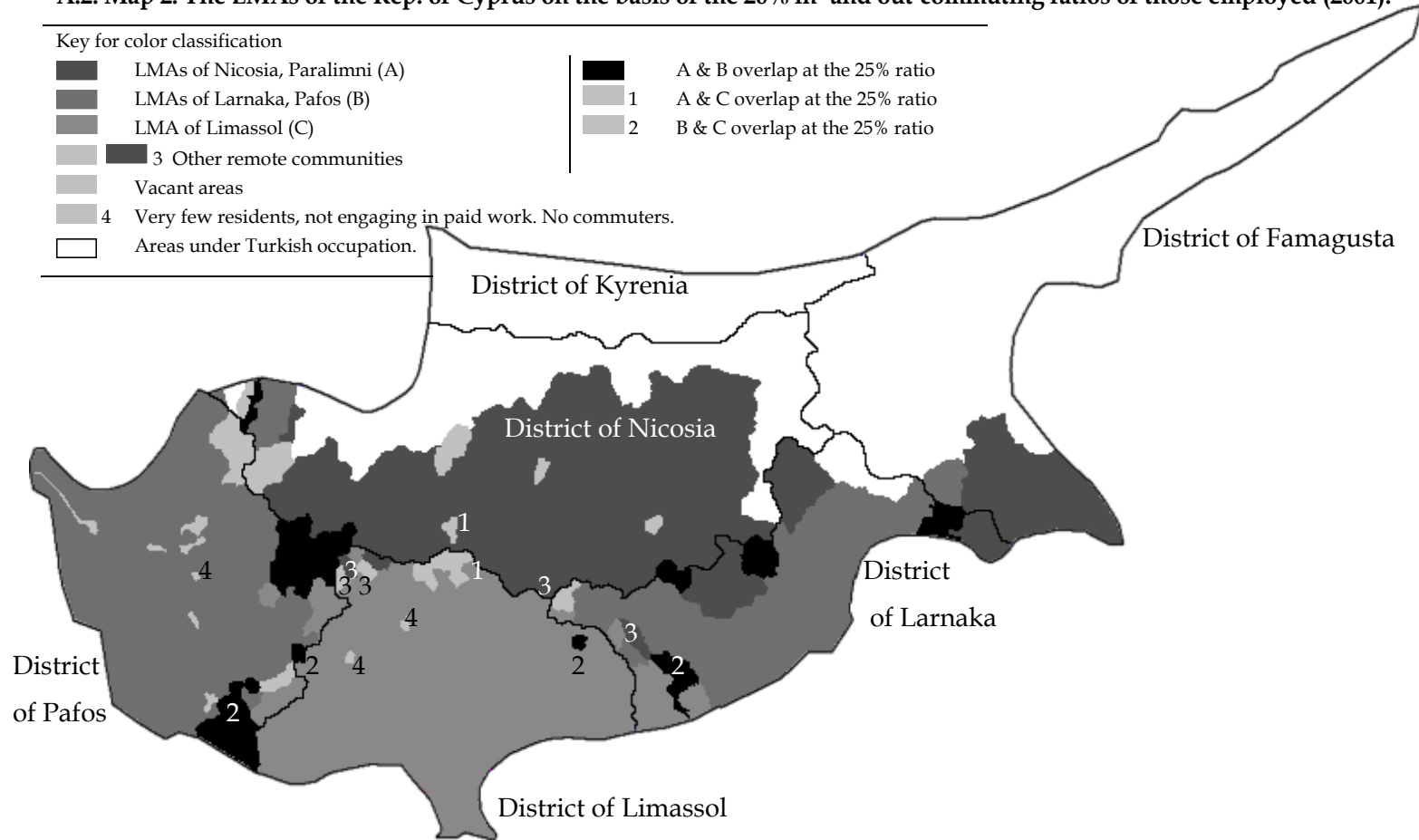
Considering that most of the commuting in Cyprus is conducted via private automobiles, the discovery of a high level of inter-locality commuting across the island is bound to be associated with high fuel-consumption budgets and pollution. This, in turn, may necessitate the consideration of policies aiming at the expansion of mass (road and rail) transportation as well as the introduction of vehicles with cleaner engines. Understandably, our new knowledge regarding commuting patterns and the extent of travel-to-work areas may come handy in public transportation planning.

## Appendix

**A.1. Map 1: The LMAs of the Rep. of Cyprus on the basis of the 25% in- and out-commuting ratios of those employed (2001).**



**A.2. Map 2: The LMAs of the Rep. of Cyprus on the basis of the 20% in- and out-commuting ratios of those employed (2001).**



Source: Own calculations based on the 2001 Census figures.

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