The impact of land-division on long-term occupation –

the possibility of such a thing as ‘natural occupation’.

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Abstract:

Within space syntax, occupation on the urban level is usually studied as occupation in the continuous space we commonly refer to as the streetscape of cities. But cities obviously do not only consist of the continuous space of streets and squares, but also consist of the discontinuous space that we commonly refer to as blocks. On the level of the city, streets and squares can be primarily regarded as spaces for movement and blocks primarily as spaces for occupation. By extension, it can be explanatory to say that cities on the most fundamental level are spatial answers to the reconciliation between the two generic functions of movement and occupation. Regarding movement, Hillier et al. has formulated a most convincing and useful concept in ‘natural movement’.¹ To bring the generic function of occupation on a par with that of movement in the discussion on urban form, maybe we can use this concept as an analogy, asking ourselves what ‘natural occupation’ would be. If natural movement is “the proportion of movement that is determined by the configuration of space itself, rather than by the presence of specific attractors or magnets”,² it is proposed in this paper that ‘natural occupation’ could be “the proportion of occupation that is determined by the division of space itself, rather than by the presence of specific briefs or regulations”.

1. Introduction

1.1. ‘Natural occupation’

Within space syntax, occupation on the urban level is usually studied as occupation in the continuous space we commonly refer to as the streetscape of cities. But cities obviously do not only consist of the continuous space of streets and squares, but also consist of the discontinuous space that we commonly refer to as blocks. Obviously, both movement and occupation can be found within blocks, just as they can both be found in streets and squares. But it is equally obvious that, on the level of the city, streets and squares can be primarily regarded as spaces for movement and blocks primarily as spaces for occupation. By extension, I believe that it is explanatory to say that cities on the most fundamental level are spatial answers to the reconciliation between the two generic functions of movement and occupation.

I further believe there to be a strong argument for such an understanding within the theories of space syntax itself. Hillier points to the fact that the two generic functions of movement and occupation, generally speaking, are difficult to reconcile within one and the same space. Therefore, he continues, as buildings grow larger we generally find that different spaces are specialised for one or the other of the two generic functions. Put differently, as buildings grow larger we do not, as in smaller buildings, move from one room with a specific occupational use to another, but rather have specialised spaces for movement (corridors) connecting other spaces specialised for occupational uses (convex rooms). Now, what is the city if not the very largest building we have, and what is the system of streets and squares we generally refer to as public space if not a system of corridors primarily used for movement, and finally, what are the blocks of our cities with their different premises and properties if not convex rooms for different occupational uses?

Though Hillier’s argument that movement is the more influential of the two when it comes to the overall configuration of cities is most convincing, it does not leave the question of occupation as a generator of urban spatial form without interest, especially if we want to bring the internal spatial order of blocks into the picture. Regarding movement, Hillier et al. has formulated a most convincing and useful concept in ‘natural movement’. To bring the generic function of occupation on a par with that of movement in the discussion on urban form, I believe we can use this concept as an analogy, asking ourselves what ‘natural occupation’ would be. If natural movement is “the proportion of movement that is determined by the configuration of space itself, rather than by the presence of specific attractors or magnets”, I propose that ‘natural occupation’ could be “the proportion of occupation that is determined by the division of space itself, rather than by the presence of specific briefs or regulations”.

What seems essential here is what we mean by occupation. Usually we understand this on a rather specific level, but what is proposed here is that on the most fundamental level, urban space does not organise a variety of different human activities in cities, such as dwelling, work and shopping, but a single activity that all these other activities have in common, namely the activity of building. If this is reformulating what is understood as function in the form-function relation concerning urban form, I also think it necessary to reformulate what is

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understood as form. We normally look at space as something physically defined. On the urban level I believe it is relevant to question whether the important spatial level is the one that is physically defined. Instead I believe that for many urban issues it would be more productive with a shift in focus, from physically defined space to legally defined space. In so doing, we can immediately distinguish a clear spatial structure within city blocks, namely their division into different premises. Premises exactly are legally defined spaces for the right to build.

Thus I have tried to develop a tool aimed at analysis of space for occupation, where this space is legally rather than physically defined. Basically it is a measure of the ratio of premises per area unit, applied to selected parts of an urban context, such as streets or blocks. This variable I call capacity, as I see it as a tool to measure the capacity of urban form to carry differences. The assumption is that parts of cities with a high capacity are able to hold more occupants, in the sense of actors. I have used it as a counterpart to spatial integration, though it is obviously inferior both in theoretical support and empirical testing.

2. **The spatial capacity of Södra Hammarbyhamnen**

2.1. **The working area of Södra Hammarbyhamnen**

In a study in 1995 of a working area close to the city core of Stockholm called Södra Hammarbyhamnen, I found interesting correlations between the spatial division of land and the pattern of settlement within the area, which seem to have implications for the existence of a specific relation between what I have come to call spatial capacity and the frequency of actors, as well as the diversity among them. This makes the study of general interest and I will go into it in some detail before heading on to further studies of the same kind. The working area of Södra Hammarbyhamnen is located directly to the south of the city core of Stockholm, but is separated from it by a lake and canal called Hammarby Sjö. The area is thus disconnected from the city core to the north, as well as in other directions. Until recently the area was used solely by work places, ranging from small offices
and artisan and trade activities to light industries and warehouses. Thus the density of the area varied greatly, as well as the standard of the buildings located in it.

Figure 2. Södra Hammarbyhamnen.

For the study of the frequency of premises related to the frequency of actors in the area, I decided to do this per block rather than per street, in order to avoid any lack of clarity as to what street an actor belongs, since many of the premises border on more than one street.

2.2. Spatial capacity and primary actors

It came as no surprise that there proved to be a strong correlation between the frequency of premises, that is the spatial capacity, and the frequency of property owners, that is the primary actors in the area. Calculated for every one of the thirteen blocks in the area, the correlation value for this relation proved to be 0.867, meaning that blocks which had more premises per hectare also had more property owners per hectare.

Figure 3. Correlation of capacity (x) and primary actors (y).

This might sound self-evident and so it is, but to consider this relationship seriously and to acknowledge its importance for the fundamental character of urban areas is far from common or self-evident. On the contrary, I believe that the lack of recognition of this relation within urban planning and design in the 20th century, is one of
the major reasons why in recent years, when facing a growing demand for traditional urban qualities, we have not been able to recreate them.

The difference between urban areas where you can find many primary actors and areas where there are few, is nothing less than fundamental. However much we try to create diversity — meaning everything from architectural variation to diversity of social and economic content — within the same premises, there seems to be a homogenising effect that over time subverts such ambitions. The tentative theory to explain this effect, which we are about to check empirically, goes like this: Since premises can only have one owner they can only be subject to one economic strategy, while the same area divided into many premises can have many owners and therefore be subject to many strategies. Even if the strategy of the owner, in the case of the same premises, may aim for great diversity, such diversity, in the case of many premises, seems to be more or less a function of the spatial division of land itself.

2.3. Spatial capacity and secondary actors

When comparing the frequency of premises to the frequency of businesses renting floor space, that is secondary actors, from primary actors within the area, I got a correlation value of 0.544.

This is not a very strong correlation, but it is substantial. Furthermore, it is surprising since there is no obvious reason why more premises per hectare would imply more economic actors per hectare, especially since this does not include property owners. When I did include property owners — which seems reasonable since they are very important economic actors in an area such as this — I got a stronger correlation value of 0.600. The results seems to imply that the tentative theory formulated earlier on, that the division of land into many premises can bring many different strategies into an area and that this, in turn, can bring more secondary actors into the same area, has some substance.

When looked at in some detail, the results were even more convincing. Of the 13 blocks there were two, called Godsfinkan and Luma, that did not comply with the general pattern. Each of these blocks consisted of a set of premises, which meant that each block had one primary actor and consequently was subject to only one strategy. The character of this strategy would obviously have a great effect on the block as a whole. Both of these blocks proved to represent quite a new and different strategy for the area, the concept of the ‘office-hotel’. The idea is that the property owner not only offers floor space and basic services, but also more advanced services such as common reception facilities, a switchboard for telephones, a restaurant, auditoriums to let and so forth.
Consequently, when leaving these two blocks out of the comparison of spatial capacity and economic actors, I got a much stronger correlation than before. The correlation between the frequency of premises and the frequency of secondary actors among the remaining 11 blocks was no less than 0.881, and when also including primary actors 0.912. Though this is a small sample, the results must be regarded as remarkable and asked for further investigation in other working areas, to see if this pattern was found elsewhere.

2.4. Spatial capacity and economic diversity

The next step was to see if this also implied a correlation regarding the degree of diversity among the secondary actors. This promised perhaps to be the most important relation, since diversity is an urban quality much sought after. I found that the frequency of premises did have a correlation to diversity in the area. Calculated per block, I found that the frequency of premises correlated to the frequency of lines of business came to the value of 0.584. To be more specific, this meant that blocks with more premises per hectare to a fairly strong degree were blocks with more lines of business per hectare.

The two blocks Godsfinkan and Luma did not comply to the general pattern very well, but when leaving these out I once again got a remarkably high correlation value, of 0.869. This seems, as far as this study goes, to confirm that there was not only a correlation between spatial capacity and the frequency of primary as well as secondary economic actors, but also with diversity among these actors. Since diversity, at least since the
The publication of *The Life and Death of Great American Cities* by Jane Jacobs, has been one of the urban qualities most searched for, this finding seemed both interesting and promising.

3. **The spatial capacity of other working areas in Stockholm**

3.1 **Introduction**

*Even though Södra Hammarbyhamnen* represents a small sample, the strong correlation found here does, however, ask for further investigation. Consequently, I decided to look into other working areas as to see if the pattern was consistent.

3.2 **Kista**

*Kista* is the most recent of the working areas in my study. It was developed during the second half of the 1970s and was from the start very successful, as it soon managed to establish itself as the centre for high technology in Sweden, with renowned companies like IBM, Hewlett Packard and Ericsson choosing to settle there. This also implies that the area is very different from *Södra Hammarbyhamnen*.

To start with the relationship between the frequency of premises and the frequency of property owners, I again got a very strong correlation, which was expected. The correlation value is even stronger in *Kista* at 0.960 than in *Södra Hammarbyhamnen*, which implies that most property owners in the area own one set of premises per block. When it comes to the impact of spatial capacity on the frequency of secondary actors, the correlations are weaker than in *Södra Hammarbyhamnen*, being only 0.443, which makes it possible to detect a pattern, but not a very strong one. The value rose to 0.527, when I put primary and secondary actors together in the same group, to consider them as general economic actors in the area. Just as in *Södra Hammarbyhamnen*, we have two odd cases. Two blocks, called *Borg* and *Keflavik*, did not comply with the general pattern in the area. As in *Södra Hammarbyhamnen*, these blocks represent extremes, but each in its own way. *Keflavik* reminds us very much of the blocks *Godsfinkan* and *Luma* in *Södra Hammarbyhamnen*. *Borg* happens to be an extreme case in the other direction where five primary actors seem to have made a similar decision, thus diverging from our general theory that says that, the larger the number of primary actors, the more likely that at least some of them decide on a strategy that promotes many secondary actors.

When I left those two blocks out and calculated the correlation for the remaining 17 blocks, I got a considerably higher correlation of 0.728. This showed that the earlier pattern where a high frequency of premises — and therefore a potentially high frequency of economic strategies — implied a high frequency of secondary actors was also found in this area. This was gratifying, as *Kista* is a totally different kind of area, in regard to both its economic contents and built form. Yet the same pattern was found in both areas, implying that the spatial variable of capacity had a considerable impact on long-term occupation in both areas. The correlation value was even higher when calculating primary and secondary actors together, as economic actors in general. It then rose to 0.777.
Finally, it was interesting to see whether this consistency also applied to the diversity of lines of business among the secondary actors, as it did in Södra Hammarbyhamnen. Calculated for the whole population of blocks this proved to be so, though the correlation value was lower, 0.515, than in Södra Hammarbyhamnen. Leaving out the two blocks Borg and Keflavik, which diverged from the pattern earlier, gave a much better result, at 0.753. The pattern was consequently also to be found in regard to this relation.

3.3. Liljeholmen

Liljeholmen is an area in transition. Large parts have already changed from industrial to office use, while other parts currently face development for housing. This makes the area one with relatively large differences in use, density and building standard. This area proved to be the one that complied least with the patterns found in other working areas. The correlation between the frequency of premises and the frequency of property owners, which earlier on had proven to be most reliable, was still found, but to a surprisingly low degree, 0.474.

The results were even worse when I turned to the relation between frequency of premises and secondary actors. Here a pattern was simply not to be found. The correlation value was only 0.034, which was the same as saying that there was none. Grouping primary and secondary actors together did not help; it only brought the value up to 0.050. Looking at the scatter in more detail though, I found that six of the 12 blocks lined up almost perfectly straight, while three bifurcated in one direction and three in another. Looking only at the six in the middle, it turned out that these had an extremely strong correlation value of 0.984, when it came to the relation between...
premises and secondary actors, and was as strong concerning the relation between premises and lines of business, reaching 0.979. When adding the three blocks that seemed to apply a strategy of proliferation, I got a correlation between premises frequency and frequency of secondary actors of 0.595, which rose to 0.610, when primary and secondary actors were counted together. By leaving out the three blocks, which seemed to have a more conservative strategy, the pattern from earlier on was once again found. This also applied to the relation between premises and diversity in different lines of business, where the correlation was 0.708.

By then I had been manipulating the sample quite a bit. It seemed more reasonable to draw the conclusion that Liljeholmen did not comply with the general pattern as well as the other areas had done. The reason could be that it contained a number of unusual cases, or the situation of being in transition, from a working area with extensive industrial activities to a denser area with ‘office-hotels’, made the area inconsistent. Another possibility is that Liljeholmen was telling me that the spatial variable of capacity did not have the kind of general impact that I hoped for, or that if it did, it was not very robust.

3.4. Ulvsunda

Ulvsunda is located 7 kilometres to the west of central Stockholm and is relatively well integrated with the surrounding areas. The area retains much of the character found in Södra Hammarbyhamnen, with a basic mix of artisan and trade activity together with light industries, warehouses and some offices.

Starting with the relation between frequency of premises and frequency of primary actors, I found a clear correlation at 0.530, lower than expected. The fairly low result was due to a single block, called Pansarröret that consists of four premises owned by the same real-estate company. When leaving that block out, I got a very strong correlation of the sort we have come to expect, at 0.958. The correlation was also to be found at the next stage when I looked at the relation between the frequency of premises and secondary actors. The correlation value for this relation was 0.586 and rose to 0.647 when combining primary and secondary actors. The scatter had an even and convincing pattern. Four of the cases in the sample lined up very straight in a slightly different direction than the others, and when counting these out I got a very strong correlation value of 0.840, which rose to 0.889 when I counted primary and secondary actors together. When it comes to diversity among the secondary actors I found a clear correlation at 0.634. Here, too, the scatter was even and convincing with only one case dropping slightly out. By leaving this one out, I reached a correlation value of 0.799.

![Figure 14. Capacity (x) and lines of business (y).](image1.png)

![Figure 15. Capacity (x) and lines of business (y), leaving out two items](image2.png)
On the whole, Ulvsunda seemed to be a most consistent area that strongly confirmed the patterns found in Södra Hammarbyhamnen and Kista and to a certain extent in Liljeholmen. Ulvsunda was especially convincing since, together with Kista, it was the case with the largest sample (18 blocks) and showed strong correlations without any extreme cases being left out.

3.5. Vinsta

Vinsta is a working area developed in the 1950s and 1960s, during the grand housing development of the western suburbs of Stockholm. This gives it a character somewhere between the older working areas of Södra Hammarbyhamnen, Liljeholmen and Ulvsunda and the fairly new one in Kista.

The correlation between the frequency of premises and the frequency of primary actors proved to be clear and strong in Vinsta at a value of 0.952. Moving to secondary actors the correlation was not as good, with a value of 0.299 that rose to 0.341 when I counted primary and secondary actors together. Once again, there was a much stronger pattern hidden behind the distortions caused by one single block. This block, called Stenen, comprised one set of premises with a high number of secondary actors, given its size. If I left this block out, I got as strong a correlation as in the earlier cases, a value of 0.602, rising to 0.724 when counting primary and secondary actors together. The same was true when looking at the diversity among the secondary actors. With the whole population I got a value of 0.142, but when leaving Stenen out it rose considerably to a value of 0.539.

3.6. Conclusions

On the whole, these studies seem to confirm the impact of the spatial variable of capacity on the economic content of different working areas. Firstly, there was a strong correlation between the frequency of premises and the frequency of primary actors that is property owners. As I have repeatedly said, this is more or less self-evident. What was not self-evident, which the studies confirmed, was that this seems to imply a higher degree of different economic strategies in the area, which had the potential of bringing in more secondary actors, that is companies or other economic enterprises renting floor space from the primary actors. The studies confirmed that this had a strong impact on diversity within the area, in the sense that more secondary actors were found in different lines of business when the frequency of premises was high than when it was not.
4. Conclusions concerning the spatial capacity of five working areas in Stockholm

4.1. All the working areas taken together

We seem to have found the same patterns in all our working areas, though to varying degrees. Each of them, taken alone, constitutes a rather small sample varying between seven and 19 units, which makes it interesting to see how they would perform if taken together. We would then have a sample of 69 units, taken from five working areas of quite different character.

If for these 69 units we again start with the correlation between the frequency of premises and the frequency of primary actors, we get a value of 0.698. The fairly low value is due to the same block, Pansarröret that we encountered earlier in our study of Ulvsunda, with an unusual ownership structure. By leaving this block out, the correlation rises to a strong and clear one at a value of 0.937. This relationship has shown itself to be consistent and clear throughout the different areas and remains so when the areas are taken together. This is no great surprise, but constitutes the first step towards the emergence of other and more interesting patterns.

Figure 18. Table showing all the values for the different areas. (Within parentheses are shown the values when leaving some items out)

<table>
<thead>
<tr>
<th>S. Hammarby</th>
<th>Kista</th>
<th>Liljeholmen</th>
<th>Ulvsunda</th>
<th>Vinsta</th>
</tr>
</thead>
<tbody>
<tr>
<td>blocks (ha)</td>
<td>0.6 – 10.8</td>
<td>1.1 – 7.9</td>
<td>0.5 – 15.5</td>
<td>0.2 – 20.7</td>
</tr>
<tr>
<td>plots/block</td>
<td>1 – 6</td>
<td>1 – 10</td>
<td>1 – 11</td>
<td>1 – 15</td>
</tr>
<tr>
<td>plots (ha)</td>
<td>0.1 – 4.9</td>
<td>0.2 – 6.0</td>
<td>0.1 – 12.2</td>
<td>0.04 – 13.6</td>
</tr>
<tr>
<td>cap./prim. act.</td>
<td>0.867</td>
<td>0.960</td>
<td>0.474</td>
<td>0.530 (0.958)</td>
</tr>
<tr>
<td>cap./sec. act.</td>
<td>0.544 (0.881)</td>
<td>0.443 (0.728)</td>
<td>0.034</td>
<td>0.586 (0.840)</td>
</tr>
<tr>
<td>cap./p. + s. act.</td>
<td>0.600 (0.912)</td>
<td>0.527 (0.777)</td>
<td>0.050</td>
<td>0.647 (0.889)</td>
</tr>
<tr>
<td>cap./lin. o. bus.</td>
<td>0.584 (0.869)</td>
<td>0.515 (0.753)</td>
<td>0.131</td>
<td>0.634 (0.799)</td>
</tr>
</tbody>
</table>

Figure 19. Capacity (x) and primary actors (y).

The next relation is that of frequency of premises and secondary actors, where we get a pattern, though not as clearly as earlier on. The correlation value is 0.484, which is fair while not strong, but when looking more
closely at the scatter we find some bifurcating tendencies that make it less convincing. This changes when counting primary and secondary actors together. For one thing, the correlation value rises to 0.569 and for another, and perhaps more importantly, the scatter itself takes the shape of a more even and clear pattern, which is more convincing as a sign of correlation.

Figure 20. Capacity (x) and secondary actors (y). Figure 21. Capacity (x) and actors in general (y).

We should remember that we are now handling a large sample that we know contains some extreme cases. Above all, we have a group of blocks over-performing when it comes to the frequency of secondary actors. By leaving seven of these blocks out: Godsfinkan, Keflavik, Luma, Marievik, Stenen, Stora Katrineberg and Tryckeriet, which comprise about 10 percent of the sample, we get a considerably better correlation value at 0.630, which rises to 0.692 when counting primary and secondary actors together. It also gives the scatter a more even and collected shape, even though some bifurcating tendencies still remain.

Figure 22. Capacity (x) and secondary actors (y), leaving out seven items. Figure 23. Capacity (x) and actors in general (y), leaving out seven items.

For the final relation, that between frequency of premises and degree of diversity among the secondary actors, the pattern is better. Taking the entire sample, we get a correlation value of 0.578, which must be considered extraordinary considering that this is the whole sample of 69 cases. The value rises when leaving out the seven blocks mentioned earlier, to 0.679, but this still leaves one block that clearly diverges from the general pattern. If we also take this one out we get a very strong and clear correlation pattern in the scatter with the value of 0.745. When considered for the whole heterogeneous sample, there still is a strong pattern showing a correlation between frequency of premises, or spatial capacity, and diversity among the economic actors in the area.
It is important to point out that the inconsistencies found in the sample do not distort the general pattern at random, but that it is possible to discern other patterns. This is most interesting from an analytical point of view, since it makes it possible to look for an explanation for the inconsistencies. Generally speaking, most of the cases deviating from the general pattern adhere to the economic strategy called ‘office-hotels’. This is not a strategy that contradicts the tentative theory proposed earlier on, but rather shows that diversity can be generated within premises as well as between them; when left alone, however, the spatial division of land seems to have a strong impact in itself.

4.2. Conclusions

Having taken the five working areas together like this, I think it is possible to say that we have detected a general pattern within them, which connects a spatial variable to a social variable. The spatial variable of capacity, here defined as the frequency of premises per hectare, counted per block, clearly correlates to varying degrees, to the frequency of both primary and secondary economic actors, in the sense discussed earlier on, and furthermore, to the diversity among these actors. This seems to be of a great interest when it comes to spatial analysis, since it seems to be a relation that describes the impact of space on long-term occupation in an area. Since we are dealing with working areas with their very few regulations I believe we can speak about something resembling ‘natural occupation’, in that what seems to determine the distribution of occupation is the division of space rather certain briefs and regulation.

It is important to note that the degrees of correlation were not very robust though, in that they varied within the analysed areas as well as between them. A fundamental reason seems to be the inherently local character of this measure, which relies on values within the unit analysed. From this one can draw the conclusion that the variable of capacity could probably be developed into greater robustness and accuracy if one could find means to relate it to more global values. One obvious measure is integration. It seems promising to try to couple this measure to capacity in some way, since it seems likely that variations in degree of integration in the street system can influence the occupation ratios in the premises. To illustrate this, one possibility would be to represent the different premises by lines on an axial map. This would influence the overall integration pattern to a certain degree. Further, it would present the possibility of capturing in the same analysis not only movement, but also occupation. In this way it would be possible to relate the integration values in such an analysis to

Figure 24. Capacity (x) and lines of business (y).

Figure 25. Capacity (x) and lines of business (y), leaving out seven items.
movement, while the connectivity value — that is how many lines are directly connected to each line — would come very close to the number of premises along a line, which presumably would capture aspects of occupation.\(^8\)


Another and maybe more precise procedure would be to represent premises as added spatial elements to a street grid, as Hillier has done with retail units, Bill Hillier: ‘The Hidden Geometry of Deformed Grids: or, Why Space Syntax Works, When It Looks as though It Shouldn’t’, *Environment and Planning B* vol. 26, no. 2 1999, p.177.


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