The kind of problem affordability is – focusing on facts

By Fanis Grammenos

A report by Metro Vancouver (2015) prompted us to write an article on the question of housing affordability and, in response to it, a thorough and lengthy critique of it appeared shortly after.

The article tackled the question of affordability from the perspective of the report: the combination of Housing plus Transportation costs. It's been argued that such sum yields a truer picture of what the household burden is when living in a city district. It has also been argued that the H+T sum is more favourable for households in compact districts and cities. We found that the data do not support such a conclusion.

That finding provoked immediate and strong objections. The critique was centered around the following points:

1. Bias and errors in the data

The data could well be biased: they are drawn from the 2011 National Household Survey (NHS) by Metro Vancouver with a stated objective to answer three questions (quoting):

1. What is the effect on affordability when transportation costs are added to housing costs?

2. Do working owner and renter households have different cost burdens?

*3. **Are transit-oriented locations more affordable** for certain households when the combined housing and transportation cost burden is considered?*

They could also be biased due to an advocacy intent (quoting): *"The report is [..] timely as the region pursues an ambitious transit expansion program, which can be catalytic for **affordable transit-oriented communities**."* In essence, Metro Vancouver is looking for confirmatory results of a presumed effect, should they exist.

The data exclude working homeowners without a mortgage, or on a pension, a deletion that would likely result in higher median homeowner burden. Omitting any type of households without a statistical justification is not only unlikely to produce an objective picture but also undermines the research's trustworthiness. Such is the available material.

Not only the household sample in the data is edited, the transport cost data is also likely erroneous, and perhaps biased (chart 1). The costs are *derived,* not reported, and they are identical for homeowners and renters irrespective of income; they **vary by distance** from the city centre. Such data contradict US-based evidence, and from Vancouver itself, that shows a strong association between income and the use of transit and active modes. The income disparity between the two groups is too large for them to register identical transport costs. In addition, the renter income profile fits precisely the reported high transit user group.

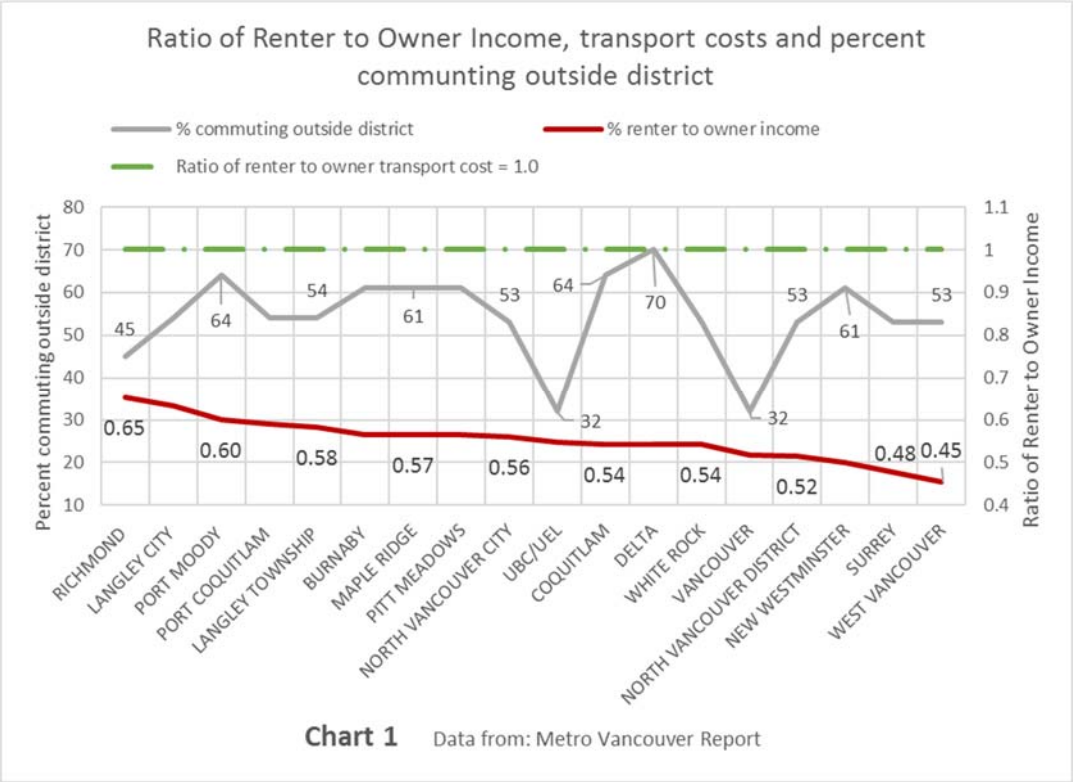


Chart 1 Data from: Metro Vancouver Report

Also, there appears to be measurable variability in commuting outside the district ranging from about one third to over two thirds, a fact that should influence the average commuting costs by district. Ignoring available socio-economic data and variability in the level of commuting undermines the value of any conclusions, particularly when the research is focused on the role of transportation on affordability. Such is the nature of the data in the report.

Alternative available data that include **all** households in each district show a good association between the ratio of owners to renters in a district and its transit mode share (Chart 2). The median income data point labels in the chart also suggest (but cannot prove) a decreasing transit use as renter incomes increase (a confirmation of previous research). Given this partial evidence, it would seem that the Metro Vancouver report data incorporate errors which may exaggerate the transport burden of renters and be biased toward central locations.

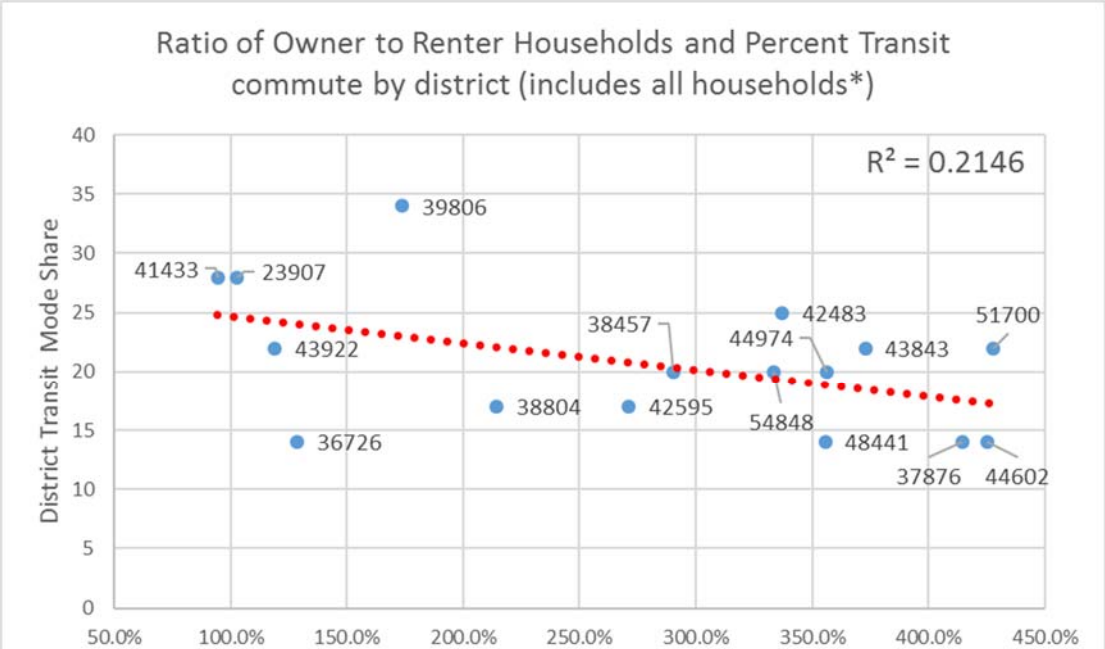


Chart 2 Ratio of Owners to Renters (Median Income labels in $)
Data from: Metro Vancouver Housing Data Book 2011

If the data is incomplete, selective and perhaps biased, as seems to be the case, it would be ill-advised to claim definitive conclusions about the H+T sum and its relation to compactness. Very little can be said without entering the speculative realm.

2.The “legacy” effect and its presumed distortion

Litman argues that the current value of old mortgage payments can produce a favourable but untrue picture of homeownership costs. The Vancouver report makes no reference to the legacy effect yet its data, indirectly, does take it into account, at least partially. By excluding working households that have paid off their mortgage, the median homeownership costs could conceivably be higher than if they were included. This assumption needs to be tested, due to other cost components.

Homeowners do spend a gradually decreasing portion of their income in mortgage payments due to inflation and nominal rise in income. However, the recorded NHS (2011) average housing costs for homeowners include municipal taxes (tied to property values), house operation, maintenance costs or condominium fees etc. These costs rise with inflation and would affect a homeowner’s housing burden. Consequently, while mortgage payments drop in relative terms, expenses rise and the net effect would be different at each stage of the mortgage history. If a choice is made to remove from the sample homeowners whose mortgage payments are low, a cut-off threshold for excluding data points would have to be set while taking into account all other expenses. This would inevitably pose questions about criteria and purpose for setting one. Such exclusion, would inevitably increase the complexity of the analysis many-fold. Until such analysis is done, it is fruitless to speculate or assert what results it would yield. No news without facts.

As it happens, the statistical complexity does not stop with "mortgage legacy", ownership costs and retirement income. Fuel prices vary monthly/yearly which induces variability in the annual transport expenses. In addition**,** previous research has shown that investment in vehicles varies among households according to income: from luxury cars to used, sub-compact sedans and to smart cars. Moreover, car owners modify their behaviour by driving less, ride-sharing or switching to hybrid/electric cars. Also, a growing number of workers telecommute, achieving transport cost reductions. The sum of these varied H+T expenses is a moving target from year to year, nearly impossible to trace and record accurately. The NHS takes a real-life snapshot that inevitably includes a mix of these variables*, without bias or advocacy intent*. It is unconvincing to hypothesize what the results would be, if different data had been collected. It would also be unhelpful to "manage" data without accounting for the bias it might introduce. But if in fact the "legacy effect" raises affordability for a measurable percentage of households, it could be viewed as a welcome indirect mechanism for improving general affordability, a positive, desirable vector, not as a statistical anomaly.

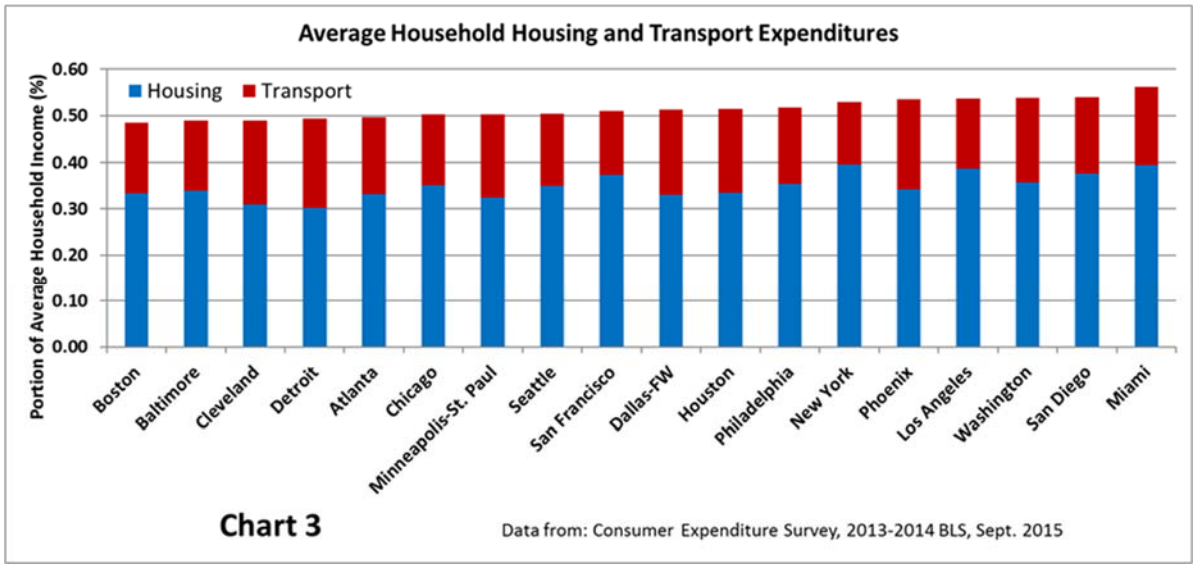
Unreliable as they may be, the report's transport cost data still show a common-sense association with distance from the city core – expected and meaningless. The central issue remains whether the **combined** H+T costs deliver affordability with respect to density or "compactness". The Metro Vancouver data include no density/compactness figures for its district municipalities; without them, it is unproductive to speculate about a correlation that cannot be computed.

So far we have seen that the report data is incomplete and could be biased in the direction of Litman's "legacy" hypothesis for homeowner housing costs and of inflating the transportation cost of renters. The former may exaggerate the median housing cost of owners and the latter inflate the median transport cost of renters. As such, and without density figures, the data does not permit any credible conclusions on the relationship between compactness and H+T burden in the Vancouver Region; contrary to assertions of evidence, it remains an open research task; speculation and incidental observations cannot fill this gap.

3. Extensive evidence – absent

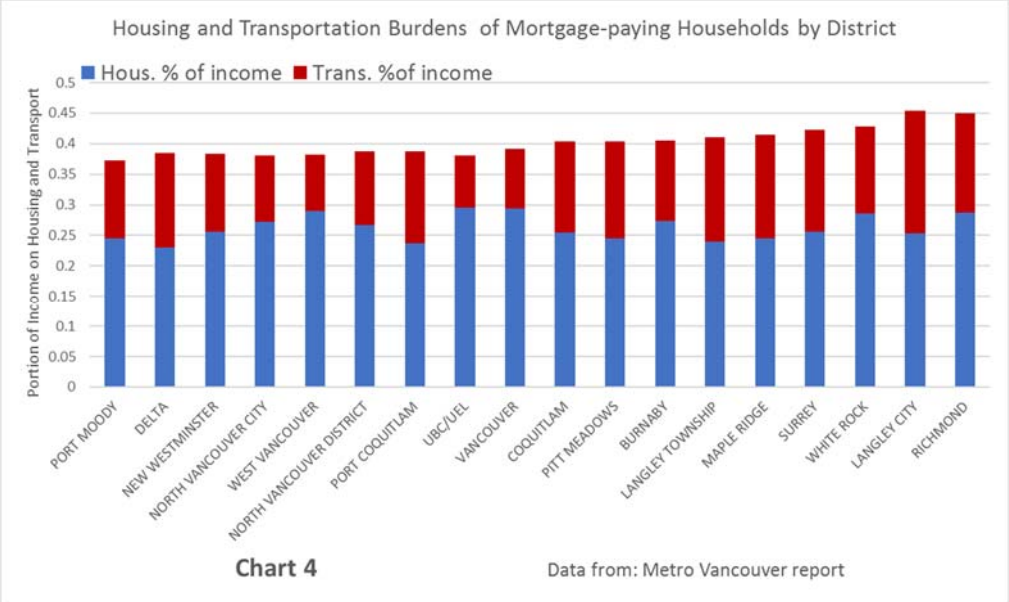
Litman advises us (quote) "there is overwhelming evidence [….] showing substantial transportation cost savings and increased affordability for lower income households that locate in compact and multimodal neighbourhoods" (i.e. the H+T equation).

A chart (3) posted elsewhere by Litman as evidence (recreated here with 2015 data) shows a progression of H+T cost burden but no correlation. One can observe instances where "familiar" compact cities show total burdens below the average (e g Boston, Chicago, Baltimore) and sprawled cities (e.g. Phoenix and Houston) above average. Contrary observations can also be made.



The lowest known compactness index city, Atlanta, shows values below average while New York, Miami and LA, both high compactness places, show high values. These contrasting, incidental observations provide no evidence of a general association, they simply reveal the complexity of the relationship.

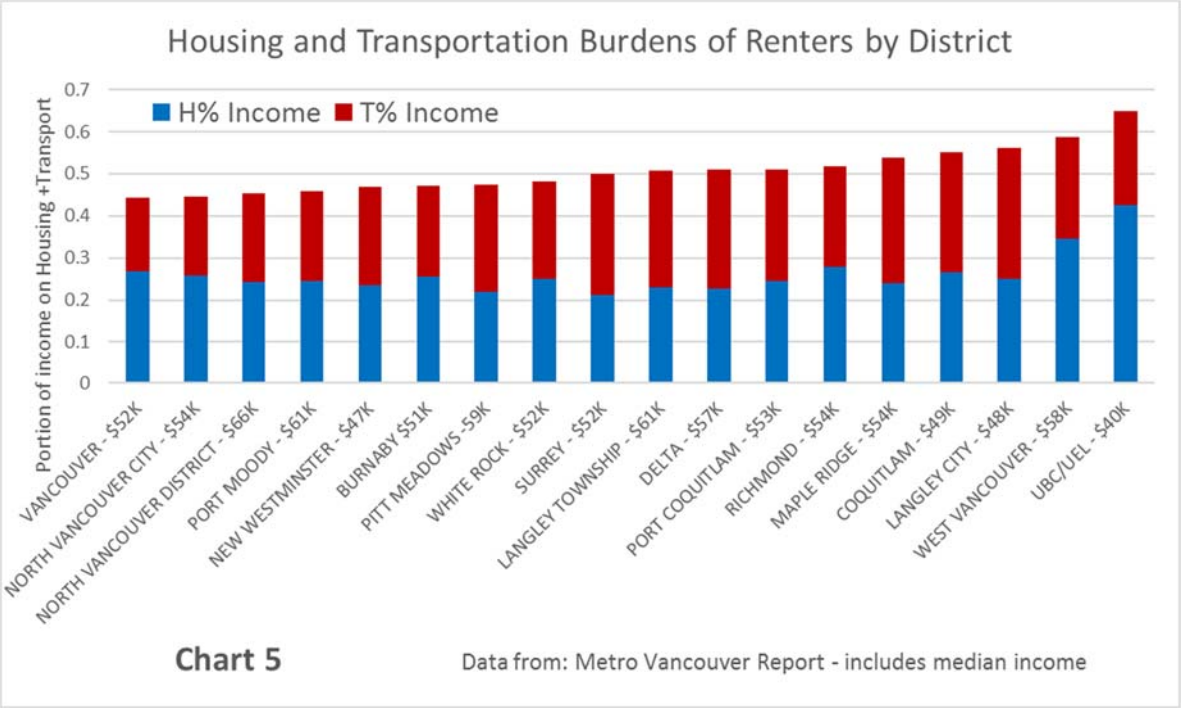
Ordering the Vancouver region's housing and transportation burden data in a similar manner, analogous observations can be made: some districts are sprawled and show below average H+T burden and others, equally sprawled, with high H+T values. The same goes for "familiar" compact districts (absent the density figures).



For example, we learn that (quote) "Port Moody [the lowest bar] and West Vancouver [the fifth lowest] are sprawled but **very affluent**" and that certain high H+T bars "belong to **lower-income** suburbs including Richmond [the highest bar], Burnaby and White Rock". A likely lesson from this

chart, after factoring income, would be that income is a significant predictor of total burden aside from density, which has yet to be shown as a reliable predictor. But a second unequivocal lesson is that, irrespective of income, the limited data set of mortgage-paying residents make the 45% "comfort" threshold of affordability no matter where they live. Density, distance and income mix in sufficient permutations to allow for this to happen.

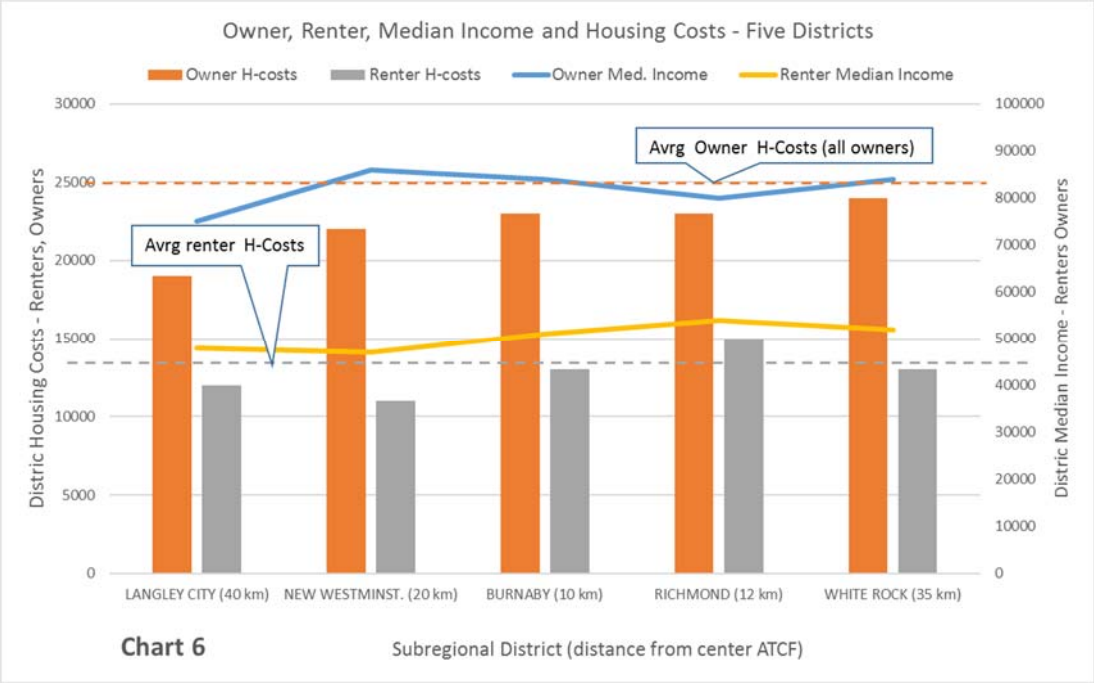
The renter H+T distribution by district allows for no conclusions either. The progression of total burden and variation in its individual components is as variegated as the owners'. Even with missing exact density figures, the chart invites interesting comparisons and questions.



UBC/UEL, for example (highest bar, chart 5), borders Vancouver and has identical transportation costs ($9000). Its rent costs are the highest in the region and differ by $3000 from Vancouver's (the lowest bar). If, as in this paired case, transport is not an active vector, can density explain the enormous difference in total burden between the two neighbours? We suspect not. Litman agrees (quote): "[It is] a university district with many **low income** students". Indeed, it has the lowest median income in the set, which easily explains its disproportional burden. In the opposite direction, Port Moody, an exurb, has average transport and above average rent costs yet it shows considerably below-average H+T burden. The explanation? An above average income – the second highest. Though we are looking for an H+T versus density association, we stumble on the importance of income as a determinant of burden.

Another income-related observation is shown in chart 6. Five of the 18 districts that register the five lowest housing costs, also report the five lowest incomes for homeowners and renters. Significantly, the income lines for both owners and renters mirror the housing cost bars. These districts are all suburban and exurban (their relative densities are not given). This example shows

an intriguing convergence of low housing costs and low incomes occurring in suburban districts. Can this convergence be explained by their density levels? What explains that Westminster has the lowest rent cost and income of this set and the second lowest of the 18 districts? Far more detailed analysis is needed to answer these and the main question of compactness vs affordability. These are essential questions when trying to understand the *structure* of a region.



4. Available statistical evidence about H+T

All explorations so far left us without a correlation between compactness and H+T and a number of questions. However, partial evidence toward an association does exist and is found in a table posted earlier by Litman, drawn from Reid Ewing's extensive study. It confirms a correlation between compactness and two variables (quote): "Each 10% increase in an (compactness) index score was associated with a 1.1% increase in housing costs and a 3.5% decrease in transportation costs relative to income." Given that the housing **burden** is on average over two times higher than the transport burden, the combined effect is not self-evident. The study authors did come to a conclusion about this effect: Residents in sprawling cities spent 52.1% of their income on housing and transportation in 2010, while those in compact cities spent 51.1% - a one percent gain.

Our analysis of data from the US CES (2015) revealed similar correlations: An increase in housing costs (R^2=0.3896) with compactness (chart 7) and a related reduction in transport costs of (R^2=0.53). When these costs are combined, however, there is a negligible, negative association to compactness (R^2= 0.042). We found average combined H+T cost of 52.1% of

income for more compact regions and a 50.6% for those with low compactness index (average 81.15 vs an average127.19 respectively for the high and low index regions). In both cases we have a trivial association not overwhelming evidence of an effect.

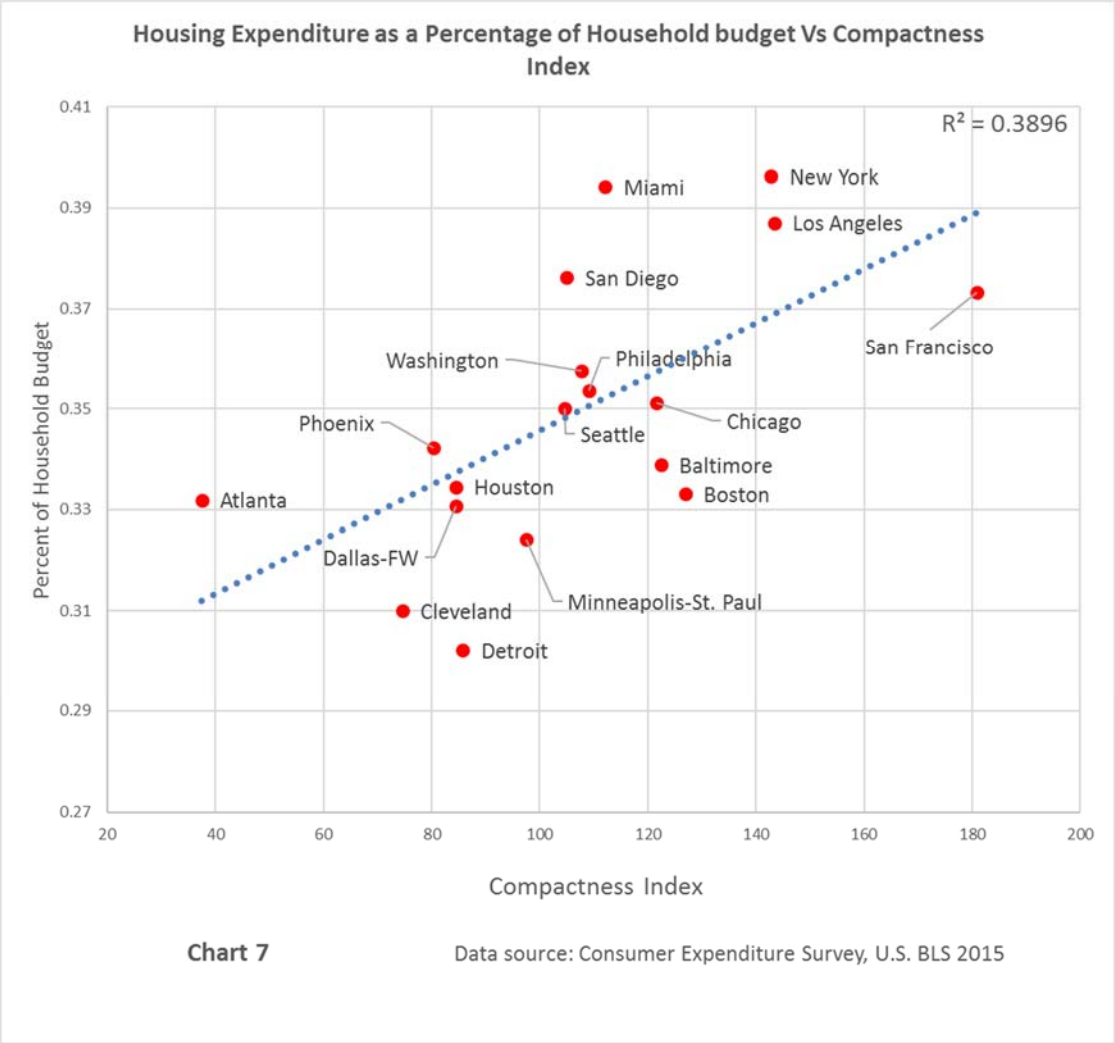


Chart 7 Data source: Consumer Expenditure Survey, U.S. BLS 2015

For more evidence, Litman draws our attention to the H+T portal. However, as it stands, the site appears as a vast shopping catalogue for choosing an affordable location in over 900 Metros. Its primary data of income and housing costs come form a CES just as in previous analyses. However, its transportation costs at neighbourhood level are *derived* not reported – perhaps an inevitable but risky option for generating unavailable data. A cursory scan through the site reveals places that are H+T affordable in low or high compactness districts with transit or without, just as in all previous studies and the Vancouver region. A conclusive summary from this enormous data set has not been reported. However, seeing that transport cost are calculated, potential findings from it, if they emerge, can be debatable.

Neither Ewing's findings nor our own are statistical breakthroughs, or are they rational grounds for an empirically-based policy. It is hypothesized that the difference between the two sets of results and the flip-flop of the correlation sign rests on the difference of housing and gas prices between the years that data were collected; a possibility. If true, **it increases** the uncertainty of the results and weakens their foundation for policy making. Gas prices and housing costs will always fluctuate; it is unscientific to have a "right" policy in the 50s, a different one in the 70s and yet another in the 2000s, each founded on oil prices. More importantly, whether the association is positive or negative becomes irrelevant when viewed in the light of its absent strength. A more solid foundation would be needed.

Since our quest centers on finding how density affects affordability, and if we assume for arguments' sake that density has a positive effect on it, it would be natural to ask what vector drives density. A recent analysis of 35 years of density trends in four Canadian metro's sheds favourable light on Vancouver's density progress. However, it does not explain the divergence between Vancouver and the other Metros. We need to look elsewhere for possible explanations.

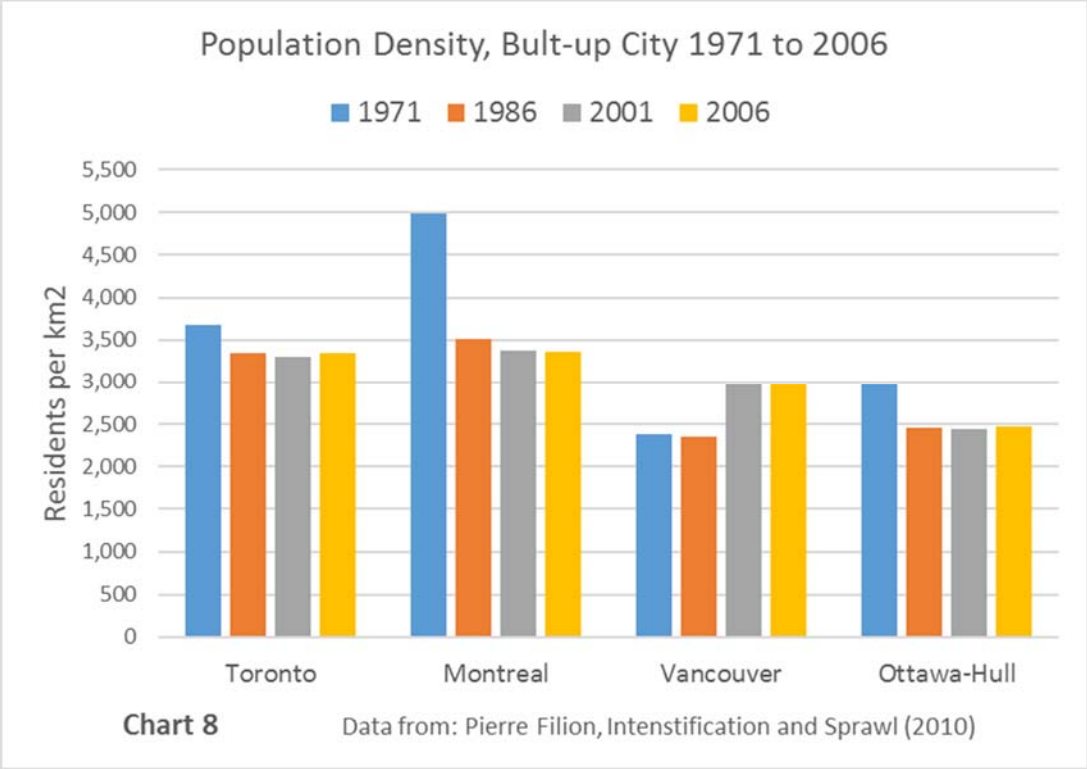


Chart 8 Data from: Pierre Filion, Intenstification and Sprawl (2010)

Vancouver is the only Metro whose density moved up in this period, having been the lowest up to 1986. If density in general is a positive vector for affordability, then affordability ought to have improved in Vancouver since 2001. Yet the opposite is true. The Metro Vancouver report lists Vancouver's housing costs as the highest among six major Metros in 2011.

The same report provides a probable hint about a factor that might have contributed to this position – lack of income growth (quote): "Median household income in Metro Vancouver has remained below $70,000 since 1990. The top income performers in the nation (Calgary, Edmonton, Toronto, Ottawa) began pulling away from Metro Vancouver in the mid-1990's." It now stands fourth in rank below Toronto and above Montreal, the lowest. One might speculate on the potential influence of income on the trajectory of density.

An analogous picture emerges at the Vancouver sub-regional level:

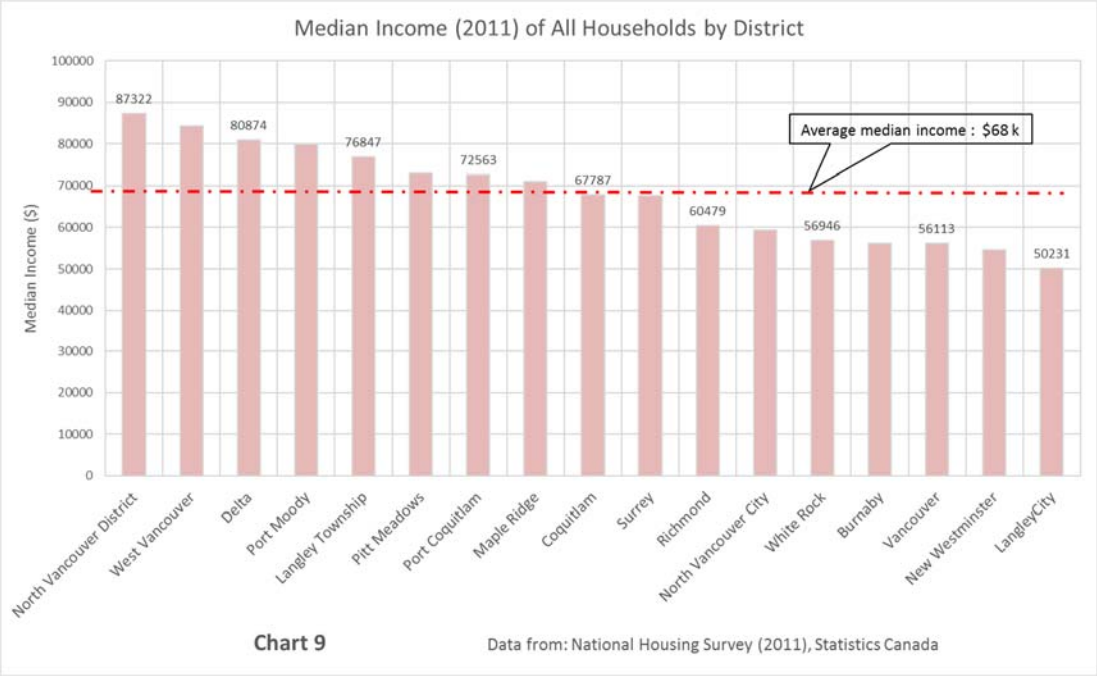


Chart 9 shows that all of the above-average income districts are suburban/exurban while among the below-average districts some are denser by comparison to their counterparts (e.g. Vancouver, North Vancouver City and New Westminster).

Again, as in the case of the national Metros, the question arises whether density levels are an outcome of a concentration of below average income households or whether other vectors induce an increase in density and the presence of lower income-rank households is a mere coincidence.

5. Purchasing a home

Litman raises the question about purchasing a home on a median income in the current market. As we saw in chart 6, there are at least five districts in the Region in which there is a concentration of moderate cost housing that matches below-average median incomes. As it happens, they are suburban/exurban ranging in distance between 10 to 40 km from the city center. Three of these are served by rapid transit, a fortuitous coincidence. If house prices escalate due to undecipherable (and uncontrollable) market trends, and if incomes remain

stagnant due to national or global pressures, inevitably, potential homeowners loose out and become tenants. Vancouver already holds the second place nationally, after Montreal, for the highest proportion of renters. No evidence exists that shows density generates more renters, which leaves us to speculate that renters (i.e. lower income households) may contribute to an increase in city density.

Summing up

The report data are edited, unreliable and could be biased. It also lacks density figures for the sub-regional districts. On this basis, no correlation can be drawn between compactness and H+T burden. Incidental, personal, paired observations are no substitute for a rigorous statistical analysis and therefore shed no new light on that relationship. The sub-regional level correlation remains an open research task.

At the regional level, this association has already been established on the basis of studies using US Metro data. It turns out too weak and subject to variance. No assertions can be based on it, much less planning policy.

The legacy effect may be a factor and have an effect on homeowner affordability and as such should be seen as a positive mechanism not a statistical abnormality. Its strength as a vector has yet to be calculated.

In exploring the influence of compactness on affordability we encounter the strong influence of income and a fundamental question. Income shows a far greater correlation to housing affordability and total H+T burden than compactness. This difference raises the question whether compactness is an outcome of income levels. Such a relationship is in fact conceivable, as social studies of cities suggest.