Assessing the role of TIF and LIHTC in an equilibrium model of affordable housing development

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TIF example

Original Tax Basis	$100,000
New Tax Basis	$500,000
Increment	$400,000
Ten Year Increment	$4,000,000
Loan Amount	$2,000,000
Debt Service (Annual)	$200,000
Excess Funds (Annual)	$200,000

Table: In this example we consider an existing structure that generates $100,000 annually in property taxes, and a new development that increase tax revenue to $500,000 annually after construction is completed. Thus, there is a difference of $400,000 per year. After 10 years, the increment becomes $4,000,000. The tax recipients only take the original tax basis, the $100,000 annually in this example, and the remaining $400,000 is given back to the original lender, either the bond owners or the bank. We assume that the developer only gets a TIF loan equal to 50% of the increment. In this case, the developer still pays back $400,000 every year for the next 10 years. However, the city is not using the full $400,000 for debt servicing; it is only using $200,000 for debt service. The remaining $200,000 can be distributed to the tax recipients, or it can be used for infrastructure development.

Low Income Housing Tax Credit (LIHTC)

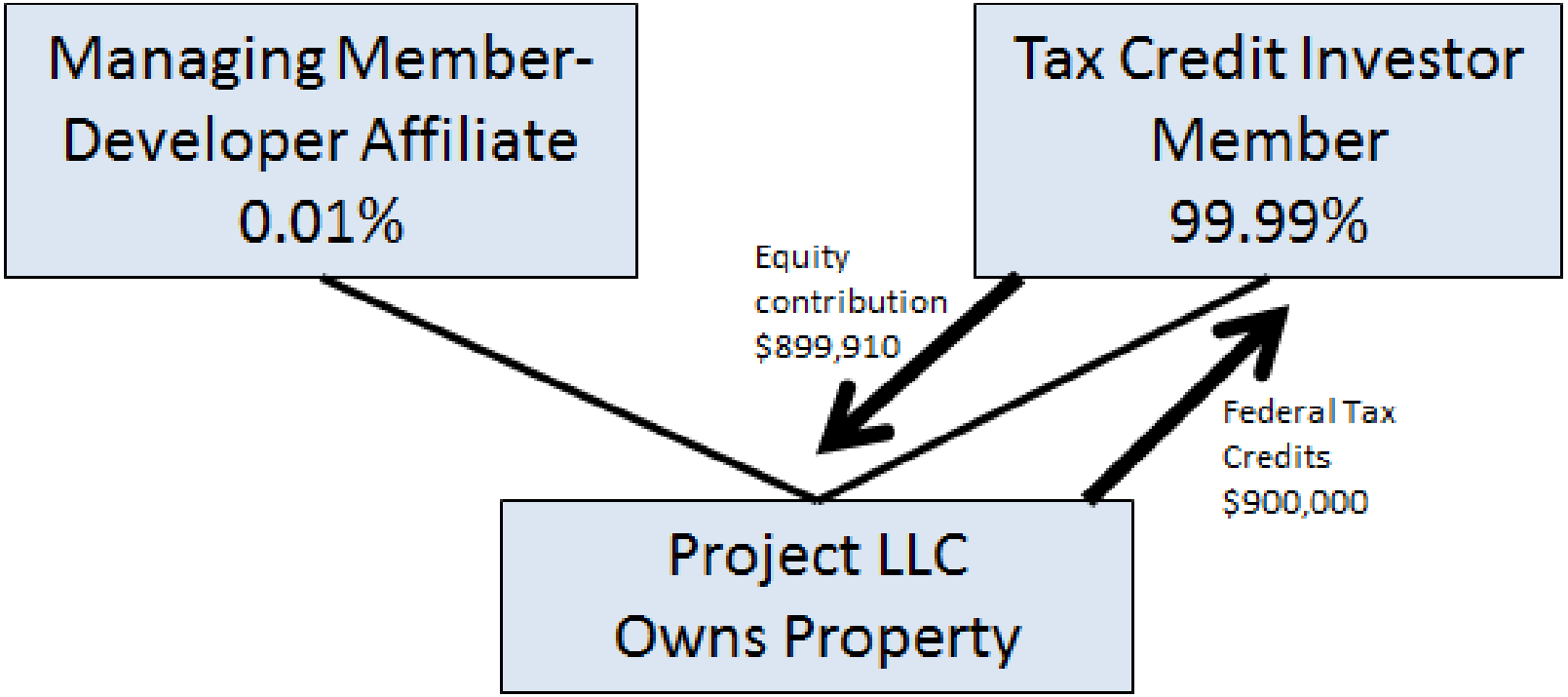


Figure: This figure illustrates a typical LIHTC deal, in which a developer is allocated \$1 million in tax credits and the market price of these credits is \$0.90. Mathematically, $\$0.90 * \$1 million * 99.99\% = \$899,910$

Goal

Our goal is to examine the role of TIF and LIHTC on affordable housing development.

- Can a TIF policy implement an equilibrium where the construction of affordable housing becomes feasible (it passes the "*but for*" test)?
- Is TIF effective in ameliorating a housing affordability crisis resulting from frictions in the housing market (e.g., zoning constraints and NIMBYism)?
- Does TIF induce global corporations to rebalance their LIHTC equity portfolios?

The model

We consider an economy with two jurisdictions, k_1 and k_2.

Local developers provide affordable housing to local poor households, and finance these investments with a mixture of debt, TIF, and LIHTC equity

The other agents in our model are 1) local rich households who lend money in the debt market to consume in the second period, 2) a corporation that buys LIHTCs in both jurisdictions, and 3) a company that owns and sells construction materials in the first period.

Competitive equilibrium

A competitive equilibrium consist of a vector $(x^A, D^A, E^A, p, q, \tau, (\pi_k)_{k\in\mathbf{K}})$, such that

- Each agent maximizes utility $u^i(x^i) = \theta^i_{10} \ln x^i_{10} + \sum_{s=s_1,s_2} \left(\theta^i_0(s) \ln x^i_0(s) + \sum_{k=1,2} \theta^i_k(s) \ln a^i_k(s)\right)$ subject to budget constraints, debt short sale constraints, and sign constraints $T^i_k \geq 0$

- Jurisdition's profit function π_k determined by agents' equity choices

- Market clearing for debt (global), equity (local), affordable housing (local), numeraire (global), construction materials (global)

Theorem 1: Under assumptions... the competitive equilibrium set is non-empty.

Characterization of equilibrium

Proposition 1: *In each jurisdiction, the ε-shock to affordable housing development drives the house price differential between states of nature, i.e.,*

$$\begin{aligned} p_1(1)/p_1(2) &= \varepsilon_1(2)/\varepsilon_1(1) \\ p_2(1)/p_2(2) &= \varepsilon_2(2)/\varepsilon_2(1) \end{aligned}$$

For example, if $\varepsilon_1(1) < \varepsilon_1(2)$, then $p_1(1) > p_1(2)$. The ε-shock can be interpreted as an underlying friction of the housing market, e.g., zoning constraints and NIMBYism

Proposition 2: *TIF increases the construction costs in the TIF jurisdiction*.

Characterization of equilibrium

Proposition 3: *The corporation's LIHTCs T_k^c decreases in the developer d_k's loan amount and the amount of TIF awarded to developer d_k by jurisdiction k*, i.e.,

$$T_k^c = \frac{\hat{T}_k^{d_k} r}{2 \cdot \omega_0^{h_k}(1) \cdot \tau} \left(\frac{\tau}{r} \omega_0^{h_k}(1) + \underbrace{\gamma_k \hat{T}_k^{d_k}}_{\text{taxes}} - \underbrace{\omega_{10}^{H_k}}_{\text{loan}} - \underbrace{\delta^{d_k}((\gamma_k - \eta_k)\hat{T}_k^{d_k} - \lambda_k)}_{\text{TIF}_k} \right)$$

Proposition 3 provides a first insight into the role of municipal public policy on global capital markets.

Roughly speaking, TIF crowds out global investors' holdings of real estate equity in the TIF jurisdiction

Assessing the role of TIF

Example 1: No TIF: $\delta_1^{h_1} = 1$ and $\delta_2^{h_2} = 1$
Example 2: With TIF: $\delta_1^{d_1} = 0.5$ and $\delta_2^{d_2} = 0$

	Example 1		**Example 2**	
	k_1	k_2	k_1	k_2
TIF_k	0.00	0.00	0.11	0.00
$LIHTC_k^c$	0.45	0.45	0.41	0.49
$Debt^{d_k}$	1.00	1.00	1.00	1.00
$ConstructionCost_k$	1.00	1.00	1.07	1.02
$PropertyTax_k^{d_k}$	0.20	0.20	0.21	0.20

Assessing the role of TIF

"But for" test: The development project will not materialize if the developer feels the expected profit without TIF is not large enough given the risk.

We take $\theta_0^{d_k}(s_1) = \theta_0^{d_k}(s_2) = 1$ for both developers d_1 and d_2. Then, the local developer's expected utility in Example 1 is equal to $\ln 0.8999$. This utility can be seen as a proxy of the developer's profitability from constructing affordable housing.

It stands to reason that affordable housing will not be developed if local developers require a expected indirect utility greater than $\ln 0.9000$.

TIF_1 increases the developers d_1 and d_2's expected utility (a proxy of profitability) from $\ln 0.8999$ to $\ln 0.9423$ for developer d_1 and from $\ln 0.8999$ to $\ln 0.9036$ for developer d_2. Thus, affordable housing development passes the "but for " test.

Assessing the role of TIF

A TIF policy of $TIF_1 = 0.11$ has the following effect on the corporation's LIHTC equity portfolio:

- TIF_1 induces the corporation to rebalance its portfolio of LIHTC equity toward jurisdiction k_2 by 8.9 percent.

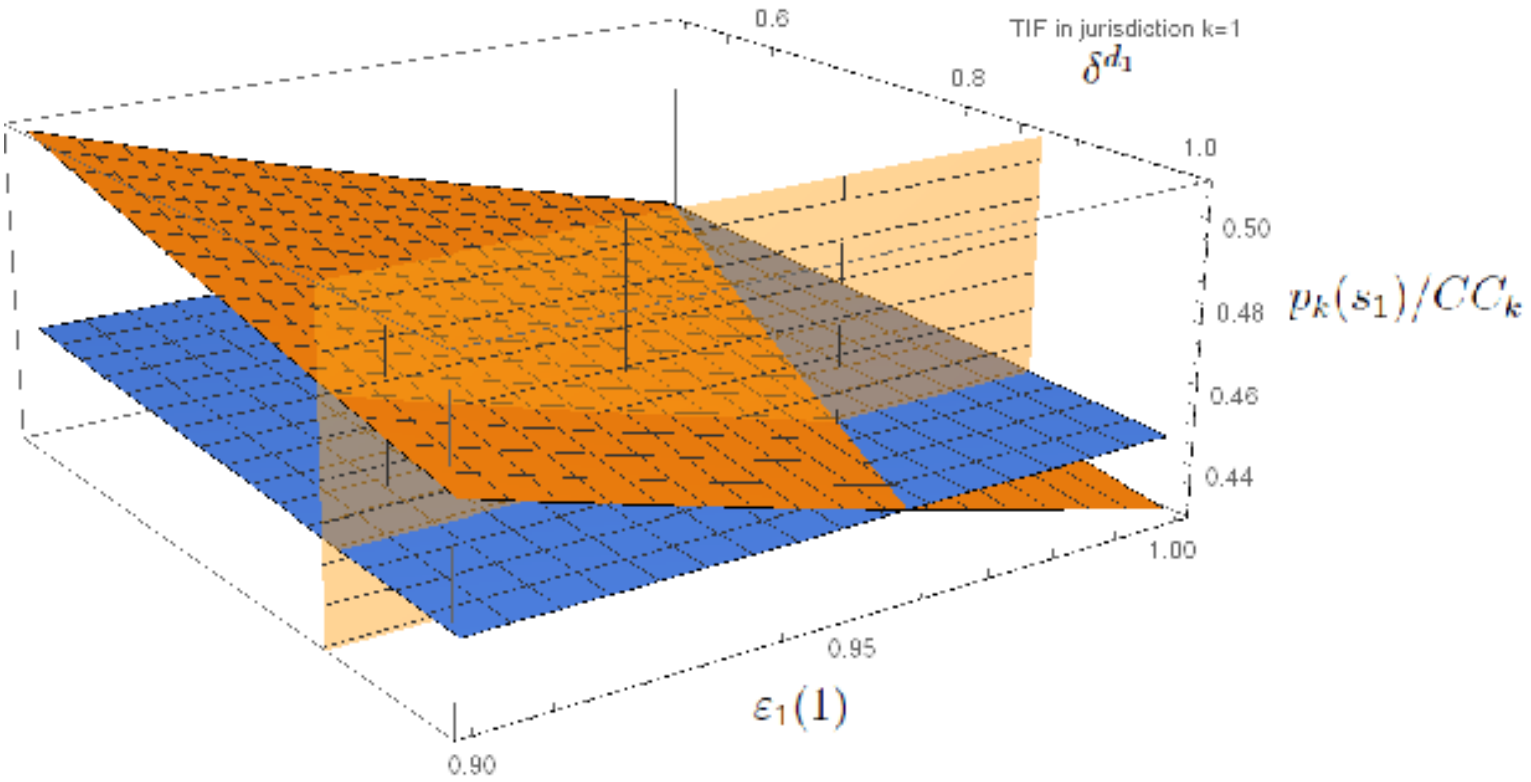
A TIF policy of $TIF_1 = 0.11$ has the following effects on construction costs:

- Construction costs in jurisdiction k_1 by 7 percent due to the additional developer d_1's resources coming from TIF_1
- Construction cost in the no TIF jurisdiction k_2 also increase due to the corporation's higher LIHTC equity investment, but the increment is only 2 percent

TIF ameliorates the ε-shock effect on affordability

The ε-shock can be interpreted as underlying frictions of the housing market, e.g., zoning constraints and NIMBYism.

Here we fix $\varepsilon_1(2) = 1$



We follow Glaeser and Gyourko (2003) and measure affordability as the ratio of house prices to housing construction costs, i.e., $p_k(s)/CC_k$. The lower this, the more affordable is housing in jurisdiction k at state s