The Correlation Between Income and Home Values: Literature Review and Investigation of Data

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*This report was prepared by the following researcher:*

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1. **The Task**

LGASA has commissioned SACES to carry out a survey of the literature regarding the correlation between housing values and incomes. In particular, LGASA is seeking a study which:

- reviews the existing literature on the correlation between house prices and incomes (and the capacity to pay rates), especially in the Australian context; and
- identifies relevant issues which are not adequately addressed in the literature and strategies to address them given the existing Australian datasets.

2. **Context**

2.1 **Equity in property taxation**

The context to this study is that the primary revenue source for local government in South Australia is rates on property. One criticism of property taxation is that it is based in part on property values, and that property values do not have a good correlation with asset owners’ capacity to pay.\(^1\) The issue is usually raised in the context of owner-occupied housing.

There is a question as to the relevance of capacity to pay in property tax decisions. It may be argued that the rationale for property taxes is:

- that they are a benefit tax in respect of local public goods and that in this context the rates payable are part and parcel of the housing choice; and/or
- that capacity to pay cannot be addressed adequately with reference to just one tax base, and that property taxes may serve the purpose of allocating part of the tax burden to elements of capacity to pay which are not captured by broad based income or consumption taxes, the prime example of which is the implicit income and consumption streams associated with owner occupied housing. In this case, property taxation might enhance the correlation between tax paid and capacity to pay when measured at the whole-of-tax-system level, even if the piecewise correlation between capacity to pay and property taxes was not strong.\(^2\)

The view of the author is that there is some substance to these arguments. However, they are not the focus of the current paper, and they are left aside. The question to be addressed is whether property taxes based on housing values bear a good correlation with the taxpayers’ capacity to pay.

This question itself raises two more issues for consideration. What is a “good” correlation? And what is capacity to pay?

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\(^1\) It is common as well for councils to impose minimum rates, so that rates do not operate as a pure ad valorem tax.

\(^2\) Of course it might be argued that a better alternative would be to redefine the income and consumption tax bases accordingly, but while this remains off the agenda the relevant point of comparison is the income/consumption tax system as is, not the ideal.
2.2 Correlation with capacity to pay

The first of these two questions is easier to answer than the second. “Good” is of course a relative concept, and a sensible point of comparison is some other tax. If we can establish the correlation between liabilities under property tax and a “capacity to pay” measure, and then compare it with the correlation between liabilities under (say) income tax and that capacity to pay measure, then we can say which tax has the better correlation with capacity to pay.

2.3 Capacity to pay

It is common to use income as a measure of capacity to pay. But capacity to pay is also affected by wealth, by prospective future income streams, and by the obligations which individuals carry. Figure 1 shows data from Kelly (2003) on average income and wealth through the lifecycle. It is clear that the conclusions we could draw about capacity to pay at different points in the lifecycle would differ significantly according to whether we used income or wealth as an indicator. And in fact, on reflection, it is arguable that neither is a sufficient measure by itself: what is needed is a whole of life, or “lifetime income” concept.

Figure 1
Income and wealth by age, Australia, 2001
Ratio of age-specific average to whole-population average

Although there are significant challenges in the construction of lifetime income data sets, there are now a number of tax-equity studies that have been carried out in this way, and such an approach is probably required if the results are to be regarded as robust. For instance, Davies, St-Hilaire and Whalley (1984) say that it is widely acknowledged that lifetime calculations would be preferable to annual income for tax incidence analysis. For the purpose of analysing individuals’ (or families’ or households’) welfare, the case for a lifetime concept would seem virtually unimpeachable if we leave aside liquidity
constraints and uncertainty. So leaving aside liquidity and uncertainty aspects, and defining lifetime income as the discounted present value of future earnings, transfer payments, inheritances and other gifts received, then there is a whole range of annual payment structures that deliver the same lifetime income. Two extreme examples are (a) one in which all income is paid in the current period and none in future periods and (b) one in which the undiscounted income payments in each period are identical. It is notable that for a given lifetime income, these two alternatives produce quite different patterns of annual income and wealth across the lifecycle. A tax equity study based on annual income or wealth is therefore likely to produce results which are influenced by timing issues which have nothing to do with the whole of life opportunities available to the individual.

A variety of approaches have from time to time been taken to the estimation of lifetime income. The simplest is to use current expenditure as a proxy for lifetime income. This approach is employed by Poterba (1989), and he argues that “provided households adhere to the basic tenets of the lifecycle-permanent income hypothesis by setting consumption in relation to lifetime resources rather than current income, total expenditure provides a better measure of long-term household well-being than annual income” [p. 327]. Of course both annual expenditure and income will vary from year to year even in the presence of a stable lifetime income. But what Poterba seems to have in mind is that expenditure is generally more stable across the lifecycle than income.

A more complex procedure is to construct synthetic estimates of income at different stages in the lifecycle. This involves making projections of income in future periods, then discounting them back to present values, and then summing to get a lifetime income estimate. In a pioneering work Davies, St Hilaire and Whalley (1984) construct synthetic longitudinal lifetime profiles of earnings and transfer payments from household survey data. Caspersen and Metcalf (1994), employing an approach that they identify with Fullerton and Rogers, make econometric estimates of age-earnings profiles and apply them to sample data to generate estimates of future income. These are then discounted back to give lifetime income estimates in present values.

A different approach is adopted in Cameron and Creedy’s (1995) analysis of a revenue neutral shift from an income tax to a consumption tax. They simulate age-earnings profiles for individuals, based on a model with “a systematic component which follows the growth pattern of the geometric mean of earnings in each age group and a random component which introduces a measure of earnings mobility” [p. 78]. A useful feature of this model it that it recognises that while an age-earnings profile may have some power to explain individual income, there will also be some short term volatility in individual earnings. This volatility is an additional factor causing current incomes to diverge from lifetime income.

In closing, it should be noted that while the focus of attention has been on lifetime income measures, there is an equivalent case for a lifetime tax concept.
3. **Australian studies of the incidence of property taxes**

The only analysis we could find specifically addressed to the incidence of property taxes is Wood’s (1999) study using data from the ABS *Survey Of income and housing costs 1990*. He constructs estimates of the ratios of property tax payments to, firstly, income and, secondly, wealth in Australia by income decile.\(^3\) Table 1 presents his results. Of the two measures presented, gross household income is the concept more commonly employed for considering issues of progressivity and regressivity. The figures show falling ratios of property tax to current income across the deciles, and property taxation is clearly regressive with respect to this income concept. The “regressivity” is less pronounced if the ratio of property taxes to net personal wealth is considered, but this is not a common benchmark for the assessment of tax progressivity.\(^4\)

It is worth noting that Wood’s measures are based on actual property tax payments rather than property values, and would therefore capture the impact of “minimum rates”, concessions and tax rate variations. Each of these elements has some effect on the degree of observed regressivity in property taxation, but it is not possible to tell from Wood’s analysis what influence is attributable to each. Certainly minimum rate provisions would have a regressive influence, and concessions are likely to have a progressive influence. Whether or not the component of rates which is an ad valorem tax on property values is regressive or progressive is uncertain (more on this below). Of course for an analysis of property taxation as it is applied in practice, it is an attractive feature of Wood’s method that it captures the connection between rates and income rather than just the connection between home values and income.

### Table 1

**Wood’s estimates of average property tax payments by income decile**

<table>
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<th>Decile</th>
<th>as percentage of net personal wealth</th>
<th>as percentage of gross household income</th>
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<tr>
<td>1 (lowest)</td>
<td>0.87</td>
<td>4.16</td>
</tr>
<tr>
<td>2</td>
<td>0.57</td>
<td>3.03</td>
</tr>
<tr>
<td>3</td>
<td>0.56</td>
<td>2.79</td>
</tr>
<tr>
<td>4</td>
<td>0.59</td>
<td>2.5</td>
</tr>
<tr>
<td>5</td>
<td>0.58</td>
<td>2.2</td>
</tr>
<tr>
<td>6</td>
<td>0.58</td>
<td>2.03</td>
</tr>
<tr>
<td>7</td>
<td>0.57</td>
<td>1.85</td>
</tr>
<tr>
<td>8</td>
<td>0.58</td>
<td>1.63</td>
</tr>
<tr>
<td>9</td>
<td>0.46</td>
<td>1.45</td>
</tr>
<tr>
<td>10</td>
<td>0.22</td>
<td>1.21</td>
</tr>
<tr>
<td>All</td>
<td>0.45</td>
<td>1.86</td>
</tr>
</tbody>
</table>


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\(^3\) Wood says that “the distributional implications of residential property taxes on wealth are then a relevant policy issue and one which has not been addressed in Australia before” [p. 240].

\(^4\) Even if one views property taxes as a type of wealth tax, it does not follow that wealth should be chosen as the reference point for an analysis of progressivity.
4. **Australian analyses of the demand for housing**

Some indirect evidence on the correlation between home values and incomes might be gathered from demand studies. Demand studies typically try to estimate the determinants of consumer spending on different commodity types. The determinants considered range greatly from study to study, but income is usually included, and it is common to see the “income elasticity of demand” for particular commodity groups reported.

The income elasticity of demand for housing is defined as the proportional change in housing expenditures in response to a 1 per cent change in income (with all prices held constant). Consider the case of a property tax which is strictly proportional to housing values, and therefore expenditures on housing.\(^5\) If the income elasticity of demand for housing is less than 1, then a tax on housing expenditures will be regressive. This is because a 1 per cent rise in incomes will lead to a less than 1 per cent increase housing expenditures and therefore a less than 1 per cent rise in tax payable. This in turn means that the ratio of tax to income falls as income increases, and the tax is then by definition regressive. By similar arguments, a property tax will be income-proportional if the income elasticity of housing demand is 1, and progressive if the income elasticity of housing demand exceeds 1. Of course by virtue of the assumption of strict proportionality of property tax with property values, any effects from minimum rates, concessions and tax rate differences are excluded in this analysis.

Selvanathan (1991) used time series data to estimate a demand system for the Australian States. His estimates of the income elasticity of housing expenditures were less than 1 for each State (ranging from 0.22 in Queensland to 0.98 in Victoria, and with values of 0.56 in South Australia and 0.88 Australia-wide).

Tran-Nam and Podder (1992) used 1984 cross-section data to estimate a demand system for Australia. They report expenditure elasticities for housing of a little below unity over a range of average household expenditure levels.

Chatterjee, Michelini and Ray (1994) also used 1984 cross-section data to estimate a demand system for Australia. They calculated “expenditure elasticities” for commodity groups. Although these differ a little from income elasticities (income includes saving), the magnitudes should be similar. The expenditure elasticities for housing costs depend on the sample point chosen, but are around unity for the three sample points for which results are calculated.

Rimmer and Powell used time series data to estimate a demand system for Australia. They report “Engel” (i.e. expenditure) elasticities for “Rent” of 1.998 in the mid-1950s and 1.483 in the late 1980s.

These studies produce varied estimates of income (or expenditure) elasticities of housing demand. Consequently it is not possible to draw inferences about the progressivity, neutrality or regressivity of ad valorem taxes on housing values, other than to say that

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\(^5\) The expenditure concept here is the market value of the housing services consumed rather than cash. Under this concept the owner occupier has a periodic expenditure on housing rather than the irregular pattern which is observed on a cash basis.
the evidence does not strongly support the arguments that taxation of residential values is either (a) regressive or (b) progressive.

5. Preliminary evidence for Australia and data limitations

Figures 2, 3 and 4 show data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey, which is carried out by the Melbourne Institute under contract to the Commonwealth Department of Family and Youth Services.

Figure 2 is a scatterplot showing observations of household financial year disposable income (“annual income”) and value of home for a sample of 4,482 Australian homeowners in 2003. The income concept is cash-only, and does not include imputed income streams such as those associated with owner occupied housing. Nor does it include capital gains, even at realisation. In these two respects, at least, the income measure falls short of a full income concept.

While a correlation appears to be present in Figure 2, it is not particularly tight. The $R^2$ statistic for this sample, which is a measure of correlation on a scale 0 to 1, is just 0.079. Note that a few values of annual income are negative, which serves to illustrate the inadequacy of annual income as a proxy for lifetime income; a negative lifetime income is simply not meaningful.

Figure 2 includes observations from all States, and from both capital city and non-capital areas. It is possible that different price levels in different regions affect the observed degree of correlation. If we observe data within a smaller geographic area – such as a labour market catchment – we might find a better correlation.

Figure 3 presents 292 observations for Adelaide only. It is evident that there is a correlation and, according to the $R^2$ statistic (0.157), it is tighter than for Australia as a whole but still quite weak.

Returning to the sample for all of Australia, we can propose a very simple relationship between home value and annual income of the form:

$$\text{home value} = \alpha + \beta \times \text{annual income}$$  \hspace{1cm} (1)

and use the data to estimate the parameters $\alpha$ and $\beta$. The results of a simple ordinary least squares regression are:

$$\text{home value} = 205 + 1.90 \times \text{annual income}$$ \hspace{1cm} (2) $\text{robust t-stats} \hspace{0.5cm} (26.5) \hspace{0.5cm} (13.0) \hspace{1cm} \text{F-stat} \hspace{0.5cm} 386.2$

The literal interpretation of the parameters $\alpha$ and $\beta$ is that the average home value occupied by a household in the sample is equal to $205,000 increasing by $1,900 for every extra $1,000 of annual income. The $F$-statistic indicates that the regression is highly significant and the $t$-statistics show that the parameters $\alpha$ and $\beta$ are significantly different from zero.
This specification is seriously inadequate in that there are certainly other explanatory
variables which would have some explanatory power and that the functional form
employed (i.e. $\alpha + \beta \times \text{annual income}$) may be inappropriate. One possible consequence
is that the parameter estimates are biased. Therefore, not too much should be made of
the parameters. However, with all its problems, the line of best fit can still help to
illustrate an important point.

Figure 4 shows the Australian data (i.e. as per Figure 2) and includes the line of best fit
calculated and reported in equation (2) above. The key point to observe in Figure 4 is
that there is quite a wide dispersion of observations around the line of best fit. For
instance, for those households with incomes in the range $49,000 to $49,999, home values
range from $80,000 to $2 million. The tax imposts associated with a uniform rate
property tax would obviously vary greatly.

This dispersion is not simply a product of the line of best fit that was chosen. It is
evident from visual inspection that there will be a substantial dispersion around any line
of best fit that we choose in which annual income is the sole “explanatory” variable.

Even if we include other explanatory variables and achieve a better fit, there is likely still
to be some variance between actual and predicted property values.

The degree of dispersion around the line is indicative of a horizontal inequity that arises,
with respect to annual income, from a tax on home values. Horizontal equity would
prevail if households with like circumstances, including identical incomes, paid identical
taxes. For this to be true, we would need actual home values to be identical for these
people. Conversely, horizontal inequity may be said to exist where people on identical
incomes pay different amounts of tax. It is clear from Figure 3 that a proportional
property tax could not achieve horizontal equity for the households in the sample.6
Moreover, the fact that the dispersion around the line of best fit appears to be quite
substantial suggests that the deviations from horizontal equity may be quite substantial.

The existence of horizontal inequity is not just a product of the specific choice of line of
best fit. As it is, the line of best fit cuts the x-axis at a negative value of x, implying that a
proportional tax on property value is regressive. But if the line of best fit passed through
the origin (implying neither regressivity nor progressivity), or cut the x-axis at a positive
value of x (implying progressivity), a substantial degree of horizontal inequity is still
implied. While a better-specified equation might improve the correlation, it is virtually
certain that some horizontal inequity will remain; the question is how much.

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6 This discussion oversimplifies somewhat. It is theoretically possible that all the variations around the line of best
fit could be explained in terms of other characteristics, and that the differences in property taxes represent an
intentional differentiation of taxation. However, this is just a theoretical possibility, and is not realistic. Consider
the example of two households on identical incomes but one with two children and one with no children, and the
household with two children buying a more valuable house. The household with two children then pays more
property tax. We cannot judge the vertical equity of this arrangement without introducing a subjective judgment,
but notwithstanding we would be on safe ground in asserting that it is rarely, if ever, the intent of policymakers to
impose extra taxes on households with more dependants. A result like this could in theory be an intentional result
of tax policy, but in reality it is almost certainly an accident. It may of course be compensated elsewhere in the tax
system.
This discussion serves to illustrate a point, but should not be taken too far. The “income” concept under consideration is seriously deficient for the intended analysis. Arguably this is true of the “tax” concept employed too. A meaningful assessment of tax equity needs to take a lifetime perspective on income and, to the extent that there is periodic variation, consumption. The data considered illustrate how we might determine the degree of progressivity involved with property taxation and an income concept. But the data are not themselves sufficient to carry out such an analysis.

6. Possible approaches to an evaluation

If a detailed capacity-to-pay analysis of property taxation were to be carried out, the following would need to be considered:

- Should the analysis be focused on home values or on property taxes paid? The latter would probably be preferable.
- Should current period income and payments data be used, or a lifetime concept? A lifetime concept is essential.
- Is it meaningful to analyse property tax on its own, or does the analysis need to take into account its fit with other taxes? The fit with other taxes needs to be taken into account. It is possible that property taxation of homes offsets the results of income–tax exemptions for owner-occupiers.
- How should renters be treated, and in particular what assumptions would one make about tax incidence? A logical starting point would be the case in which property taxes are passed on to renters in rents.

With these questions in mind, we turn now to the Australian datasets, and consider their ability to support an analysis meeting these objectives. Three datasets are considered: the 2003 Household, Income and Labour Dynamics in Australia (HILDA) Survey (carried out by Melbourne Institute under contract to Department of Family and Community Services), the 1998-99 Household Expenditure Survey (HES) and the 2000-01 Survey of Income and Housing Costs (SIHC) from the Australian Bureau of Statistics. All three are cross-sectional household surveys. We understand that the next releases of HES and SIHC are to be in a merged form.

i) Coverage of property taxes

HILDA does not have detail on property taxation. It does have information on the value of the home for homeowners and rentals paid by renters, which would allow some imputation. However, the imputation would not pick up minimum (or maximum rates), concessions, differences in rates from one local government to another, etc.

HES has information about general rates plus detailed expenditure data, taxable income and estimated values of dwellings for 6,892 households. SIHC has information about weekly rates (which comprises both general and water rates), estimated sale price of dwelling, total current weekly household income and previous financial year total income.
Conclusion: If an analysis is to consider the tax equity of council rates as actually levied then it will need to use HES.

**ii) Lifetime income concepts**

HILDA, HES and SIHC each contain “lifecycle” variables for the households in their samples.

There is a variety of lifetime income concepts that might be employed.

HILDA, HES and SIHC each provide annual income data at the household level. HILDA may have better coverage of trust income and abnormal income streams such as bequests and windfall gains. HILDA also provides comprehensive wealth data. However, annual income and wealth are quite far from a lifetime income concept.

Household spending is generally believed to be closer to a lifetime income concept, especially if it is modified where necessary to include imputed stream in respect of non-cash housing consumption. HES has data on total household expenditure. HILDA and SIHC do not.

Each of the three surveys can support human capital estimation of age-earnings profiles. HILDA can probably do it better because the repeated observations on households will allow analysis of the extent to which differences between actual incomes and conditional expectations of incomes are persistent as opposed to temporary.7

**iii) Broader tax system perspective**

If a broader tax system perspective were sought, in which rates were judged in terms of the equity of the total tax burden on households with and without rates, a more complex data set would have to be developed.

A basic starting point might be to consider simply the property tax and income tax systems, taking into account the imputed income associated with owner-occupied housing. HES is probably the best collection to implement this, because it has data on property taxes. To use HILDA and SIHC one would need to make assumptions about property tax, for instance on the basis of home values.

**iv) Incidence of property tax**

A tax incidence study would ideally cover renters and other non-homeowners. Renters do not directly pay rates, and this raises the question of tax incidence. One possibility would be to assume that rental payments include a rate component, and to impute this to renters. Each of the three surveys would be able to support this.

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7 The third wave of collection for HILDA has just been completed, and when the data becomes available later in the year there will then be a series of “observations” for each of several thousand households (and their constituent members) for 2002, 2003 and 2004.
On the basis of these considerations, HES is probably the best data collection to use in an analysis of the incidence of rates, primarily because it is the only collection that actually has data on rates. The HILDA survey is probably better suited to the estimation of reliable lifetime income estimates, and would be the best dataset to use if an analysis of the correlation between lifetime income and home values is felt to be adequate.
References


Figure 2
Correlation between household income and value of home
homeowners, Australia
Figure 3
Correlation between household income and value of home
homeowners, Adelaide
Figure 4
Household income and value of home – line of best fit
homeowners, Australia