LOOSE FILE

NO FOLDER

Salient points from Mason Gaffney, 2015, "Western Canada's Taxing Land ex Buildings, 1890-1930, and its International Demonstration Effects"

1. Ca. 1890-1930, many cities and regional districts in western Canada exempted buildings from the property tax, raising rates on land values to maintain or increase revenues
   a. This attracted both capital and people
   b. Vancouver quintupled its population, 1890-1900, outpacing U.S. cities, who were also engaged in growth rivalry with each other, overcoming qualms about growth such as are so common today
   c. Farming also boomed, as the prairie provinces filled with immigrants from as far as The Ukraine and as near as the Dakotas. Populist politics crossed the 49th parallel.
2. Vancouver voters elected Louis Denison "Single-tax" Taylor as Mayor 8 (sic) times, indicating strong popular support for the policy, contrary to allegations by sundry "knockers" and "trivializers"
3. Other Pacific Coast ports like Seattle and San Francisco seriously considered emulating Vancouver, but the most serious interest came from far east in New York City, where commercial and humanitarian forces combined to apply Canada's lessons to New York's problems, 1921-31
4. The allure of single-tax policies for immigrants is plain to see. What finally went wrong? The champions themselves misrepresented the effects by a partial analysis stressing that asking prices for land would fall. They omitted that the benefits of untaxing labor and capital and commerce would be shifted into land prices. They were unready for the "perils of prosperity": the land boom leading to a bust. The bust was accentuated by Canada's entry into Europe's war in 1914.
5. Meantime,civic leaders in NYC commissioned Robert Murray Haig to research and report back on Canada's experience and its lessons for New York
6. Haig was a mere Instructor in Economics at Columbia University, dominated by E.R.A. Seligman and Nicholas Murray Butler, outspoken and strong opponents of raising rates on land values. Haig cautiously straddled major issues.
7. There is evidence that Haig privately favored the Canadian tax policies:
   a. That straddling or equivocation itself, under the very noses of Seligman and Butler, reveals conviction and self-confidence on Haig's part, in an era before academic tenure
   b. He later endorsed Lawson Purdy, in charge of tax assessments in NYC. Purdy, an earlier supporter of Henry George's 1897 mayoralty campaign, instructed field assessors in how to up-value land and down-value buildings in the tax base. This change in assessment practice, within the latitude covertly allowed to assessors, played a major role in the striking success of the formal Ordinance, discussed below, associated with Al Smith
   c. From 1921, Haig pioneered the idea that land-value increments should be included in the base of the then-new personal income tax. This idea, which clearly sprang from his experience in Canada, has ever since been known by his name.
8. Al Smith, in his first of four terms as Governor, pushed through enabling legislation giving NYC the power to exempt middle class housing from property taxes, while raising rates on land values.
9. The manifest success of his policies helps explain his being elected Governor 3 more times (1922, 1924, and 1926), and then nominated to run for U.S. President in 1928, only to be defeated by an outpouring of religious bigotry and paranoia
10. Details of the NYC experience are given in the full paper.

11. NYC then grew in population, even percentagewise, more than all previously comparable cities, and prospered mightily. The details are given in the full paper, available at this conference site and by email.

Paul

NOTES ON RESWITCHING

1. Samuelson's example is truly bullet-proof. This is shown most clearly by doing discounted cash flow, to maximize land value. Let C0, C1 and C2 be costs incurred at the beginning of periods 0, 1, and 2, and R be the return that accrues at the end of period 2. So production occurs over 3 periods.

Land value $V = -C0 - C1e^{-r} - C2e^{-2r} + Re^{-3r} + Ve^{-3r}$ or

$V = (-C0 - C1e^{-r} - C2e^{-2r} + Re^{-3r})/(1 - e^{-3r})$

Assume for convenience that R = 100, though the number will ultimately make no difference.

| Technique | C0 | C1 | C2 | Total labor | Revenue |
|---|---|---|---|---|---|
| A | 0 | 7 | 0 | 7 | 100 |
| B | 2 | 0 | 6 | 8 | 100 |

Land value A: $VA = ( - 7e^{-r} + 100e^{-3r})/(1 - e^{-3r})$

Land value B: $VB = (-2 - 6e^{-2r} + 100e^{-3r})/(1 - e^{-3r})$

If we set VA = VB, we can solve for r, the discount rate(s) at which VA equals VB, that is, the switching points. We get two values, r = ln(1.5) = 0.405465, and r = ln(2) = 0.693147. (Samuelson's example used discrete instead of continuous compounding, obtaining r = .5 and r = 1, but that makes no practical difference.) At higher discount rates, the more capital-intensive Technique A yields a higher land value, between ln(2) and ln(1.5) Technique B yields a higher value, and then Technique A yields a higher value from ln(1.5) to 0.

| n | VA | VB | VA-VB |
|---|---|---|---|
| .00001 | 3099948.834 | 3066616.667 | 33332.167 |
| 0.05 | 570.113 | 564.582 | 5.531 |
| 0.10 | 261.392 | 259.160 | 2.232 |
| 0.15 | 159.333 | 158.174 | 1.159 |
| 0.20 | 108.935 | 108.290 | 0.645 |
| 0.25 | 79.193 | 78.838 | 0.356 |
| 0.30 | 59.773 | 59.593 | 0.181 |
| 0.35 | 46.243 | 46.171 | 0.072 |
| 0.40 | 36.387 | 36.381 | 0.005 |
| ln(1.5)= 0.405465 | 35.474 | 35.474 | 0.000 |
| 0.45 | 28.971 | 29.003 | -0.032 |
| 0.50 | 23.257 | 23.306 | -0.049 |
| 0.55 | 18.771 | 18.823 | -0.051 |
| 0.60 | 15.201 | 15.242 | -0.041 |
| 0.65 | 12.327 | 12.349 | -0.022 |
| ln(2) = 0.693147 | 10.286 | 10.286 | 0.000 |
| 0.70 | 9.993 | 9.989 | 0.004 |
| 0.75 | 8.086 | 8.050 | 0.036 |
| 0.80 | 6.518 | 6.445 | 0.073 |
| 0.85 | 5.224 | 5.111 | 0.113 |
| 0.90 | 4.154 | 3.997 | 0.156 |

2. Reswitching still occurs if we put a small number, less than 1, into period 1 of Technique A. Thus for example:

| Technique | C0 | C1 | C2 | Total labor | Revenue |
|---|---|---|---|---|---|
| A | .1 | 7 | 0 | 7.1 | 100 |
| B | 2 | 0 | 6 | 8 | 100 |

The switching points move farther apart, to r = ln(1.356866) = 0.305178, and r = ln(2.327344) = 0.844728.

As we increase C0 for Technique A, the switching points move farther and farther apart, until at C0 = 1, the lower switching point becomes r = 0, the upper point becomes r = 1.791759 and reswitching ceases, as it should considering that labor for both techniques now totals 8.

3. Reswitching still occurs at lower, more plausible discount rates. Consider the following:

| Technique | C0 | C1 | C2 | Total labor | Revenue |
|---|---|---|---|---|---|
| A | 0 | 7 | 0 | 7 | 100 |
| B | 3.3 | 0 | 3.704545455 | 7.004545455 | 100 |

For this example, the switching points are r = ln(1.01269276) = 01.01269276 and r = ln(1.10851936) = 0.103025.

Blaug's example of "reswitching," as provided by Polly C., with two ways of correcting it.

Mason Gaffney, 25 June 2002

Table 1: Compounding factors, using continuous interest

(Blaug used discrete interest, with annual compounding - rather hazardous when there are only 2-3 periods, and assumed interest rates are extremely high, but still probably not a major cause of error here).

| "i" | $e^{i}$ | $e^{2i}$ | $e^{3i}$ | |
|---|---|---|---|---|
| 1.00 | 2.72 | 7.39 | 20.09 | |
| .75 | 2.12 | 4.48 | 9.49 | |
| .50 | 1.65 | 2.72 | 4.48 | |
| .25 | 1.28 | 1.65 | 2.12 | |
| .00 | 1.00 | 1.00 | 1.00 | |

Table 2, below, is for Case A, with n nominally =3, but actually =2 because the first period is bare. There is an implicit land cost there that is not accounted for - one of the flaws in Blaug's demonstration. I show how to adjust for this by annualizing.

Costs (C), are dated by subscript. I assume they are bunched on 1-1 of each given year, although Blaug simply assigns them to "periods" - a serious flaw in his demonstration, indicating a lack of careful attention to the time periods involved.

As for revenues, Blaug gives no number, and no date, but says they are the same in either case, A or B. Thus, the preferred case is the one with lower sum of costs (col. (5)). Since A uses less labor than B, A must be more capital-intensive. (Most of B's labor comes on 1-1-03, where 03 is the 3rd year.) I assume revenues come on 12-31-03, or 1-1-04, although Blaug is not explicit on this, writing of "periods" as though they were points in time.

Giving no number for Revenues, Blaug is spared the need to account for the excess of revenues over inputs of labor and capital, i.e. to deal with land and its rent. Yet, as A and B are apparently mutually exclusive, they are most likely rival uses for the same site - why else are they mutually exclusive? Blaug bypasses this point.

Blaug does not define capital-intensity. I gather he means it is the value in (5), the sum of all labor and capital inputs, less the sum of labor inputs, all divided by (5). The sum of labor inputs is the value in the bottom row of (5), so that with "i"=0, labor-intensity = 100%: i.e., there is no capital input. Blaug does not pursue this thread, but it has a certain logic: if capital is free it has presumably been applied everywhere to the point where it's marginal product is zero, so it adds nothing to output. This is in general a fanciful situation, yet it is a theoretical possibility that we need to be able to cope with, mathematically.

The number **19.04** in (5) is in **bold** because it represents the alleged "reswitching," when compared with the comparable number in Table 3, q.v.

Columns (6) and (7) are added by me, to correct the example, to be discussed below.

Table 2: Blaug's Case A

| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|
| "i" | $C_0e^{3i}$ | $C_1e^{2i}$ | $C_2e^{i}$ | (2)+(3)+(4) | $e^{2i}$ - 1 | (5)/(6) |
| 1.00 | 0.00 | 51.73 | 0.00 | 51.73 | | |
| .75 | 0.00 | 31.36 | 0.00 | 31.36 | 3.48 | 9.01 |
| .50 | 0.00 | 19.04 | 0.00 | **19.04** | 1.72 | 11.07 |
| .25 | 0.00 | 11.55 | 0.00 | 11.55 | .65 | 17.77 |
| .00 | 0.00 | 7.00 | 0.00 | 7.00 | .00 | □ |

Table 3: Case B, with n=3. As in Table 2, Case A, I assume Revenues arrive when the period ends, on 12-31-03, or 1-1-04.

| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|
| "i" | $C_0e^{3i}$ | $C_1e^{2i}$ | $C_2e^{i}$ | (2)+(3)+(4) | $e^{3i}$ - 1 | (5)/(6) |
| 1.00 | 40.18 | 0.00 | 16.32 | 56.50 | | |
| .75 | 18.98 | 0.00 | 12.72 | 31.70 | 8.49 | 3.73 |
| .50 | 8.96 | 0.00 | 9.90 | **18.86** | 3.48 | 5.42 |
| .25 | 4.24 | 0.00 | 7.68 | 11.92 | 1.12 | 10.64 |
| .00 | 2.00 | 0.00 | 6.00 | 8.00 | .00 | □ |

Now, compare columns (5) in Tables 2 and 3. The numbers in Table 2 are all smaller than the corresponding numbers in Table 3, except for the numbers in **boldface**. Col. (5) is the sum of all labor costs plus compound interest on those costs from the date they are incurred to the end of Period 3. The smaller are those costs, the higher is the excess of revenues over costs (revenues being assumed constant in amount, and in time).

Blaug, like the Sraffians who instigated this, note that Case A yields a higher net at all rates of interest except "i" = .50, where Case B yields a higher net. They conclude from this that one cannot conclude that lower rates of interest always favor more capital-intensive investments like A over more labor-intensive ones like B. They make much of this. Blaug even writes that this demonstration "drives the last nail in the coffin" of Austrian capital theory (he might have added, of all capital theory and the mathematics of finance).

A demonstration for which so much is claimed warrants a close look, however tedious that may seem. One obvious problem is that the periods of Cases A and B are not the same. Case A does not really begin until 1-1-02, since $C_0$ is zero; and then lasts through

2 years, to 12-31-03. Thus, in every 6 year period we can have 3 cycles of A for 2 cycles of B.

To compare A and B we need to annualize the values. An alternative that is marginally simpler to display is to capitalize the annualized values in perpetuity - divide them by "i". This is simpler because the annualization factor contains "i" as the numerator, so we simply remove the numerator, leaving us to divide by the factor $[e^{in} - 1]$ (column (6)). This gives us the Discounted Cash Flow (DCF) in perpetuity.

Dividing (5) by (6) gives us (7), the DCF in perpetuity. Comparing Columns (7) for Cases A and B, the paradox of alleged "reswitching" has disappeared. The cost values for A are everywhere larger than the corresponding values for B, at each "i" shown.

(At "i" = 0, the values are both infinity. When we annualize, however, applying l'Hopital's Rule, they become different. This nice point is omitted here.)

Cleveland has attempted to overcome this problem by modifying Blaug's case A by adding a nominal cost of "1" at 1-1-01, thus stretching the period of A to 3 years, so the above correction would not change anything. She writes that she has done this and preserved the reswitching, but has not sent me the numbers. I have tried it using the format above, and it does not preserve the reswitching (she may have used different endpoints, I am not sure).

Table 4: Blaug's Case A, modified by Cleveland

| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|
| "i" | $C_0e^{3i}$ | $C_1e^{2i}$ | $C_2e^{i}$ | (2)+(3)+(4) | | |
| 1.00 | 20.09 | 51.73 | 0.00 | 71.82 | | |
| .75 | 9.49 | 31.36 | 0.00 | 40.85 | | |
| .50 | 4.48 | 19.04 | 0.00 | 23.25 | | |
| .25 | 2.12 | 11.55 | 0.00 | 13.67 | | |
| .00 | .00 | 7.00 | 0.00 | 8.00 | | |
| | | | | | | |

Compare (5) in Table 4 with (5) in Table 3 (Case B). The cost values for A are everywhere higher than for B. No reswitching is shown. I am therefore unable to evaluate Cleveland's example until I see it, because I have not been able to replicate it.

I surmise it is possible to stretch out the period of A and preserve the apparent "reswitching," by assuming some truly minuscule input of cost on 1-1-01. Cleveland's "1" was simply too large. This, however, brings us to another point, totally omitted up to now. Case B yields a large rent, which we can quantify once we have a number for the Revenues. The input of land in year one therefore has a value. This accrues interest, just like the inputs of labor. This measures a capital input, and must be added to the capital

inputs. When we adjust for this, I am morally certain that there will be no reswitching. I defer that demonstration until others shall have responded to the present one.

# Blaug's Example of "Reswitching", corrected

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | $i$ | $e^{i}$ | $e^{2i}$ | $e^{3i}$ | | | | | |
| 2 | 1.00 | 2.72 | 7.39 | 20.09 | | | | | |
| 3 | .75 | 2.12 | 4.48 | 9.49 | | | | | |
| 4 | .50 | 1.65 | 2.72 | 4.48 | | | | | |
| 5 | .25 | 1.28 | 1.65 | 2.12 | | | | | |
| 6 | .00 | 1 | 1 | 1 | | | | | |
| 7 | | | | | | | | | |
| 8 | Case A $i$ | $C_0 e^{3i}$ | $C_1 e^{2i}$ | $C_2 e^{i}$ | $\Sigma$ | $e^{ni}-1$ | $\sum_i [e^{ni}-1]$ | | |
| 9 | 1.00 | 0 | 51.73 | 0 | 51.73 | 3.48 | | | |
| 10 | .75 | 0 | 31.36 | 0 | 31.36 | 1.72 | 9.01 | | |
| 11 | .50 | 0 | 19.04 | 0 | (19.04) | .65 | 11.07 | $\Sigma_A > \Sigma_B$ | |
| 12 | .25 | 0 | 11.535 | 0 | 11.55 | | 17.74 | | |
| 13 | .00 | 0 | 7.00 | 0 | 7.00 | 0 | $\infty$ | | |
| 14 | | | | | | | | | |
| 15 | Case B $i$ | 40.18 | 0 | 16.32 | 56.50 | | | | |
| 16 | .75 | 18.98 | 0 | 12.72 | 31.70 | 8.49 | 3.73 | | |
| 17 | .50 | 8.86 | 0 | 9.90 | (18.86) | 3.48 | 5.42 | | |
| 18 | .25 | 4.24 | 0 | 7.68 | 11.92 | 1.12 | 10.64 | | |
| 19 | .00 | 2.00 | 0 | 6.00 | 8.00 | 0 | $\infty$ | | |
| 20 | | | | | | | | | |
| 21 | | | | | ↑ | | ↑ | | |
| 22 | | | | | | | | | |
| 23 | | | | | | | | | |
| 24 | | | | | | | | | |
| 25 | | | | | Blaug's Case | | Corrected Case | | |
| 26 | | | | | | | | | |
| 27 | | | | | | | | | |
| 28 | | | | | | | | | |
| 29 | | | | | | | | | |
| 30 | | | | | | | | | |
| 31 | | | | | | | | | |

$n = 2$

$n = 3$

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Blanz's Example of "Rewitching" modified by Polly, corrected
$n = 3$ = carcass life

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Case A | $i$ | $C_0 e^{3i}$ | $C_1 e^{2i}$ | $C_2 e^{i}$ | $\Sigma$ | | | | |
| $n = 3$ | 1.00 | 20.09 | 51.73 | 0 | 71.82 | | | | |
| | .75 | 9.49 | 31.36 | 0 | 40.85 | | | | |
| | .50 | 4.48 | 19.04 | 0 | 23.52 | | | | |
| | .25 | 2.12 | 11.55 | 0 | 13.67 | | | | |
| | .00 | 1 | 7 | 0 | 8 | | | | |
| Case B | 1.00 | | 0 | | 56.50 | | | | |
| $n = 3$ | .75 | | 0 | | 31.76 | | | | |
| | .50 | | 0 | | 18.86 | | | | |
| | .25 | | 0 | | 11.92 | | | | |
| | .00 | 2 | 0 | 6 | 8.00 | | | | |

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