STAREBEI: DELIVERABLE 3

Public Transport Cost and Housing Price: The Tallinn case study

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Abstract: There is evidence in the literature that housing prices capitalize public services and goods as well as public transport costs. Such studies involve hedonic price models to assess the impacts of public investment on land value or property values. The urban housing market of Tallinn in particular has transformed since the end of 1980s from a heavily subsidized centrally-planned system to a free market able to attract foreign direct investment. However, as a consequence of low interest rates, high levels of liquidity, and a positive economic and financial environment in recent years, Estonia has faced an economic boom and bust crisis. Our study investigates the influence of public transport costs on real estate prices; in particular, we assess whether public transport costs mitigate cyclical economic downturn effects.
1. Introduction

Tallinn, the capital of Estonia is a post-soviet city and like other Central Eastern European (CEE) countries has undergone major economic transformation (Keivani et al., 2001). During the global economic boom between 2004 and mid-2007, Estonia experienced a period of high liquidity and low interest rates which determined a significant increase in real estate prices. In particular, the real estate market exhibited a growth pattern of a speculative bubble (Cocconcelli and Medda, 2010). The consequent economic downturn therefore had a strong impact not only on the Estonian housing market, but also on the whole economic structure of the country. And this was especially evident in the capital, Tallinn.

The negative consequences of this process have impacts on the economic and social framework of the Tallinn society (high unemployment, mortgage default, deflationary effect on wages). It is interesting, at this point in our discussion, to ask whether housing prices have different degrees of price deceleration in relation to public transport systems during economic downturn. It has been shown that public transport plays a vital role in increasing property values (Banister and Berechman, 2000). Indeed, there is wide agreement among urban economists that housing price is inversely related to public transport cost (see Basu and Thibodeau, 1998; Li and Brown, 1980; Bollinger and Ihlanfeldt, 1996; Bowes and Ihlanfeldt 2001). For example, in Dallas, USA, the improvement in public transport (DART light railway) allowed for the revitalization of its downtown area where the value of commercial properties close to stations increased by 24% and residential values increased more than 30% (Hurst, 2008).

Against this background, the objective of the paper is to provide empirical evidence showing that public transport influences property values in Tallinn, Estonia, and it acts as a cushion during decreasing periods of real estate values. We address our objective by focussing on three specific perspectives. We first verify whether public transport costs capitalise into the real estate price. Second, we analyze if real estate prices decrease in districts with lower public transport cost. Third, by comparing two similar districts of the city, we test whether districts with lower public transport cost have a less steep decrease in housing price during an economic downturn.

The report is structured as follows: in Section 2 we review the features of the real estate market in Tallinn. Section 3 gives a perspective of the public transport. In Section 4 we provide our empirical
analysis results, and comment on the interaction between real estate price and public transport cost. Section 5 concludes the report.

2. **Tallinn, a city in transition**

In the past twenty years Tallinn has been witness to a profound urban transformation. The city has experienced the transition from a centrally planned system under Soviet Union control to market-based economies (Tsenkova, 2002). Perhaps one general assertion that can be made about Tallinn is that it has undertaken reform and introduced a modern western-style urban planning system, but nonetheless the city still suffers from its past legacy. Particularly transport infrastructure and systems and large stocks of housing estate are both in need of renovation and development (Dodgson et al., 1998).

The urban structure of Tallinn is described by Bertaud (2004) and Hirt and Stanilov (2009) as a monocentric structure with a central district (Kesklinn) comprised of rich cultural and commercial activities and reinforced by a radial transit system that makes the city centre accessible. The resident population of Tallinn is 404556\(^1\) in an area of 159.2 km\(^2\) (population density: 2,541 in/Km\(^2\)). The greatest amount of the population of Harjuma County (76%) and of Estonian inhabitants (30%) lives in Tallinn. The yearly average disposable income in Tallinn is 116000 Kroons, which is greater than in other parts of Estonia (99000 Kroons\(^2\)).

Tallinn is divided into eight administrative districts: Haabersti, Kristiine, Mustamae, Pirita, Kesklinn (City centre district), Lasnanae, Nomme, and Pohja-Tallinn. As figure 1 depicts, within the eight districts, Lasnanae is the most populated. In Kesklinn, the central district, are located the main political, administrative, touristic and commercial activities of the city.

\(^1\) Data obtained on 1\(^{st}\) April 2009.
\(^2\) Data provided by the Estonian Statistical Office.
As we have previously argued, the inheritance of large housing stocks which were predominantly under public administration (in 1990 only 28% of the dwellings were privately owned) are now being transferred from the public to the private sector (Hegedus et al., 1996; Palacin and Shelburne, 2005). For instance, Ruoppila and Kahrik (2002) observe that privatisation has been extensive (the share of private ownership in Tallinn rose from 25% to 94% between 1993 and 2000), but between 1990 and 2000 privatization has proceeded relatively slowly due to an undeveloped real estate market, lack of housing finance, and consumers who were reluctant to borrow due to high interest rates (Palacin and Shelburne, 2005).

The growth of the real estate market began in 2000 and this transition at the urban level has certainly changed also the structure and the distribution of the residential population within the city. As Figure 2 illustrates, between 2005 and 2009 although Tallinn did not suffer from the effects of emigration/immigration (the rate of change in residential population is only 0.62%), nevertheless Tallinn’s urban population moved across the city. The Pirita district, with its new and up-market profile, has grown significantly in recent years (Ruoppila and Kehrik, 2002).
Between 2006 and 2010 the real estate market suffered a severe boom and bust cycle (Cocconcelli and Medda, 2010), which weakened housing prices and created considerable volatility in the real estate market with acute consequences in the whole Estonian economy (Figure 3).

As we can see in Figure 3, after 2009 the housing price sharply declined, also in the districts with the highest property desirability, such as Pirita and Kesklinn. In order to assess the urban distribution of Tallinn’s property, we calculate the Gini coefficient on the real estate prices of all residential dwellings in Tallinn from 2006 to 2009.
Table 1. The Gini coefficients of real estate prices

<table>
<thead>
<tr>
<th>Gini Coefficient Tallinn Property prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
</tr>
<tr>
<td>2007</td>
</tr>
<tr>
<td>2008</td>
</tr>
<tr>
<td>2009</td>
</tr>
</tbody>
</table>

*Source data: city24.ee, UCL calculation.*

As we can see in Table 1, starting from a situation with a high value of distribution equality in 2006 we reach a coefficient that has increased by 100% in 2009, thus indicating that in the economic downturn the inequality related to real estate assets had significantly increased. Within this context, it is important to analyse the impacts of the economic downturn of the real estate market on transport investment, and particularly the relationship between transport cost and housing price. Before doing so, we need to turn to the main features of the transport system in Tallinn.

3. Tallinn public transport

In 2008, 32.84%\(^3\) of employed people in Estonia worked in Tallinn; the implication of the strong ten-year economic growth was an increase in traffic jams and urban congestion due to the higher number of commuters in the capital. After Estonian independence, the reliance on car usage intensified (Orru et al., 2008), as shown in Figures 4 and 5 two trends have been developing during the last ten years, an increase in the number of private cars and motorcycles, and a decrease in public transport ridership. As stated previously, the effect of the economic upturn allowed Estonians to purchase new vehicles, thereby encouraging greater use of private transport to commute. In addition, Tallinn has experienced persistent urban sprawl towards city peripheries (Norkoiv and Sepp, 2005; Leetma, 2008) thus consequently determining an increase in travel distances.

\(^3\) All data provided by Estonian Statistics Office
Figure 4. Number of passengers carried by tram and trolley buses between 2000 and 2008

Source: Tallinn key figures, Tallinn City Council. UCL calculation.

Figure 5. Rate of increase of commuters by car and motorcycles between 2001 and 2008 in Tallinn

Source: Tallinn key figures, Tallinn City Council. UCL calculation.

From 2008 Tallinn operates 68 public transport lines across its eight districts, including buses, trolley, and trams. Tallinn transport system comprises 57 bus lines, 8 trolley bus lines, and 4 tram lines that operate from 5 o’clock in the morning until midnight. The bus is the prevalent mode of transport in Tallinn, and the total length of the urban bus route is about 736 km, with 1132 bus stops (average number of stops per line is 18 with an average distance of 685 meters between stops). The average frequency of buses in the capital is about 16 minutes. Trolley buses are the second most developed mode of transport in the city: the routes are 71 km, with 128 trolley bus stations and an average distance of 560 meters between stops. The average travel time per kilometre is 2 minutes and 45 seconds, and the average waiting time for a trolley bus is 9 minutes. The tram lines are the shortest of the public service lines in the capital: the total length measures 34 km and the total number of stops is 66 (the average number of stops per line is 16) with an average of 530 meters between the stops. To cover one kilometre by tram the average transport time is over 3 minutes,
indicating that the tram is the slowest Tallinn’s transport mode when compared with bus and trolley systems.

Figure 6. Tallinn public transport routes

The city authority has undertaken a comprehensive investment program in Tallinn in order to modernise the transport fleet and improve the service (Figure 7).

Figure 7. Percentage of public transport investment in Tallinn per mean of transport

Source: Tallinn key figures, Tallinn City Council. UCL calculation.
Transport investment is the second highest expenditure in the Tallinn public budget (13% of total budget expenditure). We can observe (Table 2) that in 2008 transport investment was equal to 848 million Kroons, with an increase of 336 million Kroons since 2004 (a yearly average rate of investment increase of 15%).

Table 2. Tallinn local budget expenditure

<table>
<thead>
<tr>
<th>Tallinn Council</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Budget Expenditure</td>
<td>3639</td>
<td>3970</td>
<td>4351</td>
<td>5121</td>
<td>6254</td>
</tr>
<tr>
<td>Education</td>
<td>1512</td>
<td>1569</td>
<td>1724</td>
<td>1956</td>
<td>2344</td>
</tr>
<tr>
<td>Transportation</td>
<td>512</td>
<td>568</td>
<td>583</td>
<td>710</td>
<td>848</td>
</tr>
<tr>
<td>Social welfare</td>
<td>347</td>
<td>373</td>
<td>388</td>
<td>439</td>
<td>526</td>
</tr>
</tbody>
</table>

Source: Tallinn key figures, Tallinn City Council. UCL calculation. 'Amount Unit [Mio kr]

As Figure 8 shows, the largest part of expenditure in the public transport budget is targeted to the bus system which is the main service provision, but not necessarily the most attractive for Tallinn citizens. However, our figures represent the gross amount expenditure. If we look at the investment per route ratio, the situation is reversed: the main expenditure component per route is the tram (33 Mil. Kroons), and the trolley bus expenditure is second (24.9 Mil. Kroons). In the investment per route ratio the bus expenditure is third (10.4 Mio. Kroons).

Figure 8. Total amount of expenditure per type of public transport in the city of Tallinn

Source: Tallinn key figures, Tallinn City Council. UCL calculation.
The ratio of total passengers in relation to public transport lines is: 6.25 for tram service, 4.12 for the trolley and 1.09 for the bus service. This result can be seen as an index of transport preference where the tram, owing to a proper gangway thereby avoiding traffic jams, is the most preferable and effective mode of transport.

We have constructed a dataset of all possible journeys made from each district to several random destinations within Tallinn. This has allowed us to estimate the average journey length (origin to destination) of Tallinn inhabitants, which is on average 10 km, with an average journey time of 40 minutes. Commuters in Tallinn spend 25% of their journey time walking; the ratio between time spent waiting for the transport service and total journey travel time is very low (3%). Tallinn commuters are often forced to change their mode of transport in order to complete their journeys: we obtain from our analysis that a typical journey requires at least two changes of transport modes.

<table>
<thead>
<tr>
<th>O/D Matrix</th>
<th>Haabersti</th>
<th>Kesklinn</th>
<th>Kristine</th>
<th>Lasnamae</th>
<th>Nomme</th>
<th>Pohja</th>
<th>Pohja Tallinn</th>
<th>Mustamae</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habersti</td>
<td>2</td>
<td>14</td>
<td>9</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>4.5</td>
<td>5</td>
<td>39.5</td>
</tr>
<tr>
<td>Kesklinn</td>
<td>14</td>
<td>2</td>
<td>26</td>
<td>21</td>
<td>9</td>
<td>4</td>
<td>18</td>
<td>11</td>
<td>105</td>
</tr>
<tr>
<td>Kristine</td>
<td>9</td>
<td>26</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>43</td>
</tr>
<tr>
<td>Lasnamae</td>
<td>2</td>
<td>21</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>35</td>
</tr>
<tr>
<td>Nomme</td>
<td>3</td>
<td>9</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>Pohja</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Pohja Tallinn</td>
<td>4.5</td>
<td>18</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>29.5</td>
</tr>
<tr>
<td>Mustamae</td>
<td>5</td>
<td>11</td>
<td>3</td>
<td>1</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>26</td>
</tr>
</tbody>
</table>

We now calculate the generalized public transport cost in Tallinn by using data from the Tallinn city authority (2010). We follow for the analytical definition the guidelines given by the OECD (OECD, 2009). We consider the travel cost incurred by the average commuter who travels from district i to district j with mode m, the formula is given as follows:
\[ C_{ijm} = v_m t_{ijm} + d_{ijm} + u_m K_{ijm} \] (1)

Where:

- \( t_{ijm} \) is the travel time from district \( i \) to district \( j \) with mode \( m \);
- \( d_{ijm} \) is the travel distance from district \( i \) to district \( j \) with mode \( m \);
- \( k_{ijm} \) is the convenience of travelling from location \( i \) to destination \( j \) by mode \( m \), and it is estimated as a function of the number of transport modes necessary in order to complete the journey and the average waiting travel time;
- \( v_m \) value of time is the waiting travel time in minutes for mode \( m \), multiplied by the walking time in minutes to reach a randomly chosen stop weighted for the journey length in kilometres;
- \( c_m \) cost per kilometre which is calculated as the ratio between the cost of travel mode ticket and total route in kilometres for transport mode \( m \);
- \( u_m \) the inconvenience of travelling with mode \( m \) is estimated as the waiting time in minutes for mode \( m \), multiplied by travel time and walking time in minutes, weighted for the journey length in kilometres;
- \( K_{ijm} \) is the numbers of interchanges necessary to complete the journey from district \( i \) to district \( j \) with mode \( m \).

Figure 9. Public transport cost index per district in the city of Tallinn

Source: Tallinn City Council. UCL calculation.
The results are shown in Figure 9. The public transport cost index indicates that the Pirita district has the highest public transport cost index among the eight Tallinn districts, whereas Mustamae and Kesklinn have the lowest public transport cost index of the city.

In the previous section and in this section we have examined the urban land-use and transport systems of the city of Tallinn, we can now proceed in the analysis of our objective, which is the relationship between housing market and public transport.

4. **Public transport cost and the housing price**

We have observed that the economic downturn, between mid-2007 to 2010, was partly fuelled by the real estate speculative boom and bust cycle, and Tallinn suffered significant socio-economic impacts. However, if real estate values during the crisis have collapsed, to a large extent such a decrease in housing values was not homogenous across the entire city. In some Tallinn districts the housing price fall was steeper than in other districts. This non-homogeneous trend within the city districts was certainly due to the presence of different housing stock, accessibility to social and cultural amenities and lower public transport cost. Our attention here is focussed on the latter aspect, that is, the relationship between public transport cost and housing price. Our objective is to verify whether and to what extent districts with lower public transport cost experience a less steep decrease of housing price. Moreover, our aim is to demonstrate that during the economic downturn lower public transport cost was able to slow down the rate of the decrease of the housing price. Our assumption here is based on the concept that, because public transport is a mixed public good which requires large sunk investments, it may act as a cushion during a real estate price shock.

The study is developed through three incremental analytical steps based on three corresponding hypotheses.

1) Is public transport cost capitalized in housing price?
2) Do real estate prices decrease in districts with lower public transport cost?
3) Do districts with lower public transport cost have a less steep decrease in housing price during an economic downturn?
We conduct the analysis with a zoom-in approach by starting from an aggregate perspective of the city trends (Hypotheses 1 and 2) to the analysis of two specific districts (Hypothesis 3).

4.1 **Hypothesis 1: Is public transport cost capitalized in housing price?**

In order to assess if the public transport cost index capitalises on property values, we develop a hedonic price model of the Tallinn housing price (Rosen, 1982; Chiesura, 2004; McConnel and Walls, 2005; Debrezion et al., 2006; for literature review, see Cheshire and Sheppard, 1998). In our case we assume that the rent cost acts as a proxy for the real estate features and we calculate the hedonic price regression with ordinary least square analysis in the year 2009 and the model is formulated as follows:

\[
P_i = \beta^1 X_i + \beta^2 Y_i + \beta^3 C_i + \beta^4 T_i \quad \text{where } i = 1,...,8
\]  

Where:

- \( P_i \) is the housing price in district \( i \);
- \( X_i \) is the rent cost weighted on the housing stock district characteristics;
- \( Y_i \) is the index district amenity given by the sum of the number of social, cultural, health and leisure activities present in district \( i \);
- \( T_i \) is Tallinn land tax in district \( i \);
- \( i \) is the district of Tallinn.

<table>
<thead>
<tr>
<th>Dependent Variable: ( P )</th>
<th>( X )</th>
<th>( T )</th>
<th>( Y )</th>
<th>( C )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Coefficient</strong></td>
<td>2.11789</td>
<td>-0.584389</td>
<td>0.469522</td>
<td>-0.13053</td>
</tr>
<tr>
<td><strong>T-Ratio</strong></td>
<td>19.33</td>
<td>-3.711</td>
<td>4.357</td>
<td>-2.604</td>
</tr>
<tr>
<td><strong>Sum square residual</strong></td>
<td>0.09733</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>R^2</strong></td>
<td>0.97</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* all parameters are significant at 5%

UCL calculation.
Table 4 depicts that variable X, the proxy for housing characteristics, and variable Y, the index of district amenities, have a positive correlation with the housing price; whereas the land tax (T) and the public transport cost index (C) have a negative correlation. We are able therefore to verify our hypothesis that the public transport cost index is capitalized in housing price, that is, in a given district, as public transport cost decreases, housing price increases, and this relation in Tallinn is significant at a confidence interval of 5%.

4.2 Hypothesis 2: Do housing prices decrease in districts with lower public transport cost?

In order to test our hypothesis we estimate whether districts with lower public transport cost have a higher housing price than districts with higher public transport cost. We analyse the relationship between housing price and the public transport cost index.

\[ Y_i = \delta C_i + \varepsilon_i \quad i = 1 \ldots 8 \]

(3)

Where

- \( Y_i \) is the housing price in district i;
- \( C_i \) is the public transport cost index in district i;
- \( \varepsilon \) is the error term that we suppose to be i.i.d. \( N \sim (0, \sigma^2) \);
- \( i \) is the district of Tallinn.

The parameter \( \delta \) in equation (3) identifies the relationship between the dependent variable, housing price, and the independent variable, public transport cost index. For the period between 2007 and 2008 we calculate the rate of housing price change in the districts against the public transport cost index.

<table>
<thead>
<tr>
<th>Dependent Variable: (Y) Housing Prices</th>
<th>T.C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regressor</td>
<td></td>
</tr>
<tr>
<td>Coefficient</td>
<td>-0.1754519</td>
</tr>
<tr>
<td>T-Ratio</td>
<td>-14.51</td>
</tr>
<tr>
<td>Sum square residual</td>
<td>0.177212</td>
</tr>
<tr>
<td>R squared</td>
<td>0.96</td>
</tr>
</tbody>
</table>

\(^*\text{all parameters are significant at 5}\%\)

UCL calculation.
The result shows a negative relationship between the two variables and this implies that districts with a lower public transport cost index have a higher housing price (Table 5).

4.3 **Hypothesis 3: Do districts with lower public transport cost have a less steep decrease in housing price during an economic downturn?**

In order to test our third assumption, we compare two distinct districts, Haabersti and Mustamae, with similar district features (social, education, cultural, commercial and heath facilities, green areas, and average distance to the central business district) but with a different public transport cost index ($C_H > C_M$). In doing so, we evaluate whether the economic downturn had a greater impact in terms of housing prices on the district with higher public transport cost, i.e., Haabersti.

Between the crisis period of September 2007 and August 2008, the slope of the average housing price rate for the Mustamae district is smaller than the slope of the corresponding average curve for Haabersti, that is, the Haabersti curve is steeper than the curve for Mustamae (Figure 10). This implies that the housing price of Mustamae district was less vulnerable during the economic crisis.

**Figure 10** Average housing price rate in the districts of Haabersti and Mustamae

![Graph showing average housing price rate](image)

*Source: city24.ee, UCL calculation.*
In order to test hypothesis 3 we analyze the cross-correlation between the housing price of the two districts: Mustamae and Haabersti during three time periods:

1) Pre-Crisis (from December 2006 to August 2007)
2) Crisis (from September 2007 to August 2008)
3) Post-Crisis (from September 2008 to August 2009)

During the first period, the pre-crisis, we can observe a common trend of the housing price rate for the two districts, demonstrated by high correlation values.

Table 6. Correlation between Haabersti and Mustamae housing prices

<table>
<thead>
<tr>
<th>PRE CRISIS</th>
<th>CRISIS</th>
<th>POST CRISIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/2006</td>
<td>0.73024458</td>
<td>-0.189972874</td>
</tr>
<tr>
<td>01/2007</td>
<td>0.857174038</td>
<td>-0.945729096</td>
</tr>
<tr>
<td>02/2007</td>
<td>0.221916682</td>
<td>-0.63258887</td>
</tr>
<tr>
<td>03/2007</td>
<td>0.333646452</td>
<td>-0.244258097</td>
</tr>
<tr>
<td>04/2007</td>
<td>0.628844851</td>
<td>-0.222578775</td>
</tr>
<tr>
<td>05/2007</td>
<td>0.806680722</td>
<td>-0.43548576</td>
</tr>
<tr>
<td>06/2007</td>
<td>0.659445703</td>
<td>0.730768983</td>
</tr>
<tr>
<td>07/2007</td>
<td>0.710997109</td>
<td>0.643647928</td>
</tr>
<tr>
<td>08/2007</td>
<td>0.867804838</td>
<td>-0.28503342</td>
</tr>
</tbody>
</table>

During the economic crisis, the correlation between the housing price rates of the two districts become negative. This clearly indicates that the rate of the housing price in Mustamae, the district with a lower public transport cost, not only has a different rate of decline than Haabersti, but as depicted in Figure 10, it has a different behaviour during the crisis. In particular, in the period
between May 2008 and September 2008 we observe that the housing price rate increased rather than declined, as in the case of Mustamae.

We are able to show that Haabersti, the district with the higher public transport cost index, faces a steeper decrease in housing price during the economic downturn, whereas, Mustamae the district with a lower public transport cost index, experiences a less significant impact in relation to housing price fall. This allows us to conclude that in relation to these two districts, a lower level of public transport cost acts as a ‘dampening force’ on the housing price decline during the economic downturn.

5. Conclusion and policy recommendations

The global economic downturn has certainly shaken the market foundations of Estonia and its capital Tallinn, and this observation is particularly relevant when examining the real estate market. The real estate market is prone to instability and volatility with a cyclical behaviour that can influence the aggregate output (Wheaton, 1999). Our aim here has been to verify if transport may cushion the fall of the housing market during an economic crisis. We have provided several econometric tests and statistical analyses in order to ascertain the different perspectives from which we can examine our problem. The empirical evidence suggests that the public transport cost index has a positive effect on property values, in other words in districts where we have a lower public transport cost the housing price has decreased less than in districts with a higher public transport cost. Another important result that we have reached is that public transport in Tallinn is capitalized in the housing price in the city.

In this work we can thus far conclude that in relation to the real estate market, transport investments not only are capitalized in the housing price but are also able to reduce the impact of an economic downturn. We may therefore argue the importance of urban transport investment in a city like Tallinn. However, in order to implement a comprehensive public transport investment policy, it is necessary to address the problem of the financial sources.

In general, the cost of public transport investment cannot be refunded only through operational revenues so, in order to satisfy the criteria of investment feasibility, the theory of land value finance has been developed in order to accrue the increase in real estate value due to the transport investment (for a literature review, see Medda, 2009).
Given the results of our analysis, we suggest that the land value financing mechanism may be suitable as an earmarked tax toward transport investment. Tallinn has already implemented a land tax mechanism to capture the increase in property value within its legal and planning framework (see Appendix 1). Since our proposal is to dedicate part of the actual land tax revenue to transport investment, we expect the costs for the administrative and legislative implementation to be small in relation to the accrued revenue acquired through land value capture taxation (additional analyses are necessary to support this proposal).

As a result, Tallinn will have a new alternative financial source for transport investment, but another possible consequence of this fiscal reform may be greater acceptance of the land tax by the Estonian citizens. Estonia has confronted two fundamental concerns during the modernization of its fiscal system and the implementation of its land tax, firstly, the lack of a fiscal tradition among its citizens, and secondly, a culture of mistrust of citizens towards their government (Kornai, 1990; Tanzi, 1994). Therefore, the partial conversion of the land tax into an earmarked tax dedicated to transport investment may increase the tax acceptability and the transparency in its administration.
Appendix 1

Land Tax in Estonia

The Land Tax is a local tax implemented in July 1993. Between 1993 and 1996 the revenue of this tax was divided between the Estonian central government and local authorities, but after 1996 it became a local tax and the entire revenue was designated for the municipality and local budgets. Land tax is borne by the owner of the land or in some cases by the user of the land; the tax rate is between 0.1 and 2.5% of the annual assessment of the land value, and the tax rate is established by local government councils at the start of each taxation year.

The Land tax is paid on all land except: (1) where economic activity is prohibited; (2) land attached to diplomatic buildings or consular missions of foreign countries; (3) cemeteries and land used for places of worship; (4) land used by foreign countries or international organizations; and (5) land used by the headquarters of allied forces. Land Tax is not paid on land in municipal ownership or land in public use on the basis of local authority decisions.

Land is classified in relation to its use and its valuation differs for each of the four types of land:

- Urban
- Agricultural
- Forest
- Other

The Land Tax is a tax based on the value (estimated) of the entirety of Estonian land, and in particular, is defined by law as a land value tax where the market value of the plot is taxable. According to the Land Valuation Act the valuation target is “plots of land without buildings, forest, other vegetation or accessories situated thereon”. Only the land itself is taxable, any improvements (buildings and business activities) are ignored entirely, and land valuations are based on good practice: internationally-recognized principles of valuation immovable (such as the sales comparison method, capitalized earning method, cost method).

The estimated value has been determined in an agreement with the Land Valuation Act, with information received from the corresponding local government and the Estonian Land Board; the
assessment is a “periodic valuation⁴” carried out by valuators (nominated by central government) on the basis of real estate data transactions by zone⁵. The carrying out of an assessment is decided by the central government and in particular on the proposal of the Ministry of the Environment.

The assessed value of the land per square meter in a given zone is the taxable amount on which the tax rate is levied in order to ascertain how much the taxpayer should pay to the fiscal authority. Payment is made in three installments: on the 15th of April, July and October.

In order to facilitate the payment procedures and taxable amount calculation, central government with the help of Estonian Land Board, in 2002, developed an efficient cadastral system known as the Cadastral Information System (CIS), where landowners can access the exact taxable value of their land via internet. The Tax and Customs Board subsequently issues a tax notice of the amount due.

It is noteworthy that Land tax collection mechanisms and collection costs are borne by central government which then transfers the whole revenue to local authorities: land tax represent a cost for central government and has no advantage in economic terms; it is not paid to any specific local budget expenditure account but rather it is income for local authorities to use for their budget expenditures.

In Figure 11 among the local taxes, the Land Tax represents the largest portion of revenue among local taxes and as Figure 12 depicts, between 2000 and 2007 there was a steady increase in Land Tax revenue. According to the authors’ calculation, the average growth rate of revenue for local budgets

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⁴ Land Valuation Act, §4.
⁵ A value zone is a well defined area which has a similar value level and value formation mechanisms (Land Valuation Act).
derived from the Land Tax was about 7% a year. At present, the Land Tax is the most important local revenue in the budget: in 2008 Land Tax constituted 90% of all local tax revenue.
References


