Imperial College London

The Option Value of Active Mobility: House Prices and Journeys to Work in Auckland City

Prof. Tim Hazledine from the Economics Department of University of Auckland

Wednesday, 06 October 2010 - 16:00

Location: Room 610, Skempton (Civil Eng.) Bldg, Imperial College London

Abstract
About ten percent of the journeys to work (JTW) by residents of Auckland City are by an "active" mode -- walking or cycling. In this seminar firstly econometric model of the propensity to choose active JTW modes, using 2006 Census data at the local suburb level, is presented. Then, the links between the active JTW and property values is explored. The actual propensity for active JTW as a regressor in a hedonic house transaction price model reveals a negative effect. But when socio-economic and other demand-side factors affecting mode choice are controlled, the resulting "supply-side" effect is strongly positive; implying that a one standard deviation in the attractiveness of active JTW is worth about 10% of the average house price. This is a very considerable effect, given the quite small proportion of JTWs that are actually walked or cycled. It implies either that it is the option value of being able to conveniently walk or cycle that is valued in the housing market, and/or that urban form features conducive to active trips are also valuable in their own right.

Biography
Tim Hazledine, a New Zealander, is a Professor at the Economics Department of University of Auckland. Previously, he has taught at the University of British Columbia, Queen's University Ontario, Balliol College Oxford, and University of Warwick from where he received his PhD. In recent years his research has focussed on pricing and competition in airline markets. His current interests are agglomeration economies and related urban transport issues.

The Option Value of Active Mobility: House Prices and Journeys to Work in Auckland City

Tim Hazledine

Economics Dept

University of Auckland Business School

Joint work with Stuart Donovan, MRC (from study prepared for NZTA)

GIS data supplied by Kim Ollivier

t.hazledine@auckland.ac.nz

Abstract

- About ten percent of the journeys to work by residents of Auckland City are by an "active" mode -- walking or cycling. The paper first reports econometric modelling of the propensity to choose active JTW modes, using 2006 Census data at the local suburb level. Then, the link between active JTW and property values is explored. Including the actual propensity for active JTW as a regressor in a hedonic house transaction price model reveals a negative effect. But when socio-economic and other demand-side factors affecting mode choice are controlled for, the resulting "supply-side" effect is strongly positive, implying that a one standard deviation in the attractiveness of active JTW is worth about 10% of the average house price. This is a very large effect, given the quite small proportion of JTWs that are actually walked or cycled. It implies either that it is the option value of being able to conveniently walk or cycle that is valued in the housing market, and/or that urban form features conducive to active trips are also valuable in their own right.

Outline of talk

- General context: valuing urban form
- Specific context: the journey-to-work (JTW) mode choice decision in Auckland City
- The specific question: *Is the attractiveness of active JTW modes (walking, cycling) worth something to city residents?*
- We answer this question, even though we currently have no actual urban form data!
- We infer that what we call "Active Mobility" is worth **a lot** (*ca.* $50,000 per house)
- But that doesn't necessarily mean we need more of it

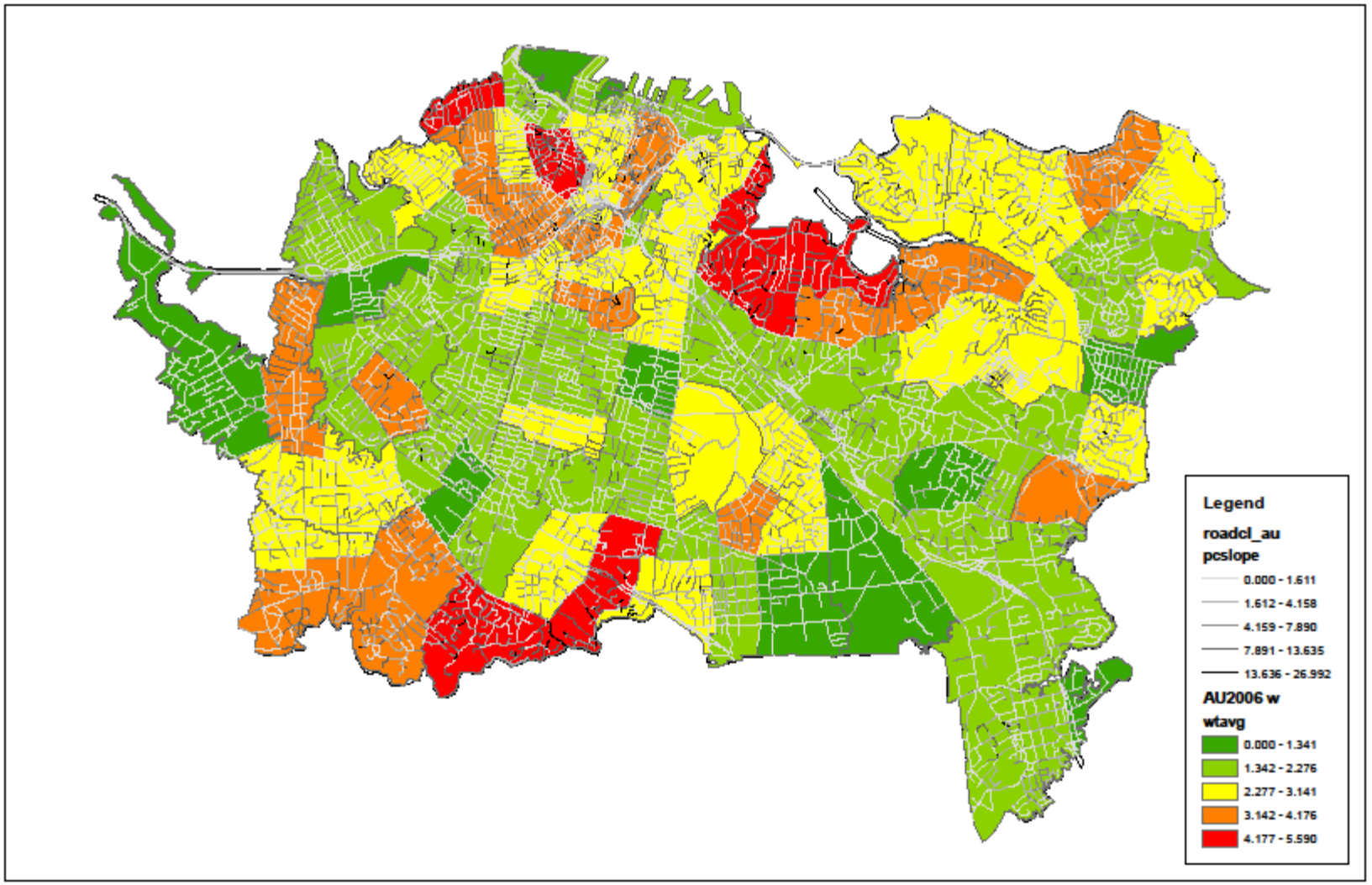
The research literature context

- Three literatures involved here:
- (a) Defining, measuring "urban form"
- (b) Hedonic house or land price modelling, which may include urban form measures or proxies
- (c) Travel determinant studies, including mode choice

- Our contribution is to link (b) and (c), though it would be nice to have input from (a) as well.

measuring "urban form"

- I found that the planning and urban design literature has developed cogent protocols for specifying dimensions of urban form that can be quantified and applied by trained field researchers
- Eg: Ewing & Hardy: *imagability/legibility/enclosure, human scale/ transparency/ linkage/ complexity/ coherence*
- NZTA :"The Seven Cs" -- *context/ character/ choice/ connections/ creativity/ custodianship/ collaboration*
- Cable: *character/continuity & enclosure/ quality of public realm/ease of movement/ legibility/ adaptability/ diversity*
- But not yet implemented for Auckland City, alas



Sources: Corax Mobile, Dept of Statistics
Zenbu POI, QVNZ, OpenGPS, LINZ
Projection NZTM 24 Sept 2010

0 1,050 2,100 4,200
Meters

1:84,036

Urban Form

Weighted Average Slope per AU of roads between intersections

Valuing good urban form

- Literature survey: searched *EconLit*
- Keywords= "urban form" in Abstract
- Get 146 catches
- Reviewed all of these
- Found 40 which related transport and urban form, of which:
  - -- 2 examined impacts of urban form and transport factors on property values
  - -- 30 examined determinants of transport behaviour, mostly use of vehicles or public transit

Valuing good urban form

- Song & Knaap (JUE, 2004) perhaps the most impressive study
- In the spirit of the "New Urbanism", they estimate a model of house prices in Portland, Oregon
- Use GIS methods to quantify urban form dimensions
- Find that : "*some but not all features of the new urbanism provide benefits for which urban residents are willing to pay*"
- "Walkability" (% of neighbourhood homes within one quarter mile of commercial uses and bus stops) is positive for property values

Modelling Active Journeys to Work in Auckland City

- We use data from the March 2006 Census of NZ
- At the "Area Unit" level (AU = suburb, average population around 4,000)
- 100+ AUs in Auckland City; 330+ in all four cities that are part of the Greater Auckland region
- The following table shows the proportions of the various JTW choices in Auckland
- (note that Auckland City is more densely populated than the other three cities)

Modelling Active Journeys to Work in Auckland City

JOURNEY TO WORK MODE SHARES, AUCKLAND CITIES, CENSUS DAY 2006						
	CAR	TRAIN	BUS	WALK	CYCLE	AT HOME
OTHER AKL CITIES' MODE SHARES	0.840	0.011	0.038	0.030	0.007	0.073
AKL CITY'S MODE SHARES	0.734	0.012	0.087	0.078	0.014	0.076

Modelling Active Journeys to Work in Auckland City

Define: Akij = probability that person k living in Area Unit i, and working in AU j walks or cycles to work

Then test: Akij = f(Dk, Ui, Uk, DISTij)

Where Dk is the set of socioeconomic characteristics of k and of k's household; Ui and Uj are the sets of relevant urban form characteristics of i and j (inbetween?); and DISTij is the trip length

Unfortunately, we don't have any U measures....

Modelling Active Journeys to Work in Auckland City

- Model differences in AU-average values of "active" JTW (= sum of walking and cycling mode choice shares) in terms of AU-average values for
- JTWDIST: distance to work, kms
- MVH: number of motor vehicles per household
- AGEMED: median age of AU residents
- PAKEHAR: proportion pop'n white ("pakeha")
- SMOKERT: prop'n smokers
- MALER: prop'n male
- WHITECOLLAR: prop'n in white collar jobs

Dependent Variable: WALKR+CYCLER
Method: Least Squares
Date: 10/04/09 Time: 14:40
Sample: 1 351 IF RURAL<1 AND AC=1
Included observations: 101

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.148810	0.213133	0.698203	0.4868
JTWDIST	-0.016441	0.004211	-3.904504	0.0002
MVH	-0.294707	0.022718	-12.97224	0.0000
AGEMED	-0.004274	0.002291	-1.865393	0.0653
PAKEHAR	0.078761	0.072348	1.088642	0.2791
SMOKERT	-0.397200	0.209653	-1.894554	0.0613
MALER	1.059010	0.276441	3.830876	0.0002
WHITECOLLAR	0.228820	0.136187	1.680190	0.0963

R-squared	0.864184	Mean dependent var	0.097875
Adjusted R-squared	0.853962	S.D. dependent var	0.108578

Modelling Active Journeys to Work in Auckland City

- Results: quite good R2 for a cross sectional model, but not particularly high coefficient significance levels
- Less likely to walk or cycle to work if
  - Live further away from job
  - Household has a lot of cars
  - Older
  - Smoke
- More likely to walk or cycle to work if
  - Male/white/white collar worker
- Note that adding household income to the model contributes nothing
- Beware endogeneity issues...

Modelling property prices

- Now we move to a database (from Quotable Value NZ) recording characteristics of every property sale in Auckland City 2004-06
- More than 11,300 residential property sales
- We will be looking for evidence of an impact on house prices of active journey-to-work factors
- Striking results: actual active JTW is negatively related to property prices, but the attractiveness of walking or cycling is strongly positive for prices

Modelling property prices

- Following Bourassa *et al* (2004) and Samarasinghe & Sharp (2008)
- Specify "hedonic" model to explain actual property sale prices in terms of various features of the property (land area, building characteristics), of the location (views, distances to valuable places, and, if we have them, of the neighbourhood (including urban form as well as social and demographic factors -- though beware of endogeneity with these)

Modelling property prices

- Follow the models on the handout
- Page 6 has a fairly standard hedonic model
- Page 7: add in Active JTW% -- **negative coefficient**
- But this variable does not control for personal/household demand-determining characteristics
- That is, we could have two people, neighbours, and working in the same part of the city, with different tastes for walking or cycling, and so with different JTW choices
- We'd like to control for these taste (demand) factors, so that differences in JTW can be attributed to urban form and other supply-side determinants

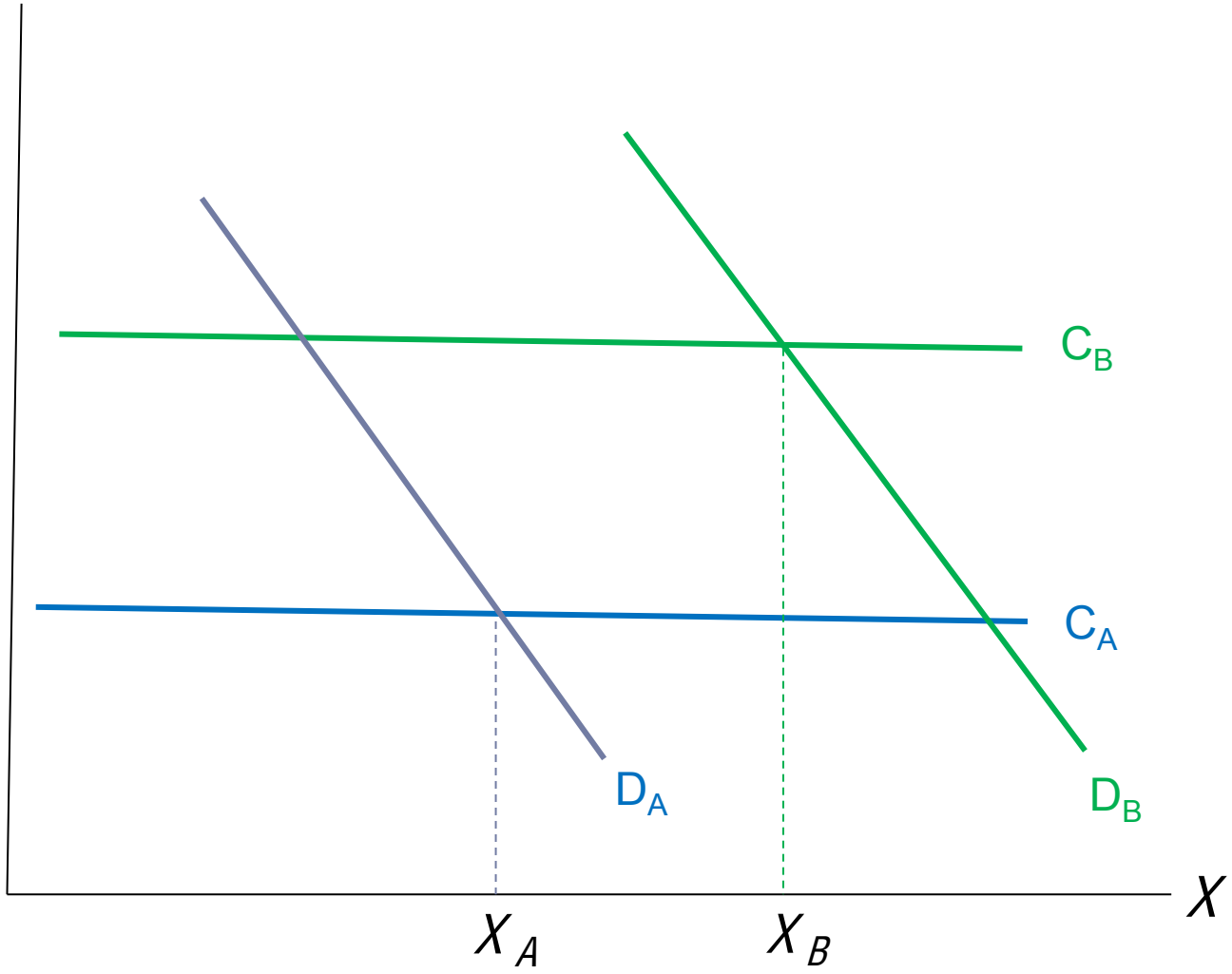


Fig 1: Actual Share Active-JTW

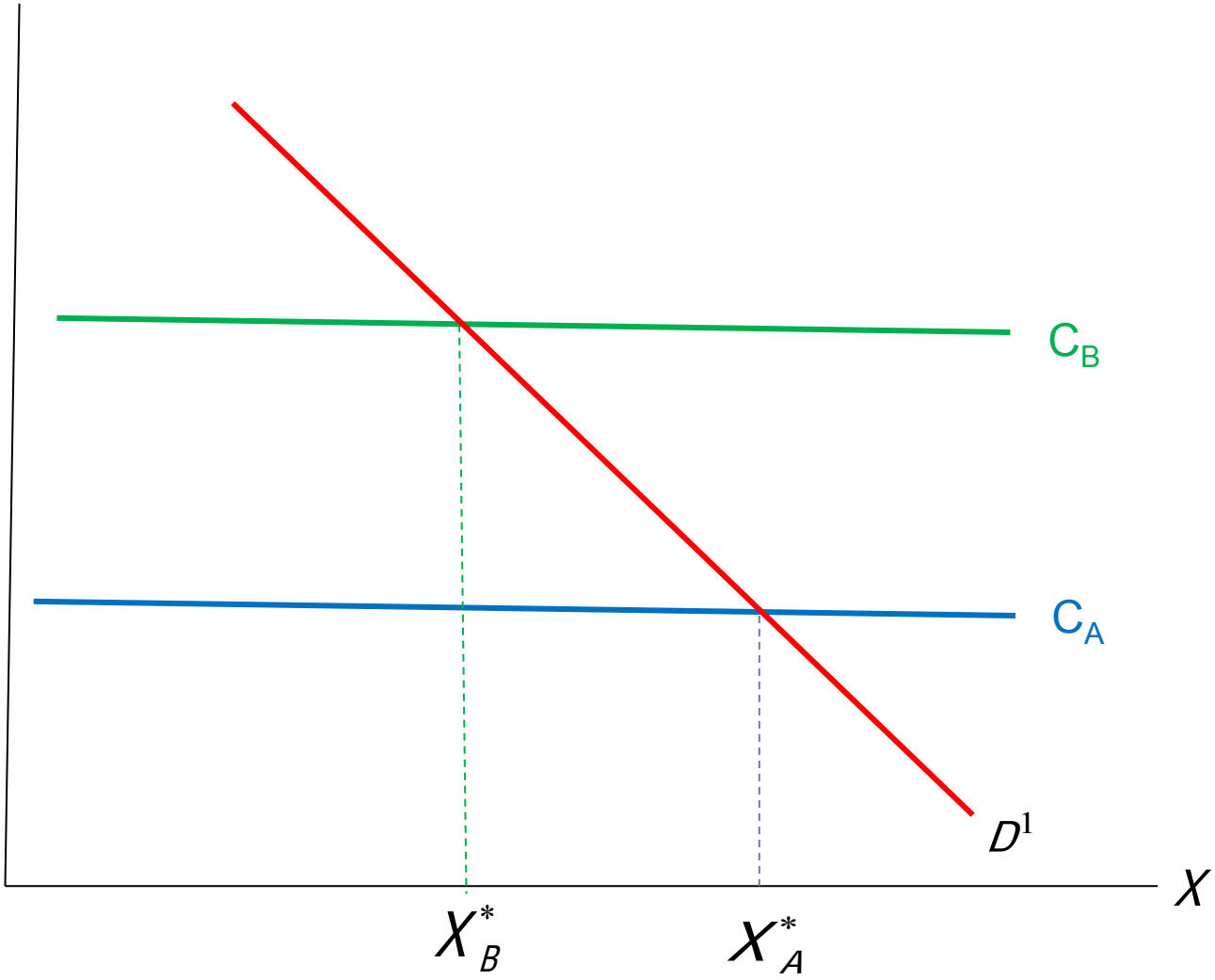


Fig 2: Standardised Shares

Modelling property prices

- So what we are trying to do here is control for differences in demand-side determinants of Active JTW, to reveal, as a residual, differences in "supply-side" factors
- That is, differences in the inherent attractiveness of walking or cycling (whether or not people actually choose to do it)
- As noted, we don't have any direct urban form-type measures of attractiveness
- So we infer them, implicitly assuming that our regression model for Active JTW included all relevant demand side characteristics (which is hardly likely....but)

Modelling property prices

- The regression model on page 8 of the handout has the constructed variable "ACTIVEFRIENDLY", which is intended to measure the differences between the "*" values of X for properties in two area units A and B
- And we see this constructed variable comes through with a very (too?) large and positive coefficient
- And note that it just about wipes out WORKDIST as an explanatory variable
- It is a large effect – similar to that of the "Grammar Zone" dummy variable on page 11

Implications

- An Area Unit with characteristics friendly to active journeys to work has houses worth more than other AUs
- For example comparing two AUs for which the difference in Active JTW due to differenc in ACTIVEFRIENDLY equals one standard deviation of Active JTW, we'd predict that the average (ie around $500K) house would be worth about $50K more on the market
- Given that only a smallish minority actually do choose, on any given day, to walk/cycle to work, this suggests that the option value of doing so is worth a lot of money...too much to be credible?

Policy implications

- Being able to walk or cycle to work seems to be quite valuable
- Why?
- Well, everybody knows that active travel modes are much better for fitness and health (apart from chance of violent injury) than are sedentary trips
- So should goverment actively encourage people to walk or cycle to work?
- **NO!**

Policy implications

Why not ?!?

- Precisely because "everybody knows"
- That is, people who choose to drive or take train or bus to work do so knowing perfectly well that this is not so "good for them" from a health and fitness perspective.
- That is, they fully [?] internalise the loss of these benefits, such that the benefits they get from driving etc must more than compensate
- Have to call on externalities to justify any public information/exhortation program

Policy implications

- But the supply side may be a different story
- Individuals have little or no control over the attractiveness of active JTW
- So can we therefore justify policies or programs to improve this, given their apparently huge payoff in housing values?
- Well, yes, maybe, but:
  - -- could be proxying other things (other urban form factors)
  - -- the benefits of these policies will be entirely [?] captured by existing homeowners -- ie a big wealth transfer to them from the taxpayer

Policies

- Just marginal ("triangle") welfare benefits to travellers induced to switch from sedentary JTW modes by more attractive active alternatives
- Problem is, of course, that these benefits are attached to land (location), and land is in fixed supply
- So not like, say, a technological improvement which lowers the costs of DVD players (etc – ie , any product for which the output is elastically supplied to a competitive market)

Walking+cycling regressions, Auckland Area Units, October 4, 2009-10-04

+ Property Sales regressions, October 5, 2009

First, explain propensity to choose an active JTW mode (the sum of the proportions of walkers and cyclists):

Dependent Variable: WALKR+CYCLER
Method: Least Squares
Date: 10/04/09 Time: 11:32
Sample: 1 351 IF RURAL<1
Included observations: 323

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.621315	0.064840	9.582211	0.0000
JTWDIST	-0.001322	0.001269	-1.042115	0.2982
MVH	-0.201667	0.014027	-14.37709	0.0000
AGEMED	-0.008411	0.001008	-8.346415	0.0000
PAKEHAR	0.185380	0.033652	5.508665	0.0000
SMOKERT	-0.459719	0.111534	-4.121774	0.0000
WHITECOLLAR	0.049424	0.063659	0.776394	0.4381
INCOMEP	2.00E-07	8.02E-07	0.248916	0.8036

R-squared	0.611598	Mean dependent var	0.057657
Adjusted R-squared	0.602967	S.D. dependent var	0.069751
S.E. of regression	0.043950	Akaike info criterion	-3.387056
Sum squared resid	0.608465	Schwarz criterion	-3.293492
Log likelihood	555.0095	F-statistic	70.85948
Durbin-Watson stat	1.437369	Prob(F-statistic)	0.000000

This is for all Auckland region – note that JTW distance is not significant

do it for just Auckland city AUs:

Dependent Variable: WALKR+CYCLER
Method: Least Squares
Date: 10/04/09 Time: 12:44
Sample: 1 351 IF RURAL<1 AND AC=1
Included observations: 101

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.810727	0.140372	5.775571	0.0000
JTWDIST	-0.019784	0.004454	-4.441443	0.0000
MVH	-0.292218	0.026053	-11.21613	0.0000
AGEMED	-0.007261	0.002319	-3.131529	0.0023
PAKEHAR	0.070789	0.085195	0.830901	0.4082
SMOKERT	-0.459085	0.230933	-1.987958	0.0498
WHITECOLLAR	0.184107	0.148800	1.237280	0.2191
INCOMEP	6.81E-07	1.22E-06	0.560202	0.5767

R-squared	0.843281	Mean dependent var	0.097875
Adjusted R-squared	0.831485	S.D. dependent var	0.108578
S.E. of regression	0.044572	Akaike info criterion	-3.307540
Sum squared resid	0.184757	Schwarz criterion	-3.100401
Log likelihood	175.0308	F-statistic	71.48849
Durbin-Watson stat	1.335884	Prob(F-statistic)	0.000000

So JTW matters for Auckland city, but not for region as a whole

Try for region excluding Auckland city:

Dependent Variable: WALKR+CYCLER
Method: Least Squares
Date: 10/04/09 Time: 12:48
Sample: 1 351 IF RURAL<1 AND AC=0
Included observations: 222

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.248748	0.039716	6.263125	0.0000
JTWDIST	-0.002581	0.000709	-3.641202	0.0003
MVH	-0.055332	0.010724	-5.159544	0.0000
AGEMED	-6.46E-05	0.000665	-0.097186	0.9227
PAKEHAR	0.089043	0.019952	4.462838	0.0000
SMOKERT	-0.225556	0.066243	-3.405006	0.0008
WHITECOLLAR	-0.192465	0.039776	-4.838744	0.0000
INCOMEP	6.61E-07	6.78E-07	0.975526	0.3304

R-squared	0.343505	Mean dependent var	0.039360
Adjusted R-squared	0.322031	S.D. dependent var	0.026052
S.E. of regression	0.021451	Akaike info criterion	-4.810747
Sum squared resid	0.098468	Schwarz criterion	-4.688128
Log likelihood	541.9930	F-statistic	15.99624
Durbin-Watson stat	2.146081	Prob(F-statistic)	0.000000

JTW works!

(so need dummy for Auckland city, if doing all-region JTW model)

Note that personal income is never significant

Back to Auckland City sample, add in % male (MaleR):

Dependent Variable: WALKR+CYCLER
Method: Least Squares
Date: 10/04/09 Time: 14:37
Sample: 1 351 IF RURAL<1 AND AC=1
Included observations: 101

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.158490	0.213941	0.740809	0.4607
JTWDIST	-0.015905	0.004275	-3.719979	0.0003
MVH	-0.301618	0.024427	-12.34783	0.0000
AGEMED	-0.004288	0.002296	-1.867511	0.0650
PAKEHAR	0.053091	0.079610	0.666892	0.5065
SMOKERT	-0.434733	0.215526	-2.017075	0.0466
MALER	1.069162	0.277328	3.855225	0.0002
WHITECOLLAR	0.208409	0.138956	1.499815	0.1371
INCOMEP	8.86E-07	1.14E-06	0.780638	0.4370

R-squared	0.865078	Mean dependent var	0.097875
Adjusted R-squared	0.853346	S.D. dependent var	0.108578
S.E. of regression	0.041580	Akaike info criterion	-3.437494
Sum squared resid	0.159061	Schwarz criterion	-3.204464
Log likelihood	182.5935	F-statistic	73.73446
Durbin-Watson stat	1.307805	Prob(F-statistic)	0.000000

So drop income:

Dependent Variable: WALKR+CYCLER
Method: Least Squares
Date: 10/04/09 Time: 14:40
Sample: 1 351 IF RURAL<1 AND AC=1
Included observations: 101

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.148810	0.213133	0.698203	0.4868
JTWDIST	-0.016441	0.004211	-3.904504	0.0002
MVH	-0.294707	0.022718	-12.97224	0.0000
AGEMED	-0.004274	0.002291	-1.865393	0.0653
PAKEHAR	0.078761	0.072348	1.088642	0.2791
SMOKERT	-0.397200	0.209653	-1.894554	0.0613
MALER	1.059010	0.276441	3.830876	0.0002
WHITECOLLAR	0.228820	0.136187	1.680190	0.0963

R-squared	0.864184	Mean dependent var	0.097875
Adjusted R-squared	0.853962	S.D. dependent var	0.108578
S.E. of regression	0.041493	Akaike info criterion	-3.450694
Sum squared resid	0.160114	Schwarz criterion	-3.243556
Log likelihood	182.2601	F-statistic	84.53596
Durbin-Watson stat	1.315213	Prob(F-statistic)	0.000000

We use this regression model to construct variable “Activefriendly”, which is actual (WalkR+CycleR), minus all the demand “taste for active JTW” variables multiplied by their estimated coefficients in the model above --- (av number of motor vehicles in AU households, median age in AU, proportion of “Europeans” in AU, proportion of current smokers in AU, proportion of males in AU and proportion of jobs that are “whitecollar” (managerial, professional, clerical, sales))

We don’t subtract the journey to work distance variable, because this is expected to be a universal determinant of the attractiveness of active JTW modes

That is, what we are trying to get here is a measure of active travel choice, corrected for AU-specific demographic etc factors which affect the actual decision to walk/cycle in each AU but shouldn’t affect the impact of active mode-friendliness on property prices across Auckland city.

The Census – which is all about households -- is quite forthcoming with these specific demand “taste shifters”, but has nothing to tell us (I think) about “supply side” characteristics of the walk or cycle to work event – eg, attractiveness of the route, safety, security, convenience, presence of dedicated walking or cycling paths, topography. So, these all end up in the error term of the regression, and thus are bundled in to our Activefriendly measure (good), along with any universal determinants of demand (eg, attractiveness of substitutes, such as public transit) (good), plus any missing AU-specific taste variables (bad). Hopefully, there aren’t enough of the latter to spoil Activefriendly as an index of the basic attractiveness of choosing active JTW travel modes.

Now we move to our property price database, and insert Activefriendly and the other AU variables. First we replicate the most successful regression from the last time this database was used (170809 @ 08.44am):

Dependent Variable: LOG(SALE_PRICE)
Method: Least Squares
Date: 10/05/09 Time: 08:56
Sample: 1 12394 IF SALE_PRICE<3000000 AND SPOT>0
Included observations: 11321

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.94319	0.187746	74.26609	0.0000
LOG(FLOOR_AREA)	0.761311	0.005516	138.0154	0.0000
BUILDING_AGE	-0.002335	9.02E-05	-25.88658	0.0000
DATE	0.000145	2.19E-05	6.657365	0.0000
LEVEL	-0.000863	0.005667	-0.152368	0.8789
VIEWWATER	0.158531	0.011876	13.34895	0.0000
VIEWWIDE	0.150538	0.019652	7.660168	0.0000
VIEWSLIGHT	-0.010815	0.007205	-1.501073	0.1334
DECK	0.092039	0.005147	17.88157	0.0000
GARAGES	-0.006318	0.005293	-1.193569	0.2327
LOG(WORKDIST)	-0.147571	0.025915	-5.694352	0.0000
DIST_PARK	-0.005379	0.009803	-0.548699	0.5832
DIST_CBD	-0.048066	0.001604	-29.96506	0.0000
DIST_JUNCT	0.044879	0.005161	8.696355	0.0000
(DIST_JUNCT)^2	0.000313	0.000589	0.530703	0.5956
DIST_STATI	0.110973	0.006557	16.92453	0.0000
(DIST_STATI)^2	-0.014812	0.001095	-13.52329	0.0000
DIST_SCHOO	-0.011519	0.005581	-2.064018	0.0390
DIST_SHOP	0.253187	0.031972	7.918945	0.0000
(DIST_SHOP)^2	-0.293445	0.035183	-8.340484	0.0000
LAND_AREA	2.299223	0.077221	29.77457	0.0000

R-squared	0.809655	Mean dependent var	12.96595
Adjusted R-squared	0.809318	S.D. dependent var	0.569643
S.E. of regression	0.248747	Akaike info criterion	0.057092
Sum squared resid	699.1883	Schwarz criterion	0.070697
Log likelihood	-302.1711	F-statistic	2403.288
Durbin-Watson stat	1.125246	Prob(F-statistic)	0.000000

no problem (whew!)

so first just add in the actual active JTW choice – ratio of walkers+ratio of cyclists:

Dependent Variable: LOG(SALE_PRICE)
Method: Least Squares
Date: 10/05/09 Time: 08:58
Sample: 1 12394 IF SALE_PRICE<3000000 AND SPOT>0
Included observations: 11321

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	14.00547	0.177663	78.83159	0.0000
LOG(FLOOR_AREA)	0.691924	0.005558	124.4972	0.0000
BUILDING_AGE	-0.001651	8.74E-05	-18.89005	0.0000
DATE	0.000142	2.07E-05	6.846862	0.0000
LEVEL	0.007934	0.005368	1.477979	0.1394
VIEWWATER	0.159739	0.011238	14.21466	0.0000
VIEWWIDE	0.151697	0.018596	8.157625	0.0000
WALKR+CYCLER	-1.174801	0.032320	-36.34875	0.0000
VIEWSLIGHT	0.000732	0.006825	0.107256	0.9146
DECK	0.083263	0.004876	17.07444	0.0000
GARAGES	-0.027662	0.005043	-5.485137	0.0000
LOG(WORKDIST)	-0.653086	0.028192	-23.16603	0.0000
DIST_PARK	0.014758	0.009293	1.588111	0.1123
DIST_CBD	-0.050824	0.001520	-33.44270	0.0000
DIST_JUNCT	0.006277	0.004997	1.256124	0.2091
(DIST_JUNCT)^2	0.006259	0.000581	10.76856	0.0000
DIST_STATI	0.079624	0.006264	12.71112	0.0000
(DIST_STATI)^2	-0.009794	0.001046	-9.367491	0.0000
DIST_SCHOO	0.023968	0.005370	4.462944	0.0000
DIST_SHOP	0.136827	0.030423	4.497546	0.0000
(DIST_SHOP)^2	-0.187312	0.033420	-5.604814	0.0000
LAND_AREA	2.702399	0.073907	36.56466	0.0000

R-squared	0.829582	Mean dependent var	12.96595
Adjusted R-squared	0.829265	S.D. dependent var	0.569643
S.E. of regression	0.235377	Akaike info criterion	-0.053318
Sum squared resid	625.9892	Schwarz criterion	-0.039065
Log likelihood	323.8064	F-statistic	2619.178
Durbin-Watson stat	1.172180	Prob(F-statistic)	0.000000

Walking/cycling is bad for property prices!

But, let's use the demand-corrected variable ACTIVEFRIENDLY instead:

Dependent Variable: LOG(SALE_PRICE)
Method: Least Squares
Date: 10/05/09 Time: 09:01
Sample: 1 12394 IF SALE_PRICE<3000000 AND SPOT>0
Included observations: 11321

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.12696	0.188749	69.54720	0.0000
LOG(FLOOR_AREA)	0.737927	0.005539	133.2143	0.0000
BUILDING_AGE	-0.002130	8.92E-05	-23.88024	0.0000
DATE	0.000140	2.15E-05	6.501369	0.0000
LEVEL	0.006151	0.005577	1.102819	0.2701
VIEWWATER	0.166548	0.011672	14.26883	0.0000
VIEWWIDE	0.142219	0.019308	7.365755	0.0000
VIEWSLIGHT	-0.013998	0.007079	-1.977408	0.0480
DECK	0.084916	0.005068	16.75514	0.0000
GARAGES	-0.014797	0.005216	-2.836820	0.0046
LOG(WORKDIST)	0.037626	0.027040	1.391481	0.1641
DIST_PARK	-0.015557	0.009642	-1.613368	0.1067
DIST_CBD	-0.057953	0.001649	-35.14096	0.0000
DIST_JUNCT	0.043064	0.005070	8.493822	0.0000
(DIST_JUNCT)^2	0.000222	0.000579	0.383314	0.7015
DIST_STATI	0.104215	0.006449	16.15901	0.0000
(DIST_STATI)^2	-0.014635	0.001076	-13.60240	0.0000
DIST_SCHOO	0.006728	0.005555	1.211190	0.2258
DIST_SHOP	0.217702	0.031454	6.921215	0.0000
(DIST_SHOP)^2	-0.286455	0.034561	-8.288273	0.0000
LAND_AREA	2.352377	0.075898	30.99400	0.0000
ACTIVEFRIENDLY	1.097556	0.054048	20.30696	0.0000

R-squared	0.816357	Mean dependent var	12.96595
Adjusted R-squared	0.816016	S.D. dependent var	0.569643
S.E. of regression	0.244339	Akaike info criterion	0.021423
Sum squared resid	674.5689	Schwarz criterion	0.035676
Log likelihood	-99.26380	F-statistic	2391.807
Durbin-Watson stat	1.131185	Prob(F-statistic)	0.000000

Hey presto… it's positive and strong for property values!

But note that it almost wipes out the significance of log(JTWdist) – does this mean that all of this variable's significance is in fact due to its effect on the attractiveness of active travel modes…. Surely not….

071009: actually, it also changes the sign of JTWdist!

So could the entire JTWdist effect be all about walkability/cyclability….?

Drop it:

Dependent Variable: LOG(SALE_PRICE)
Method: Least Squares
Date: 10/07/09 Time: 08:48
Sample: 1 12394 IF SALE_PRICE<3000000 AND SPOT>0
Included observations: 11321

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.20403	0.177920	74.21326	0.0000
LOG(FLOOR_AREA)	0.738861	0.005476	134.9221	0.0000
BUILDING_AGE	-0.002143	8.77E-05	-24.42587	0.0000
DATE	0.000139	2.15E-05	6.494393	0.0000
LEVEL	0.005986	0.005576	1.073509	0.2831
VIEWWATER	0.165448	0.011614	14.24539	0.0000
VIEWWIDE	0.141896	0.019301	7.351586	0.0000
VIEWSLIGHT	-0.014041	0.007071	-1.985825	0.0471
DECK	0.085427	0.005055	16.90034	0.0000
GARAGES	-0.013960	0.005163	-2.704118	0.0069
DIST_PARK	-0.014672	0.009602	-1.527986	0.1265
DIST_CBD	-0.056136	0.000958	-58.61504	0.0000
DIST_JUNCT	0.045219	0.001659	27.25450	0.0000
DIST_STATI	0.103537	0.006425	16.11553	0.0000
(DIST_STATI)^2	-0.014389	0.001058	-13.60588	0.0000
DIST_SCHOO	0.005290	0.005452	0.970211	0.3320
DIST_SHOP	0.222108	0.031138	7.133068	0.0000
(DIST_SHOP)^2	-0.290257	0.034415	-8.434064	0.0000
LAND_AREA	2.347879	0.075716	31.00921	0.0000
ACTIVEFRIENDLY	1.072615	0.050704	21.15457	0.0000

R-squared	0.816325	Mean dependent var	12.96595
Adjusted R-squared	0.816016	S.D. dependent var	0.569643
S.E. of regression	0.244339	Akaike info criterion	0.021242
Sum squared resid	674.6851	Schwarz criterion	0.034199
Log likelihood	-100.2387	F-statistic	2643.486
Durbin-Watson stat	1.132336	Prob(F-statistic)	0.000000

Now try (again?) social_deprivation, dist to beach, grammar zone:

Dependent Variable: LOG(SALE_PRICE)
Method: Least Squares
Date: 10/07/09 Time: 08:54
Sample: 1 12394 IF SALE_PRICE<3000000 AND SPOT>0
Included observations: 11321

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.82241	0.173525	79.65681	0.0000
LOG(FLOOR_AREA)	0.688940	0.005605	122.9216	0.0000
BUILDING_AGE	-0.001884	8.61E-05	-21.88093	0.0000
DATE	0.000142	2.07E-05	6.864657	0.0000
LEVEL	0.011723	0.005372	2.182381	0.0291
VIEWWATER	0.147262	0.011352	12.97199	0.0000
DIST_BEACH	-0.021335	0.001970	-10.83013	0.0000
GRAMMAR_ZONE	0.094253	0.006429	14.66022	0.0000
SOCIAL_DEPRIVATION	-0.000743	2.97E-05	-25.00678	0.0000
VIEWWIDE	0.137051	0.018588	7.373105	0.0000
VIEWSLIGHT	-0.021993	0.006810	-3.229532	0.0012
DECK	0.065487	0.004973	13.16909	0.0000
GARAGES	-0.023648	0.004997	-4.732625	0.0000
DIST_PARK	-0.004561	0.009321	-0.489307	0.6246
DIST_CBD	-0.049617	0.001018	-48.75696	0.0000
DIST_JUNCT	0.037793	0.001619	23.34573	0.0000
DIST_STATI	0.107752	0.006204	17.36807	0.0000
(DIST_STATI)^2	-0.016013	0.001021	-15.68574	0.0000
DIST_SCHOO	-0.013260	0.005334	-2.486015	0.0129
DIST_SHOP	0.201088	0.030133	6.673286	0.0000
(DIST_SHOP)^2	-0.278864	0.033306	-8.372707	0.0000
LAND_AREA	2.664515	0.074101	35.95795	0.0000
ACTIVEFRIENDLY	0.620460	0.051376	12.07676	0.0000

R-squared	0.829930	Mean dependent var	12.96595
Adjusted R-squared	0.829599	S.D. dependent var	0.569643
S.E. of regression	0.235147	Akaike info criterion	-0.055186
Sum squared resid	624.7105	Schwarz criterion	-0.040285
Log likelihood	335.3810	F-statistic	2506.071
Durbin-Watson stat	1.166312	Prob(F-statistic)	0.000000

these variables work, but they reduce the size and significance of ActiveFriendly, apparently because of correlation with social deprivation…