Did High Gas Prices Cause the Great Recession? Theory and Empirical Evidence

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Energy, Housing, and the Great Recession

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The Great Recession

...it was the collapse of the housing bubble...that was the spark that ignited a string of events, which led to a full-blown crisis in the fall of 2008.
The Great Recession
The Great Recession
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The Great Recession

- Housing Crisis
- Financial Crisis
- Recession
The Great Recession

- Housing Crisis
- Financial Crisis
- Recession
The role of gas prices
Housing crisis response
Housing crisis response
Housing crisis response
Housing crisis response
Housing crisis response
Housing crisis response
Distance to Urban Core

Most Resilient: 28.8

Least Resilient: 66.9
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<th>Income</th>
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VMT

Most Resilient

15,092

Least Resilient

20,460
Transportation Cost as Percent of Income

Most Resilient: 17.9
Least Resilient: 24.7
Foreclosure Rate

Most Resilient

Least Resilient
Foreclosure Rate

Most Resilient: 0.06%

Least Resilient:
Foreclosure Rate

Most Resilient: 0.06%

Least Resilient: 0.13%
Price Drop

Most Resilient

Least Resilient
Most Resilient

Price Drop

Least Resilient

6%
Price Drop

Most Resilient

6%

Least Resilient

57%
The city

- Monocentric metro area: city and suburbs
- Housing stock in city is fixed
- Suburbs can grow
- Housing quality is homogeneous
Households

- $N$ indexed by $i$
- household $i$ has income $y_i$; households indexed s.t. $y_1 \geq \ldots \geq y_n$
- Utility over housing services, $H$, and a numeraire, $Z$: $\phi(H, Z)$
Commute costs

Value of housing services at ea. distance:

\[ R_i(x) = R_i^0 - \tau_i x \]

- \( R_i^0 \) - value of housing services at city center
- \( \tau \) - commute cost per unit distance
- it is assumed \( \tau_i > \tau_{i-j} \) for \( j = \{1, 2, 3, \ldots\} \) (e.g. Bartolome and Ross (2003))
- \( x \) - commute distance
Housing as investment, equilibrium requires:

\[
\frac{R}{P} = (1 - \theta)(r + t) + \delta + \alpha + m - \pi^e
\]

- \( R \) - rental services
- \( P \) - home price
- \( \theta \) - marginal tax rate
- \( r \) - mortgage rate
- \( t \) - property tax (share)
- \( \delta \) - depreciation rate
- \( \alpha \) - risk premium
- \( m \) - maint. cost per dollar
- \( \pi^e \) - expected appreciation
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“user cost of housing” - \( C \)

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Poterba (1984, 1991)
Max willingness to pay, or bid-price for home

\[ P_i(x) = \frac{R_i^0 - \tau_i x}{(1 - \theta_i)(r + t) + \delta + \alpha + m - \pi^e} \]

- decreasing in commute cost, mortgage rate, and property tax
- increasing in expected appreciation
- user cost magnifies home price effect of an increase in commute cost
Suburban sprawl

Land on the suburban boundary is developed if the bid price exceeds a reservation price:

\[ b_s^* = \frac{1}{\tau_i} \left[ R_i^0 - \left( (1 - \theta_i)(r + t) + \delta + \alpha + m - \pi^e \right) A \right] \]

- the boundary is pushed out as . . .
- commute cost falls
- mortgage rate falls
- expected appreciation increases
Proposition 1
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Lowest income households rent in city center. But lowest income *homeowners* live farthest from the city.
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Homeowners in the suburb are most vulnerable to an energy price shock: they are the most exposed and least able to absorb increased costs.
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Homeowners in the suburb are most vulnerable to an energy price shock: they are the most exposed and least able to absorb increased costs.

Accommodative monetary policy and housing subsidies exacerbate housing market vulnerability to energy price shocks by encouraging home ownership among low income households.
Energy price shock

- raises $\tau_i$
- lowers $\pi^e$
- But does not change relative magnitude of intercept or slope of bid-price functions
Proposition 2
After an energy price shock, each homeowner can only stay put or default
Energy price shock

\[ P_i(x) = \frac{R_i^0 - \tau_i x}{(1 - \theta_i)(r + t) + \delta + \alpha + m - \pi^e} \]
House price changes

The graph shows the relationship between the distance in miles and the house price in dollars. The lines indicate how the price changes as the distance increases. The different lines represent different data sets, each with a linear decrease in price as the distance increases.
Percent fall in home prices
Outstanding mortgage debt as a share of the purchase price is given by . . .

\[ \psi_i = \frac{(1 - \rho_i) \left[ 1 - (1 + r)^{-(\bar{T}_i - T_i)} \right]}{1 - (1 + r)^{-\bar{T}_i}} \]

- \( \rho_i \) - downpayment as percent of purchase price
- \( \bar{T}_i \) - term of fixed rate mortgage
- \( T_i \) - periods before energy shock that home was purchased
Underwater homes

Underwater iff ...

\[ \tilde{P}_i(x_i) < \psi_i P_i(x_i) \]

\[ \frac{c_i(R_i^0 - \tilde{\tau}_i x_i)}{\tilde{c}_i(R_i^0 - \tau_i x_i)} < \psi_i \]
Proposition 3
Proposition 3

The likelihood “i” is underwater is ...
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The likelihood “i” is underwater is . . .

Increasing in

• commute dist.
• mortgage term
• decline in appr. expectations
• inc. in commute cost
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Increasing in:
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Decreasing in:
- downpayment
- term of ownership
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The likelihood “i” is underwater is ...

Increasing in
- commute dist.
- mortgage term
- decline in appr. expectations
- inc. in commute cost

Decreasing in
- downpayment
- term of ownership
- rental rate in the city

If i is underwater, so is i + 1, i + 2, ...
Underwater homes

Underwater iff ...

\[ \tilde{P}_i(x_i) < \psi_i P_i(x_i) \]

\[ \frac{c_i (R_i^0 - \tilde{\tau}_i x_i)}{\tilde{c}_i (R_i^0 - \tau_i x_i)} < \psi_i \]
Households underwater
Households underwater
Households underwater
Accommodative monetary policy and federal housing policies lower the user cost of housing, making prices more sensitive to gas prices, and this more likely to be underwater following an energy price shock.

But they ALSO increase the number of underwater households by shifting the suburban boundary farther out.
Low user cost of housing and low commute cost push suburban boundary and make each household more susceptible to energy shock.
Summary

- Low user cost of housing and low commute cost push suburban boundary and make each household more susceptible to energy shock.

- Energy shock increases commute cost, lowering bid-price for all housing, but because the commute distance is greater in suburbs, the magnitude of the effect is greater in suburbs.
Summary

• Low user cost of housing and low commute cost push suburban boundary and make each household more susceptible to energy shock.

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- Energy shock increases commute cost, lowering bid-price for all housing, but because the commute distance is greater in suburbs, the magnitude of the effect is greater in suburbs.
- Income is also lower, so homes most exposed are least able to absorb the changes.
- Mortgages with low downpayments, long terms, and flexible rates increase likelihood of being underwater, so does high share of recent purchases.
Conclusions

- A theory for why the housing bubble burst when it did.
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- Focused on gas prices. Suburban households use more other energy too (Glaeser and Kahn)