Property Tax Reform

Augmenting efficiency metrics with housing price responses

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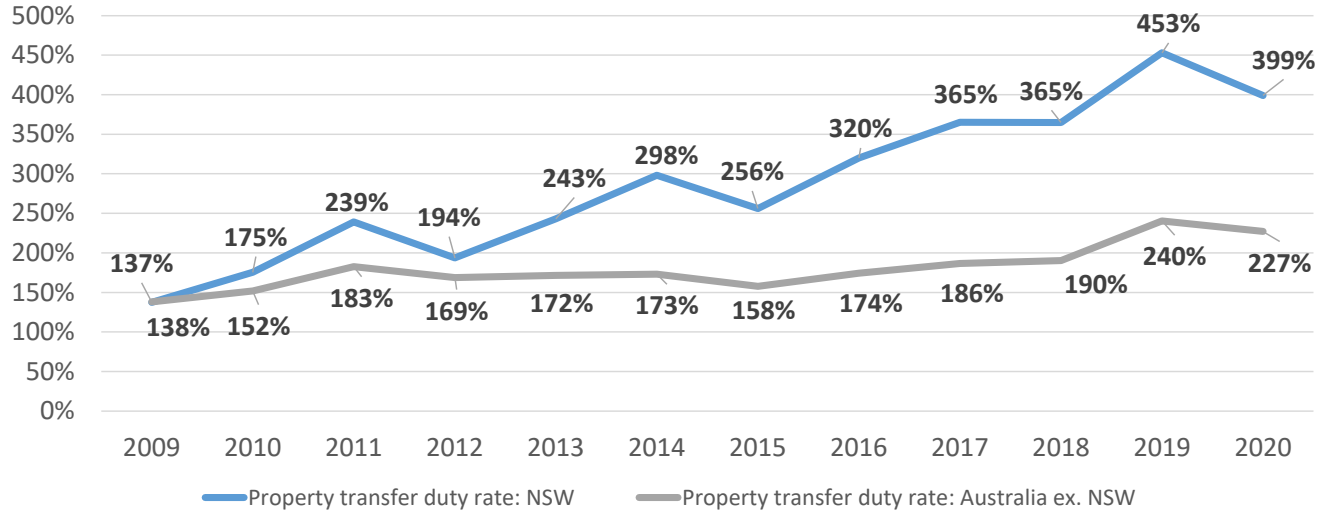
Quick summary
Arguments in support of property tax reform (mainly stamp duty removal)

- Efficiency effects of **transfer duty (TD)** in particular are very large.
  - Significant barriers to consumption of **moving services** exist due to the current tax system;
  - Fewer transactions than is optimal [Davidoff and Leigh (2013); Adams et al. (2020)];
  - Distortions quantified using Computable General Equilibrium (CGE) models;
  - These analyses do not track market prices of housing.



Today focus
Studying housing price impacts of property tax reform

We address this by developing a housing price module for VURMTAX
(Victoria **U**niversity **R**egional **M**odel with **Tax** detail).

With the module in place we can revisit old questions, or ask some new ones.

1. **The old question:** Can we rank the relative efficiency of property taxes?
    - Does the absence of transactions and market prices from past studies matter for efficiency?
    - We find they do not. See our paper:
      https://www.copsmodels.com/ftp/workpapr/g-330.pdf

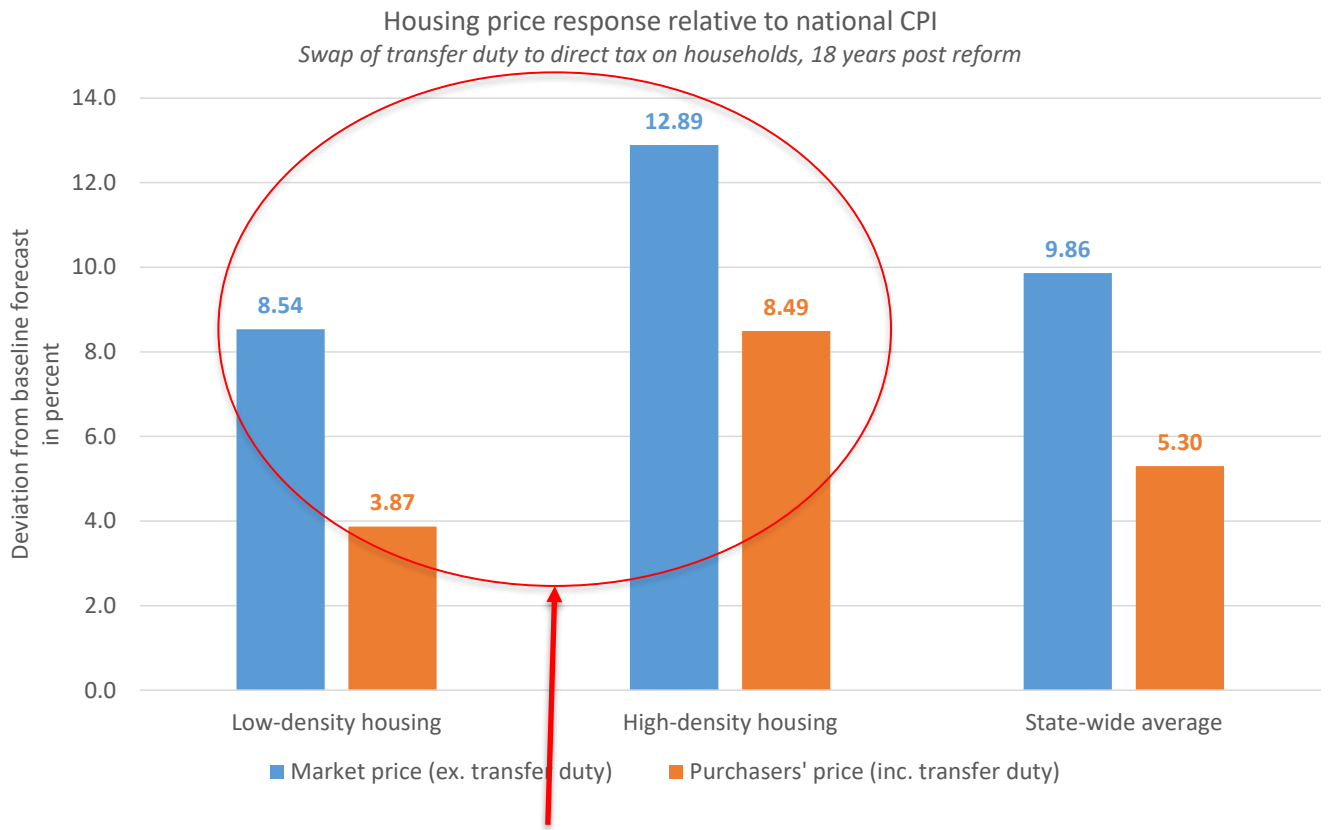
1. **The new questions:** How large are the housing price responses?
    - Market prices for housing are very high relative to income. Pushing them higher would amplify debt-to-income levels => diminished macrostability.

Three simulations today

- Not covering all seventeen tax swaps today.

- Our agenda is less ambitious.
  - **Simulation A.1:**
    - Remove TD;
    - Replace revenue with a direct tax on households;
    - What are the housing price consequences?
      - Low-density (LD) versus high-density (HD), distinguished by **turnover rates** (approx. LD: 24 yrs, HD: 9 yrs) and **land intensity** (approx. LD: 60%, HD: 40%).
  - **Simulation A.2:**
    - Impose a broad-based, uniform rate land tax (BBUIV);
    - Return the revenue to households via a direct transfer;
    - Relatively uncontroversial findings, as tax is capitalised into land price.
  - **Simulation A:** Direct swap of TD for BBUIV.
    - Is *A = A.1 + A.2*?

Simulation A.1: Housing price responses
Average market price movement exceeds average tax rate



Same sign, different magnitude: inhomogeneous housing price movements for different type of housing. **What causes this?**

Simulation A
Strong interaction effects mean A is not the sum of its parts!

Same magnitude, different sign: A.1 (blue bars) + A.2 (yellow bars) do not yield A (black diamonds) for housing price responses. **Why?**

Todays talk
Model outline, then some price decompositions

- **Our model of housing prices in VURMTAX.**
    - General form;
    - Assumptions;
    - Final levels equations.

- **Decomposition results for simulations A.1 and A.2, and relating them to simulation A.**

Modelling property prices

Defining the price of a structure $PVS_{i,q,t}$
General form

- Market price of housing capital of density type *i* in region *q* at time *t* is defined as $PVC_{i,q,t}$:

$$PVC_{i,q,t} = -\frac{RTD_{i,q,t}}{2} \cdot PVC_{i,q,t} + PV\_CAPINC_{i,q,t} + PV@SALE\_C_{i,q,t}.$$

- Market price of land along similar dimensions is $PVL_{i,q,t}$:

$$PVL_{i,q,t} = -\frac{RTD_{i,q,t}}{2} \cdot PVL_{i,q,t} + PV\_LNDINC_{i,q,t} + PV@SALE\_L_{i,q,t}.$$

- Sum yields market price of a housing structure $PVS_{i,q,t}$. Tied down by observed average market prices for detached dwellings and apartments in each region:

$$PVS_{i,q,t} = PVC_{i,q,t} + PVL_{i,q,t}.$$

Data inputs

- Many data sources used to parameterize the data arrays in this system.
  - **Australian Bureau of Statistics** national accounts and I-O tables;
  - **Australian Census** to split housing into two density types (low-density and high-density), each with two tenure types (rented and owner-occupied);
  - **State Revenue Office** for property tax loads (and thus tax rates) by land zone type;
  - **Valuer-General** sales figures for holding periods $H_{i,\mathrm{NSW},2016/17} = \{ 24.6, 9.2 \}$ for $i \in \{$ DwellingLow, DwellingHigh $\}$, and land stocks in NSW;
  - **Domain** for housing prices by region in base year
  - **NSW TSY Interstate Comparison of Taxes** used to define progressive transfer duty rate scale;

- Yield initial values for post-tax rentals, market prices, etc.
- How do we take account of future values?

Growth in nominal incomes and prices

- Investor expectations for post-tax asset incomes at time *T* [$UNITINC\_A_{i,q,T}$ where $A \in \{C, L\}$ in region *q*], unit construction costs at time *T* ($CON\_COST_{i,q,T}$), and other relevant coefficients are related to corresponding quantities at (the present) time *t* via:

$$F_{i,q,T} = F_{i,q,t} \cdot \Pi_{\tau=0}^{T} \left(1 + G_{A,i,q,\tau}\right),$$

where *F* is any of the aforementioned income/price/cost coefficients, and $G_{A,i,q,\tau}$ is identical for $A \in \{C, L\}$.

- Given $G_{A,i,q,T}$ and the mortgage rate NR_T, the power of the real discount rate at time *T* is:

$$RDISC_{A,i,q,T} = \frac{\left(1 + G_{A,i,q,T}\right)}{\left(1 + NR_T\right)}.$$

Some algebra later…
Neat levels form of the housing price equations

$$\left(1+\frac{RTD_{i,q,t}}{2}\right)\cdot PVC_{i,q,t} = ATDFACT_{CAP,i,q,t}\cdot\left(UNITINC\_C_{i,q,t}\right)$$
$$+\left(1-\frac{RTD_{i,q,t}}{2}\right)\cdot LRDFACT_{CAP,i,q,t}\, CON\_COST_{i,q,t},$$

$$PVL_{i,q,t} = -\frac{RTD_{i,q,t}}{2}\cdot PVL_{i,q,t}\cdot\left(1+LRDFACT_{LND,i,q,t}\right)$$
$$+ATDFACT_{LND,i,q,t}\cdot UNITINC\_L_{i,q,t}$$
$$+LRDFACT_{LND,i,q,t}\cdot PVL_{i,q,t}.$$

Complications reserved for the discount factors
The black circles

- The discount factor for income earned over the holding period $H_{i,q,t}$, which is linked to the turnover rate and transaction volumes (and is thus dynamic).
- Solved using adaptive multi-step Runge-Kutta integrators in GEMPACK.

$$\mathrm{ATDFACT}_{A,i,q,t} = \int_0^{H_{i,q,t}} \Pi_{\tau=0}^{T}\left(\mathrm{RDISC}_{A,i,q,\tau}\right)\mathrm{dT}$$

$$= \mathrm{RDISC}_{A,i,q,t} \int_0^{H_{i,q,t}} \mathrm{RDISC}_{A,i,q,t}^{T} \cdot \exp\left(-\frac{T\cdot(T+1)}{2S_{i,q,t}}\right)\mathrm{dT}$$

$$= \sqrt{\frac{\pi \cdot \mathrm{RDISC}_{A,i,q,t} \cdot S_{i,q,t}}{2}} \cdot \exp\left(\frac{S_{i,q,t}\cdot \log^2\left[\mathrm{RDISC}_{A,i,q,t}\right]}{2} + \frac{1}{8S_{i,q,t}}\right)$$

$$\cdot\left[\mathrm{erf}\left(\frac{2S_{i,q,t}\cdot\log\left(\mathrm{RDISC}_{A,i,q,t}\right)-1}{2\sqrt{2S_{i,q,t}}}\right)\right.$$

$$\left.-\mathrm{erf}\left(\frac{-2H_{i,q,t}+2S_{i,q,t}\cdot\log\left(\mathrm{RDISC}_{A,i,q,t}\right)-1}{2\sqrt{2S_{i,q,t}}}\right)\right].$$

Results

How do we simulate a transfer duty-land tax swap?

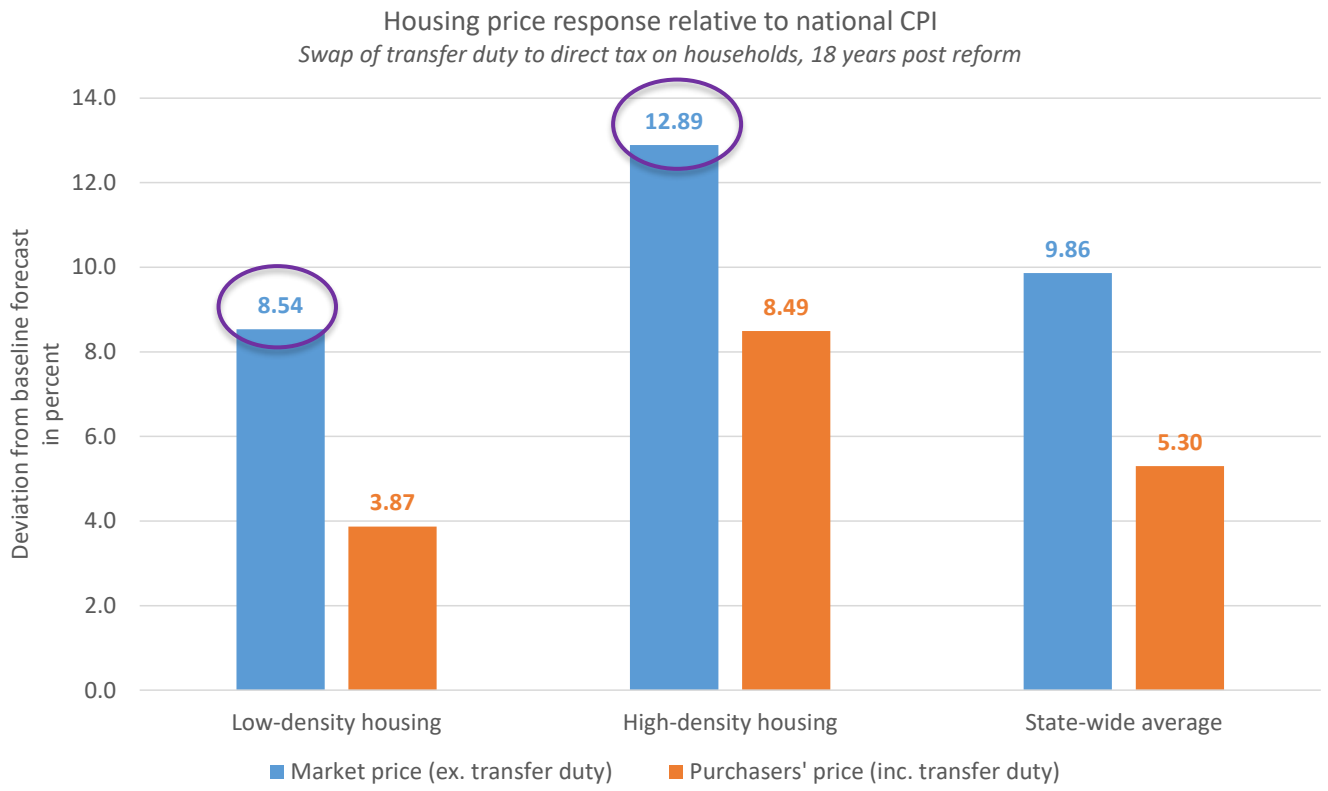
We run our transfer duty-land tax swap as three distinct simulations.

1. **Simulation A.1:**
    - Remove TD and replace revenue with a direct tax on households.

2. **Simulation A.2:**
    - Impose a BBUIV and return the revenue to households via a direct transfer.

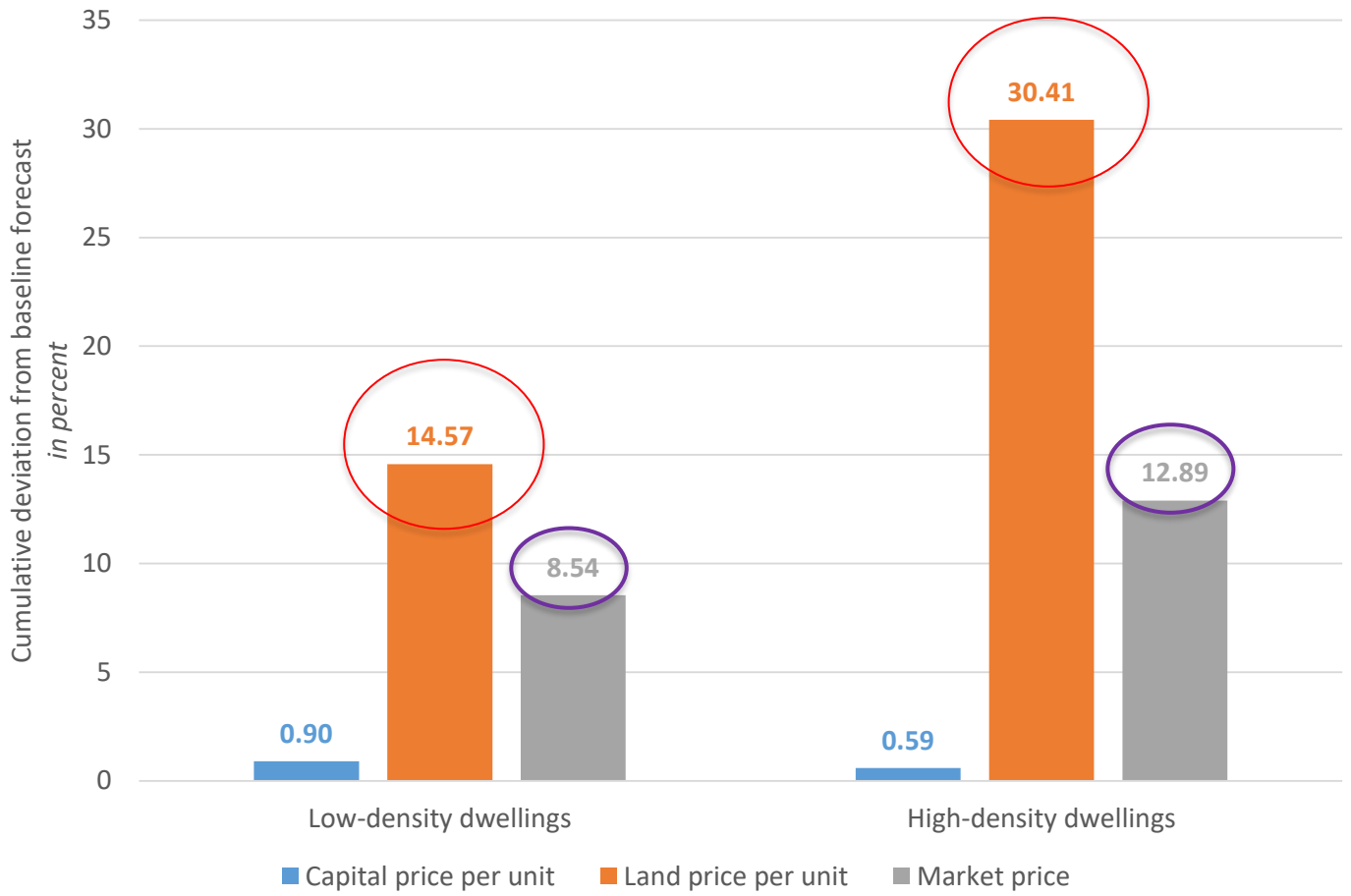
3. **Simulation A:** Are results close to A.1 + A.2?
    - Remove TD.
    - Replace revenue (dollar-for-dollar) with a broad-based, uniform rate land tax (BBUIV).

Flashback: Simulation A.1
Housing price responses



Simulation A.1: Transfer duty -> direct tax on households
Land, capital and market price responses

- Little long-run capital price response, as expected;
- Large land value responses. Much higher for high-density than low-density housing.
- **Can we understand the cause of these differences?**



Simulation A.1: Transfer duty -> direct tax on households
Land value decompositions

- Recall the land value formula from earlier.

$$\begin{aligned}\mathrm{PVL}_{i,q,t} = &-\frac{\mathrm{RTD}_{i,q,t}}{2}\cdot \mathrm{PVL}_{i,q,t}\cdot\left(1+\mathrm{LRDFACT}_{\mathrm{LND},i,q,t}\right)\\ &+\mathrm{ATDFACT}_{\mathrm{LND},i,q,t}\cdot \mathrm{UNITINC\_L}_{i,q,t}\\ &+\mathrm{LRDFACT}_{\mathrm{LND},i,q,t}\cdot \mathrm{PVL}_{i,q,t}.\end{aligned}$$

- Can repeatedly substitute the expression for PVL into the third term on the right-hand-side. It becomes a geometric progression which can be written as:

$$\begin{aligned}\mathrm{PVL}_{i,q,t} = &-\frac{\mathrm{RTD}_{i,q,t}}{2}\cdot \mathrm{PVL}_{i,q,t}\cdot\left(1+\mathrm{LRDFACT}_{\mathrm{LND},i,q,t}\right)\\ &+\mathrm{ATDFACT}_{\mathrm{LND},i,q,t}\cdot \mathrm{UNITINC\_L}_{i,q,t}\\ &+\frac{\mathrm{LRDFACT}_{\mathrm{LND},i,q,t}}{1-\mathrm{LRDFACT}_{\mathrm{LND},i,q,t}}\cdot\left[-\frac{\mathrm{RTD}_{i,q,t}}{2}\cdot \mathrm{PVL}_{i,q,t}\cdot\left(1+\mathrm{LRDFACT}_{\mathrm{LND},i,q,t}\right)\right.\\ &\left.+\mathrm{ATDFACT}_{\mathrm{LND},i,q,t}\cdot \mathrm{UNITINC\_L}_{i,q,t}\right],\end{aligned}$$

$$\frac{\dfrac{\mathrm{LRDFACT}_{\mathrm{LND,DwellingHigh,NSW},2040}}{1-\mathrm{LRDFACT}_{\mathrm{LND,DwellingHigh,NSW},2040}}}{\dfrac{\mathrm{LRDFACT}_{\mathrm{LND,DwellingLow,NSW},2040}}{1-\mathrm{LRDFACT}_{\mathrm{LND,DwellingLow,NSW},2040}}}\approx 2.6.$$

Simulation A.1: Transfer duty -> direct tax on households
Land value decompositions

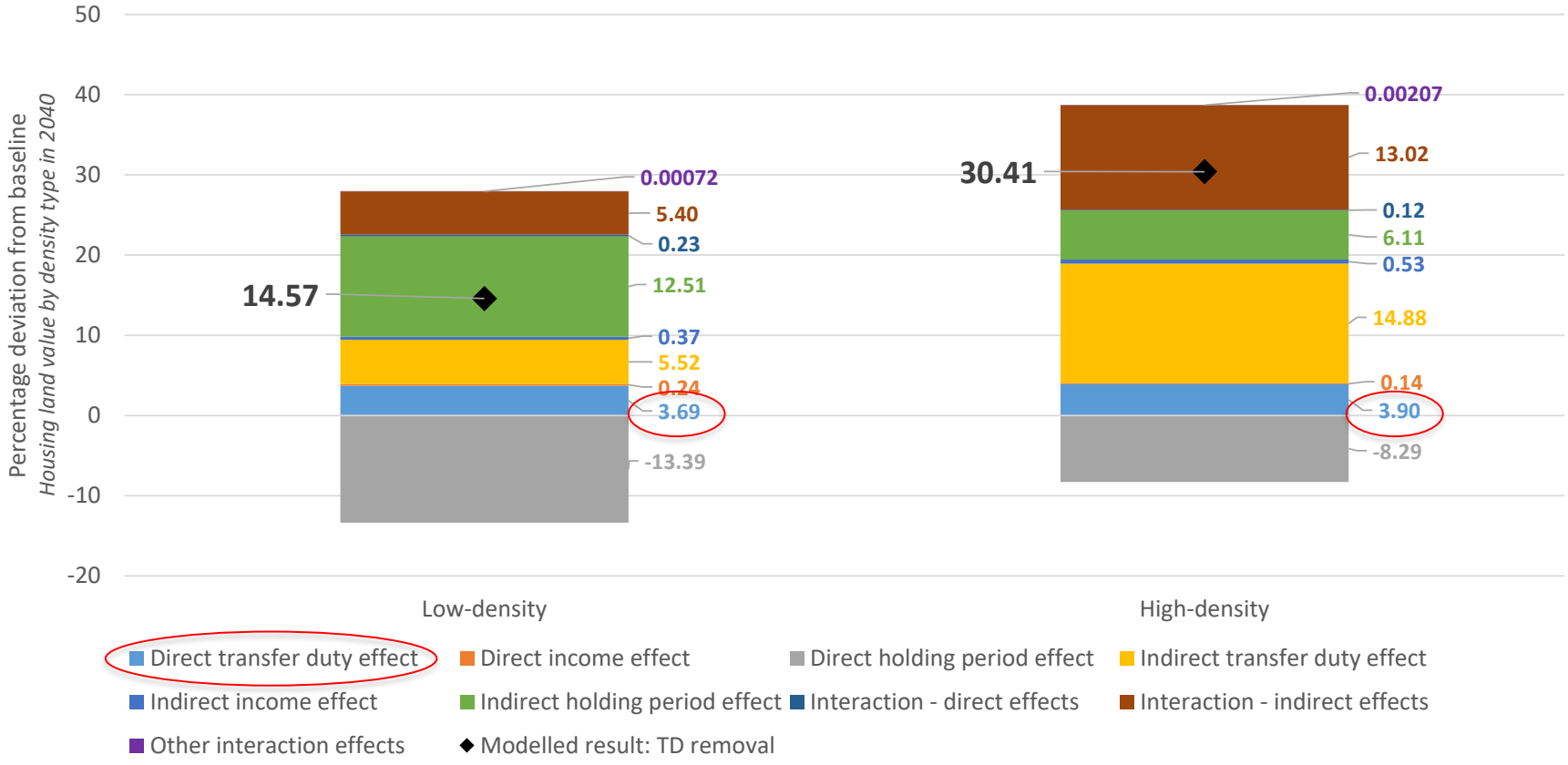
- In this form there are three potential drivers of land price in a policy simulation PVL_P relative to the base case PVL_B. These are changes in ***RTD*** (transfer duty effects), changes in **UNITINC** (income effects), or changes in ATDFACT and LRDFACT (holding period effects).

$$\begin{aligned}\mathrm{PVL}_{i,q,t} = & -\frac{\mathrm{RTD}_{i,q,t}}{2}\cdot \mathrm{PVL}_{i,q,t}\cdot\left(1+\mathrm{LRDFACT}_{\mathrm{LND},i,q,t}\right) \\ & +\mathrm{ATDFACT}_{\mathrm{LND},i,q,t}\cdot \mathrm{UNITINC\_L}_{i,q,t} \\ & +\frac{\mathrm{LRDFACT}_{\mathrm{LND},i,q,t}}{1-\mathrm{LRDFACT}_{\mathrm{LND},i,q,t}}\cdot\left[-\frac{\mathrm{RTD}_{i,q,t}}{2}\cdot \mathrm{PVL}_{i,q,t}\cdot\left(1+\mathrm{LRDFACT}_{\mathrm{LND},i,q,t}\right)\right. \\ & \left.+\mathrm{ATDFACT}_{\mathrm{LND},i,q,t}\cdot \mathrm{UNITINC\_L}_{i,q,t}\right],\end{aligned}$$

- These three effects are come in two forms.
  - *Direct effects:* Changes of quantities in the red box.
  - *Indirect effects:* Changes of quantities in the green box.
- The direct effects can interact with one another. So too can the indirect effects. We thus have *direct* and *indirect* interaction effects.
  - A decomposition of the total policy deviation thus has 8 driving factors.

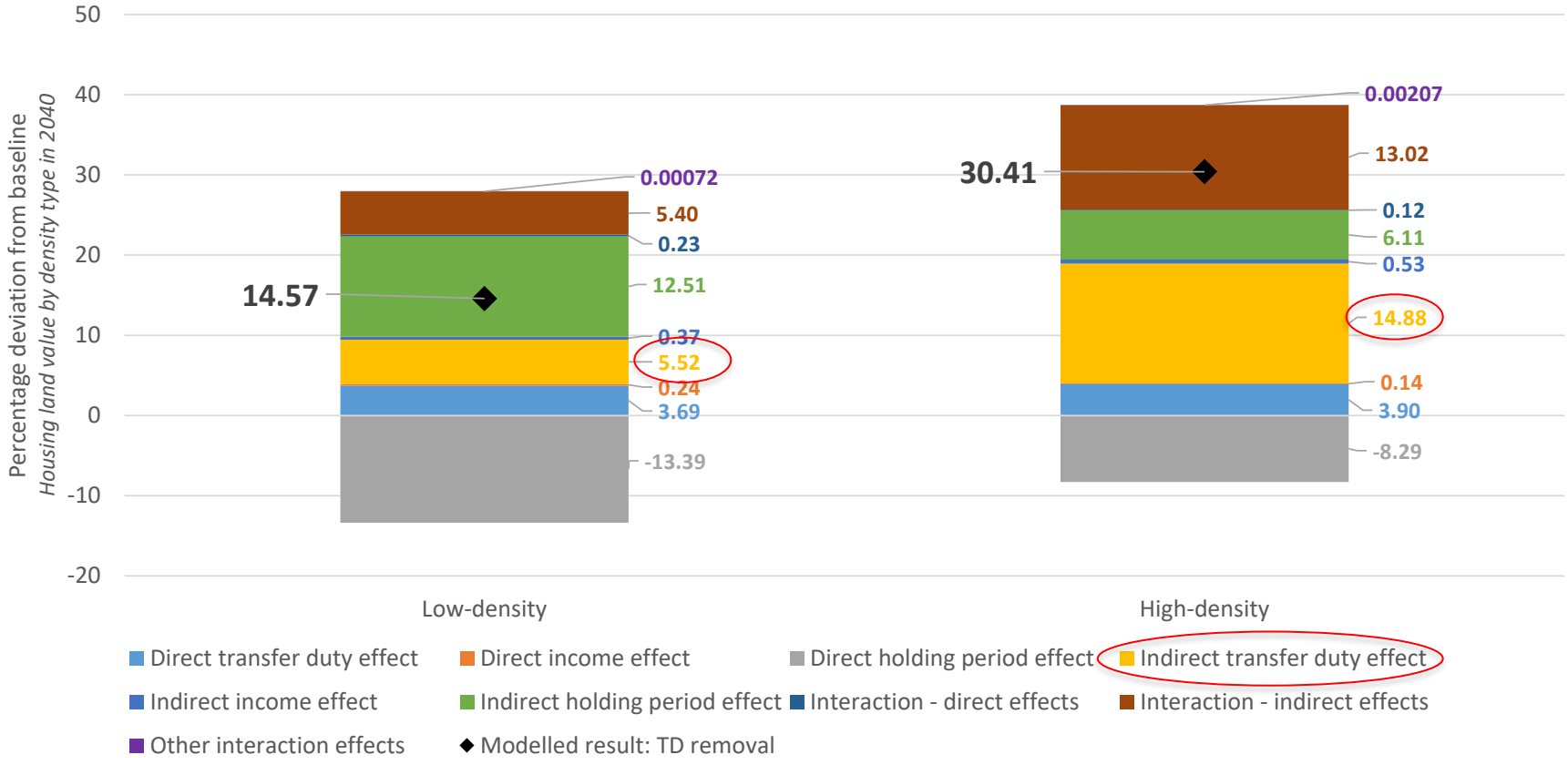
Simulation A.1: Transfer duty -> direct tax on households
Land value decomposition I

- Our eight factors together explain all the variation (purple residuals are small);
- Highlight 1:
  - Direct transfer duty effects < RTD. Why? The tax is incident on buyers and sellers;
  - Effect larger for high-density. Why? Holding period is half low-density.



Simulation A.1: Transfer duty -> direct tax on households
Land value decomposition II

- Highlight 2:
  - Indirect TD effect for high-density is 2.6 times as large - dominant response. **Why?** Much lower holding period, so many more transaction events over lifetime.
  - Effect larger for high-density. Why? Holding period is half low-density.



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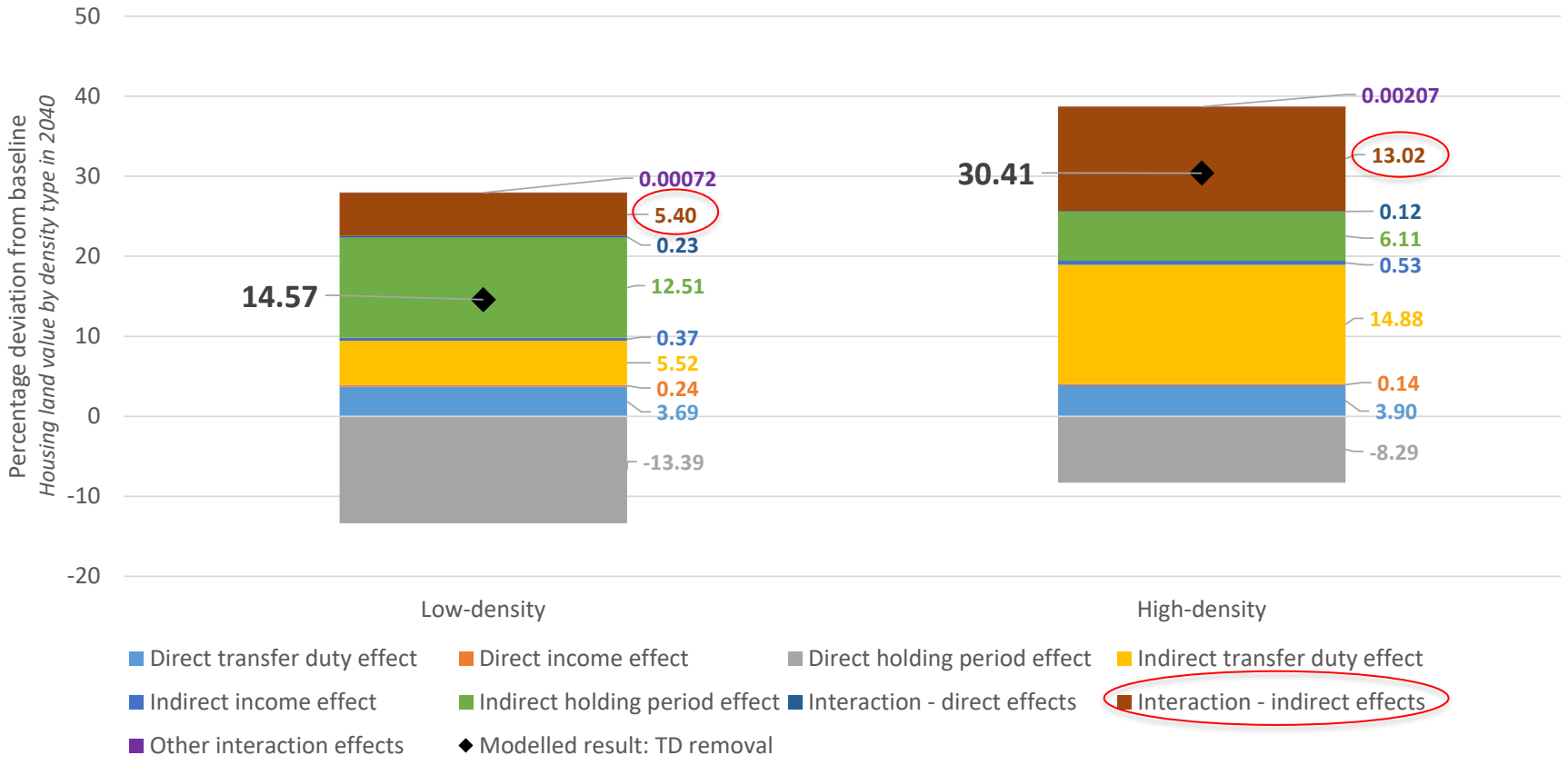
Simulation A.1: Transfer duty -> direct tax on households
Land value decomposition IV

- Highlight 3:
  - Indirect interaction effect is also large. Why? Removing TD reduces the holding period. Many more transactions occur. Each transaction is however free of TD.

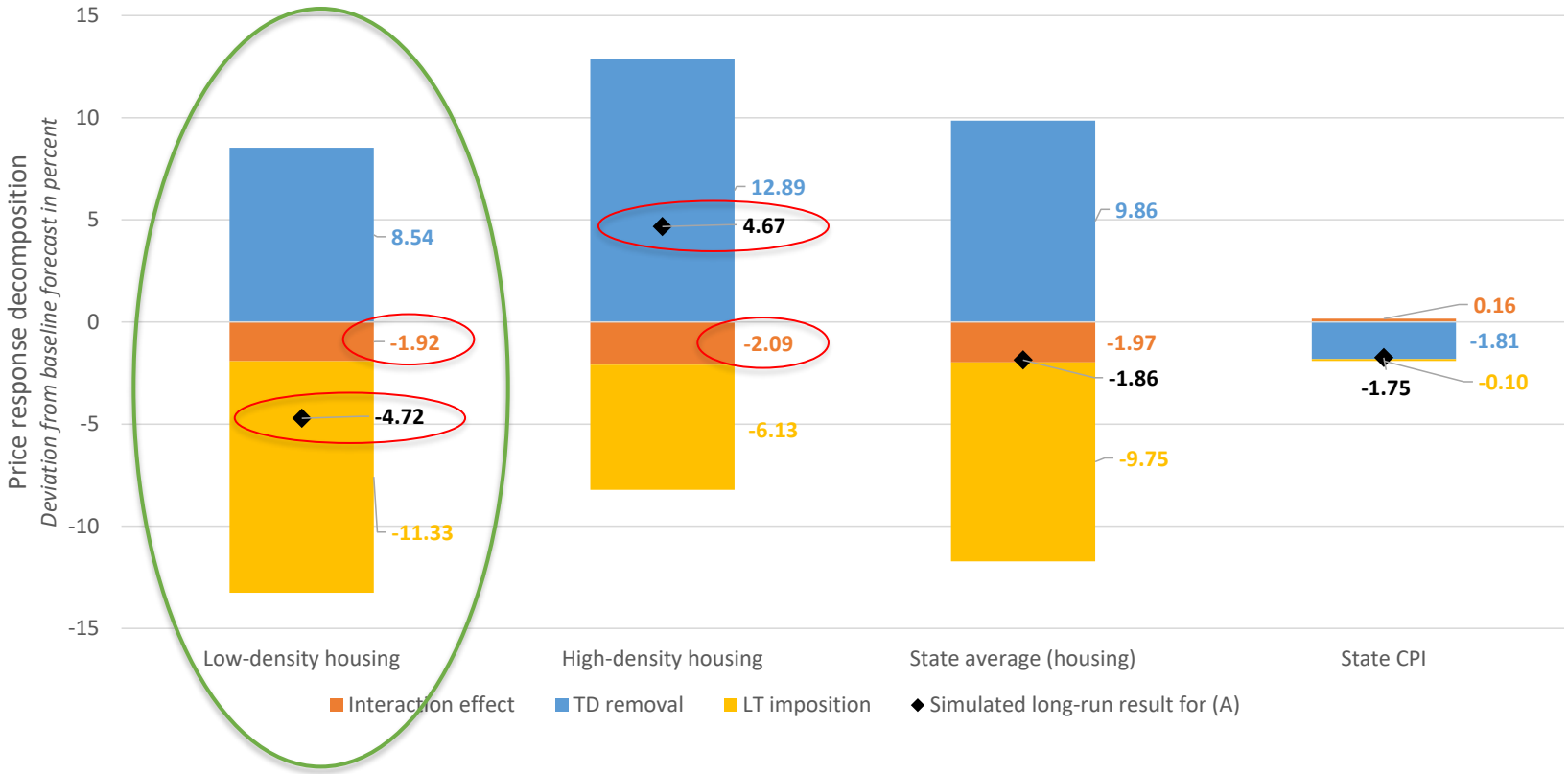


Simulation A.2: Land tax-> direct transfer
Land value decomposition V

- Our eight factors together explain all the variation (purple residuals are small);
- Highlight:
  - Indirect income effect dominates as expected, because land is long-lived.

Simulation A: Transfer duty -> land tax
Overall response in housing prices and more interaction effects

- Highlight:
  - A.1 (blue bars) + A.2 (yellow bars) **do not equal** A (black diamonds).
  - Strong interaction effects in price response when we replace one tax with another.



Simulation A: Transfer duty -> land tax
Land value decomposition VI

- The model remembers you cannot count transfer duty savings twice!

Summary

We develop new theory to facilitate asset pricing in a CGE model.

- Some insights:
  - Investors are sensitive to taxes paid by both themselves and future owners when valuing land;
  - This has material impacts on physical asset valuations where land intensities are large, like housing;
  - Removal of transaction taxes like TD on housing can put significant, upward pressure on housing prices, if not replaced by other property taxes.

- Interaction effects can be significant when studying tax mix swaps.
  - Tax changes can impact market prices, particularly for land-intensive assets. These market prices feed into the tax base for other taxes, like transfer duty.
  - Partial equilibrium framework can lead to double counting of savings, and over estimation of price responses.
  - Strengthens the case for a general equilibrium framework.