SUB-URBANISATION, EMPLOYMENT CHANGE AND COMMUTING IN TALLINN METROPOLITAN AREA

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Summary. The aim of the current article is to analyse the role of sub-urbanisation and employment change in commuting in Tallinn metropolitan area, Estonia. The paper analyses changes in commuting compared to the late Soviet period, and clarifies the compositional differences between commuters and non-commuters. Data analysis is based on anonymous individual 2000 census records, and it employs bivariate and multivariate methods. The major conclusions state that the commuting field of Tallinn enlarged and commuting intensity from suburbs-to-Tallinn increased in the 1990s. Commuters differ from non-commuters in both Tallinn and the suburbs in regard to most of the social, demographic and housing variables studied. People who sub-urbanised in the 1990s were more likely commuters than people who lived in the suburbs at the end of the Soviet period, while high-unemployment areas did not send more commuters to Tallinn compared to low-unemployment areas.

Key words: sub-urbanisation, employment change, commuting, Tallinn metropolitan area, Estonia

1. Introduction

One of the most important features of spatial population change in many of the East and Central European countries in the 1990s was sub-urbanisation (see Kok and Kovács, 1999; Kovács, 1994; Kupiszewski et al., 1998; Rowland, 1998; Sýkora and Čermák, 1998; Timár and Váradi, 2001). This was also true in Estonia (Leetmaa, 2003). The most

important features of economic restructuring in East and Central European countries were related to (1) changes in the sectoral composition of employment, as both agriculture and industry faced employment losses, while new jobs emerged mainly in the service sector, (2) and the increase of unemployment (De Melo and Gelb, 1996). In Estonia, the losses of agricultural jobs were especially remarkable due to the very radical political and economic reforms at the beginning of the 1990s (Bunce, 1999; Puur, 1997; Unwin, 1998).

The aim of the current article is to analyse changes in job-related commuting in the metropolitan area of the capital city, Tallinn (Figure 1), Estonia in the 1990s compared to the end of the Soviet period, and how they are related to sub-urbanisation and employment change. The article consists of the following sections. The first part gives and overview of commuting in Tallinn metropolitan area in the late Soviet period. We proceed with the analysis of sub-urbanisation and employment change in Tallinn metropolitan area. These two context-setting parts are followed by sections that introduce the hypotheses, data and methods of the study. Sections four and five present the results of data analyses on commuting and commuters in Tallinn metropolitan area. We focus on job-related commuting between Tallinn and its suburbs. People who live in the suburbs but work in the capital city are considered in-commuters, and people who live in Tallinn but work in the suburbs are considered out-commuters. In-commuters and out-commuters form the total number of commuters in the current study. Non-commuters in Tallinn are people who both live and work in Tallinn, and non-commuters in the suburbs are people who both live and work in the suburbs.

[FIGURE 1 ABOUT HERE]

2. Sub-urbanisation, employment and commuting in the Soviet period

Commuting is related to the processes of population and employment redistribution. There are two basic causes for commuting — people change their place of residence but not their job, or people change their job (enter the labour market) and not their place of residence. The importance of these two reasons has been different in different societal contexts. In the Western countries, the first reason (i.e. sub-urbanisation) has typically been the major cause for commuting (Artís and Suriñach, 2000; Berg et al., 1982). The main reasons for sub-urbanisation itself are typically related to environmental, housing and life course changes (see, e.g. Mieszkowski and Mills, 1993; Wachs et al., 1993).

The situation was different in the communist countries, where much of the increase in commuting was due to the second — employment related — reason. Under the conditions of a shortage economy, with priorities given to industrial development and the policy to curb large town growth, job increase in major urban areas tended to precede housing investments (Konrád and Szelényi, 1974; 1977; Murray and Szelényi, 1984; Szelényi, 1996), and commuting served to draw surplus rural labour into the urban industrial economy (Fuchs and Demko 1977a; 1977b; 1978a; 1979b). Even more, the

planners first discovered that commuting based on public transport was cheaper than the building of new housing stock, which led to the policy of substituting migration with commuting (Fuchs and Demko 1977b, p. 464; 1978b, p. 177). Second, the planners urged people to combine rural and urban ways of life. Jobs were located in major cities, but subsistence agriculture was promoted as well, due to the constant food shortages. Living in suburbs made the combination of urban and rural ways of life possible, which also brought an increasing number of people to these locations from other rural areas. This process has been labelled as para-urbanisation (Mezga, 1993) or diverted migration to ex-urban areas (Sjöberg, 1992) in countries under central planning. As a result of these developments, (1) cities became employment centres but the share of people living in urban areas remained low, and (2) rapid population growth in the suburbs was coupled with increased commuting to major cities.

Commuting had some specific features in the former Soviet Union, to which Estonia belonged between 1945 and 1991. Urbanisation was more rapid there compared to other European communist countries (Tammaru, 2001b). This was due to the ideological considerations behind spatial population change; urbanisation in the member states of the former Soviet Union was based on the inter-woven processes of industrialisation and immigration, mainly from Russia to the other member states (see Mettam and Williams, 2001 for Estonia). This increased directly the share of the urban population in the member states of the Soviet Union and indirectly in Russia as well, since part of the migration from Russia to the other member states was rural-to-urban migration (see Kulu, 2001 for Estonia). Due to extensive industrialisation and immigration, the number of

people living in Tallinn metropolitan area increased from 265,000 people in 1950 to 620,000 people in 1990 (according to the boundary defined as in 2000).

In 1990, 78% of the population of Tallinn metropolitan area lived in the capital city, and half of these people were immigrants. Central cities typically dominated also in other major metropolitan areas of the former Soviet Union (Rowland, 1998, pp. 276–279). This is very different from the neighbouring Nordic countries, where approximately every second inhabitant of the capital city region lives in the suburbs (Kliimask 1995, p. 16). In North America the share of people living in central cities has dropped well below the 50% level (Bourne, 1997, p.167). Since much of the population increase of Tallinn was due to immigration, substituting migration with commuting was not particularly relevant compared to other countries under central planning. Tallinn serves as a typical case here, since the population of the major cities of the former Soviet Union (except Russia) mostly grew due to immigration, with immigrants originating mainly from Russia. This is why commuting was modest in the metropolitan areas of the former Soviet Union, not only compared to Western countries, but also compared to other countries under central planning (Fuchs and Demko, 1977b, pp. 465–467).

Developments in agriculture were also related to migration and commuting in the Soviet Union. This was more similar to what happened in other countries under central planning. Low labour productivity and the related food shortages kept a relatively large proportion of native populations in rural areas. The result, i.e. a divided labour market and residence pattern for immigrants and local people (Tammaru, 2001b) is specific to the Soviet

Union. Estonia is a typical case here. There was a high concentration of immigrants employed in industry, who lived in urban areas (90% of non-Estonians lived in urban areas and they formed 50% of the urban population in 1990), and a relatively high share of Estonians who were engaged in agriculture and who lived in rural areas (60% of Estonians lived in urban areas in 1990).

The relatively low urbanisation level of Estonians could be explained by the increased importance of agriculture, especially after the so-called Food Production Programme was launched in the 1980s to cure food shortages in the former Soviet Union. Furthermore, this was one of the factors that brought along the internal migration turnaround in the 1980s in Estonia (Marksoo, 1992). Migrants settled mainly in the vicinity of major cities, especially in the suburbs of Tallinn (Kliimask, 1997, p. 156; Marksoo, 1990, pp. 61–63). While environmental and housing related motives were very much behind suburban growth in the Western countries, getting a job and a relatively high income in agriculture was as important in Estonia (Must and Lõo, 1985, p. 21). E.g., in 1982 as many as 50% of suburban workers in the Tallinn metropolis worked in agriculture (Marksoo et al., 1983b, table 3).

The high dominance of Tallinn in the metropolitan area, differences in the residence and employment of Estonians and ethnic minorities, and a high level of agricultural employment and competitive salaries in agricultural enterprises located in suburban areas had a direct impact on commuting in late Soviet Estonia (Kaup, 1986; Kümmel, 1987; Marksoo et al., 1983a; 1983b). First, commuting was relatively modest due to the

immigration-based industrialisation and urbanisation on one hand, and due to the increased priority of agriculture (caused by food shortages, which tied a relatively large number of Estonians to rural areas), on the other. There were only 7,000 in-commuters to Tallinn in the late Soviet period (Marksoo et al., 1983b, table 5). Second, the role of sub-urbanisation was modest in commuting — only 16% of commuters were the former residents of the capital city (Marksoo et al., 1983b, p. 124). Third, in- and out-commuting flows in Tallinn were comparable in size and increasingly counter-balanced each other. While in-commuting to Tallinn was much greater than the opposite flow in the late 1960s, this difference had almost disappeared by the 1980s as a result of increased out-commuting from Tallinn (Marksoo et al., 1983a, p. 15). Fourth, the relatively large number of out-commuters from Tallinn (about 6,000 commuters in the late Soviet time) was related to the higher need for labour in agriculture, due to the constant food shortage and low labour productivity under central planning. With the help of state support, agricultural production units in suburbs were able to pay higher salaries than industrial and service enterprises in Tallinn, which made them increasingly attractive for people living in the capital city. 75% of the out-commuters from Tallinn started to commute due to a change of job, the main reason for that being higher salaries paid in agriculture (Marksoo et al., 1983b, table 8 and p. 126). Fifth, commuting depended on public rather than private transport. E.g., all the major agricultural enterprises in suburbs supported commuters with their own buses, and in 1982 only 14% of commuters used a car (Marksoo et al., 1983b, p. 110).

3. Sub-urbanisation and employment change in the 1990s

The number of people living in Tallinn metropolitan area increased from 265,000 inhabitants in 1950 to 620,000 inhabitants in 1990. The population growth of Tallinn metropolis exceeded the population growth of Estonia's total population, and therefore, the share of the country's population living in Tallinn metropolitan area increased considerably over time as well, from 26% in 1950 to 39% by the year 1990 (Figure 2). The situation changed in the 1990s. The population of Tallinn metropolis decreased significantly and dropped to 540,000 inhabitants by the year 2000. The decrease was similar for Estonia's total population. Population losses in Tallinn and the rest of the country were mainly due to a considerable number of immigrants returning back to Russia (Tammaru and Kulu, 2003). Therefore, the share of Estonia's total population living in Tallinn metropolitan area did not change in the 1990s. Within the metropolis, the proportion of people living in the city and in the suburbs changed little during the Soviet period (Figure 2). The share of people living in Tallinn city increased slightly between 1950 and 1970, remained unchanged in the 1970s, and started to decrease thereafter (Marksoo, 1990). This process continued through the 1990s due to the emigration of Russians, and due to increased sub-urbanisation (Leetmaa, 2003). Net migration was positive in all of the suburban communes in the 1990s (Figure 3), mainly on account of in-migration from the capital city. Despite emigration and sub-urbanisation, Tallinn with its 400,000 inhabitants still houses 74% of the people living in the metropolitan area, which is comparable to the respective figure in 1950, and leaves 26% or 140,000 people for the suburbs.

[FIGURE 2 ABOUT HERE]

[FIGURE 3 ABOUT HERE]

Agricultural employment was very important for the people living in suburban areas at the end of the Soviet period. The situation changed in the 1990s due to economic restructuring. While 50% of the people living in suburbs were employed in agriculture in 1982, less than 10% of people were engaged in agriculture in 2000 (Figure 4). Employment in the service sector went through the opposite change, and more than half of the employed people in the suburbs worked in service sector in 2000. This was part of the overall change to a service based economy in post-Soviet Estonia (Eamets, 1999; Puur, 1997), which was especially noticeable in Tallinn. However, the service sector was not able to absorb all the released labour: if unemployment was virtually non-existent in the late Soviet period, then as many as 12% of people in the Tallinn metropolitan area were unemployed in 2000. Unemployment was typically the lowest in the communes closest to Tallinn and the highest in the more distant communes (Figure 5).

[FIGURE 4 ABOUT HERE]

[FIGURE 5 ABOUT HERE]

4. Hypotheses of the study

Both the increase in sub-urbanisation and the decrease in agricultural employment in suburbs give us ground to expect changes in all aspects of commuting established by the end of the Soviet period. More specifically, one could hypothesise that the reduction in agricultural employment in rural areas extended the commuting field of Tallinn; in-commuting intensity to Tallinn increased in the 1990s due to sub-urbanisation and job losses in suburban areas; out-commuting from Tallinn decreased during the transition period since the agricultural farms that people mainly commuted to in the Soviet period collapsed in the 1990s; and the main direction of commuting flows target Tallinn due to its high dominance in the metropolitan area, and the high number of new service sector jobs created there during the post-Soviet transition period.

Regarding the differences between commuters and non-commuters, one could set up the following hypotheses based on previous research. Middle-aged people typically have higher commuting probabilities than younger and older people (Artís and Suriñach, 2000, p. 1440). Married people are more likely to commute than others as well. Gender-wise, previous research has revealed that men tend to have higher commuting probabilities and they commute longer distances (Blumen, 1994). Most likely, Estonians dominate among commuters, since they constitute the majority of the people who sub-urbanised in the 1990s (Tammur, 2003), and there are more Estonians living in rural areas, which were hit by losses in agricultural employment in post-Soviet Estonia, compared to ethnic minorities (cf. Eamets, 1999; Puur, 1997). Previous research indicates that better educated and more skilled people have higher commuting probabilities (Artís and Suriñach, 2000, p. 1441), which could also be expected in Estonia. As sub-urbanisation

was partly related to the building of new residential areas in the suburbs in post-Soviet Estonia (Leetmaa, 2003), one could expect that commuters are more likely to live in the houses built in the 1990s than non-commuters. Previous research indicates also that commuters live in bigger houses with better facilities (Artís and Suriñach, 2000, p. 1442). We expect that these hypotheses will hold when comparing commuters with non-commuters both in Tallinn and in the suburbs. Only the housing facilities could be expected to be better for non-commuter in Tallinn. Finally, one could hypothesise that people who sub-urbanised in the 1990s and people living in high unemployment communes are more likely to commute than non-commuters in the suburbs.

5. Research data and methods

Data on commuting in Tallinn metropolitan area (Figure 1) is derived from the anonymous individual 2000 census records. We compare data on commuting in 2000 to that in 1982, when the previous large-scale study was carried out in Estonia (see Marksoo et al., 1983a; 1983b). There are, however, some problems when analysing changes in commuting between 1982 and 2000. First, data for the year 2000 is based on the census, while data for the year 1982 was obtained from commune authorities, for rural areas, and from enterprises, for urban areas (Marksoo, 1983a, pp. 14–15). Second, data for the year 1982 contains information only on commuting between Tallinn and the suburbs, and not between all the destinations within the metropolis, which limits the analyses of geographical patterns of commuting over time. However, Tallinn, the capital of Estonia,

is very dominant in its metropolitan area, with the main commuting flows running between Tallinn and the suburbs, which makes this problem less acute. Despite differences in data collection principles, both data sets capture all the commuters between Tallinn and its suburban area in 1982 and 2000. This enables the tracking of the most important changes in the number of commuters and the direction of commuting in post-Soviet Estonia.

The delineation of the border of Tallinn metropolitan area is based on job-related commuting according to the 2000 census data. All the communes from which at least 15% of employed people commuted to Tallinn are included in the metropolis. The 15% criterion has often been used for delineating metropolitan areas (Cheshire and Hay, 1989, p. 15; Morrill et al., 1999, p. 734), although other approaches could be used as well (Adams et al., 1999; Laan and Schalke, 2001; Morrill et al., 1999). The 15% criterion was used in the current study as it fits well with previous Soviet era studies (Kaup, 1986; Kümmel, 1987; Marksoo et al., 1983a; 1983b), which helps to enrich the temporal analysis of commuting.

Applying the 15% commuting criterion to the 2000 census data, 10 urban and 21 rural communes[1] belong to Tallinn metropolitan area. For analysing changes in commuting within the metropolis, we first mapped people's places of residence and job in 1982 and in 2000. The analysis of the geography of commuting is followed by the analysis of the

[1] The urban communes are Tallinn, Aegviidu, Kehra, Keila, Kohila, Loksa, Maardu, Paldiski and Saue; the rural communes are Anija, Harku, Juuru, Jõelähtme, Keila, Kernu, Kiili, Kohila, Kose, Kuusalu, Kõue, Loksa, Nissi, Padise, Raasiku, Rae, Rapla, Saku, Saue, Vasalemma and Viimsi (see also Figure 1). Some

composition of commuters, based on the 2000 census. Binary logistic regression is used to analyse the probability of being an in-commuter to Tallinn as compared to the probability of being a non-commuter in Tallinn, or being a non-commuter in a suburb. Non-commuters comprise only of employed people, which means that unemployed and inactive people are excluded from the data analysis. To achieve comparable group sizes for logistic regression for these three research populations, a 25% random sample was drawn from non-commuters of Tallinn (Table 1). We can formalise the logistic regression model as follows:

$$\log \frac{p(Y_i = 1)}{p(Y_i = 0)} = \alpha + \sum_{k=1}^{K} \beta_k X_{ik}$$

Where $(Y_i = 1)$ is an individual's $i = 1, \ldots I$ probability to be an in-commuter to Tallinn. $p(Y_i = 0)$ is an individual's $i = 1, \ldots I$ probability to be a non-commuter in Tallinn in Models 1 and 2, and an individual's $i = 1, \ldots I$ probability to be a non-commuter in the suburbs in Models 3 through 5. α is constant, X_{ik} is the value of the variable for an individual, and β_k is the parameter describing the impact of this variable, with K variables. In Models 1 and 3, K includes socio-demographic variables, and in Models 2 and 4 we add housing variables in comparing in-commuters to Tallinn with non-commuters both in the capital city and the suburbs. Model 5 compares in-commuters to Tallinn only with non-commuters in suburbs, and it clarifies the role of sub-urbanisation and employment change in in-commuting to Tallinn. For that purpose we add two new

exceptions were allowed in applying the criterion (Paldiski, Loksa and Rapla fall slightly below the 15% level) to enhance comparability with Soviet time studies.

research variables (place of residence in 1989 and unemployment level in the home commune in 2000), and one control variable (place of residence within the suburb in 2000) to Model 5.

[TABLE 1 ABOUT HERE]

6. Commuting in Tallinn metropolitan area

To analyse changes in the Tallinn metropolitan area, the 15% commuting criterion is applied to both 1982 and 2000 data. Since the exact figures on commuting in 1982 could be obtained only for urban but not for rural communes, the analyses of these changes is based on the example of urban areas. Analysts (Kaup, 1986; Kümmel, 1987; Marksoo, 1995) included Aegviidu, Kehra, Keila, Kohila, Loksa, Maardu, Paldiski, Rapla, Saue and Tapa into Tallinn metropolitan area at the end of the Soviet period (see Figure 1). If we apply the 15% of employed people working in Tallinn criterion to the 1982 data, almost half of these towns would not meet it by far. The towns that fall considerably below the 15% level are Loksa, Paldiski, Rapla and Tapa. The situation is different in 2000. Paldiski exceeds the 15% level and Rapla falls just below it. The share of commuters from Loksa is 9%, which is more than in 1982. Furthermore, the share of commuters is 24% in the surrounding Loksa rural commune, which almost did not send any commuters to Tallinn in 1982. Thus, only Tapa did not come close to reaching the

15% level, also in 2000. This means that the commuting field of Tallinn enlarged in the 1990s, extending to about 50 to 70 kilometres from the capital city.

We can conclude that the hypothesis regarding the extension of the commuting field of Tallinn was confirmed. The hypothesis of the increase of in-commuting to Tallinn was confirmed as well (Figures 6–7). All in all, 22,000 people commuted to Tallinn daily in 2000. The respective figure was 6,000 people in 1970 and 7,000 in 1982 (Marksoo et al., 1983b, table 5). Two urban communes, Saue and Maardu, were included in the population of Tallinn in the 1982 study. In 2000 the number of commuters to Tallinn was 18,000 excluding these towns. There were only two communes in 1982, but as many as eight communes in 2000 from which more than 1,000 people commuted to Tallinn. The total number of in-commuters to Tallinn in 2000 (22,000) equals to 1/3 of the employed people living in suburban areas. In the inner-circle communes (Harku, Jõelähtme, Kiili, Maardu, Saku, Saue and Viimsi), the share of in-commuters to Tallinn exceeds half of the employed people. About one third of the employed people in the inner-circle communes (Aegviidu, Keila, Kernu, Kohila and Raasiku) commute to Tallinn and about one fourth in the more distant outer circle communes (Anija, Kehra, Kose, Juuru, Kuusalu, Loksa, Nissi, Rapla and Vasalemma).

Of the commuters in 2000, 12,500 people or 58%, had also lived in the suburbs at the end of the Soviet period, 6,500, or 30%, had moved from Tallinn to the suburbs, and 2,600, or 12%, had moved from the rest of the country to the suburbs in the 1990s. This means that sub-urbanisation was a more important factor leading to in-commuting to Tallinn in 2000

than it was in the late Soviet period: 30% of commuters originated from the capital city in 2000 compared to 16% in 1982 (Marksoo et al., 1983b, 124). In 2000, sub-urbanisation was also a more important factor contributing to commuting than labour market change in the suburbs. Without Maardu and Saue, the number of commuters increased by 11,000 people between 1982 and 2000. Of these 11,000 people, 5,100 moved from Tallinn to suburbs, and 2,300 moved from the rest of the country to the suburbs between 1989 and 2000. This means that commuting increased by 3,600 people on account of people who already lived in suburban area at the end of the Soviet period.

[FIGURE 6 ABOUT HERE]

[FIGURE 7 ABOUT HERE]

[FIGURE 8 ABOUT HERE]

Out-commuting from Tallinn increased steadily during the Soviet period and the flows between Tallinn and the suburbs almost counterbalanced each other in 1982 (Figure 8). Together with the dramatic increase in in-commuting to Tallinn in the 1990s, this situation changed. The increase applies to almost all urban and rural communes (Figures 6–7), and Tallinn has a positive net flow with all of them. Out-commuting from Tallinn remained stable, and altogether 6,000 inhabitants of Tallinn are employed in suburban area, as it was in the late Soviet period. Thus, unexpectedly, out-commuting from Tallinn did not decrease despite significant losses in agricultural jobs in the suburbs in the 1990s.

The hypothesis that Tallinn with its 400,0000 inhabitants is the major centre of the metropolis and has few competitors in triggering commuters was confirmed. Among other centres, only two attracted more than 500 commuters in 2000. These were Keila (9,500 inhabitants) for the Western, and Rapla (5,800) for the Southern corner of the metropolis. The Eastern corner had many small competing centres, including Kehra, Loksa and Kuusalu. Maardu, the second largest town, with 16,000 inhabitants, holds no major attraction for the nearby rural areas. The commuters working there (mainly in the port and many other industrial enterprises) originate mainly from Tallinn rather than from the surrounding rural communes.

While public transport, including that organised by enterprises themselves, was very important during the Soviet period, today, car-based commuting is of utmost significance. The change to car-based commuting is dramatic. In 1982, only 14% of commuters used a car (Marksoo et al., 1983b, p. 110), which was similar to the average of the Soviet Union (Fuchs and Demko, 1978, p. 178). Today about 60% or 19,000 of all the commuters use a car as their main transport mode for travelling between home and work in the Tallinn metropolitan area (Tammaru, 2002). 15,000 of the 22,000 in-commuters to Tallinn use a car, which is more than the total number of commuters between Tallinn and the suburbs (13,000) in the late Soviet period. Half of the car-commuters live in the inner circle communes bordering with Tallinn. Although this means that the travel distance is not particularly long, it brings along congestions in the capital city. However, increased car ownership has made the considerable increase in commuting possible, since the public transport system is inefficient, and many people living in suburban communes had to find

a new job in Tallinn after the dramatic reduction of employment in agriculture at the beginning of the 1990s.

7. Composition of commuters

The number of commuters and the intensity and geography of commuting flows, together with the transport mode, changed considerably between 1982 and 2000. Next, we will analyse the composition of commuters in 2000. As the main commuting flows run from suburbs to Tallinn, we will compare in-commuters from the suburbs to the capital city, first with non-commuters in Tallinn, and second with non-commuters in the suburbs, using binary logistic regression. For the sake of simplicity, we use the term commuters instead of in-commuters to Tallinn in this section. In Models 1 and 3 we will focus on the selectivity of commuting by socio-demographic variables. In Models 2 and 4 we add housing related variables. In Model 5, we add two research variables (place of residence in 1989 and unemployment in home commune in 2000) and one control variable (place of residence in the suburb in 2000) in order to clarify the role of sub-urbanisation and unemployment in commuting by comparing in-commuters to Tallinn with non-commuters in the suburbs.

Almost all the main social and demographic characteristics of a population produce a statistically significant differentiation between commuters and non-commuters in Tallinn (Table 2, Model 1). Age differences are very pronounced, but not quite as expected.

Middle-aged people are most likely to sub-urbanise (Jõeveer 2003), but they do not have the highest probability of becoming a commuter. Commuters are younger than non-commuters in Tallinn, and the commuting probability decreases as a person's life course progresses. Gender and ethnic differences are expected: women are less likely to commute than men and ethnic minorities commute less likely than Estonians. Family status indicates that commuters are more likely to be married than non-commuters in Tallinn. The hypothesis that people with tertiary education are more likely to commute is rejected, since they have the lowest commuting probability. Differences by occupation are less significant. Professionals, clerks and service workers are less likely, and manual workers are more likely to be commuters, than professionals. However, the differences are statistically significant only for professionals and service workers.

[TABLE 2 ABOUT HERE]

Most of the results obtained from Model 1 hold true after introducing the housing related variables (Table 2, Model 2). The only significant change is related to occupational status. Most importantly, being a manual worker increases significantly the probability of being a commuter, which strengthens the results obtained from Model 1. We can conclude that commuters are not only less educated, but they also are more likely to have blue-collar jobs compared to non-commuters in Tallinn. The hypotheses that commuters have a higher probability than non-commuters in Tallinn of living in single-family houses, houses built in the 1990s, and in ones with less facilities are all confirmed.

Let us next compare commuters with non-commuters in the suburbs (Table 3, Model 3). Age, gender and ethnic differences between commuters and non-commuters in the suburbs are similar to those between commuters and non-commuters in Tallinn (Table 2, Model 1). Other variables — family status, education and occupation — yield different results. Commuters had a higher probability to be married compared non-commuters in Tallinn, but they are more likely unmarried compared to non-commuters in the suburbs. The probability of being a commuter decreased with the decreasing level of education compared to non-commuters in the capital city, while it increases compared to non-commuters in the suburbs. Likewise, commuters were more likely manual workers than non-commuters in Tallinn, but the opposite is true when comparing commuters with non-commuters in the suburbs — manual workers have clearly the lowest commuting probability. We can conclude that not only people with tertiary education, but also managers, specialist and other people employed in offices and in the service sector have less jobs available in suburbs, and they tend to commute to Tallinn, while manual workers (both skilled and unskilled) tend to work in their home commune. This also confirms the hypotheses that in-commuters to Tallinn are better off both as regards their educational and occupational status compared to non-commuters in suburbs.

[TABLE 3 ABOUT HERE]

Let us proceed with the analysis of housing related variables (Table 3, Model 4). The hypotheses that commuters have a higher probability of living in single-family houses, houses built in the 1990s, and that they have more facilities compared to non-commuters

in suburbs are confirmed. Unexpectedly, however, commuters have less living space compared to non-commuters in suburbs. Finally, we focus on the impact of sub-urbanisation and the level of unemployment in the home commune on in-commuting to Tallinn, controlling the effect of socio-demographic and housing related variables (Table 3, Model 5). It becomes evident that in 1989, today's in-commuters to Tallinn were more likely to live in the capital city than in the suburbs. This means that people who moved from Tallinn to the suburbs between 1989 and 2000 or sub-urbanised in the 1990s have a much higher commuting probability than people who lived in the suburbs both in 1989 and 2000. People who moved from the rest of the country to the suburbs in the 1990s also have a higher commuting probability than those who lived in the suburbs both in 1989 and 2000. The level of unemployment in suburban communes had less impact on commuting. Furthermore, people who lived in high unemployment areas did not have a significantly higher probability of being a commuter. This confirms previous results that sub-urbanisation, rather than labour market change, made the most important contribution to the increase in in-commuting from the suburbs to Tallinn in the 1990s. Expectedly, commuting probability increased with distance from Tallinn. New variables introduced in Model 5 did not have a major impact on the socio-demographic variables. The situation is different in the case of housing-related variables, as their significance decreased considerably. However, we can still argue that in-commuters to Tallinn have a higher probability to live in single-family houses, and houses built in the 1990s compared to non-commuters in the suburbs, but they do not live in the better housing conditions as regards facilities and space per person.

8. Conclusions and discussion

In-commuting to Tallinn was modest and the commuting field of Estonia's capital city was rather limited in the late Soviet period. Sub-urbanisation and labour market changes in the 1990s led to the hypotheses that the commuting field and in-commuting to the capital city of Estonia both increased in 2000 compared to 1982. These hypotheses were confirmed. In-commuting to Tallinn increased considerably as the capital city became the focal point of employment for people living across the metropolis in the 1990s. The number of in-commuters increased, especially from the surrounding communes of Tallinn, which experienced their highest net migration rates in the 1990s. This is different to what happened in the 1980s, when population growth in these communes did not bring along a respective growth in job-related commuting (Marksoo et al., 1983b). Then people tended to change both — places of residence and jobs. Nowadays people tend to change only their place of residence, moving out from Tallinn and continuing to work in the capital city. As a result of this, as many as half of the employed people living in the neighbouring inner circle communes work in Tallinn, which means that these communes have become typical dormitory areas of the Estonian capital city. As such, the process is similar to the initial stages of sub-urbanisation in the Western countries (Berg et al., 1982; Wachs et al., 1993) and especially to that in North America (Bourne, 1997; Hartshorn and Muller, 1989).

In-commuting to Tallinn increased due to the increase in car-based commuting. Cars form by far the most important transport mode for commuters today, while public transport dominated overwhelmingly during the Soviet era. There are possibly three main reasons behind the increase in car-based commuting. First, sub-urbanisation brought along a much more fragmented settlement pattern compared to the Soviet period. In addition to the relatively compact settlements of the Soviet period, two other types of areas witnessed population growth in the 1990s: (1) summer cottages built during the Soviet period have been extensively rebuilt for permanent living (Saluveer, 2001) and (2) new single-family housing estates have proliferated around Tallinn (Leetmaa, 2003). People living in both of these areas depend almost exclusively on private transport (Tammaru, 2002). Second, the public transport system is not convenient and efficient due to its low frequency and slow speed, plus the fact that the public transport systems of Tallinn and the suburbs are not integrated. Third, the parallel and dramatic increase in car ownership, compared to the late Soviet period, enables commuters to use private rather than public transport. However, there are 30 cars per 100 people in Estonia today, which is still far less than in the Western countries (Estonian Statistical Office, 2003).

The hypothesis that out-commuting from Tallinn decreased in the 1990s due to the collapse of agricultural production (that attracted commuters in the Soviet period) in suburban areas was rejected. The number of out-commuters was similar in 1982 and 2000. This means that out-commuting from Tallinn should have new underlying causes compared to those in the late Soviet period. The most important reason is probably related to the relocation of industrial enterprises from Tallinn to nearby communes, due

to the rapid growth of the service sector in Estonia's capital city. The related increase in competition for land results in industrial enterprises leaving the city (see Rohelaan, 2002). The enterprises do not move far from Tallinn, wanting to still remain close to the capital and its ports. Many of the employees continue to work in these relocated enterprises but do not change their place of residence.

The hypotheses regarding the socio-demographic characteristics of commuters were partly confirmed. When previous research has indicated that middle-aged people have the highest commuting probability (Artís and Suriñach, 2000, p. 1440), then this is not the case in Tallinn's metropolis. Commuters were younger than non-commuters, and commuting probabilities decreased as people's life courses progressed. The higher commuting probabilities among men and Estonians were expected. Commuters were married compared to non-commuters in Tallinn, and unmarried compared to non-commuters in the suburbs. We expected that commuters would have a higher educational and occupational status compared to non-commuters. These hypotheses were confirmed comparing commuters with non-commuters in the suburbs, but rejected comparing commuters with non-commuters in Tallinn.

There are probably several explanations for such results. The higher educational and occupational status of non-commuters in Tallinn is probably related to the Soviet legacy effect. The concentration of people with tertiary education and white-collar jobs into major cities was very significant in the former Soviet Union. These people were engaged in sub-urbanisation in Western countries (Berg et al, 1982), but sub-urbanisation was

modest in the former Soviet Union (Tammaru, 2001). Despite suburbanisation in Tallinn metropolitan area in the 1990s (Leetmaa, 2003), and the important contribution of people with tertiary education to that process (Uibopin, 2004), the share of people with tertiary education and white-collar jobs is still very high in Tallinn. The higher educational and occupational status of commuters compared to non-commuters in suburbs could probably be explained by the lack of proper employment opportunities for those people in the suburbs. Agricultural employment that dominated in the suburban area in the late Soviet period has been replaced in the 1990s by industrial jobs as a result of industrial relocation from the capital city to suburbs, and by local service jobs. These jobs are typically not attractive for better-educated people, and therefore, people with tertiary education and white-collar jobs commute more likely compared to people who belong to other educational and occupational categories.

We hypothesised that housing conditions are better for commuters compared to non-commuters, e.g. that commuters have a higher probability of living in a single-family house and in a house built in the 1990s compared both to non-commuters in Tallinn and in the suburbs. These hypotheses were largely confirmed. Finally, we expected that people who sub-urbanised in the 1990s and people who work in high unemployment communes have a higher commuting probability. The first hypothesis was confirmed, since people who moved from Tallinn to the suburbs between 1989 and 2000 had considerably higher commuting probabilities than people who lived in the suburbs both in 1989 and in 2000. But the second hypothesis was rejected, since high unemployment areas did not send more commuters to Tallinn compared to low unemployment areas.

This leads to the conclusion that sub-urbanisation had a greater impact on the increase in-commuting to Tallinn than employment change in the suburbs, although both contributed to the increase in the number of commuters compared to the late Soviet period.

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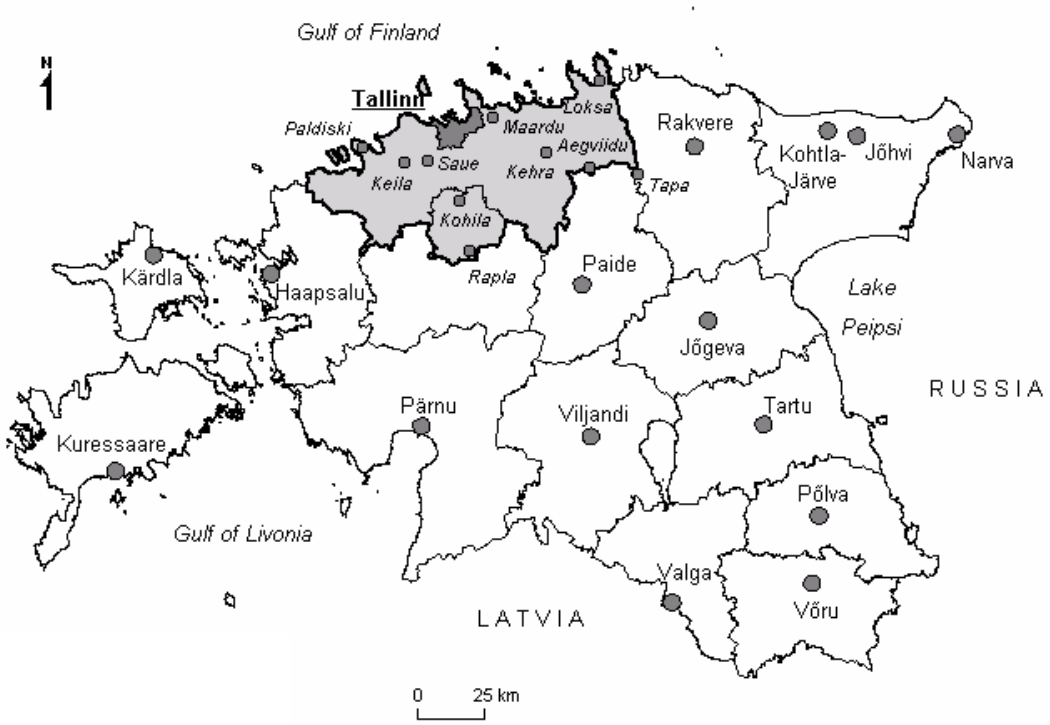


Tallinn metropolitan area
county border
Tallinn capital city
Maardu satellite towns of Tallinn
Paide county seats and other major towns

Figure 1. Major Estonian cities and satellite towns.

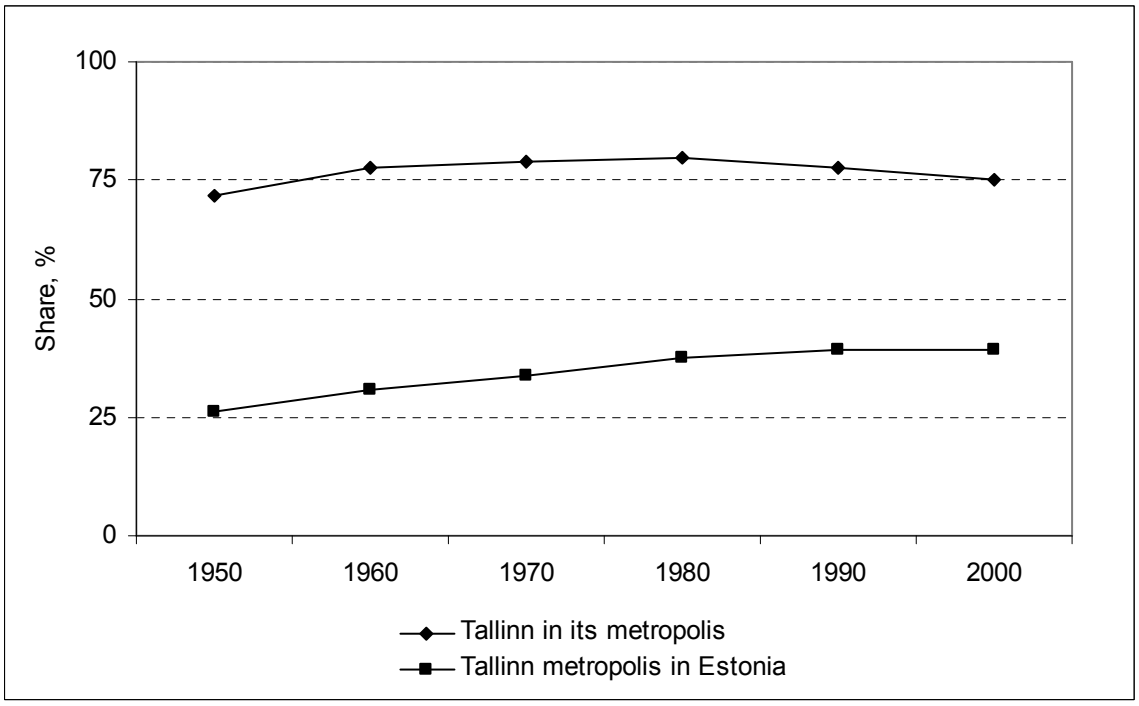
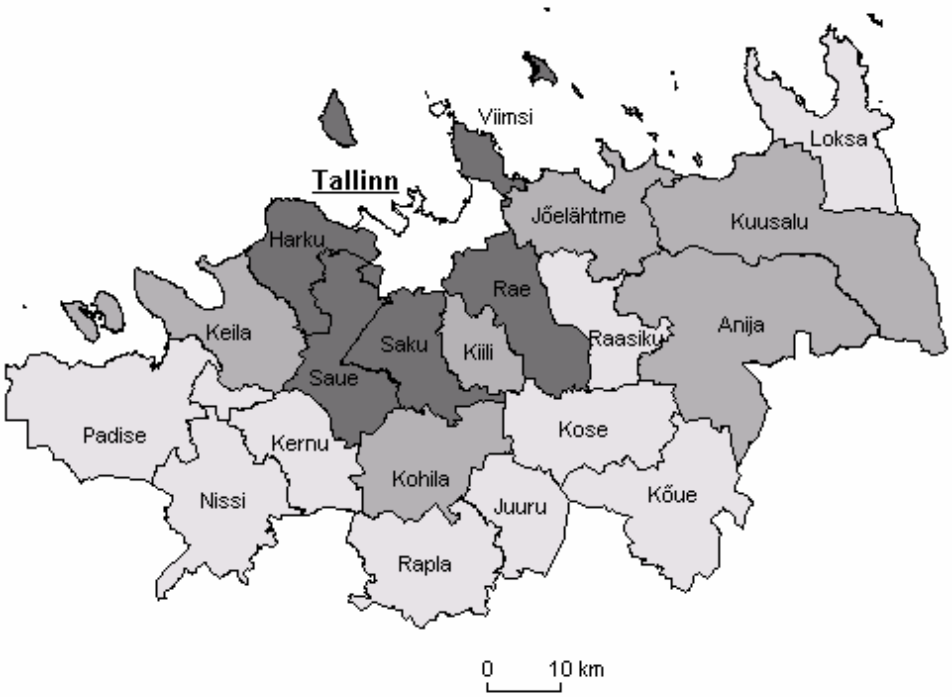


Figure 2. Share of Tallinn metropolis in Estonia's total population, and share of Tallinn in the total population of its metropolis (%), 1950–2000.

Source: Estonian Statistical Office, 1975; 1978; 1982; 2001a.



less than 50‰
50-99‰
100‰ and over

Figure 3. Net migration per 1000 inhabitants in the suburbs, 1989–2000.

Source: 2000 Census.

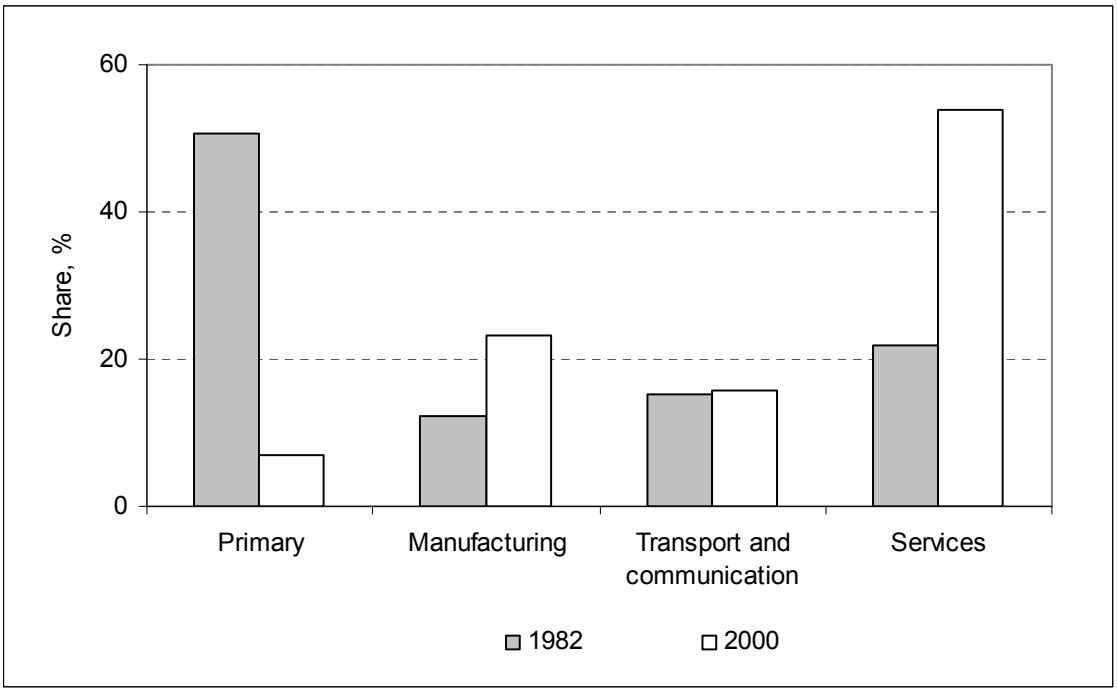


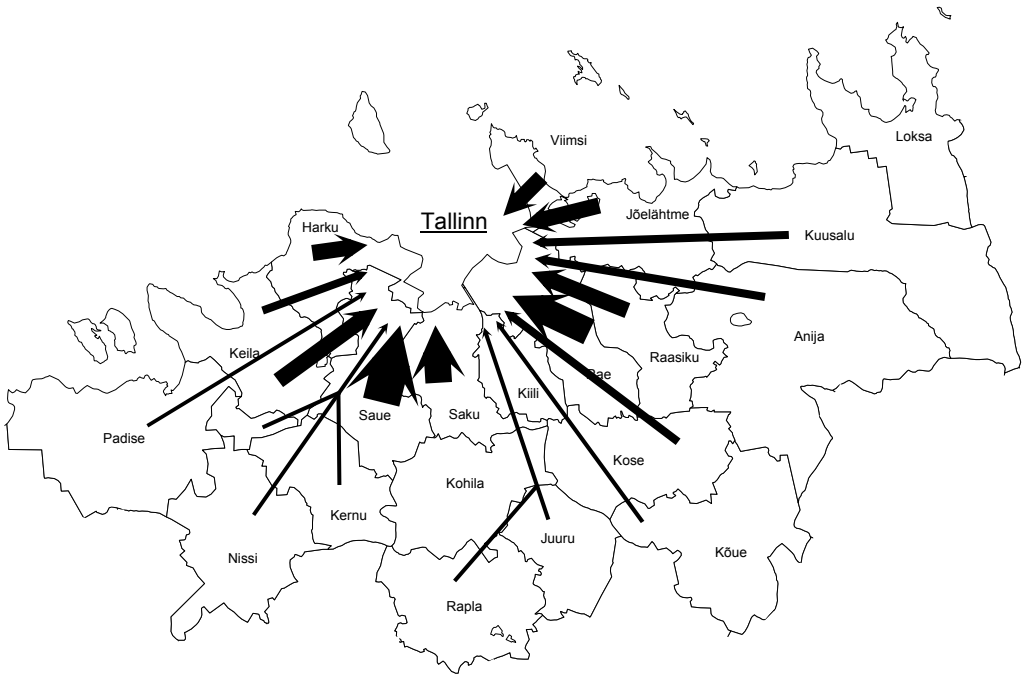
Figure 4. Sectoral composition of employment in Tallinn's suburbs, 1982 and 2000.

Sources: Estonian Statistical Office, 2001b; Marksoo et al., 1983a.

less than 10%
10–14%
15% and over

Figure 5. Unemployment rate in the suburbs, 2000.

Source: 2000 Census.



less than 99 people
100-249 people
250-499 people
500- 999 people
more than 1000 people

Figure 6. Number of in-commuters to Tallinn, 1982.

Source: Marksoo et al., 1983a.

Figure 7. Number of in-commuters to Tallinn, 2000.

Source: 2000 Census.

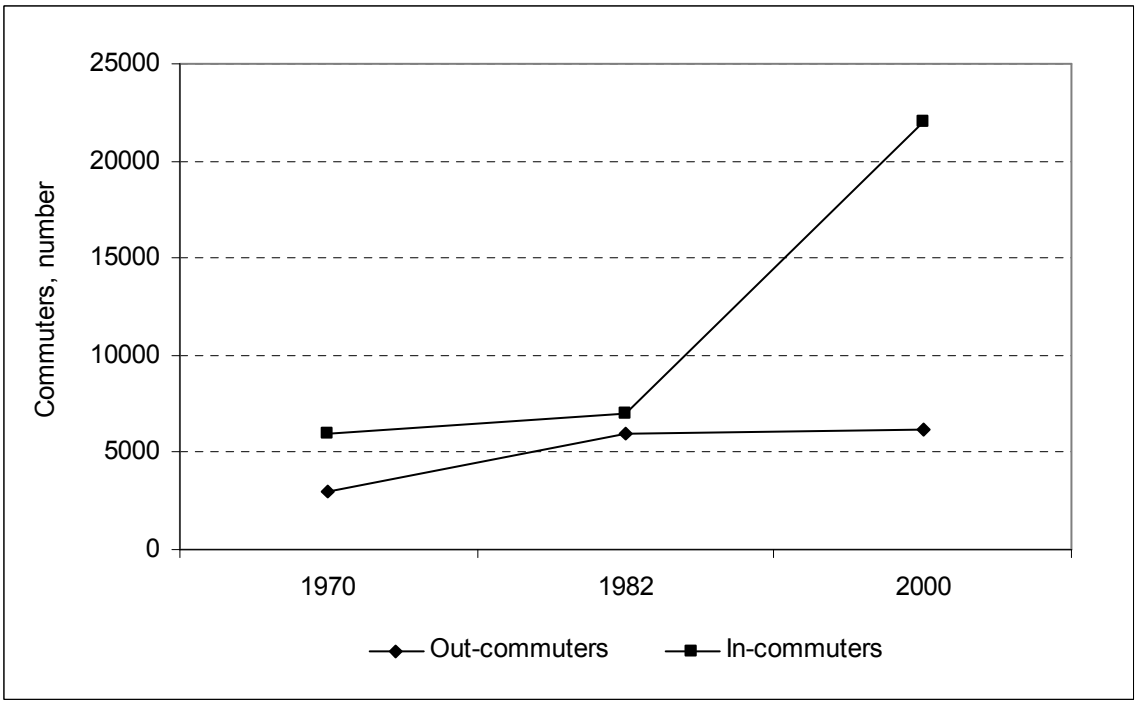


Figure 8. Number of Tallinn's commuters in 1970, 1982 and 2000.

Sources: Marksoo et al., 1983a; 2000 Census.

Table 1. Research variables (%).

	Total	Non-commuters in Tallinn*	Non-commuters in suburbs**	In-commuters to Tallinn***
Research populations				
Non-commuters in Tallinn	35.4			
Non-commuters in suburbs	37.8			
In-commuters to Tallinn	26.8			
Age				
<30	22.6	24.0	17.1	28.6
30–49	50.9	47.3	53.2	52.2
50–64	24.0	25.3	26.9	18.0
65+	2.6	3.3	2.8	1.2
Gender				
Male	46.7	44.6	45.8	50.9
Female	53.3	55.4	54.2	49.1
Ethnic origin				
Estonian	70.5	59.0	73.8	81.0
Ethnic minority	29.5	41.0	26.2	19.0
Family status				
Married	56.0	53.5	58.8	55.3
Unmarried	44.0	46.5	41.2	44.7
Education				
Primary	25.2	17.4	34.5	22.4
Secondary	50.2	51.0	48.7	51.3
Tertiary	24.6	31.6	16.8	26.3
Occupation				
Manager	14.8	15.5	11.1	19.1
Professional	28.8	35.0	21.5	31.0
Clerk	6.7	6.7	5.9	7.6
Service worker	13.2	13.3	12.6	13.9
Manual worker	36.5	29.5	48.9	28.3
Living space				
Less than 55 m^2	90.2	95.1	90.7	82.7
55 m^2 and over	9.8	4.9	9.3	17.3
Availability of facilities				
Few facilities	66.9	80.5	59.2	60.3
Many facilities	33.1	19.5	40.8	39.7
Time when dwelling was built				
Before the 1990s	55.6	50.7	58.7	57.6
In the 1990s	44.4	49.3	41.3	42.4
Dwelling type				
Multi-family house	73.9	90.1	65.3	64.7
Single-family house	26.1	9.9	34.7	35.3
N	80,398	28,476	30,406	21,516

* People who lived and worked in Tallinn in 2000
** People who lived and worked in suburban communes in 2000 (Figure 1)
*** People who lived in suburban communes, but worked in Tallinn in 2000

Table 2. Differences between commuters and non-commuters in Tallinn.

	Model 1 β	Model 2 β
Age (Base: <30)		
30–49	-0.013	-0.028
50–64	-0.552***	-0.543***
65+	-1.377***	-1.336***
Gender (Base: Male)		
Female	-0.154***	-0.139***
Ethnic origin (Base: Estonian)		
Ethnic minority	-1.202***	-1.051***
Family status (Base: Married)		
Unmarried	-0.274***	-0.202***
Education (Base: Primary)		
Secondary	-0.233***	-0.242***
Tertiary	-0.438***	-0.506***
Occupation (Base: Manager)		
Professional	-0.223***	-0.134***
Clerk	-0.026	0.082**
Service worker	-0.068*	0.035
Manual worker	0.036	0.186***
Time when house was built (Base: Before 1990s)		
In the 1990s		1.360***
Availability of facilities (Base: Lower-order facilities)		
Higher-order facilities		-0.493***
Living space (Base: Less than $55m^2$)		
$55m^2$ and over		0.005
Dwelling type (Base: Multi- family house)		
Single-family house		1.292***
-2 Log likelihood	63915.031	58344.480

Significance: * = 10%, ** = 5%, *** = 1%

Table 3. Differences between commuters and non-commuters in suburbs.

	Model 3 β	Model 4 β	Model 5 β
Age (Base: <30)			
30–49	-0.573***	-0.582***	-0.553***
50–64	-0.868***	-0.864***	-0.880***
65+	-1.306***	-1.287***	-1.312***
Gender (Base: Male)			
Female	-0.450***	-0.443***	-0.424***
Ethnic origin (Base: Estonian)			
Ethnic minority	-0.259***	-0.268***	-0.408***
Family status (Base: Married)			
Unmarried	0.041**	0.070***	0.092***
Education (Base: Primary)			
Secondary	0.349***	0.340***	0.291***
Tertiary	0.509***	0.473***	0.320***
Occupation (Base: Manager)			
Professional	-0.025	0.011	0.078**
Clerk	-0.027	0.014	0.060
Service worker	-0.225***	-0.173***	-0.004
Manual worker	-0.900***	-0.840***	-0.690***
Time when house was built (Base: Before 1990s)			
In the 1990s		0.541***	0.072**
Availability of facilities (Base: Lower-order facilities)			
Higher-order facilities		0.054***	-0.021
Living space (Base: Less than 55m^2)			
55m^2 and over		-0.091***	-0.041*
Dwelling type (Base: Multi- family house)			
Single-family house		0.054**	0.079**
Place of residence in 1989 (Base: Suburb)			
Tallinn			1.101***
Other Estonia			0.339***
Unemployment in home commune (Base: Less than 10%)			
10–14%			-0.092***
15% and more			-0.014
Place of residence in the suburb in 2000 (Base: Inner circle)			
Middle circle			-0.987***
Outer circle			-1.775***
-2 Log likelihood	65833.462	65458.215	58669.235

Significance: * = 10%, ** = 5%, *** = 1%