

Quellenangabe für den nachstehenden Beitrag:

Jens-Martin Gutsche (2003): The Role of the Municipal Fiscal System in the Traffic Increase in Conurbations. In: Association for European Transport (Hg.): Conference Proceedings of the European Transport Conference, October 8th – 10th 2003, Strasbourg, France.

# **THE ROLE OF THE MUNICIPAL FISCAL SYSTEM IN THE TRAFFIC INCREASE IN CONURBATIONS**

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## **1. RELEVANCE OF THE FISCAL SYSTEM FOR TRAFFIC GENERATION IN CONURBATIONS**

### **1.1 Location decisions are traffic decisions**

The constantly growing volume of motorised traffic in conurbations continues to cause political dispute about how to find and pick the most suitable measures to be taken. A closer look at the driving forces behind the trend towards a more and more car-depend society leads to the conclusion that most of the decisions which are highly relevant to the transportation and mobility patterns in urban regions, are made away from the transportation sphere and mostly without any thought given to the traffic effects they cause.

As one of these areas of decision making the location choices of private households are of very substantial traffic relevance as they determine people's framework for daily transportation decisions (mode, distances) for as long as they live in the chosen location. Especially when purchasing a house or apartment, this period can be very long. Shortly spoken: location decisions are traffic decisions (even though oftentimes not all transportation implication are taken into consideration when making the location decision).

### **1.2 Interaction of municipal and private location decisions**

Households act as purchasers and tenants on the real estate market where supply and demand are in constant interaction. A lack of supply oftentimes leads to the construction of new housing developments. As an exemple, in the Greater Hamburg region about 13'000 new dwellings<sup>1</sup> are completed every year. In most cases, new developments rely on zoning decisions of the municipalities. People's places of residence in a conurbation are therefore not only the result of location choices by the households but also of zoning decisions by the municipalities. At the same time land use and zoning decisions of local authorities are reacting to the demands expressed on the real estate market.

If the location choices of households are of high relevance for the generation of traffic, and municipal zoning decisions have an influence on the locations offered by the real estate market, it is crucial for traffic planners to get a better idea not only of households' but also municipalities' motives for location decisions.

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<sup>1</sup> Not including federal and state social housing programs.  
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### **1.3 Relevance of signals sent out by the fiscal system**

Housing and transportation decisions are capital-intensive. Therefore, fiscal regulations play a major role in the decision making processes. The influence of signals sent out by fiscal regimes towards the private households and their traffic-relevant decisions have been subject to various studies in the last years.<sup>2</sup> In Germany a political dispute about the tax deduction rules for commuters and the federal aid for households building or buying new dwellings continues to make headlines.

Despite this focus on the private households the fiscal system also sends out signals for local land use decisions. Just as their citizens, also communities do react very sensitively to the financial effects their decisions have on their own budget. In a study on the Berlin-Brandenburg region in 1998 the author interviewed mayors and decision makers in local planning authorities in order to identify motives for zoning decisions.<sup>3</sup> Within a range of factors, including such soft but strong motivations as the prestige of being an “active and growing community”, one of the most important reasons identified was the financial component. Most communities have high profit expectations regarding new housing developments. While these expectations mostly refer to the additional revenue (e.g. income tax, federal subsidies and tax equalisation, ...) the estimations of possible additional costs (e.g. for schools and kindergartens) are oftentimes rather flux.

### **1.4 Desirable signals of the fiscal systems (from a traffic planner's point of view)**

Seen from a transportation planner's point of view it would be preferable if municipalities would - as far as possible - give preference to those locations for new developments where the needs of its future inhabitants (getting to work, doing shopping, getting the kids to school, meeting friends, ...) could be satisfied with the lowest possible amount of individual motorised transportation. Thus, the fiscal system should encourage municipalities to step back from highly traffic generating development projects and to favour other, more integrated developments. A predictable negative fiscal outcome of developments in very traffic intensive locations should make it easier for communities not to carry out a development project and let a neighbour community with less traffic generating locations on offer step in to provide the amount of new houses demanded by the market.

### **1.5 Research questions**

Since in the reality of German conurbations development request of investors are often approved by local authorities even though these projects generate enormous amounts of car traffic, this paper tries to answer the following questions:

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<sup>2</sup> E.g. Potter, S., Enoch, M. P., Rye, T. and Black, C (2001); Apel, D., Henckel, D. (1995)

<sup>3</sup> Gutsche (2000)

- What influences of the location characteristics of new dwellings on their residences' daily travelled distance by car can be measured? (section 2)
- What is the local fiscal balance (additional revenues minus additional costs) of a new housing development depending on its location? (section 3)
- What does the comparison of the empirical answers of the first two questions say about the role of the German fiscal system regarding urban sprawl and traffic increase? (section 4)

## **2. TRAFFIC GENERATION OF NEW DEVELOPMENTS**

### **2.1 Moving households as an empirical challenge**

The aim of this section is to determine the differences in the daily travelled distance by car by the residents of recently constructed dwellings that are caused by different location characteristics.

The influence of land use and transportation demand has been subject to different studies world-wide.<sup>4</sup> Despite that, predicting the average mobility pattern of households moving into a new setting by using data of standard national or regional household surveys<sup>5</sup> can lead to significant errors. In terms of the daily travelled distance by car the adaptation to a location by a households moving in can be very different from the average mobility pattern of the people already living there.<sup>6</sup> Especially in suburban communities newcomers oftentimes travel longer daily distances than long-time residences living next door. The difference comes with the stronger orientation (work place, friends, ...) of the newcomers towards their old environment, e.g. the core city.

### **2.2 Household survey and location evaluation**

Due to these uncertainties about the usage of average mobility data, the author carried out an own household survey in the Greater Hamburg region in 2000/2001. Its sample only consisted of households living in a new dwelling not older than 5 years at the time of the survey. In total, 4'127 people in 1'744 households responded to the questionnaire including a 24-hours-trip-protocol.

For each responding household the characteristics of the housing location were evaluated by using three indicators (figure 1). All three indicators are on a quantitative scale. The data was collected by using geographical information systems (GIS) and on-site analysis.<sup>7</sup>

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<sup>4</sup> A good overview can be found in: Wegener, M., Fürst, F. (1999)

<sup>5</sup> In Germany e.g. KONTIV (Kontinuierliche Erhebung des Verkehrsverhaltens) and SrV (System repräsentativer Verkehrserhebungen)

<sup>6</sup> Empirical evidence of this effect for the Greater Berlin region is described in: Geier, S., Holz-Rau, C. and Krafft-Neuhäuser, H. (2001)

<sup>7</sup> Documentation of the household survey and the housing location evaluation in: Gutsche (2001)

Therefore, each person in the sample could be characterised by the distance travelled by car on the day of the survey and the indicators of the location he or she lives in.

indicator	definition
macro location	weighted distances to work places and inhabitants in the region
micro location	number of shops, schools, kindergartens, play-grounds and public services within walking distance
public transportation	quality of public transportation (distance to stations, frequency of service, type of system)

figure 1: indicators of the housing location evaluation, source: Gutsche (2001)

### 2.3 Results

Linking the data from the household survey and the housing location evaluation leads to the results displayed in figure 2.

The categories (“high”, “medium”, “low”) used in the figure refer to specific intervals of the quantitative indicator values. “High” stands for “many work places close-by”, “many shops and schools close-by”, “good public transportation”.

All three factors have an influence on the average distance travelled by car per day and person by the residence of new dwellings. The strongest influence comes from the indicator “macro location”. This underlines the importance of a regional perspective dealing with communities’ motivations for land use and zoning policies.

Average distance travelled by car per day and person (6 years and older) depending on the location characteristics of their dwelling recently constructed in the Greater Hamburg region (2000/2001)

indicator “public trans- portation”	indicator “macro location”	indicator “micro location”		
		high	medium	low
high	high	11,3	11,3	-
	medium	-	-	-
	low	-	-	-
medium	high	11,8	11,9	12,1
	medium	-	-	-
	low	-	-	-
low	high	14,5	14,8	15,9
	medium	23,4	24,4	24,9
	low	24,0	26,9	28,3

Empty fields (“-“): combination of indicator values does not exist in the region

figure 2: average distance travelled by car per day and person (6 years and older) depending on the location characteristics of their recently build dwelling, source: Gutsche (2001)

## 2.4 Regional projection

In order to create a map of the intensity of the average traffic generation by new housing developments the indicators shown in figure 1 were collected on a region-wide level. Working on a grid basis of one square-kilometre each location in the Greater Hamburg region could be described by the three indicators (“macro location”, “micro location” and “public transportation”).

In a last step, a value for traffic generation intensity could be allocated to each grid field in the region representing the average kilometres travelled per day by residents of new dwellings corresponding to the residence location’s indicator values (figure 2). The allocation was calculated on the basis of ten value intervals for each indicator allowing a more gradual attribution of traffic generation values than displayed in figure 2, which only uses three intervals per indicator to facilitate the reading.

Figure 3 shows the traffic generation map calculated for new housing developments in the Greater Hamburg region. It is characterised by the following factors:

- The distance of a location for a new development from the conurbation's core has the strongest influence on the volume of motorised traffic it will generate.
- In the suburban belt the traffic intensity of new housing development located along the radial axes of development with central places and transit lines is slightly lower than of developments located in-between the development axes.
- Central places outside the core city show lower traffic intensity for new housing developments than non-central communities located at the same distance of the region's core.
- Locations with a good level of near-by services (schools, stores, ...) generate slightly less traffic than comparable locations without these services close by.
- Within the range of its service public transportation supports the effects of reducing the amount of individual motorised traffic caused by residences of new housing developments.

### Intensity of traffic generation by new housing developments

Estimated average distance travelled by car per day and person (6 years and older) by residence of recently constructed dwellings in the Greater Hamburg region

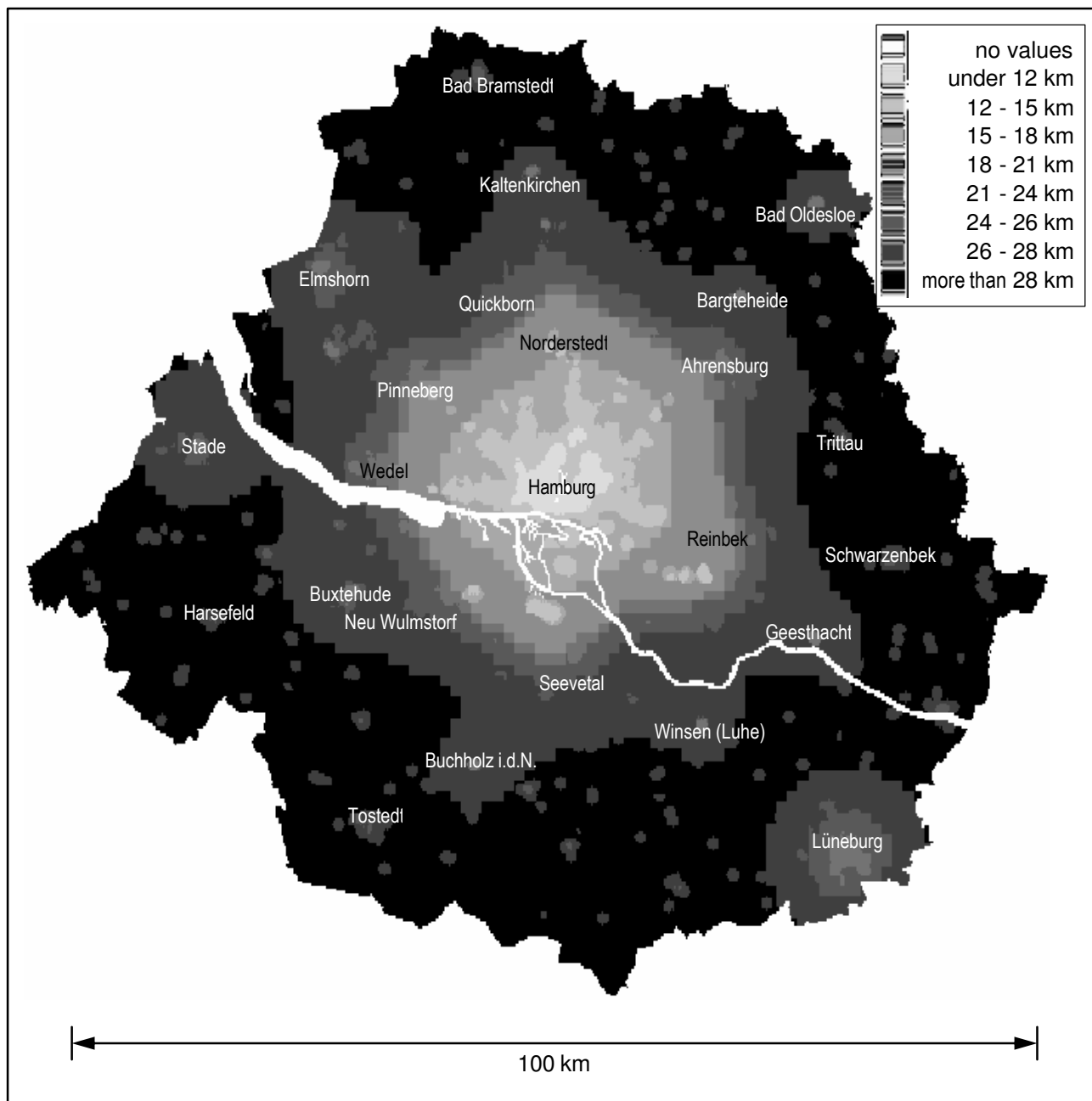


figure 3: estimated average kilometres travelled per day and person (6 years and older) by residence of recently constructed dwellings in the Greater Hamburg region, source: Gutsche (2003a)

### **3. LOCAL FISCAL BALANCE OF NEW HOUSING DEVELOPMENTS**

#### **3.1 Marginal analysis: To what extent does the next development pay off for the community?**

The underlying assumption of the research questions in section 1 is that the expected fiscal effect of a housing development has an influence on the zoning decision to be taken by the municipality concerned.<sup>8</sup> The fiscal balance of a new development therefore is interpreted as the economic “signal for action” sent out by the fiscal system towards the communities when taking zoning decisions.

Hence, the aim of this section is to draw a map of the fiscal balances of new housing developments in the Greater Hamburg region already studied in section 2. The fiscal balance of a new housing development is defined as the marginal benefit generated by the development (more tax revenue, more state aid) minus the marginal costs it causes (more local spending for schools and infrastructure).<sup>9</sup>

#### **3.2 Particularities of the municipal structure and local financing in Germany**

The outcome of a marginal fiscal analysis of new housing development strongly depends on the underlying administrative and fiscal structure in the region studied. With respect to the summarising nature of the presentation, in this paper only the following particularities of the municipal structure and local financing in Germany are highlighted:

- In comparison with other European countries, the municipal level in Germany is rather important in terms of its decisive power and its fiscal importance. Public spending of all German municipalities adds up to about 60% of the expenditure of the state level (Länder) and 55% of federal spending. The municipalities are in charge of land use planning and zoning within their jurisdiction with some restrictions coming from regional and state planning.
- Communities' revenues come from three major sources: taxes (45% including portions of the income, business and sales tax and the total property tax), user charges (15%) and state aid (40%).
- Depending on their size communities provide public services through different administrative structures. While bigger cities are in charge of all municipal services (schools, kindergarten, social security, health, ...), smaller and suburban communities belong to counties (Kreis) in charge of the more central municipal services. For providing these services the

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<sup>8</sup> In this context R. Wassmer speaks of “fiscalization of land use” which he applies to urban retail sprawl. See Wassmer (2001)

<sup>9</sup> Detailed documentation of the fiscal impact analysis in: Gutsche (2003)

member communities pay an allocation to the county. In addition, very small communities are sometimes members of a mandatory local authorities association (Samtgemeinde or Amt) also financed through allocations paid by the member communities. The allocations to be paid by a community to the county (and in some cases: to the mandatory local authorities association) are based on the community's revenues from taxes and state aid.

- In almost all German states (Länder) the communities participate in a system of tax equalisation (Kommunaler Finanzausgleich). Municipalities receive state aid as a function of their ratio of size, central function and tax revenue.

### 3.3 Model for estimating the fiscal balance of new housing developments in different locations

For estimating the marginal costs and revenues of a municipality caused by a new housing development a fiscal model was used (figure 4).

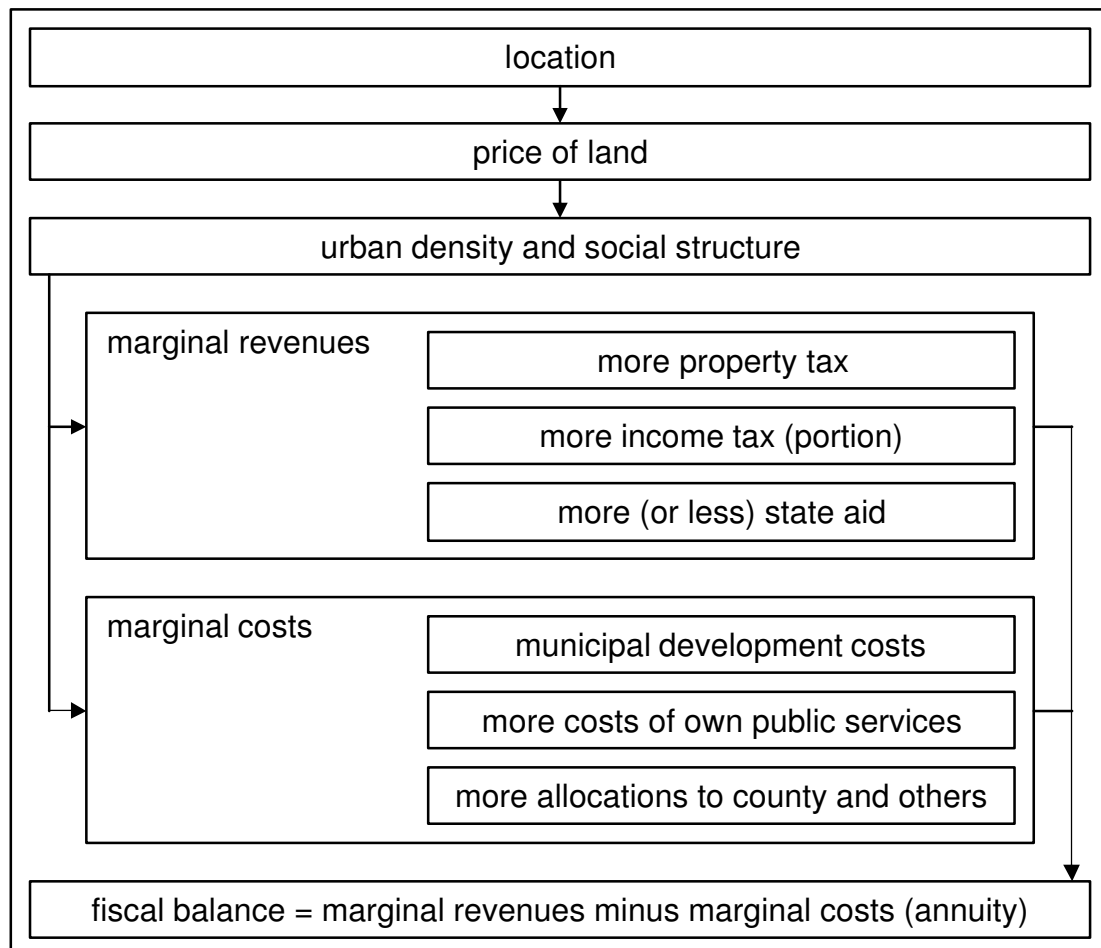


figure 4: model for estimating the fiscal balance of new housing developments for the concerned community as a function of the chosen location, source: Gutsche (2003a)

The model first creates an average housing development for the location analysed which it characterises by its urban density and the social structure of its future inhabitants (income, household size, number of children, portion of tenants and owners). Based on these parameters the model calculates the additional tax revenues, the effects of the development on the community's volume of state aid as well as the additional costs (development, public services, allocations). As almost all of these factors vary over time, the fiscal balance is calculated as an annuity over 25 years with a true interest rate of 4% p.a.<sup>10</sup> In addition, a reduced model version is used assuming the same density and demographics in all locations.

### 3.4 Results

The model described in section 3.3 delivers a fiscal balance for each location. In the analysis a map with a 100x100 metre grid was used. As the outcome varies with each location, the fiscal balances were classified into the following four categories:

- “High fiscal surplus”: local revenues greatly exceed local expenditures
- “Fiscal surplus”: local revenues exceed local expenditures
- “Almost no fiscal effect”: local revenues more or less match local expenditures
- “Fiscal deficit”: local expenditures exceed local revenues

Figure 5 shows the distribution of these categories to the locations in the Greater Hamburg region.<sup>11</sup> The core city, not belonging to a county, shows a high fiscal surplus in almost all locations within its border. In contrast to that, new housing developments in almost all locations in the suburban and hinterland communities being part of a county have no fiscal effect as their additional revenues and expenditures more or less match.

In some suburban communities new housing developments lead to a negative fiscal balances. Major reason for this result is the already relatively high level of annual tax revenue (income and especially business tax) of these communities, causing special tax equalisation regulations to capture most of each additional local revenue for county or state-wide redistribution. As these are particularities, the resulting balances are not used for further interpretations.

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<sup>10</sup> Shorter periods and higher interest rates lead to more negative annuities.

<sup>11</sup> The fiscal analysis in figure 5 contains a simplification in order to handle a particularity of the studied region. In reality, the City of Hamburg not only has municipal but also state status (Stadtstaat). Therefore, it additionally receives state taxes and has to provide state services (e.g. police, higher education, ...). As this is only the case for three German cities (Berlin, Hamburg, Bremen), the analysis displayed in figure 5 only takes into account the fiscal effects on the municipal level. In order to split off the state level, the fiscal characteristics of the City of Hanover (in another analysis version: City of Kiel), another big city and core of a comparable region in Northern Germany, are used for calculating the (purely municipal) fiscal balances for the location within the city limits of Hamburg in figure 5.

Fiscal balance of new housing developments for the municipality concerned

*Fiscal characteristics of the City of Hanover used for locations in Hamburg  
in order to split off the state level of the City of Hamburg*



100 km

- "High fiscal surplus": local revenues greatly exceed local expenditures
- "Fiscal surplus": local revenues exceed local expenditures
- "Almost no fiscal effect": local revenues more or less match local expenditures
- "Fiscal deficit": local expenditures exceed local revenues

figure 5: *fiscal balance of new housing developments for the municipality concerned, source: Gutsche (2003a)*

## 4. CONCLUSION: THE ROLE OF THE MUNICIPAL FISCAL SYSTEM FOR URBAN SPRAWL AND TRAFFIC INCREASE

### 4.1 Comparison of the empirical results: What a helpful signal from the fiscal system would be like

Figure 6 shows an abstraction of the empirical results of the sections 2 (traffic generation of new housing developments) and 3 (fiscal effects of new housing developments). The city region is simplified as a circle containing the core city in its centre and the suburban and hinterland communities around.

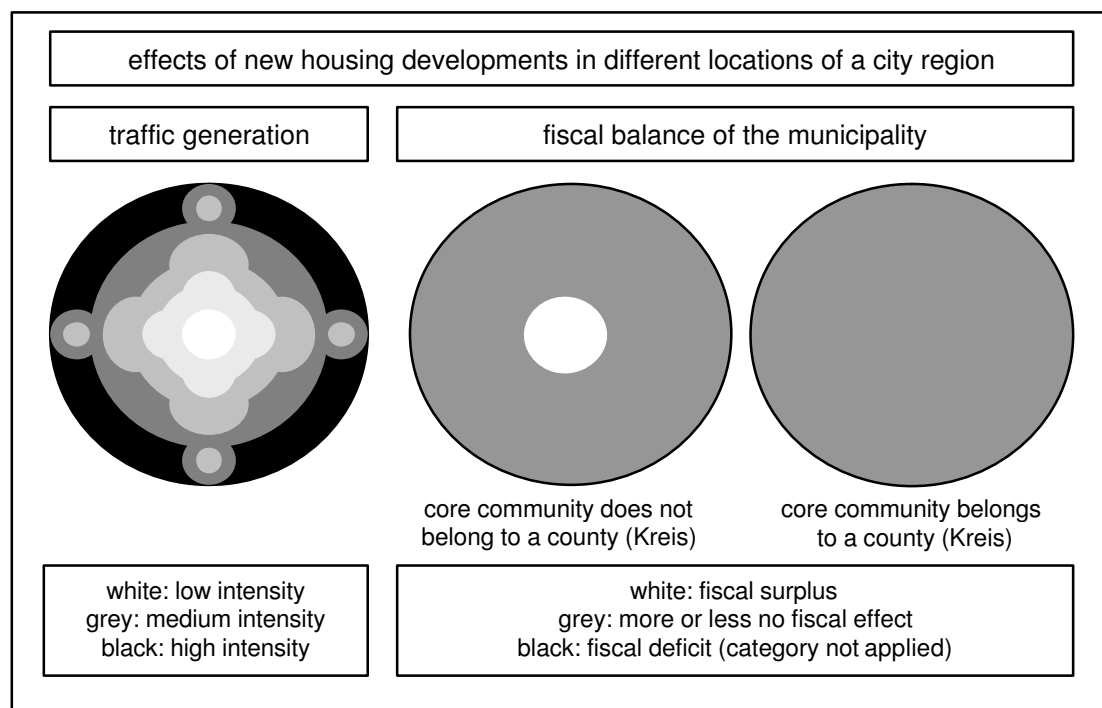


figure 6: abstracted results of the empirical analysis of the effects of new housing developments concerning traffic generation and local fiscal balances, source: Gutsche (2003b)

Looking at the "traffic side" of figure 6, a traffic reducing fiscal system would have to make new housing developments fiscally more attractive

- for the core city community than for suburban and hinterland communities.
- for suburban communities than for hinterland communities.
- for central communities than for non-central communities
- for communities with transit services and good social infrastructure than for communities without these services.

Concerning the absolute level of the fiscal balances, new housing developments should not be fiscally attractive in locations of high traffic intensity (especially non-central suburban and hinterland municipalities).

The results of the fiscal analysis show that the status quo does not fulfill these requirements. New developments are only fiscally more attractive in the core city if the central community does not belong to a county.<sup>12</sup>

The fiscal system creates no differences between all the locations in communities belonging to a county.<sup>13</sup> Therefore, the signals sent out toward the local planning decisions is the same to suburban and hinterland communities. Inside the counties no difference is neither made between central and non-central communities.

The signal to communities belonging to a county that new development have almost no fiscal effect neither encourages the central communities to develop their sites in order to respond to the demand on the real estate market, nor does it distract non-central communities from developing traffic intensive sites.

Over all, the spatial analysis shows that the signals sent out by the German fiscal system towards the communities when deciding about new housing developments and zoning policies contain aspects supporting a traffic intensive urban sprawl.

Despite that, the fact that new housing developments in the communities belonging to a county almost have no fiscal effect is a substantial argument and support for initiatives seeking a regional co-ordination of the communities concerning their zoning policies. One important aim of these initiatives is to reduce the volume of traffic generated by new housing developments. These co-operations oftentimes fail because the individual communities have high expectations regarding the fiscal surplus that new developments are supposed to generate. Thus, communities continue to compete for developers and new inhabitants. But as the results of section 3 show, in reality the amount in dispute (fiscal surplus of new developments) is generally much lower than expected.

At the same time, the discrepancy between the expected fiscal surplus and the real fiscal balance “close to zero” show another important influencing factor of the German fiscal system on the local planning process: Its signals are almost unreadable. In practice, it is almost impossible for members of the municipal councils to predict the fiscal effects of their planning decisions.<sup>14</sup> Especially the system of tax equalisation (Kommunaler Finanzausgleich), a time lag in the distribution of the income tax and the allocations to be paid to the county and - in some cases - mandatory local authorities associations

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<sup>12</sup> While this is true for most bigger core cities, some medium size core cities (e.g. Lüneburg) do belong to a county (Kreis).

<sup>13</sup> Except for the bigger core cities all communities belong to a county (Kreis). In the Greater Hamburg region only the City of Hamburg does not belong to a county while all other 272 communities displayed in figure 5 are part of one of the six counties surrounding Hamburg.

<sup>14</sup> This conclusion is not only the result of the empirical discrepancy between the expectations of municipal decision makers and the calculated fiscal balances but has also been the appraisal of different municipal treasurers in the Greater Hamburg region contacted during the analysis.

(Samtgemeinde or Amt) lead to an overestimation of the fiscal outcome of new developments.

Just as fiscal regulations provide major leverage to influence the traffic relevant decisions of private households (location of residence, commuting distance, modal split) the structure of the fiscal system has an important influence on municipal planning decisions shaping a region's traffic evolution.

Therefore, transportation planning has a substantial interest in a local fiscal structure,

- that sends out signals to the communities supporting the aims of a traffic minimising spatial structure, and
- that is transparent enough so that these signals can be understood and productively anticipated by the local decision makers.

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