Comment on "Supply Constraints do not Explain House Price and Quantity Growth Across U.S. Cities"

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1 Introduction

Louie et al. (2025) (henceforth LMW) claim to provide evidence that housing supply constraints are quantitatively unimportant in understanding changes in housing prices and quantities in the United States. In this short comment, I show that LMW's empirical model is unidentified. LMW models housing demand as a function of population and average income. However, supply constraints are a key determinant of population growth: newcomers are less able to move into a city that restricts the construction of new housing. Hence, LMW does not have exogenous variation in demand. Accordingly, the empirical results are uninformative about the role the housing supply constraints.

2 Supply elasticities are correlated with population growth

In this section I walk through LMW's equations and show that the key parameters are unidentified. Housing demand (in percentage changes) is

$$\widehat{H}_i^D = \epsilon_y \widehat{Y}_i - \epsilon_p \widehat{P}_i + \widehat{\theta}_i, \tag{1}$$

while housing supply is

$$\widehat{H}_i^S = \psi_i \widehat{P}_i + \widehat{\sigma}_i. \tag{2}$$

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For city i, $\widehat{P}_i$ and $\widehat{H}_i$ are growth rates of housing prices and quantities, and $\widehat{Y}_i$ is total income growth, where total income = population × average income. The income elasticity of demand is ϵ_y and the price elasticity of demand is ϵ_p, while $\widehat{\theta}_i$ captures demand shocks. The supply elasticity is ψ_i and $\widehat{\sigma}_i$ captures supply shocks.

From equating quantity demanded with quantity supplied, we have LMW Equations 1 and 2:

$$\widehat{P}_i = \frac{\epsilon_y}{\psi_i + \epsilon_p}\widehat{Y}_i + \frac{\widehat{\theta}_i - \widehat{\sigma}_i}{\psi_i + \epsilon_p}, \tag{3}$$

$$\widehat{H}_i = \frac{\psi_i \epsilon_y}{\psi_i + \epsilon_p}\widehat{Y}_i + \frac{\psi_i\widehat{\theta}_i + \epsilon_p\widehat{\sigma}_i}{\psi_i + \epsilon_p}. \tag{4}$$

LMW claim that regressing price growth on total income growth (separately by high- and low-elasticity subgroups Ω^j, $j \in \{H, L\}$) yields the following slope coefficient (p.8):

$$\beta_j = \frac{\epsilon_y}{\psi_j + \epsilon_p} + \frac{1}{\psi_j + \epsilon_p}\frac{\mathrm{Cov}(\widehat{\theta}_i - \widehat{\sigma}_i, \widehat{Y}_i)}{\mathrm{Var}(\widehat{Y}_i)}, \quad i \in \Omega^j,\ j \in \{H, L\}. \tag{5}$$

Similarly, regressing quantity growth on total income growth gives

$$\gamma_j = \frac{\psi_j \epsilon_y}{\psi_j + \epsilon_p} + \frac{\psi_j}{\psi_j + \epsilon_p}\frac{\mathrm{Cov}(\widehat{\theta}_i + \frac{\epsilon_p}{\psi_j}\widehat{\sigma}_i, \widehat{Y}_i)}{\mathrm{Var}(\widehat{Y}_i)}, \quad i \in \Omega^j,\ j \in \{H, L\}. \tag{6}$$

Critically, LMW implicitly assume that $\psi_i = \psi_j$ for each city i in subgroup Ω^j, $j \in \{H, L\}$. That is, the supply elasticity is assumed to be constant within each subgroup, which implies $\mathrm{Cov}(\psi_i, \widehat{Y}_i) = \mathrm{Cov}(\psi_j, \widehat{Y}_i) = 0$, allowing us to pull terms out of the covariance. This assumption is not noted or defended.

But supply elasticities do in fact vary across cities: $\psi_i \neq \psi_j$. Moreover, housing supply constraints make it more difficult for newcomers to move into a city; so the supply elasticity affects population growth, which in turn affects total income growth. Hence, the supply elasticity ψ_i is correlated with total income growth: $\mathrm{Cov}(\psi_i, \widehat{Y}_i) \neq 0$.[1] When $\mathrm{Cov}(\psi_i, \widehat{Y}_i) \neq 0$, the slope coefficients β_j and γ_j cannot be simplified without further assumptions, as I demonstrate below.

[1] Note that LMW cannot test this assumption using elasticity estimates from the literature without undermining their own exercise. If we assume that the elasticity in the data is ψ_i^k from an external source k, then we are also imposing the restriction that any estimated elasticity must recover the assumed value.

First, regressing price growth on total income growth in subgroup Ω^j gives the slope coefficient $\beta_j = \frac{\mathrm{Cov}(\widehat{P}_i, \widehat{Y}_i)}{\mathrm{Var}(\widehat{Y}_i)}$. The numerator is

$$\begin{aligned}\mathrm{Cov}(\widehat{P}_i, \widehat{Y}_i) &= \mathrm{Cov}(\frac{\epsilon_y}{\psi_i + \epsilon_p}\widehat{Y}_i + \frac{\widehat{\theta}_i - \widehat{\sigma}_i}{\psi_i + \epsilon_p}, \widehat{Y}_i) \\ &= \mathrm{Cov}(\frac{\epsilon_y}{\psi_i + \epsilon_p}\widehat{Y}_i, \widehat{Y}_i) + \mathrm{Cov}(\frac{\widehat{\theta}_i - \widehat{\sigma}_i}{\psi_i + \epsilon_p}, \widehat{Y}_i).\end{aligned} \tag{7}$$

Note that ψ_i is not a constant, and when $\mathrm{Cov}(\psi_i, \widehat{Y}_i) \neq 0$, we cannot simplify the expression for β_j without further assumptions. Second, the regression of housing quantity growth on total income growth (in subgroup Ω^j) faces the same problem. The numerator of the slope coefficient $\gamma_j = \frac{\mathrm{Cov}(\widehat{H}_i, \widehat{Y}_i)}{\mathrm{Var}(\widehat{Y}_i)}$ is

$$\begin{aligned}\mathrm{Cov}(\widehat{H}_i, \widehat{Y}_i) &= \mathrm{Cov}(\frac{\psi_i \epsilon_y}{\psi_i + \epsilon_p}\widehat{Y}_i + \frac{\psi_i \widehat{\theta}_i + \epsilon_p \widehat{\sigma}_i}{\psi_i + \epsilon_p}, \widehat{Y}_i) \\ &= \epsilon_y \mathrm{Cov}(\frac{\psi_i}{\psi_i + \epsilon_p}\widehat{Y}_i, \widehat{Y}_i) + \mathrm{Cov}(\frac{\psi_i \widehat{\theta}_i + \epsilon_p \widehat{\sigma}_i}{\psi_i + \epsilon_p}, \widehat{Y}_i)\end{aligned} \tag{8}$$

Again, the expression cannot be simplified when ψ_i is not a constant. Hence, the expressions for β_j and γ_j above in Equations 5 and 6 (from LMW p.8) are incorrect. Additional assumptions are required to derive the expressions in LMW.

LMW claim in Equation 3 that their framework implies the following relationships: $\beta_H < \beta_L$ and $\gamma_H > \gamma_L$. That is, for a given change in total income, prices increase less and quantities increase more in high-elasticity cities compared to low-elasticity cities. But these relationships hold only under the implicit assumption that $\psi_i = \psi_j$ in each subgroup. Since this assumption is not justified, neither are LMW's main predictions.

The correlation between the supply elasticity ψ_i and total income growth $\widehat{Y}_i$ also overturns the derivation of the instrumental variables estimate of the average supply elasticity in LMW Equation 5. The first stage is a regression of price growth $\widehat{P}_i$ on total income growth $\widehat{Y}_i$, and the reduced form is a regression of quantity growth $\widehat{H}_i$ on total income growth $\widehat{Y}_i$.[2] Since $\widehat{H}_i = \psi_i \widehat{P}_i + \widehat{\sigma}_i$, the IV estimator for subgroup j is

$$\theta_j = \frac{\mathrm{Cov}(\widehat{H}_i, \widehat{Y}_i)}{\mathrm{Cov}(\widehat{P}_i, \widehat{Y}_i)} = \frac{\mathrm{Cov}(\psi_i \widehat{P}_i, \widehat{Y}_i)}{\mathrm{Cov}(\widehat{P}_i, \widehat{Y}_i)} + \frac{\mathrm{Cov}(\widehat{\sigma}_i, \widehat{Y}_i)}{\mathrm{Cov}(\widehat{P}_i, \widehat{Y}_i)}, \quad i \in \Omega^j,\ j \in \{H, L\}. \tag{9}$$

[2]Hence, the separate regressions discussed above are simply the component terms of the IV estimator. We instrument for prices using total income, but total income is endogenous to quantity (through supply constraints). The instrument is invalid.

In contrast, LMW claim in Equation 5 that

$$\theta_j = \psi_j + \frac{\mathrm{Cov}(\widehat{\sigma}_i, \widehat{Y}_i)}{\mathrm{Cov}(\widehat{P}_i, \widehat{Y}_i)}, \quad i \in \Omega^j,\ j \in \{H, L\}. \tag{10}$$

But because $\psi_i \neq \psi_j$ and $\mathrm{Cov}(\psi_i, \widehat{Y}_i) \neq 0$, the expression cannot be simplified as claimed. Hence, θ_j does not identify the average supply elasticity in subgroup j.

One final implication of $\mathrm{Cov}(\psi_i, \widehat{Y}_i) \neq 0$ is that the supply and demand graph in LMW Figure 1 is incorrect. Their empirical model is not accurately described as an exogenous shift in demand, since the demand shifter (total income growth) is correlated with supply constraints. The standard supply and demand model does not apply in this scenario.

3 Conclusion

To conclude, note that LMW are effectively proposing a new estimate of the housing supply elasticity (LMW Table IV). Their elasticity disagrees sharply with the elasticities from the literature: when splitting the sample into high- and low-elasticity subgroups (using existing elasticities), LMW report statistically indistinguishable estimates, when we expect to find a larger elasticity in the high-elasticity subgroup (and vice versa). As readers, we are being asked to decide whether we trust this new elasticity more than the existing estimates.

References

Louie, S., J. A. Mondragon, and J. Wieland (2025, March). Supply constraints do not explain house price and quantity growth across U.S. cities. Working Paper 33576, National Bureau of Economic Research.