Supply Side Constraints in the Israeli Housing Market – Impact of State Owned Land

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Motivation

• The Israeli case is unique (93.6% of lands under ILA control) - general conclusions may arise from the unique

• Many studies found strong impact of land supply on housing supply and elasticity, but hardly any in a detailed and spatial context

• Although high in the public debate, the impact of ILA tenders on the supply of housing is unclear
Land supply and housing supply

- Land is the most basic input for housing supply
- Land supply is a factor of: land availability and supply elasticity, land use and planning regulation, land ownership (public or private), construction costs and topography
- Land supply and prices are the most important factors affecting housing supply and prices. Housing supply elasticity is rising with land supply

(Glaeser & Gyourko, 2005; Glaeser, et al., 2006; Saiz, 2008; Saks, 2008; Sinai, 2010; Grimes & Aitken, 2010; Peng & Wheaton, 1994)
Concentrated land ownership

- Concentrated land ownership - lowers competition, supply elasticity and building density
  (Markusen & Scheffman, 1978; Vousden, 1981; Mills, 1980)

- Singapore - stable market with elastic supply in spite of public ownership and land constraints
  (Tu, 2004; Hwang & Lum, 2007; Ooi & Le, 2012)

- Hong Kong - land supply did not impact housing supply, because of developers “land banks”
  (Peng & Wheaton, 1994; Tse, 1998)

- Land is a better speculative investment than housing
  (Nathanson & Zwick, 2013)

- The ILA is increasing land prices by releasing too small amounts of land to the market
  (Borukhov, 1979; Eckstein & Perlman, 1997; Werczberger & Borukhov, 1999)
Israeli land ownership

• 93.6% of land in Israel is under governmental control
• Ownership: Government - 69.4%, JNF - 11.7% and DA - 12.5%
• A regulatory land authority (ILA) was established in 1960 to administer lands
• Lands are allocated to developers and the public via tenders (by law since 1992) for a period of 49 or 98 years
• Tenders are “first-price sealed-bid auctions” most of which are with minimum price (since 1999)
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**I. Public land private initiative**

- **Public land**
  - **ILA Planning**
    - **ILA, Planning committee**
  - **ILA Land tender**
    - **ILA, Developers**
  - **Building permit**
    - **Developers, Municipalities**
  - **Building start**
    - **Developers**
    - 36% of starts 2005-2015

**II. Public land public initiative**

- **Public land**
  - **MOH Planning**
    - **MOH, Planning committee**
  - **ILA/MOH Land tender**
    - **MOH, ILA, Developers**
  - **Building permit**
    - **Developers, Municipalities**
  - **Building start**
    - **Developers**
    - 11% of starts 2005-2015

**III. Private land private initiative**

- **Private land**
  - **Planning**
    - **Developers, Planning committee**
  - **Building permit**
    - **Developers, Municipalities**
  - **Building start**
    - **Developers**
    - 53% of starts 2005-2015
Theoretical framework – Model

- Land supply and tenders:
  1) $LS_{kt} = \eta(L_{kt-1}, UL_{it}, PN_t)$
  2) $PL_{kt}^{Max} > PLM_{kt}$

- Land demand:
  3) $\pi_{kt+1} = P_{kt+1} - PL_{kt} - CC_{kt}$
  4) $PL_{kt} = \gamma(P_{it}, PN_t, P_{it}, L_{it}, S_{it}, CC_t)$

- Marketed land:
  5) $L_{it} = \sum_{k=1}^{n} LS_{kt}, PL_{kt}^{Max} > PLM_{kt}, UL_{it} > 0$

- Housing supply:
  6) $S_{it} = \delta(P_{it}, PN_t, L_{it}, P_{it}, L_{it}, S_{it}, CC_t)$
Theoretical framework - ILA policy decisions

- Four policy measures impacting land supply:
  1. Where \((i)\) land is offered in tenders
  2. When \((t)\) land is offered in tenders
  3. Amount \((LS_{it} \text{ or } LS_{kt})\) of land offered
  4. Minimum price \((PLM_{kt})\)

Are policy measures constraining land supply thus lowering housing supply and/or crowding in private lands?

Is there a spatial effect?
The Sample – Annual spatial panel data

Space, $t$:  
- 45 spatial units:  
  - 30 largest cities  
  - 15 sub-districts

Time, $t$:  
- 11 years (2002-2012)

Space-time:  
- Panel of 495 observations
# The Data – variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Symbol</th>
<th>Unit</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing starts</td>
<td>( S_{it} )</td>
<td>sqm</td>
<td>CBS</td>
</tr>
<tr>
<td>Local house prices</td>
<td>( P_{it} )</td>
<td>NIS(2009)/sqm</td>
<td>KARMAN</td>
</tr>
<tr>
<td>National house prices</td>
<td>( PN_t )</td>
<td>NIS(2009)/sqm</td>
<td>KARMAN</td>
</tr>
<tr>
<td>Construction cost</td>
<td>( CC_t )</td>
<td>index</td>
<td>CBS</td>
</tr>
<tr>
<td>Land offered</td>
<td>( LS_{it} )</td>
<td>sqm</td>
<td>ILA</td>
</tr>
<tr>
<td>Share of minimum price</td>
<td>( PLM_{it} )</td>
<td>%</td>
<td>ILA</td>
</tr>
<tr>
<td>No offers</td>
<td>( NO_{it} )</td>
<td>Dummy</td>
<td>ILA</td>
</tr>
</tbody>
</table>
Spatial lags

- Neighboring regions enter the model by spatial lag variables (denoted by tildes)
- Lagged variables are constructed with a weights matrix of population-weighted distance (row summed to 1):

\[ w_{ij} = \frac{POP_j}{POP_i + POP_j} \cdot \frac{1}{d_{ij}} \]

\[ W_{ij} = \frac{w_{ij}}{\sum w_{ij}} \]

\[ \tilde{X}_i = \sum_{j \neq i} W_{ij} X_i \]
Unit Root tests

<table>
<thead>
<tr>
<th>Variable</th>
<th>IPS</th>
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<tbody>
<tr>
<td></td>
<td>d=0</td>
<td>d=1</td>
<td></td>
</tr>
<tr>
<td>Housing starts</td>
<td>-0.237</td>
<td>-9.613</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.407)</td>
<td>(0.000)</td>
<td></td>
</tr>
<tr>
<td>House prices</td>
<td>2.678</td>
<td>-4.877</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.996)</td>
<td>(0.000)</td>
<td></td>
</tr>
<tr>
<td>National house prices</td>
<td>1.848</td>
<td>-14.628</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.968)</td>
<td>(0.000)</td>
<td></td>
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- Tenders data cannot be tested because of zeros, other methods were used to assess stationarity.
Estimation

- 2 Estimation equations (Non-stationary cointegrating vectors and Residuals stationary equation):

\[ \ln(S_{it}) = \alpha_i + \beta_1 \ln \left( \frac{P_{it}}{CC_t} \right) + \beta_2 \ln \left( \frac{PN_t}{CC_t} \right) + \beta_3 \ln(S_{it}) + \beta_4 \ln \left( \frac{P_{it}}{CC_t} \right) + \nu_{it} \]

\[ \nu_{it} = \beta_5 \ln(\text{LS}_{it-2}) + \beta_6 \text{PLM}_{it-2} + \beta_7 \text{NO}_{it-2} + \beta_8 \ln(\text{LS}_{it-2}) + \]

\[ \beta_9 \text{PLM}_{it-2} + \beta_{10} \text{NO}_{it-2} + \lambda \nu_{it-1} + \rho \nu_{it} + u_{it} \]

- Cointegration tests performed on residuals
- Variables have non-standard distributions (super-consistency properties)
### Estimation results

<table>
<thead>
<tr>
<th>Model</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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</tr>
<tr>
<td><strong>Stage 1 - non-stationary</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( P )</td>
<td>0.960</td>
<td>0.821</td>
<td>0.677</td>
<td>0.780</td>
<td>0.853</td>
<td>0.850</td>
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<tr>
<td>( PN )</td>
<td>0.372</td>
<td>-0.370</td>
<td>0.553</td>
<td>0.545</td>
<td></td>
<td>-0.131</td>
</tr>
<tr>
<td>( S )</td>
<td>0.433</td>
<td>0.486</td>
<td>0.553</td>
<td>0.545</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \tilde{P} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Stage 2 - stationary</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( LS )</td>
<td>0.065***</td>
<td>0.065***</td>
<td>0.062***</td>
<td>0.061***</td>
<td>0.058**</td>
<td>0.058**</td>
</tr>
<tr>
<td>( PLM )</td>
<td>0.089</td>
<td>0.097</td>
<td>0.127</td>
<td>0.122</td>
<td>0.099</td>
<td>0.099</td>
</tr>
<tr>
<td>( NO )</td>
<td>0.583**</td>
<td>0.602**</td>
<td>0.604**</td>
<td>0.582**</td>
<td>0.552**</td>
<td>0.549**</td>
</tr>
<tr>
<td>( \tilde{LS} )</td>
<td>0.077</td>
<td>0.077</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \overline{PLM} )</td>
<td>0.233</td>
<td>0.224</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \overline{NO} )</td>
<td>0.210</td>
<td>0.176</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \lambda )</td>
<td>0.225***</td>
<td>0.225***</td>
<td>0.211***</td>
<td>0.207***</td>
<td>0.206***</td>
<td>0.206***</td>
</tr>
<tr>
<td>( \rho )</td>
<td>-0.518**</td>
<td>-0.617**</td>
<td>-0.806***</td>
<td>-0.791***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Results

• High elasticity of supply ($0.677 < \beta_1 < 0.960$)
• Negative national spillover
• Positive spillover from neighboring to local construction ($\beta_3 > 0$)
• Spatial substitution in construction ($\beta_4 < 0$)
• ILA tender’s impact on supply significant but low ($0.058 < \beta_5 < 0.065$)
• Minimum prices do not effect supply
• No tenders yields higher supply ($\beta_7 > 0$)
• Tenders do not have a spatial effect
Conclusions and policy implication

• Very high elasticity of supply in the 2008-2012 “Boom” period
• ILA tenders have a very low positive short-term impact on local housing supply, because
  - Scarcity of public land crowed-in private land in demand areas
  - Some evidence of developer’s ‘land banks’
• Public land needs to be more elastic
• Private land reserves should be monitored
Thank you!