ESSAYS ON EMINENT DOMAIN AND PROPERTY RIGHTS

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ESSAYS ON EMINENT DOMAIN AND PROPERTY RIGHTS

A Dissertation
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy
Economics

by
Meng Wang
December 2012

Accepted by:
William R. Dougan, Committee Chair
Kevin K. Tsui
Robert K. Fleck
F. Andrew Hanssen
ABSTRACT

Shortly after the Supreme Court’s decision in *Kelo vs. City of New London*, which expanded the scope of eminent domain power, thirty-seven states enacted legislation to restrict their local governments’ use of eminent domain. This paper uses a model of the efficient limitation on government discretion to explain (1) the initial responses of local government to *Kelo* and (2) the subsequent responses of state legislatures. It shows that elimination of the public-use doctrine is plausibly welfare reducing since it introduces additional uncertainty without offsetting expanded benefits. I test two predictions of the theoretical analysis: First, the post-*Kelo* actions of local governments indicate that they are inclined to use eminent domain frequently when it is allowed. Second, at a higher level of rule making - the state level in this case – there is a desire to rein in the use of eminent domain. The empirical evidence supports these predictions.

The second paper examines the impact of privatizing state-owned housing units on the development of a private market, focusing on price and quantity effects. I explore this issue in the context of China’s 1994 housing reform in urban areas. I use the pre-reform public sector size as a source of cross-section variation to test the effects. The results suggest that the privatization reform allowed urban residents to increase their consumption of private housing, and led to an increase in the equilibrium purchase price. The positive effect on price suggests that privatization had larger effect on the demand than on the supply.

The third chapter examines the transaction of prohibited urban housing on rural land in China. Focusing on the supply side of rural residential land, this paper develops a theoretical framework that shows under the fragmented property regime regarding land in
China, village council without many fiscal resources has incentive to turn rural residential land into urban housing use to grab rents, although it is not legally allowed. Following a perspective of paternalism, central government chooses to tolerate or restrict the sales of the prohibited housing, concerning the trade-off between agriculture output and fiscal tension among different government levels. Evidence is provided.
DEDICATION

I dedicate this work to my family, my friends and all who support me, encourage me, and help me.
ACKNOWLEDGMENTS

I would like to acknowledge the great guidance and help of my advisor, Dr. William Dougan. I deeply thank my committee members, Dr. Kevin Tsui, Dr. Robert Fleck and Dr. F. Andrew Hanssen for their advice and support. I am also grateful to the members of public workshop in John E. Walker Department of Economics at Clemson University. I benefited greatly from seminars and informal conversations with faculty members from the department.

I specially thank Dr. Wei Yu for bringing me to Clemson, and Myles Wallace for being supportive here.
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CHAPTER ONE

A THEORY OF THE POLITICAL RESPONSE TO THE KELO DECISION

1. Introduction

For more than a century our jurisprudence has wisely eschewed rigid formulas and intrusive scrutiny in favor of affording legislatures broad latitude in determining what public needs justify the use of the takings power…clearly there is no basis for exempting economic development from our traditionally broad understanding of public purpose…we emphasize that nothing in our opinion precludes any State from placing further restrictions on its exercise of the takings power.

Justice John Paul Stevens

The Kelo decision threaten[ed] more homes, small businesses, and churches with destruction … than all the nuclear-tipped missiles than Soviet Union could have launched in a pre-emptive first strike at the height of the Cold War.

Bob Marshall

In the case of Kelo v. City of New London, a 5-4 majority of the U.S. Supreme Court held that the general benefits accruing from redevelopment projects make such projects a permissible public use under the Takings Clause of the Fifth Amendment. Although the Kelo decision itself confirmed the appropriateness of the use of eminent domain expanded for economic development projects, the Court left to the states the option to enhance property protection against such activities. Since then a large majority of the states have placed stricter limits on the use of eminent domain. By July 2007, two years after the Supreme Court’s ruling, 37 states had enacted legislation to restrict their local governments’ eminent domain power. In addition, post-Kelo referenda restricting eminent domain were approved by voters in five states. In the remaining eight states, a number of bills or discussions

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3 See U.S. CONST. amend. V, “[N]or shall private property be taken for public use, without just compensation”.
addressing eminent domain abuse have appeared, but none has passed⁴. Given that the chief advocates of eminent domain laws - cities, developers and planners - are presumably politically influential, the rapid enactment of limitations on this power is a remarkable and historic response to one of the most controversial Court decisions in recent decades.

Why did this national backlash occur? And why did eight states choose not to follow the lead of the others? This paper proposes to answer these questions by applying a positive model of constitutional choice to the determination of the state-level rules governing the eminent-power of local government.

The analysis begins with a related question: what general rules might emerge to constrain the taxation of property in a democracy? Two broad alternatives are given particular consideration: A uniform rate structure imposing the same rate on all taxpayers, and a discriminatory rate structure that allows variation in tax rates among taxpayers based on some observable criteria.

It is important to understand why eminent domain could be considered a type of discriminatory tax⁵. The immediate political appeal of discriminatory taxation is that a subgroup of property owners can be made to bear a disproportionate share of the cost of a government project of general benefit. The takings clause of the U.S. Constitution requires that “just compensation” be paid when eminent domain is invoked, and American courts

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⁴ These states are Arkansas, Hawaii, Massachusetts, Mississippi, New Jersey, New York, Oklahoma and Rhode Island. The legislatures of these states made even less progress after July 2007. See Appendix 1B for more discussion.

⁵ Eminent domain is distinguished from taking or seizure by “just compensation” doctrine. Given that in most condemnations the “just compensation” requirement is not satisfied as we discuss, however, we will not differentiate these three concepts notably. In this paper, taking or seizure is viewed as eminent domain without full compensation. Most existing literature basically treats these three the same way.
have held that the preferred measure of “just compensation” is “fair market value”\(^6\). Yet today a large number of court decisions set compensation below market value\(^7\). Deviation from this measure of just compensation can be viewed as an implicit, differentiated tax. Based on this point we can ask the essential question: why is local government constrained from the full exercise of its eminent-domain power?

This question can be considered to be one of constitutional design, either implicit or explicit. I follow Hayek (1960) in defining a constitution as a set of rules that specify the restrictions to be imposed on legislative outcomes. This set of rules is postulated to derive from the unanimous consent of self-interested citizens at a constitutional stage that is either temporally prior to, or otherwise binding on, subsequent government actions. The presumed basis for those rules is to preclude laws or actions that are, \textit{ex ante}, Pareto-dominated by other laws or actions, however attractive they may be to a momentary majority \textit{ex post}. In this paper I will analyze the relationship between the expected incidence of costs and benefits and the citizenry’s choice of rules, in particular, those rules governing eminent domain. I will show that, when no particular group can expect to gain \textit{ex ante} from discriminatory treatment, the government’s eminent domain authority will be restricted more stringently. Moreover, if a judicial ruling such as \textit{Kelo} exogenously relaxes those constraints, there will be a widespread support for new laws at a higher level of government restoring the previous restrictions on lower levels of government.

\footnote{6 Even “market value” approach fails to compensate owners for their lost surplus because it only represents the second-highest valuation of a parcel. Furthermore, it might fail to consider a variety of incidental economic losses that taking land inflicts on its owners. For example, American law denies any compensation to owners of businesses that are destroyed because of taking while the business cannot relocate.}

\footnote{7 One illustration of this is Penn Central Transp. v. City of New York. See 438 U.S 104 (1978). In this case, “the property owner is deprived of compensation for all or part of the appreciation in market value between the time of his original investment and the date of condemnation” (Epstein 1985).
}
The paper is organized as follows. The first section presents some background information on state legislative responses to the *Kelo* decision. The next section discusses those studies of eminent domain that are most closely related to *Kelo*. Section 3 develops a theoretical model of the choice of constitutional or higher-level limits on local governments’ ability to impose discriminatory taxes or to implement other forms of takings. Sections 4 and 5 provide some empirical tests of model’s prediction. The last section concludes.

2. Literature Review

2.1 An overview of eminent domain

Eminent domain is the power of the state to seize a citizen’s real property with due monetary compensation but without the owner’s consent. What is known as the “takings clause” of the Fifth Amendment to the U.S. constitution specifies, “[N]or shall private property be taken for public use without just compensation”\(^8\). Yet the takings issue remains controversial (Epstein 1985, Farber 1992, Levmore 1991, Miceli and Segerson 1996, Wyeth 1996).

The first issue in dispute is the “public use” doctrine: Is eminent domain needed at all? A few economists suggest leaving property transactions to the private sector, because takings may be less efficient in acquiring property than voluntary transfers (Munch 1976, Polinsky 1979, Epstein 1985, Paul 1987)\(^9\). Some others argue that “public use” is a minor

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\(^8\) Similar clause is present in every state constitution. See [http://www.castlecoalition.org/legislativecenter/185?task=view](http://www.castlecoalition.org/legislativecenter/185?task=view). See also, e.g. ALA. CONST. art. I, § 23, art. XXI, § 235; CAL. CONST. art. I, § 19; DEL. CONST. art. I, § 8; FLA CONST. art. X, § 6(a); IND. CONST. art. 1, § 21; KAN. CONST. art. 12, § 4; I.A. CONST. art. I, § 4.

\(^9\) An empirical study by Munch (1976) found that eminent domain condemnation for a Chicago urban renewal project overcompensated owners of high-value property, because they had better lawyers to contest government appraisals, while it undercompensated owners of low-value property.
limitation on takings (Fischel 1995)\textsuperscript{10} that is largely self-limiting (Merill 1986), so allowing government the freedom to take land for transfer when it is used to deal with potential holdout promotes efficiency in the process of land assembly (Epstein 1993, Duke and Bromley 2009). Concerned about the offsetting cost, Miceli and Segerson (2007) contribute with a bargain model to suggest that eminent domain should be limited to large-scale projects with significant threat of holdout. Eminent domain has become increasingly controversial in recent decades, as it has been exploited primarily for economic development\textsuperscript{11}. This paper takes a different perspective on this issue by analyzing how relaxation of the public-use doctrine would affect property owners' expected welfare and thus their preference over property acquisition through eminent domain.

The second topic is the “just compensation” doctrine. Michelman’s (1967) utilitarian comparison of “demoralization” costs to “settlement costs” suggests that, given the government's power to take property, compensation should be paid if and only if settlement costs are lower than demoralization costs. Epstein’s work (1985) stands in marked contrast, arising from his distrust of the legislature to act efficiently. If government is not a neutral third party in matters concerning eminent domain, the obligation to pay will shape the behavior of the government’s action and bias its choice of compensation downward. The idea that owners of property should be compensated is usually not disputed, but what constitutes just compensation is a matter of controversy (Goldberg, Merrill and Unumb

\textsuperscript{10} Fischel (1995) argues, “It isn’t just roads and post offices that qualify as public goods”, “The state’s or nation’s ability to alter its economic institutions is an important public good”.

\textsuperscript{11} See Altshuler and Luberoff, 2003, p42-44.
1987; Kanner 1973). In this paper, the compensation issue is critical in the way that it defines discrimination in the model defined in Section 3.

Empirical studies to date have focused primarily on identifying the effects of eminent domain in U.S. cases. For example, Guidry and Do (1998) conclude from their hedonic analysis that properties acquired through eminent domain receive compensations that exceeds sales prices of comparable properties. DeGennaro and Li’s (2010) empirical work supports their theoretical argument that more restrictive eminent domain law may spur business formation. Chen and Yeh (2012) find that decisions favoring the government in physical takings cases subsequently displace commercial tenants, increase the average cost of relocating them, and reduce compensation paid by local government to property owners subject to takings.

2.2 Choice of Eminent Domain Law

Although most of the existing literature concerning eminent domain is normative, as reflected in the unified approach of Epstein (1992) and Danzon (1992), a few studies have taken a positive perspective. Bell and Parchomovsky (2006) argue that narrowly defining public use is likely to harm private property owners because government can achieve any land use goal through its full panoply of power; they also develop a model of political decisions regarding property to show that government's choice to pay compensation is based on decision-makers’ political calculi. Fleck and Hanssen (2010, forthcoming) examine the role of judicial review and how it affects citizens’ decision to adjust eminent domain power delegated to politicians repeatedly. O’Hara and Dougan (1998) explore a positive

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12 Several compensation mechanisms are proposed for the purpose of efficiency enhancement. See Hermelin (1995) and Bell and Parchomovsky (2007).
13 Both proposed that the choice of legal rule related to “physical invasions” typically turns on a trade-off between externalities and holdouts, and the best we can do is to minimize the sum of the costs that are associated with these two forms of bargaining obstacles.
interpretation of constitution selection regarding discriminatory taxes to explain restrictions on eminent domain. According to their theory, the legal rules that attain constitutional status are those that are agreeable to all self-interested individuals predicting the implications of those rules for their expected lifetime utility. This idea can also be seen in Ely (1992)\textsuperscript{14} and Lamoreaux (2011)\textsuperscript{15}. I will follow this approach to examine the case of eminent domain law under ongoing majority-rule decision-making.

A few empirical studies have examined the choice of eminent-domain law. Lopez, Jewell and Campbell (2009) evaluate each of the new post-\textit{Kelo} laws and categorize the states according to a survey based on 18 criteria\textsuperscript{16}. They find that states with greater economic freedom, greater value of new housing construction, and less racial fragmentation and income inequality are more likely to impose more meaningful restrictions, and to do so more quickly. Morriss (2009) finds that legislatures facing fiscal constraints are less likely to surrender their valuable eminent domain powers, while legislatures in more competitive political environments are more likely to do so. Neither of these two papers provides a theoretical interpretation to identify the causal relationship.

\section{A Model of Constitutional Design}

In this section I assume a two-stage procedure consisting of a “constitutional ” or “rule-making” stage followed by a policy-choice stage, in which specific actions are chosen by a

\textsuperscript{14} According to James Ely (1992), there is little doubt that the U.S. Constitution was written and adopted by people who believed in private property.

\textsuperscript{15} In her paper, Lamoreaux points out that widespread property ownership is the key to resolving the mystery between the repeated reallocations of property and Americans’ belief of secure property rights.

simple majority of citizens\textsuperscript{17}. Majority-rule voting is used to choose among the set of constitutionally allowed policies, as defined by the rules agreed upon by unanimous consent in the initial stage.

Citizens are assumed to have rational expectations, in the sense that their forecasts of future policy outcomes are unbiased. The unanimity condition implies that the constitution disallows any policy that is Pareto-dominated by some other policy in terms of all citizens' expected net wealth and its variance.

Let there be $N$ citizens in the society, each of whom $i$ is endowed with property worth $Y_i$, which might vary in the future. So taxpayer $i$'s expected net wealth is defined to be:

$$E(C_i) = E(Y_i - T_i) \quad \forall \ i \in [1, \ldots, N]$$

where $T_i$ is the individual's tax payment. And the future property value and tax payment are governed by a known joint distribution function $F_i(Y, T)$.

Each citizen is further assumed to maximize his expected utility, which is a function of his future net wealth, given the assumption of risk aversion.

The objective of the government is to maximize the utility of a voting majority, subject to a single public good $G$ and the restrictions imposed by the constitutions. The public good is produced according to the function $G(Z, L_g)$, where $Z$ is a vector of purchased inputs other than land and $L_g$ is land of a particular type specific to the provision of $G$.

Given the cost function $c(G)$, the government’s required tax revenue is therefore $R = c(G) = P \ast Z + c(L_g)$, where $P$ is a vector of exogenous input prices, and $c(L_g)$ is the acquiring cost of land $L_g$ through ordinary purchase.

\textsuperscript{17}The “constitutional” stage may alternatively be thought of as occurring at a higher level of government that can restrict lower level government.
The set of policies to be considered includes two sources of financing: direct taxes on property and seizure without compensation\(^{18}\). The government’s budget constraint is

\[
\sum_{i}^{N} T_i = R
\]

To derive the choice of a constitution, we consider the consequences, in particular the expected net wealth and its variance under various possible policies, given different initial conditions (Fleck and Hanssen Forthcoming)\(^{19}\). Figure 1.0 provides us with a general idea of how the variation in initial information can induce differences in the agreed-upon boundaries on what policies are constitutionally legitimate. \(A\) represents the set of all possible tax policies. Citizens would want neither individual tax liability to exceed his wealth nor total revenue collected to exceed what is required to finance \(G\), so the set of government projects comprises only those that satisfy the budget constraint, depicted as the smaller set \(B\). In the following subsections, we will see under what circumstances citizenry would further narrow the policy set down to \(C\), in which equal tax payment is preferred to unrestricted taxes; and to \(D\) where flat-rate tax dominates equal-amount tax\(^{20}\). Following that we then turn to an intensive discussion of the constitutionality of discriminatory taxes and eminent domain.

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\(^{18}\) Seizure without compensation is an extreme case of eminent domain with under compensation. We assume so only to simplify our tax payment analysis in subsection 3.3.

\(^{19}\) In their paper, Fleck and Hanssen argue “A critical concern for identifying whether a court can successfully protect minorities is when a veil of ignorance is lifted: In essence, when do voters learn whether they will be in a potentially tyrannizing majority or a potentially tyrannized minority.”

\(^{20}\) Strictly speaking, there are small intersections of \(C\) with \(D\) and \(E\). Under proportional tax regime, equal \(Y_i\) and \(t_i\) generate equal tax payment \(T_i\), shown as the intersection of \(C\) and \(E\); various \(Y_i\) and various \(t_i\) might also yield equal \(T_i\).
3.1 Comparison among several property tax regimes

First, we compare several property tax regimes and see what types of policies are undesirable for all households and thus constitutionally prohibited.

For the purpose of our analysis, we assume that each household’s property is of equal endowment value to all others, but has household-specific uncertainty in its future pattern, meaning that ex ante each household does not know its future wealth exactly.

3.1.1 Equal tax payment regime\textsuperscript{21}

Consider a simple case, in which all government projects are financed only through direct property taxation. The budget faced by government is

\[
\sum_{i=1}^{N} T_i = R = c(G)
\]

\textsuperscript{21} For better understanding, we first introduce property tax to distinguish from seizure, which is also a special type of tax on property. We do not really compare which regime is better in general, only hoping to discuss whether we want property tax only or a mix of both, given various initial conditions.
Under the assumption of risk aversion, every citizen prefers a certain tax payment equal to its expectation over an uncertain tax liability. This leads to our first proposition.

**Proposition 1:** Under the assumption of risk aversion, if there is uncertainty in future property value, an equal tax payment is preferred by all citizens to unrestricted direct tax, i.e. random tax assignment up to individual wealth. A fixed amount $T_i^* = \frac{R}{N}$ dominates random tax payment $T_i$ such that $E(T_i) = \int_0^{Y_i} T dF_i(Y, T) = \frac{R}{N}$.

**Proof.** All proofs are in the Appendix 1A.

### 3.1.2 Proportional tax regime

Now we are led to ask what might be the influence of a proportional rate compared to equal tax payment. Government budget constraint is still

$$\sum_{i=1}^{N} T_i = R = c(G)$$

Under a flat-rate tax regime, property owners cannot precisely calculate their future tax burden if there is household-specific uncertainty in their future property values. However, a flat-rate tax generates smaller variance compared to that generated by equal tax payment regime. Therefore flat-rate tax dominates equal-amount tax payment. This is our second proposition.

**Proposition 2:** Under the assumption of risk aversion, if there is uncertainty in future property value, a flat-rate tax is preferred by all citizens to equal-amount tax, i.e. a tax rate $t$ such that $t \sum_{i=1}^{N} Y_i = R$ dominates a fixed tax payment $T_i^* = \frac{R}{N}$.

### 3.1.3 Structure of variable tax rates

Just now we analyze the dominance of flat-rate tax over equal-amount tax payment. In stead, what if tax rate varies with property value, i.e. $t = t(Y_i)$? Would the variable tax rate
structure be prohibited unanimously? Or in other words, would flat-rate still dominate variable rate structure?

The government budget constraint is still

$$\sum_i^N T_i = R = c(G)$$

where $T_i = t(Y_i)Y_i$.

Since the tax rate is closely associated with property values, both the expected net wealth and the variance of it will vary non-linearly.

If the tax is progressive, the tax rate increases in property value. Higher expected property value indicates lower expected net wealth compared to that generated by flat tax. However, the variance is also smaller than that under the fixed-rate regime.

If the tax is regressive, tax rate moves in the opposite direction of property value. In this case, larger expected property value implies larger expected net wealth as well as larger variance of it relative to that from flat rate. Although the specific preference over regressivity is determined by utility function form, potential taxpayers may wish to impose further constitutional constraint on the regressive rate schedule under the assumption of risk aversion\textsuperscript{22}.

This analysis of expected net wealth and its variance between variable tax structure and flat rate leads to one implication that neither proportionality nor variability in tax rate dominates the other. This generates our third proposition:

\textsuperscript{22} Whether regressivity is constitutionally permissible depends on specific utility function form. When the future property value is low, the substitution effect usually dominates income effect, so taxpayers with lower wealth are likely to take on more risk to obtain higher expected net wealth if tax is progressive. But regressive tax does not have this feature.
**Proposition 3:** When there is household-specific uncertainty in future property value, if some citizens expect to gain from disparate tax treatments, then a variable tax-rate structure is not Pareto-dominated.

3.1.4 Comparison of the constitutionality among three tax regimes

We already see that except for the random tax payment, the dominance among the three tax regimes we discuss above is not complete. Thus the likelihood of them being disallowed by constitution is also different.

First, the dominance of flat rate over equal-amount is weaker than that discussed in Proposition 1 because the expected net wealth generated under these two regimes is not comparable. If property owner’s future property value is larger than the average, equal-amount tax liability actually yields higher net wealth, hence for this group of owners there is a tradeoff between higher expected net wealth and larger variance. The strength of this dominance depends on specific utility function form.

Second, although variable rate structure is not Pareto-dominated, the flat rate tax is less likely to be prohibited. This is because for flat rate tax, individuals’ tax liabilities depend strictly upon property owners’ ability to pay and vary correspondingly, whether the flat rate is high or low. However, under the progressive tax regime, the degree of progressivity results from the political process in the post-constitution period, which introduces additional uncertainty in the net wealth.

Third, the proofs of Proposition 1, 2 and 3 show that equal-amount tax scheme yields larger variance than progressive tax does, while the expected net wealth is not comparable. However, if property owners can predict their positions in the distribution of future wealth, for example, if there are more owners who expect to have low-valued
properties, progressivity is less likely to be disallowed; while the other way around if more owner’s future property values are larger than the average.

In general, flat-rate tax is least likely to be restricted and equal-amount tax is more likely than the other two.

3.2 Discriminatory taxation

Proposition 3 provides the basis for a more detailed discussion of the constitutionality of disparate tax rates. In this section we add information about property types, values and group formation, which could be observed or forecasted. Let the set of initial information be \( \alpha \) such that \( F_i(Y,T) = \Phi(Y,T|\alpha) \), where \( \alpha \) is a vector of fundamental characteristics associated with citizens and their properties. We construct the simplest possible example of an information set that can cause expectation asymmetry among property owners, by which discriminatory tax action would be allowed.

Let \( \alpha = \{A, B\} \)

where \( A \) and \( B \) are two types of properties which are distinguished by some economically or potentially fundamental characteristics associated with properties. For example, \( A \) could be residential property and \( B \) commercial property\(^2\), which differ fundamentally in terms of their usefulness as voting blocs.

3.2.1 Predictable difference in property values

\(^2\) We have not categorized \( A \) and \( B \) in a more specific way so far. It could be determined by any property characteristics, like residential vs. commercial, urban vs. rural, or blighted vs. nice properties. In our empirical studies, we would discuss the classification along the dimension of property value. This is why we have differential property values, instead of identical value for each household to begin with.
First consider a case, in which discrimination occurs along the dimension of property values. For simplicity we assume everyone is equally likely to be in the majority.\footnote{This might be true because there could be many characteristics that sort people into groups and potentially different majority might be formed. See Kristov and McClelland (1992) and Dougan and Snyder (1996). Sometimes even no majority is formed.}

We at this moment assume that households have different before-tax property value, which is predictable \textit{ex ante}. As we already see in section 3.1.3, households with lower-value property expect to gain under progressive tax. Although there is uncertainty in majority composition, as long as a household can predict its future position in property value distribution at constitutional stage, discrimination according to values would not be considered constitutionally impermissible since some people expect to benefit.

This result is even stronger if the group with lower value could form a stable majority in post-constitutional periods. Specifically, if these owners expect to be in the winning group most of time, then higher tax rates levied on owners with higher-valued properties would be preferred.

We can also draw another implication that the larger the property value skewness is, the less likely the tax discrimination based on property values is prohibited. This is because the more skewed the property value distribution is, the easier it is for property owners to predict their future gain from disparate tax treatment, therefore the more unlikely discriminatory taxation is to be banned.

\subsection*{3.2.2 Predictable majority formation}

Besides the property values, discrimination could also occur along other dimensions under majority rule.

As we state at the beginning of this section, the government’s objective is to maximize the utility of a voting majority, subject to the public good $\tilde{G}$ and constitutional...
restriction. So the distribution of cost, specifically the tax liability is actually determined by the political process.

Then consider the possible majority formed according to property types; for example, type A owners find it less costly to affiliate with each other than with others. If group A is larger in size, it is not difficult for a citizen to anticipate whether he would be in majority or minority. Then under majority rule, constitution rule would not rule out such a policy that the total or larger part of public projects costs is distributed equally among the B type owners, while the majority member, A type owners pay nothing or the remaining part of cost equally\textsuperscript{25}.

3.3 Introducing seizure\textsuperscript{26}

Seizure of property through eminent domain can be viewed as a special type of discriminatory assessment. We now apply our discussion of disparate tax to the analysis of the constitutionality of seizure. We begin by positing two types of land $L_g$ and $L_p$, occupied by different citizens. These subscripts reflect the assumption that certain types of more likely to be useful for government activities or public projects than others. In this case, the relevant information set is

\[
\alpha = \{L_g, L_p\}
\]

In this specification, the owners of the two types of land are corresponding to the groups A and B defined in previous subsections. For simplicity we only discuss a situation where majority composition is unknown and a uniform property tax rate applies on every taxpayer.

\textsuperscript{25} In Dougan and Snyder (1996), they argue, “When the citizens of democracy start with unequal endowments, redistributive policies are likely outcomes of simple majority rule.” In our model, property differential opens the way to tax different groups differently.

\textsuperscript{26} See note 7 and 16 for why seizure could apply to taking property with compensation.
3.3.1 Asymmetric Expectation Under Public Use Doctrine

Our first concern is that at the time the rule with respect to eminent domain is made, some households may expect to gain a large share of the benefits while the rest bear the bulk of the costs. In this case eminent domain will not be prohibited unanimously\textsuperscript{27}, because the landowners who expect to benefit on net will block any proposal constitutional prohibition of eminent domain for public use.

To illustrate, consider a case in which $L_g$ would be used only on some specific public projects $G$. There are two ways to obtain $L_g$: (1) purchase through negotiation; or (2) condemn it.

Under (1), the government’s budget constraint is:

$$t' \sum_{i=1}^{N} Y_i = R' = P * Z + \sum_{i \in S} Y_{i}^P = \left( P * Z + \sum_{i \in S} Y_i \right) + \sum_{i \in S} (Y_{i}^P - Y_s)$$

$$= c(G) + \sum_{i \in S} (Y_{i}^P - Y_s)$$

$$= c(G) + \Delta R$$

where $S$ denotes the subgroup of $L_g$ owners whose properties are selected for public use. $Y_{s}^P$ is the personal valuation of $L_g$, which is greater than its market value, represented by $\Delta R > 0$.

Since the purchase price is negotiated by landowners and government, property owners could sell their lands at the price of personal evaluation and enjoy the surplus. But this also requires larger total tax revenue to finance the public project. It is easy to show

\textsuperscript{27} When the forms of policies and their distributive effects are endogenous, citizens with political power would be willing to deviate away from status quo, to playing some other forms of redistributive games, and they even will decide some rules that induce asymmetries among voters. That is how we obtain the result of a mix of property tax and eminent domain. We only need to find the conditions under which property tax only is not a unanimous agreement.
how the gains and costs are expected to be distributed between two types of landowners (See Table 1.0). From the upper panel we can see that even when there is uncertainty among \( L_g \) type owners, this group as a whole expects to obtain a positive gain, while \( L_p \) type owners will bear an extra amount of tax burden.

When seizure is allowed under channel (2), the budget becomes:

\[
t'' \sum_{i \in S} Y_i = R'' = P \cdot Z = \left( P \cdot Z + \sum_{i \in S} Y_i \right) - \sum_{i \in S} Y_i = c(G) - \sum_{i \in S} Y_i
\]

The major cost and benefit bearers are opposite in this situation. Even though owners of seized \( L_g \) do not have to pay property tax, in general the group as a whole expects to be made worse off; while \( L_p \) owners are tax favored, due to the lower tax rate \( t'' < t' \).

**Table 1.0 Comparisons of Expected Gain and Loss between Two Groups**

<table>
<thead>
<tr>
<th></th>
<th>( L_g ) Group</th>
<th>( L_p ) Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase through</td>
<td>Expected Gain</td>
<td>( \Delta R )</td>
</tr>
<tr>
<td>negotiation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Expected Cost Burden</td>
<td>( t' \sum_{i \in L_g} Y_i )</td>
</tr>
<tr>
<td>Seizure allowed</td>
<td>Expected Cost Burden</td>
<td>( \sum_{i \in S} Y_i + t'' \sum_{i \in L_g \cap S} Y_i )</td>
</tr>
</tbody>
</table>

Note: in this table, \( s \) denotes the portion of \( L_g \) owners whose properties are selected for seizure, and \(-s\) denotes the portion of \( L_g \) owners whose properties are not seized.
Clearly, $L_g$ owners prefer purchase through negotiation, while $L_p$ owners would favor seizure\textsuperscript{28}. It is our fourth proposition:

Proposition 4: With heterogeneity in expectation of cost burden distribution between groups of different land types, some seizure power will be allowed. The larger the expectation differential is, the more likely is the use of it.

3.3.2 Constitutional Restrictions on Eminent Domain

As previously argued, the public use doctrine identifies properties with higher valuation in public projects to generate asymmetric expectations among property owners. What if the “public use” condition is eliminated? If it were proposed that eminent domain be unrestricted, would citizens uniformly reject this proposal at a constitutional level?

In this case, the selection of any property to condemn does not at all depend on its private or public valuation as determined by the inherent property characteristics. Instead, this type of taking is completely arbitrary, and every household faces a nonzero probability of having its property seized\textsuperscript{29}. No one will be able to accurately predict his expected cost burden, \textit{ex ante}. As a consequence, it is quite likely that all property owners would have highly similar expectations regarding the outcome. Seizure for this type of government activities is thus undesirable for the reason that no one expects to be better off \textit{ex ante}. So this generates our fifth proposition:

\textsuperscript{28} According to Lamoreaux, “where voters did not have a stake in a particular kind of property, they were generally indifferent to protecting it or, worse yet, eager to redistribute it in their own best interests.” Lamoreaux, Naomi R., 011, The Mystery of Property Rights: A U.S. perspective. The Journal of Economic History, vol. 71(2): 275-306.

\textsuperscript{29} Justice O’Connor’s dissent in \textit{Kelo v. City of New London}, 545 U.S. 469 (2005) at 494: “Today the Court abandons [its] long-held, basic limitation on government power. Under the banner of economic development, all private property is now vulnerable to being taken and transferred to another private owner, so long as it might be upgraded ...”
Proposition 5: If households are risk averse, completely arbitrary seizure due to violation of public use doctrine will be prohibited at the constitutional stage.

Furthermore, there will be every chance that taxpayer attempts to reap potential benefits from a seizure or to reduce his own tax payment by rent seeking, in the expectation of other people’s similar incentive and behavior. Such an effort is indeed wealth reducing because it dissipates the potential net benefits if there are any (Klingaman 1969, Dougan and Snyder 1996)\(^3\). In this situation, taxpayers’ expected utility declines further. This social cost adds more incentive to constrain arbitrary seizure constitutionally.

4. Empirical Tests

In this section we use Proposition 4 and 5 to develop testable implications of the responses of local and state governments to the *Kelo* decision.

4.1 Analogy between constitution restricting policy and state legislation governing local government

The model developed in Section 3 distinguishes a rule-making stage from a policy-choice stage at a single government level. To generate testable implications, the model can be reinterpreted as analyzing the choices made by a higher-level government constraining lower governments’ behavior. Specifically, law enactment at state level is treated as analogous to a constitutional stage that can be used to restrain local governments from pursuing policies that would be prohibited if all lower jurisdictions’ choices could be constrained to options that at not Paredo-dominated over a long horizon. Condemnations are usually conducted at local level, and there is at any moment a potential majority in favor

of some discriminatory treatment like seizure. Governments cannot easily bind themselves, but municipal governments can be bound by state-level rules.

4.2 Research design

4.2.1 Proxy for expectation symmetry

The model suggests that citizens’ expectations influence their preferences over rules. In practice, however, voter’s expectations are not directly observable. Moreover, very few sources of data exist that document the condemnation of properties in the U. S., including the frequency, purpose, type of properties and type of transfers. This paper considers using the number of taking cases for private use as a proxy to capture the degree of expectation symmetry among property owners in general.

The underlying mechanism works in this way: number of takings for private use reflects local government’s reliance on eminent domain for its activities of any purpose. Court decisions like *Kelo* and its consequent increase in taking cases put more properties and property types at risk of seizure. Although we cannot identify the types of properties condemned, as predicted by our model in 3.3.2, the risk-averse public would pass more stringent law at state level.

4.2.2 Test strategy

The theory generates two predictions:

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31 In fact, there were many reports of emboldened local policy makers taking greater numbers of properties after *Kelo*. See Berliner (2006) and Lopez and Totah (2007).
33 See Footnote 2.
34 One might argue that the increase in taking cases may be due to more condemnations of $L_e$ as described in model, not necessarily more property types at risk of seizure now. To answer this question, note that our choice of independent variable is the takings for private use, instead of taking for traditional public projects. Even if this were true, we would not observe any positive correlation between takings and new legislations. Or if the model were wrong, we should observe no or negative correlation either.
(1) According to 3.3.2, elimination of the "public use" doctrine would stimulate an increase in seizures for private use at local level, because there can exist a majority at any time, in which some property owners reap the potential net benefits from a seizure and to avoid seizure on themselves.

(2) This increase would cause property owners’ expectations to perceive that their properties are more equally subject to seizure in the long run without a public use condition. Proposition 5 indicates that a State legislature, responding to its risk-averse constituents, would like to reconsider the existing laws and take steps to close the loopholes.

This yields:

*Hypothesis: States at risk of more post-Kelo seizures for private use are more likely to enact more stringent eminent domain law.*

We propose a two-step procedure to test our hypothesis. First, we establish whether the *Kelo* decision significantly increased takings cases for private use. At this step, in addition to the aggregate trend of all states, we also compare to see if there is any difference in the trends between groups by whether there was a law passage. If the data confirm our model’s first prediction, we can move further to see whether this increase in taking cases for private use is associated with a higher probability of enactment of statewide restriction on eminent domain.

4.2.3 Choice of variables indicating the degree of asymmetry

We must allow for some degree of asymmetry in public expectation35, which means winning groups do exist in some dimensions. This idea is drawn from one stylized fact: In the last

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35 For example, both the New York Times and Washington Post’s editorial boards agreed with the *Kelo* ruling.
two decades, eminent domain has been mostly employed for redevelopment plans rather than the previous large-scale urban renewal programs, so its most obvious use is condemning blighted areas\textsuperscript{36}. Then owners of nice properties are relatively safe and more likely to benefit. We introduce two sets of variables in property value distribution to analyze the effect of asymmetry.

According to Proposition 4, the likelihood of allowing eminent domain power depends on differential expectation. As mentioned above, blighted properties are more likely to be condemned. Therefore, if there exists a stable group of owners with high value properties expecting to benefit in long run, then taking low value properties is less likely to be prohibited. States with such a stable group would have lower probability to pass more stringent law on eminent domain. Income inequality is introduced as a proxy for wealth fragmentation. The larger the inequality is, the larger the expectation differential is, thus the less likely taking blighted property is to be restricted.

Expectation asymmetry is also reflected in property values. One might argue that property values positively correlate to law passage because higher value means more to lose in takings\textsuperscript{37}. But this paper provides another interpretation. In states with higher overall property values, owners of “blighted” properties are likely to be a minority, so more high-value property owners expect to benefit from expansive eminent domain. Therefore, these states would favor taking shabby properties for economic development to protect themselves. While for states with averagely low-valued properties, the majority composition is opposite, so owners’ expectations are more symmetric under the wider use

\textsuperscript{36} There are also other dimensions to measure the asymmetry, like residential properties are less likely to be condemned compared to commercial properties. But data limitation does not allow us to analyze this.

\textsuperscript{37} Based on Fischel's “homevoter” hypothesis.
of eminent domain. Hence these states are more likely to restrict the use of eminent domain for other purposes. We consider home price index to take into account this effect and predict home price index negatively influences law enactment.

4.3 Data and descriptive statistics

4.3.1 Dependent variable

Prior to the introduction of dependent variables, we need to take a look at the variation of pre-\textit{Kelo} laws across states. This examination results from the concern that the restrictiveness of old eminent domain law of each state might affect citizens’ demand for new law after \textit{Kelo}. So if there is a large variation in strictness of pre-\textit{Kelo} laws across states, our estimate would be biased. Although a few forbade economic development takings because of state Supreme Court decisions, virtually every state, pre-\textit{Kelo}, had fairly broad blight condemnation laws (Somin, 2009). This similarity in restrictiveness of pre-\textit{Kelo} law across states rule out this potential effect.

A binary code is used to quantify each state’s choice about whether to enact new eminent domain law. As of July 2007, the dependent variable LAWENACT is coded as 1 if state updated its eminent domain legislation and 0 otherwise. There were 37 states that had such post-\textit{Kelo} reform. The mean is 0.74 with standard deviation 0.443. Table 1.1 represents the data and descriptive statistics in detail for both dependent variables.

4.3.2 Explanatory variables

To test the model’s prediction, the first set of variables measures the per-year taking numbers for private use by state in the two-year post-\textit{Kelo} world. Since the effective date of new eminent domain law varied across states, we built a two-year window to capture the consequence of \textit{Kelo} decision, during which, most states experienced an increase in aggregate taking numbers and considered to restrict eminent domain power. AVG0507
represents the annual number of takings for private use since *Kelo* until June 2007 for each state (Berliner, 2006). According to model’s prediction, citizens’ preference over stricter eminent domain law is positively affected by taking numbers for private use.

Table 1.3 summarizes the levels of and changes in per-year taking numbers during the two periods of interest. Note that from now on, the observation for Pennsylvania is dropped from our sample for the rest of our analysis because the pre-*Kelo* taking number is such a big outlier that it conceals all potential patterns in the other states. Column 1 presents data for states where a law was passed restricting eminent domain, and column 2 for states that did not. Row 4 displays the changes in average takings for private use between periods, increases are found in both columns. Table 1.3 shows clearly that after the *Kelo* decision states on average experienced an increase in condemnations for private use. However, the heterogeneity between groups is remarkable, as shown in column 3. The cross-group differences in average takings are shown by comparison between columns 1 and 2, from which we see that in both periods, group with law enactment has more takings on average. Large within-group variation also exists for all full sample and subsamples. This raw data analysis is consistent with our theory’s prediction that states with greater numbers of takings for private use are more likely to restrict the use of eminent domain power.

We introduce income inequality and a home-price index to control for heterogeneity in expectations and Table 1.2 and 1.3 present descriptions and summary statistics for these variables. INCOME INEQUALITY measures the ratio of the average income\(^{39}\) for the top 5%

\(^{38}\) See Appendix 1D for a detailed discussion of the validity of this data source.

\(^{39}\) Note that to use this control, we actually assume wealth is a proxy of house assets’ value, thus income inequality captures the property value distribution.
families to the average income of families in the middle fifth\textsuperscript{40} (The Economic Policy Institute and the Center on Budget and Policy Priorities, 2006). Wealth is a notable way to describe the economic and political fragmentation of the society. Takings, especially for economic development, disproportionately redistribute from poor property owners to developers and planners. As suggested by the model, greater income inequality makes less likely a consensus to restrict taking powers. The raw data analysis in Table 1.3 also shows that the states enacting new law on average have lower income inequality, as implied by our theory.

The variable HPI is based on the adjusted FHFA indexes used to compute the home value series (Davis and Heathcote, 2007), with mean of 1.677 and standard deviation of 0.333. Following our analysis in subsection 4.2.3, we expect this housing value index to reduce the likelihood of more restrictions on local governments’ taking powers. Table 1.3 provides us with some preliminary evidence regarding the predicted negative correlation, that states updating their eminent domain law have a lower home-price index.

We also control for population density of each state\textsuperscript{41}. The reason is that the expectation impact of takings might differ in densely compared with sparsely populated areas. For the same number of taking cases, the more populated a state is, the less likely each citizen’s land would be seized, and thus lower probability of being condemned reduces citizen’s preference against eminent domain power.

\textsuperscript{40} We use family in middle fifth to compare because this fifth family is the largest group of homeowners, which might be affected most by takings. Bottom fifth families are in fact less affected since most of them even do not own any housing units. See McMillen, Daniel P., “Changes in the Distribution of House Prices over Time: Structural Characteristics, Neighborhood, or Coefficients”, 2007, working paper. And see Fesselmeyer, Eric, Le, Kien T. and Kiat Ying Seah, “Changes in the White-Black House Value Distribution Gap from 1997 to 2005”, 2012, working paper.

\textsuperscript{41} Alternative measures of scale effect are considered as well, such as population, total land area or only private land area. Moreover, two methods for degree of urbanization are proposed, ratio of urban population and ratio of urban lands. Later I will look at whether our estimate is robust to specifications controlling for different measures associated the population and land area.
4.4 Econometric model

At first, we apply OLS regression to consider the relationship between law passage and explanatory variables of interests. Then, because the dependent choices in our regressions are discrete, a simple Probit model is developed for the binary outcomes regression LAWENACT.

4.4.1 Instrumental-variable approach

An important specification issue with respect to our basic OLS or simple Probit regression arises from the potential endogeneity problem. As discussed in section 4.3.2, during the two-year window after the *Kelo* decision most states experienced an increase in aggregate taking numbers and considered restricting eminent domain power. But the timing issue is not concerned seriously, so we cannot completely isolate the effect of *Kelo* decision on local governments’ taking behaviors. In addition, property owners care about how the *Kelo* decision changed the taking pattern. If state legislators choose to restrict local government’s taking power to respond solely to the increase in number of taking cases during the period, or if we simply include the taking history in our regression, neither model can identify the impact of *Kelo* decision on the taking pattern, and the estimate will be biased. To fix these problems, I consider a Probit model with endogenous covariates to correct. I use per-year takings of all purposes for 1998-2002 as an instrument to estimate the underlying demand for post-*Kelo* taking for private use, and then the effect of *Kelo* decision would be better captured. The first-stage equation can be expressed as:

\[ AVG0507_t = \alpha_0 + \alpha_1 AVG9802ALL_t + X_i\alpha_2 + e_t \]

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42 I check this regression by including taking history as a control, and only the linear model gives some information.
43 See Appendix 1D for more reasons to use this estimation method.
Estimates of this equation can be interpreted as telling us the difference between states with and without strong reliance on eminent domain. Some states do not have a history of takings, while for others eminent domain became an important tool for local government. This instrument will be valid if it reflects that each state’s taking history is more likely in property owners’ minds to influence their expectations. More importantly, using takings for all purposes between 1998 and 2002 reveals how this reliance expands to private use because of *Kelo*; while using taking just for private use as instrument might only suggest the time trend. I also include GDP GROWTH RATE as additional instrument to examine if economic characteristics affect taking numbers, provided that many condemnations in recent decade are employed for economic development. We predict that states whose economies are growing faster will demand less for eminent domain.

The first-stage relationship is shown in Table 1.4. The correlation between taking history and post-*Kelo* takings only for private use is strongly positive and robust to the inclusion of controls (regression 2 and 3). The F-statistics indicate a strong instrumental variable. So we may infer that states heavily relying on eminent domain in the past did expand its use of taking for private use after *Kelo*. The GDP GROWTH RATE does not seem to play an important role in our first-stage regression, in spite of its negative relation consistent with our prediction.

5. Results

5.1 Linear Regressions for LAWENACT

We first take a look at the simple OLS regression results. The first two specifications in Table 1.5 indicate some correlations between post-*Kelo* taking number and law enactment, with a coefficient of .005 at 5% level. But our estimates are improved by using historical
taking patterns as an instrument, in terms of both significance and magnitude. As discussed in section 4, because state legislators choose to restrict taking power to respond to the increase of taking cases for private use during the two-year period after *Keo* based on local governments' past behaviors, the effect of taking history must be taken into account. Column 3 reports the result using only taking history as an instrument, and the model is just identified. In column 4 I use real GDP growth rate as an additional instrument. The statistic for the overidentification test is 3.37, so we cannot reject the hypothesis that all excluded instruments are exogenous even at the 10% level. Columns 3 and 4 indicate that for every one unit increase in post-*Keo* taking case, the likelihood that state legislature enact new law increases by about 1 percentage point.

5.2 Probit Regressions

Table 1.5 also reports the results from simple Probit regressions, which are presented in columns 5, and those from instrumented Probit estimation shown in column 6-7. The model fit appears fine shown as in and Wald Chi2. In general, the non-linear regressions generate estimates with larger magnitudes for all variables.

In the simple Probit regressions, AVG0507 provides some explanatory power. With all controls in the regression, specification 5 suggest that one unit increase in average taking during the two-year post-*Keo* period increases the probability of updating the law by only 0.9 percentage points.

However, the explanatory ability of average post-*Keo* takings is improved dramatically by instrumenting AVG0507 via AVG9802ALL, although inclusion of GDP

---

44 The p-value of the Wooldridge's robust score test of endogeneity is .096, and hence we can reject the hypothesis that the post-*Keo* taking number is exogenous at the 10% level, but we cannot reject it at the 5% level. A regression-based test of endogeneity gives a p-value of .039, which means that we can reject the null hypothesis at 5% level
GROWTH RATE as additional instrument actually reduces our findings about the post-*Kelo* average taking for private use. The results through specification 6 and 7 show that states with one more taking case have a significant around 4 percentage points higher chance to enact new law to restrict local governments' taking behavior. Moreover, the positive marginal effects in all specifications confirm our model's prediction. States with larger numbers of takings are more likely to pass new laws restricting their cities' use of eminent domain.

5.3 Results for controls

Some information regarding our asymmetry proxies can also be drawn from Table 1.5. The measure of income inequality is negatively significant across all regression models. This finding is consistent with our prediction discussed in section 4. The negative coefficient shows that states with greater inequality are less likely to alleviate the bias of private use takings against the poor. The magnitude of this evidence is larger, falling in the range between 0.3 and 1.2 for any one unit increase in income inequality index.

A negative effect is found for the home-price index as well. The effect of home price is notably large, but only plays the role in the non-linear regressions, with coefficients ranging from -1.415 to -.362.

Population density seems to have little effects on property owners' decision. The negative relationship confirms our prediction that more populated states are less likely to enact stricter laws\(^\text{45}\). Note that adding population density control does not change our results much as shown in first two columns of Table 1.5\(^\text{46,47}\).

\(^{45}\)Following our discussion in footnote 40, using other measures for scale effect and density issue, such as population, total land area, private land area, and ratio of private land, generates does not change our result remarkably. They are very similar in terms of sign, significance and magnitude of estimates across these alternative specifications. The coefficients are between .034 and .041,
5.4 Robustness Checks - Effect of Democracy Mechanism

Focusing on state legislative responses to *Kelo* decision neglects other potential sources of restrictions from democracy mechanism, such as citizen initiatives and legislative referenda\(^{46}\). Therefore, we use two alternative sets of measures for the state responses to estimate our model as a robustness check on the categorizations, mainly concerning for the effect of direct democracy. The first is developed in the 50-State Report Card by the Institute for Justice through its Castle Coalition project (2007), according to which 41 states in total have enacted some form of law. Somin’s method (2008) is the most current source to date, including any new state amendments after the Castle Coalition, but his classification is such different that only 34 states are coded as 1\(^{49}\), for indication of eminent domain reform\(^{50}\).

First, we recategorize reforms using Castle Coalition coding and only present the evidence from instrumented Probit estimations. This alternative specification reported through column 1 and 2 of Table 1.6 confirms our previous findings. One additional taking case for private use in post-*Kelo* world is associated with an increase in the likelihood of passing new law by 3.7 percentage points.

---

\(^{46}\) Besides OLS regression, I also compare the results with and without population density in IV-2SLS model, the coefficient is 0.011 at 1\% level, the same as that in specification 3.

\(^{47}\) In addition, I also run both linear and Probit regressions using per capita annual taking instead, but the estimates provide little explanatory power through all specifications. See Appendix 1E for details. This suggests that property owners might care more about the level instead of per capita annual taking.

\(^{48}\) See more documentation in Appendix 1B.

\(^{49}\) One possible reason for this smaller number is reflected in Somin (2009), in which he mentioned “This Article challenges the validity of claims that the political backlash to *Kelo* will provide the same sort of protection for property owners as would a judicial ban on economic development takings”. By this purpose, he probably excludes the reforms in some states.

\(^{50}\) In both countings, Pennsylvania is deleted.
Next, following Somin’s research (2007), we count states that enacted any kind of law, including all kinds of referenda. Based on this classification, we report the marginal effect after instrumented Probit estimation in column 3 and 4. These results, as in the case of using the Castle Coalition data, confirm our basic findings, but in a larger magnitude, with an estimate of .052, significant at 1% level.

The Castle Coalition data yields slightly different estimation results for some of our control variables, however. More densely populated states are less likely to pass new law. Income inequality still contributes to the model’s explanatory power, falling in a range from -.947 to -.857 at 5% level. But no evidence is found to support the hypothesis that the home price index influence individuals’ expectations about their likely benefits from stringent eminent domain law.

6. Conclusion and Discussion

The post-KeLo state legislative response in terms of restrictions on eminent domain is a remarkable and historic response to one of the most controversial Court decision in recent years.

This paper’s explanation of the national backlash emphasizes voter’s expectation at constitutional stage regarding their future wealth and social position. Given land endowments of different types, public use doctrine helps single out those properties generating higher value in public projects, from which owners of non-public use land expect to benefit overall. Elimination of the public use restriction reshapes landowners’ expectations that their properties may be condemned with a highly similar probability, which leads to a demand for state-level restriction on municipal eminent domain under the assumption of risk-aversion. The empirical tests support our model’s predictions.
References


Table 1.1 Dependent Variables and Summary Statistics

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<thead>
<tr>
<th>STATE</th>
<th>LAWENACT</th>
<th>LAWTYPE</th>
<th>LAWDAYS</th>
<th>STATE</th>
<th>LAWENACT</th>
<th>LAWTYPE</th>
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2. LAWDAYS measures the days from Jan 1st, 2005 until the lay was enacted, right truncated at 926 days, which is about 2 years and half after Jan 1st, 2005 and 2 years after Kelo. The summary of LAWDAYS is calculated based on the states, which updated laws.

36
Table 1.2 Summary Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>AVG0507</th>
<th>AVG9802ALL</th>
<th>AVG9802</th>
<th>HPI</th>
<th>INCOME INEQUALITY</th>
<th>POPULATION DENSITY</th>
<th>GDP GROWTH RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>The annual takings for private use since Kelo until June 2007 for each state</td>
<td>The annual takings for all purposes between 1998 and 2002 for each state</td>
<td>The annual takings for private use between 1998 and 2002 for each state</td>
<td>The Home Price Index is based on the adjusted FHFA indexes used to compute the Home Value series. The second quarter of 1990 is defined as 100</td>
<td>The ratio of the average income for the top 5% of families to the average income for the middle fifth families. Income listed is after federal tax and includes capital gains</td>
<td>Persons (100) per square miles of each state in 2006</td>
<td>Annual growth rate of real GDP from 1997 to 2004</td>
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<td>Obs.</td>
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<td>49</td>
<td>49</td>
<td>49</td>
<td>49</td>
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<td>49</td>
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<td>10.327</td>
<td>194.449</td>
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<td>1.677</td>
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<td>3.295</td>
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Note: 1. The data are compiled from “Opening the Floodgates: Eminent Domain Abuse in the Post Kelo World”, Berliner and Dana, Washington, DC: The Institute for Justice, 2006; and from examining the cases filed in the courts, available at http://lawcrawler.findlaw.com/.

2. Observations for Pennsylvania are omitted.


### Table 1.3 Comparison between Groups\(^1\)

<table>
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<th>Variables</th>
<th>States with LAWENACT=1</th>
<th>States with LAWENACT=0</th>
<th>F-test</th>
</tr>
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<tr>
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<td></td>
<td></td>
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<tr>
<td>Taking numbers</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Pre-<em>Kelo</em> for all purposes (1998-2002)</td>
<td>214.694 (532.509)</td>
<td>138.385 (216.409)</td>
<td>0.165***</td>
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<tr>
<td>Pre-<em>Kelo</em> for private use (1998-2002)</td>
<td>5.75 (10.662)</td>
<td>2.692 (3.728)</td>
<td>0.122***</td>
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<tr>
<td>Two-year post-<em>Kelo</em> period (06/24/2005-06/31/2007)</td>
<td>11.917 (27.073)</td>
<td>5.923 (10.275)</td>
<td>0.144***</td>
</tr>
<tr>
<td>Diff12</td>
<td>6.361 (25.109)</td>
<td>3.307 (8.169)</td>
<td>0.106***</td>
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<tr>
<td>Property value distribution</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPI</td>
<td>1.628 (.325)</td>
<td>1.815 (.328)</td>
<td>1.020</td>
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<td>INCOME INEQUALITY</td>
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<td>4.458 (0.533)</td>
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<td>1.389 (1.623)</td>
<td>3.252 (4.070)</td>
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<td>GDP GROWTH RATE</td>
<td>2.897 (1.095)</td>
<td>2.785 (1.178)</td>
<td>1.158</td>
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</table>

Note: 1. Observations for Pennsylvania are omitted.

2. Diff12 measures the difference of per-year takings for private use between pre- and post-*Kelo* decision.
Table 1.4 Effect of Taking History on Local Government’s Response to *Kelo*
(First-Stage Estimates)

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<td>INCOME INEQUALITY</td>
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<td>F-test</td>
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Note: 1. Observations for Pennsylvania are omitted.

2. Significance levels are indicated by *** for 99%, ** for 95%, and * for 90%.
### Table 1.5 Effects of Expectation Measurements On LAWENACT

(Robust Std. errors appear in the parentheses)

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<th>Probit Marginal</th>
<th>IV-Probit Marginal</th>
<th>Marginal</th>
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<td>.008*** (.006)</td>
<td>.009** (.004)</td>
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<td>.034* (.019)</td>
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<td>HPI</td>
<td>-.334* (.198)</td>
<td>-.326 (.206)</td>
<td>-.303 (.204)</td>
<td>-.362*** (.200)</td>
<td>-1.197 (.180)</td>
<td>-1.415** (.729)</td>
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<td>INCOME</td>
<td>-.345*** (.116)</td>
<td>-.360*** (.135)</td>
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<td>-1.247*** (.435)</td>
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Note: 1. In specifications 3 and 7, AVG0507 is instrumented by AVG9802ALL.
2. In columns 4 and 8, I use real GDP growth rate as additional instrument.
3. Significance levels are indicated by *** for 99%, ** for 95%, and *for 90%.
4. Marginal effects are calculated at sample mean for column 6-8.
Table 1.6 Instrumented Probit Results Reporting Marginal Effects Using Alternative Dependent Variables

(Robust Std. errors appear in the parentheses)

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<td>POPULATION DENSITY</td>
<td>-.158* (.095)</td>
<td>-.1813** (.084)</td>
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</table>

| Obs. | 49 | 49 | 49 | 49 |
| Wald chi2 | 25.58*** | 12.88** | 34.88*** | 28.94*** |

Note: 1. In specifications 1 and 3, AVG0507 is instrumented by AVG9802ALL.
2. In columns 2 and 4, I use real GDP growth rate as additional instrument.
3. Significance levels are indicated by ***for 99%, **for 95%, and * for 90%.
4. Marginal effects are calculated at sample means.
CHAPTER TWO

PRIVATIZATION OF STATE-OWNED HOUSING UNITS AND THE
DEVELOPMENT OF PRIVATE MARKET:
EVIDENCE FROM CHINA’S 1994 HOUSING REFORM IN URBAN AREAS

1. Introduction

China’s housing market and the policies regarding it prior to 1994 were dramatically
different from most other countries. While subsidized housing is a welfare benefit in
developed countries, state-owned housing since the founding of the PRC has represented a
large share of housing stock that was provided as an in-kind benefit to public employees.
Whereas occupants of state-owned housing represent about 18% of households in Africa,
16% in Asia and 8% in Latin America\textsuperscript{51}, the corresponding figure for China was 40% in
1993 among urban residential households (Wang 2011).

As economic reforms starting in the late 1970s took hold through the 1990s,
China’s policymakers sought to privatize the ownership of major economic resources. One
important object of this reform was housing and land tenure in urban areas, with state
employees being encouraged to purchase housing at very generous prices. By 1998,
allocation of housing by the State as an in-kind benefit had completely ceased; the housing
system in urban areas was fully privatized, giving China one of the highest rates of home
ownership in the world.

It is believed that government intervention distorts individuals’ decisions regarding
residential mobility (Hughes and McCormick 1987) and employment (Svarer, Rosholm and
Munch 2005), and also discourages private investment (Moon and Stotsky 1993). Hence the
lessons to be learned from China’s privatization are of potential importance for much of the

\textsuperscript{51} Data are from the United Nations Human Settlements Indicators (2001).
developing world, where state provision of housing is common\textsuperscript{52}. This paper analyzes how the institutional change in the property rights governing home ownership affects the development of a private housing market, in terms of both price and quantity effects.

A review of the existing literature suggests two major considerations for explaining the underlying mechanism for the post-reform development of private housing market in China.

The first of these is the effect of eliminating the pre-reform misallocation of housing units due to state subsidies on subsequent quantity and price effects after privatization (Wang 2011). This analysis builds on the model of rent control. Gould and Henry (1967) first show that the introduction of price controls can either raise or lower the price of a substitute good. Fallis and Smith (1984, 1985) extended Gould and Henry’s model by considering a rationing process; their analysis indicates that under most conditions, rent controls with exemptions cause the rental price on uncontrolled units to exceed the equilibrium price in the absence of controls. Wang (2011) also tests these theory analyses using data from China, and finds that the removal of price distortion through privatization reform allowed households to increase their consumption of housing and led to an increase in equilibrium housing prices\textsuperscript{53}.

The second line of research explaining the post-reform developments in the private housing market focuses on the income shocks. Ortalo-Magne and Rady (2006) develop a life-cycle model to show that capital gains in starter homes affect the demand for trade-up

\textsuperscript{52} Projects of similar types have occurred in some other Asian and Eastern European countries.

\textsuperscript{53} Wang’s interpretation assumes that privatization reform removes the price distortion and that there is no state control in private market afterwards. However, the new subsidy system to its employees’ housing in the private market\textsuperscript{53} suggests that the post-reform private market might not be considered as free of state intervention. In addition, Wang’s interpretation focuses only on the distortion in subsidy receivers’ consumption, ignoring the potential effect on unsubsidized individuals’ current consumption if they highly expect future housing benefit.
homes of higher quality. Several papers draw on Ortalo-Magne’s model to examine the impact of public housing privatization on the prices of private market in Hong Kong (Ho and Wong 2006) and in Singapore (Sing, Tsai and Chen 2006). But these papers focus more on the long-run dynamics and predict the falling trend of housing price in private market. Wang (forthcoming) contributes to this interpretation by offering an empirical test that the housing privatization gives occupants the full ability to access the value associated with property. This paper’s interpretation is closely aligned with this line of literature, but the income shock due to the discounted purchase of public housing only explains part of the impact of the reform on households’ demand for the private housing in China.

In my framework, the state and private housing are substitutes, and the allocation of subsidized state housing largely affects public employees’ demand for private housing because it was cheaper. Even those individuals who were not offered such a unit were waiting for future allocation. Privatization reform creates a wealth effect\(^{54}\), loosens credit constraints, and alters previously unsubsidized employees’ purchase strategy, all of which shift the demand for private housing. The supply curve also shifts out as the stock of state homes entered private market. It is straightforward that equilibrium quantity increases; however, the effect on price, if any, depends on whether this reform has a larger effect on the demand than on the supply.

This paper uses cross-sectional analysis to measure the impact of China’s housing reform on its private housing market. I use a difference-in-difference approach as my baseline empirical strategy, considering both the price and quantity effects. Since the reform only targeted public employees and all of them were affected, the pre-reform public-

\(^{54}\) Detailed discussion of the potential wealth effect is presented in Appendix 2B.
sector size in urban population is employed as an indicator for the degree of reform effect in each location.

Using panel data collected from the Statistical Yearbook of China for 1990-2000, we find that controlling for jurisdiction fixed effects, the privatization reform led to a significant increase of 15.67 percent in price and an increase of 3.815 percent in quantity in the private housing market. These empirical results suggest that the wealth effect and the purchase strategy change associated with the reform increased public employees’ demand for private housing. And this increase in demand led to a significant rise in housing price in the private market.

This paper proceeds as follows. Section 1 provides background information about the privatization reform and several theoretical frameworks closely related to it. The next section presents details about the housing reform and its institutional context. Section 3 provides a demand-and-supply analysis of the impact of privatization on the private market. Section 4 describes data. The identification and estimates of the impact of housing reform on private housing market are discussed in section 5. The last section concludes.

2. Institutional Background

2.1. The Evolution of the Chinese housing system

(1) 1949-1978: Completely planned control over housing market

Upon gaining political power in 1949 China’s central government founded a nationalized planned economy and took over the ownership of important economic resources, including land and some real estate properties in urban areas. Households that already possessed private ownership of owner-occupied homes were allowed to retain ownership for their own residences. But through the so-called socialism transformation, the state condemned
property rights over a portion of homes that previously had been rented out, and returned part of the rents to the original owners according to a pre-determined ratio\textsuperscript{55}. Through this policy the state highly centralized the management and allocation of real estate, which significantly attenuated the property rights of private homes during that period.

In addition, all new housing units had been built by the government or work units and allocated to their employees based on their job tenure, position, marital status, and social links. Highly subsidized rents were charged, and wages were not fully adjusted in ways that reflected the differential housing benefits received by different employees. Employees could only consume the service generated by the housing units, having no rights to own, to bequeath, or to claim the rent from it. This further shrunk the proportion of private homes in the entire stock. By 1978, the rate of state ownership reached 74.8\%\textsuperscript{56}. Moreover, due to stringent restrictions on private construction and transactions, private housing market almost disappeared.

(2) 1978-1988: Early housing reform

The central government recognized serious problems under the initial system, such as provision shortages\textsuperscript{57}, poor management and corruption (Wang and Murie 1999). One important factor was the huge cost of maintaining such a system. As Zhang (2000) indicates, as of 1991 rent on state-owned housing averaged 0.13 ¥/m\textsuperscript{2} ($0.024/m\textsuperscript{2}) of living space, while maintenance expenses averaged 2.31 ¥/m\textsuperscript{2} ($0.434/M\textsuperscript{2}). Housing costs accounted for

\textsuperscript{55} This socialism transformation of private real estates had its stated purpose: to remove the oligopolistic market power of large lessors. Seemingly, this is similar to the Land Reform Act in Hawaii, but these two cases have different economic and political origins. See Croix and Rose (1995) for more detailed discussion.

\textsuperscript{56} Data source: Statistical Yearbook of China, 1980.

\textsuperscript{57} Although state invested 37.4 billion RMB in housing construction during the 30 years since 1949, the provision still fell largely short of urban residents’ need. In 1978, the average per capita living space in urban area was just 3.6 square meters, and there were 8.69 million households lacking housing units, which accounted for 47.5\% of the total urban households.
only 1 percent of the average worker’s earnings. Other problems arose from this housing system. Tying housing to employment discouraged private investment in real estate and attenuated labor mobility towards private sectors, which harmed economic development (Tomba 2004a, Liu, Park and Zheng 2002). Poor management and corruption created substantial inequalities and political costs.

In the late 1970s, China began to modify its housing policy in various ways, for example, attempting to diversify home ownership by selling new units. In the early 1980s, several small-scale experiments were carried out in four cities, which included a project proposing that employees, work units and government share the cost of newly built homes, with limited property rights belonging to individuals. The central government also began increasing both rents and wages to encourage home purchases in the late 1980s. Private investment and construction of housing were allowed as well. However, these experiments had little impact because public employees had no incentive to buy homes due to the in-kind benefit system.

(3) 1988-now: Privatization and market-oriented housing system

After several years of experiments, in July 1994 the State Council announced new policies designed to encourage the development of private housing markets. This reform had five key aspects:

• Public employees residing in state-owned units were offered the opportunity to purchase full or partial property rights at a below-market price partly based on seniority.

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58 The limited property rights include the rights to use and to bequeath; but not the rights to sell, to rent or to use it as collateral.
59 The property rights associated with private housing do not include the ownership of land. In urban area, all lands are of state ownership, but private sector could purchase land use rights for 70 years.
60 Partial property rights include the right to own, to use, to bequeath the property and limited right to claim the rent from it. Only after five years, these housing stocks with partial property rights could
While the option to buy the home had no specified time limit, the government encouraged immediate purchase by specifying a schedule of price increases over time.

- As added incentive to purchase homes, the reform included proposals to increase rents of state units for households with double incomes\(^{61}\), from less than 1% to 15% of average earnings by 2000, and eventually to the level of cost or market price.
- The allocation of in-kind housing would be completely ceased by 1998.
- A new employment-based subsidy system would be launched: the Housing Provident Fund (HPF), which is a compulsory deposit scheme for housing with employer matching at a fixed portion of monthly salary\(^{62}\).
- An Affordable Housing system targeting lower income families would be developed.

According to the China News Analysis (1998), most buyers chose to purchase full property rights over their apartments (with only 18% having partial rights), and paid less than 15% of the market value for their homes. The impact of this housing reform was evident in the increasing home ownership rate\(^{63}\). The time trends in Figure 2.1 show that the rates of home ownership both in the public sector and in the aggregate increased dramatically following the 1994 reform, while for households headed by private employees it remained relatively flat (Wang forthcoming, Wang 2011).

2.2. The Financial Environment

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\(^{61}\) Double incomes mean that both persons of a couple are public employees.

\(^{62}\) According to this plan, a fixed percent of employee’ wages are deposited into an account under his name and employer matches its contribution in every month. The fund can be used for a wide range of housing services associated with private property rights, including building or improving private homes, outright purchases, down payment and mortgage expenses. The contribution level was initially set at 5 percent of employees’ wage.

\(^{63}\) See Appendix 2C for a discussion of home ownership in detail.
Individual mortgages by formal banking institutions for home purchases were rare in China before privatization. However, it is shown that informal sector lending was very common around the time of the reform (Feder et al. 1992). This helps rule out the potential effect of financial factors associated with the housing market, if any.

3. Underlying Theoretical Mechanism

A simple supply-and-demand analysis provides a sufficient basis for determining the impact of privatization reform on the housing market.

Before the reform, public employees could be divided into two groups of housing consumers. The first group receives the state-subsidized housing without ownership, so its members enjoy purely the housing service but have no access to the value associated with the ownership of properties. Members of group might still demand some private homes, depending on their preference over these two types of housing, relative prices and quantities, and budget constraint.

The other group, which does not obtain the subsidized housing, has to rely on private market for housing with complete property rights. But the wages of public employees with similar characteristics are not fully adjusted to offset differences in their housing benefits, so members of this group have lower effective incomes than they would have if they had a state-owned apartment. They do, however, aspire to receive the seniority-based benefits in the future. This anticipation may bias their current purchase of private housing since the future in-kind benefit cannot be capitalized and turned into current use. If the net benefit of waiting outweighs that of immediate purchase at market price primarily because of transaction costs, these public employees are likely to defer or reduce their current purchase.
The total demand in private market is denoted as \( X^D D(\theta P) \), where \( P \) is the equilibrium price of housing unit, and \( X^D \) is a vector of characteristics that affect public employees’ demand for private housing such as income and state allocation. \( \theta \) is introduced to capture the substitution effect caused by new subsidy. The private supply, denoted as \( X^S S(P) \), is a function of price \( P \) and a vector of variables that affect supply, \( X^S \). At the initial equilibrium, the value of \( P \) must be such that:

\[
Q^D = X^D D(\theta P) = X^S S(P) = Q^S
\]

The privatization then combines the previously state-owned units with the private ones, and thus alters the equilibrium in the private market. The supply of private housing shifts out by the exact amount of units owned by state before reform. The aggregate demand for private housing must include the residents in formerly state subsidized homes now, and magnitude of the shifts in demand operates through several channels.

First, for the public employees residing in state homes prior to the reform, the transformation of property rights from state ownership into private ones allows the residents to obtain the full benefits of home ownership. After acquiring either full or partial property rights, individuals can access the wealth of their homes because they now can sell homes, rent out rooms in the private market, or use it as collateral in loans. Being able to use homes in a more productive way implies a significant wealth effect, which may increase the demand for private housing.

Second, cessation of the housing allocation may alter the purchase strategies of public employees on the waiting list. If these employees’ pre-reform purchase is biased due to their expectation of future housing allocation, noting that there is no forthcoming allocation could induce their purchase in private market at the amount they would choose without that expectation.
Third, the new HPF works like a closed-end matching grant for housing. Particularly, public employees who were on the waiting list for the housing allocation enjoy the benefit now, and the size of this group was not a small fraction of urban population\(^{64}\). One of the notable differences between the old and the new housing subsidy system is that the new system only subsidizes housing with private property rights. Moreover, the new subsidy in cash allows public employees to more flexibly adjust their housing choice\(^{65}\). This factor should also increase the demand for private homes.

To understand the impact of the reform on the equilibrium price, let’s take a look at the price change measured in terms of percentage.

The percentage change of equilibrium quantity supplied is given as \(\Delta Q^S = \Delta X^S + \varepsilon^S \Delta P\), where \(\Delta Q^S = \frac{dQ^S}{Q^S}\), \(\Delta X^S = \frac{dX^S}{X^S}\) is the outward shift due to the entrance of previously state-owned stock, \(\varepsilon^S\) is the supply elasticity, and \(\Delta P = \frac{dp}{p}\).

Similarly, the percentage change of equilibrium quantity demanded is \(\Delta Q^D = \Delta X^D + \varepsilon^D (\Delta P + \Delta t)\), where \(\Delta Q^D = \frac{dQ^D}{Q^D}\), \(\Delta X^D = \frac{dX^D}{X^D}\) is the shifts due to the wealth effect and changes in purchase strategies, \(\varepsilon^D\) is the demand elasticity, and \(\Delta t\) is the substitution effect induced by new subsidy.

At the new equilibrium, equating \(\Delta Q^D = \Delta Q^S\) yields

\[
\Delta X^D + \varepsilon^D (\Delta P + \Delta t) = \Delta X^S + \varepsilon^S \Delta P
\]

By solving for \(\Delta P\) we obtain

\[^{64}\text{In Appendix 2D, I discuss the magnitude of this potentially affected group in detail, showing that this waiting group accounted for roughly 25\% of the total population from 1989 to 1993. But the government annual investment in housing was only 4.3\% of the existing housing stock, which was far from enough to meet employees’ housing need.}\]

\[^{65}\text{See footnote 4 for detailed discussion of the wider range of use under this subsidy.}\]
\[ \Delta P = \frac{\Delta X^D + \varepsilon^S (\Delta t) - \Delta X^S}{\varepsilon^S - \varepsilon^D} \]

From the equation above, the impact of the reform on the equilibrium price is determined by the magnitude of the shift in demand relative to that of supply, given by \( \Delta X^D + \varepsilon^S (\Delta t) - \Delta X^S \) as well as by the elasticities of supply and demand. Since \( \varepsilon^S > 0 \) and \( \varepsilon^D < 0 \), we only need to know the sign of \( \Delta X^D + \varepsilon^S (\Delta t) - \Delta X^S \). If the outward shift of demand curve is larger than that of the supply curve, i.e. \( \Delta X^D + \varepsilon^S (\Delta t) > \Delta X^S \), there must be an increase in housing price at new equilibrium.

4. Empirical Tests and Data

4.1. Treatment design

Although the 1994 housing reform was nationwide, I attempt to exploit some measurement of cross-jurisdiction variations to examine the degree of property rights effects.

Lacking direct information about measuring the strength of the reform in each location, I consider the fact that before 1994 residents’ housing largely related to their employment status. I follow the logic in previous section that this privatization affected only the employees in the public sector by (1) selling the state-owned housing units\textsuperscript{66} to current occupants, and (2) ending the allocation to alter waiting people’s purchase strategies, and (3) launching the HPF to further encourage consumption in the private market. It is therefore plausible to assume that roughly all public employees were affected in this reform,

\textsuperscript{66} Public sector here includes only governmental authorities, state-owned institutions and state-owned enterprises. For all the estimations, although their housing benefit and wage scheme were quite similar to state employees, we do not include the collective work units in our measure of public sector for two reasons: First, only a portion of collective employees enjoyed the same housing benefit as state employees, but I can not identify how large that proportion was. Second, the reform at first targeted the state employees, and then extended to the collective employees a couple of years later. But in our discussion of potentially affected public employees in Appendix 2D, both types of employees are concerned.
so public sector size prior to 1994 indicates how much each urban area was influenced by this reform.

I use the number of public employees relative to population in an urban area as the measure of public sector size. I first calculate the average public sector size for each jurisdiction using data from years 1990-1994. Based on this calculation, the 30 jurisdictions are ranked from high to low, as shown in Table 2.1. For group comparison, the 15 jurisdictions with the largest pre-reform public sector size are then classified as the treatment group, while the lower 15 jurisdictions are used as the control group. Table 2.2 shows that the treatment group on average has a public sector share of employment that is 15 percentage points greater than the control group, which is a significant difference.

4.2. Test strategies

The analysis in Section 3 suggests that if the privatization has a larger impact on demand than on the supply, the equilibrium price moves upward. I test this price effect by looking at whether jurisdiction with larger pre-reform public sector size also experienced greater increase in housing prices after the reform.

Also, households enjoying the benefits brought about by the privatization reform are likely to pursue more or better housing. So a change in the quantity of housing service consumed by an average household after the reform should vary positively with the pre-reform public sector size.

4.3. Data

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67 For the price effect estimation, the data come from year 1993 and 1994 consistent with the length of price series.
68 One potential concern about group definition is whether group composition is constant over time. According to our data, only one jurisdiction switched from treatment group to control group after the reform, and one from control group to treatment group. Using direct measure of the public sector size can avoid such problem.
Due to the lack of city-level data for many provinces in earlier years, the empirical study in this paper is conducted at the province level. The primary data sources for this paper’s analysis are the Statistical Yearbooks of China and all provinces, covering all 30 jurisdictions\(^{69}\) directly under the central government in Mainland China during the sample period 1990 to 2000. Since the 30 jurisdictions vary considerably in their geography, demography and economic development levels\(^{70}\), I use per capita measurements for most variables.

4.3.1 Outcome measurements

I first look at the price effect of the 1994 housing reform. Data on housing prices from as early as beginning of the 1990s are not common, and provincial or city level statistics on the value and floor space of residential homes sold are only available since 1993.

I construct the average price per square meter of residential units as the total value divided by the floor space. The price series is converted into real 1990 RMB using the GDP deflator for China issued by IMF\(^{71}\). Table 2.2 shows that in 1993 the treatment group faced a lower market price than the comparison group: 167.483 compared to 243.971, which is a significant difference at the 5% level.

Panel A of Table 2.3 summarizes the levels and changes in logarithm of the market price. Data are presented by group in rows (1) and (2), with differences in average logarithms of market prices between groups in row (3). Entries in column (3) of Table 2.3 present the changes over time periods. As noted in Table 2.3, the jurisdictions with larger

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\(^{69}\) Since 1997, Chongqing was separated from Sichuan to become the 4\(^{th}\) municipality under the direct jurisdiction of central government. But all the data prior to that cannot be separated between Sichuan and Chongqing, so I aggregate the data of these two jurisdictions since 1997.

\(^{70}\) For example, Beijing, Tianjin, Shanghai and Chongqing are municipalities, while the other 26 are provinces.

\(^{71}\) Data source is available at [http://www.econstats.com/weo/CCHN.htm](http://www.econstats.com/weo/CCHN.htm).
pre-reform public sector size were initially smaller than their counterparts with smaller pre-reform public sector size, but grew faster after the reform. The relative gain (the difference-in-difference of the changes in logarithm of market price) is .229, significant with a t statistic of 15.52.

Figure 2.2 (A) depicts the average market price by group in each year in the sample. Before 1994, the difference between the two groups was relatively large, with the control group growing faster. However, the convergence of the two lines indicates that the treatment group experienced a faster increase in the market price after 1995. By 2000, the treatment group reached to a level quite close to the control group.

I also use per capita floor space as a proxy for the equilibrium quantity of housing services consumed by urban residents, measured in square meters (1 square meter is equivalent to 10.764 square feet). Although urban residents in jurisdictions from the treatment group consumed more floor space than those in the control group (10.412 m² relative to 9.448 m²) in 1993, the two groups are not statistically different from each other. From this outcome measurement, we may conclude that these two groups were similar before the reform.

Panel B in Table 2.3 provides similar results for per capita floor space. The level terms by group are shown in row (4) and (5), with differences in row (6). Differences between before and after the reform for each group are displayed in column (3) as well. The average consumption of housing services in terms of floor space was at first larger in jurisdictions in the treatment group, and also grew faster than those in the control group. The relative gain is .413, and the t statistic is 2.917.
Figure 2.2 (B) shows the pattern in the period of 1990 to 2000. From 1990 to 1994, the gap of floor space between two groups was relatively constant. Since 1997\textsuperscript{72}, however, the treatment group started to grow faster the two lines diverged. By 2000, the gap had widened by 76.5%.

This simple difference in difference analysis for both outcome measurements suggests that the 1994 privatization does seem to have had a significant impact on the housing market, with a positive impact on price. However, this simple comparison in Table 2.3 and Figure 2.2 make no allowance for other sources of variations in the private housing market.

4.3.2 Other controls

Table 2.2 displays the characteristics of urban households from the two groups prior to the privatization reform. Urban residents in jurisdictions with a larger pre-reform public-sector size earned similar disposable income\textsuperscript{73} to residents from jurisdictions with smaller pre-reform public sector. The statistics also indicate that urban households in jurisdictions from the treatment group significantly have an average of .152 more members than those from control group.

5. Identification and Estimation Results

To go beyond the raw data analysis in Section 4, this section presents the regression estimates of the impact of 1994 housing reform on the private market.

The 1994 housing reform brought about variations in two dimensions: (1) time (before and after the reform), and (2) geographic (jurisdictions with different pre-reform public sector size). These variations allow me to perform a difference-in-difference

\textsuperscript{72} The time lag effect on floor space will be discussed later in more details.

\textsuperscript{73} Disposable income is measured as the per-capita after-tax total income.
framework. We start with the baseline models of the average and dynamic effects using the continuous treatment.

5.1 Average effect

In the raw data analysis in the previous section I use a median-split binary code to define the treatment and control groups. However, this strategy has several disadvantages. First, Table 2.1 suggests that the distribution of pre-reform public-sector size is continuous, rather than having massive points on both ends. So the dichotomous coding might miss some important information\textsuperscript{74} and thus bias the estimates. Second, the validity of the difference-in-difference estimation with binary coding also depends on constant composition of both treatment and control groups over the course of the policy change. Otherwise differencing does not eliminate averages of the individual effects. Third, group classification requires necessity of the assignment of cutoffs, whose locations may to some extent be debatable. To avoid any of these problems, I use the direct measure of pre-reform public sector size to test the continuous strength of this reform.

5.1.1 Evidence on housing prices

To gauge the reform’s effect on housing prices, I estimate the following equation over 30 jurisdictions in 8 years from 1993 to 2000:

\[
R_{it} = \alpha_0 + \alpha_1 \text{Regime2}_t + \alpha_2 \text{Publicsize}_i + \alpha_3 \text{Regime2}_t \times \text{Publicsize}_i + \alpha_3 \text{X}_i + e_{it}
\]

where \(R_{it}\) is the logarithm of market housing price in jurisdiction \(i\) and year \(t\). \text{Regime2}_t is a time indicator equal to 1 for period of 1990-1994 and 0 for years 1995 to 2000; it reflects

\textsuperscript{74} When doing hypothesis test, the loss of information when dividing continuous variables into categories typically translates into losing power. See Aiken and West (1991), Multiple Regression: Testing and Interpreting Interactions for more discussion and references. Also see Van Belle (2008) Statistical Rules of Thumb, pp. 139 - 140.
the impact of time-varying economic environment. Note that although the reform was announced in July 1994, 1994 is defined as the last year before and 1995 as the first year after the reform. This is because there is a lag after the announcement by the central government before each jurisdiction and lower level governments enact detailed policy. \( PublicSize_i \) is the pre-reform public-sector-size. The vector \( \mathbf{X}_{it} \) includes individual and household characteristics that may shift the demand for housing services, including logarithm of per capita disposable income and household size. The inclusion of \( \mathbf{X}_{it} \) controls for changes in the demand for housing driven by factors other than the reform.

In this specification, the coefficient \( \alpha_3 \) is the parameter of primary interest, capturing the impact of pre-reform public-sector size on the price of housing in the private market. The coefficient estimate of the interaction term in regression (1) is expected to be positive if the reform has larger impact on demand than on supply. All the estimates of impacts on price are displayed in Panel A of Table 2.4.

The model in column (1) also includes a set of control variables, the logarithm of per capita disposable income and urban household size. The coefficient of interaction term, \( \alpha_3 \), 1.836, is positive and is significant at the 5% level. If the pre-reform public sector size increases 0.1 unit, it leads to a 18.36 percent increase in the post-reform housing price compared with before the reform. This result suggests that the privatization reform did significantly increase demand for private housing more than the supply.

The first regression relies on the assumptions that there are no unobservable differences in housing preferences for housing between urban residents that vary with the size of the public sector. While this assumption is strong, it may be plausible to assume that urban residents’ demand in the private housing market may also be driven by some other factors, such as demographic or geographic characteristics. So I include province fixed
effects to capture unobserved, time-invariant preferences for private housing market. The result in Column (2) shows that this specification yields a much better model fit, as evident from the adjusted R$^2$ and Wald test. But the estimated impact of reform is smaller, with a coefficient of 1.567 (significant at the 1% level).

5.1.2 Did the Housing Reform Increase Housing Consumption?

In addition to the price of housing, outward shifts in demand and supply will also increase quantity consumed. So I estimate the regression:

$$F_{it} = \alpha_0 + \alpha_1 Regime2_t + \alpha_2 PublicSize_i + \alpha_3 Regime2_t \times PublicSize_i + \alpha_4 X_{it} + e_{it}$$

(2)

where $F_{it}$ is per capita floor space in jurisdiction $i$ and year $t$, others the same as (1). And the estimate of $\alpha_3$ is expected to be positive.

Results similar to those in price estimations, but a little weaker, are found for floor space (Panel B of Table 2.4). The estimates of interesting variable are positive through both specifications. But in the first regression with disposable income and household size as controls, the coefficient of the interaction term, 3.873 is not significant.

Unlike the case for housing price, the coefficient on the interaction term in the floor-space regression increases to 3.952 as we add province fixed effect (column 4), and is significant at 1% level. For every 0.1 unit increase in pre-reform public sector size, the per capita housing area occupied increases by .3952 square meters. The change in significance when adding fixed effect could be possibly interpreted as that: in those population-sparse jurisdictions, the effect of reform is more likely to be reflected in living space, estimation without controlling for this geographic feature would just give large noise. So removing this effect can help isolate the impact of the reform shock on quantity choice. The model’s
explanatory power is also improved substantially by inclusion of province fixed effects, as suggested by Wald statistic.

5.2 Dynamic effect

To allow the time effect to assume a more flexible form, the following models are estimated from the same sample size:

\[ R_{it} = \beta_0 + \sum_{t \geq 1993} \beta_t * Year_t * PublicSize_t + \beta_2 X_{it} + e_{it} \quad (3) \]

\[ F_{it} = \beta_0 + \sum_{t \geq 1991} \beta_t * Year_t * PublicSize_t + \beta_2 X_{it} + e_{it} \quad (4) \]

Compared to equations (1) and (2), these flexible specifications allow us to examine the time variations in the impact of public sector size.

Estimating the flexible form yields three advantages. First, by looking at the dynamic impact we can test the important assumption that two groups follow the same housing development pattern before the reform. Second, expectations of the reform in the near future may bias some jurisdictions’ detailed policy; for example, some local governments may start to sell those state homes in advance. Although the experiments of the 1970s revealed central government’s interest in housing reform, interviews by Davis (1993) with urban residents in China suggest that both central and municipal governments hid their privatization plans from most of the residents in the early 1990s. The dynamic model can help us test if there was an expectation bias. Third, as indicated by the raw data in Figure 2.2 (B), it seems quite likely that there were lagged effects on quantity. In contrast to the instant fluctuation of price, quantity consumption does not respond to the reform immediately; it is determined by the inherent characteristics of the physical capital. Current housing stock is fixed, and private companies usually need years to adjust their supply. That is why we observe that floor space started to respond in 1997, almost two years after the
introduction of the new housing policy. Using this dynamic estimation helps identify the full policy effect.

The specification is the same as column (4) of Table 2.4. The estimates of the flexible equation displayed in Table 2.5 are similar to the estimates of equations (1) and (2). The relevant categories that are omitted from the regression are the interaction $year_{1993} \times PublicSize_i$ and an indicator for 1993 in the price series 1993-2000, and $year_{1990} \times PublicSize_i$ and an indicator for 1990 in floor space series 1990-2000.

5.2.1 Price effect

The coefficient estimate of $Year_t \times PublicSize_i$ for year 1994 is not statistically different from $Year_{1993} \times PublicSize_i$, but those interaction terms become significant immediately after the privatization. The sign of the coefficients of the interaction terms are positive in all years. The magnitudes fluctuate slightly, but all are larger than the estimate of 1.567 in Table 2.4. It first reaches 2.290 in 1995, and then declines to 2.234 in 1996. After years of fluctuation through 2000, the positive effect still exists. The results suggest that the housing reform effect on price started in 1995. In general, the interactions of pre-reform $PublicSize_i$ with most of the years following the reform are significant and indicate an impact that is similar to that reported in Table 2.4.

5.2.2 Quantity effect

The regression on housing-service quantity presented in column (2) tells a slightly different story. The signs of the coefficients of $Year_t \times PublicSize_i$ are positive in most of the years, except for 1994 and 1995. The magnitude increases by year after the reform, but this dynamic identification gives a different result from the baseline model. It leaps to 5.002 in 1998 (roughly triple that of 1997), which is larger than what is reported in column (4) from Table 2.4, 3.952. This increase continues in the next year, with an incremental living space
of 1.773 square meters. But this upward trend stops and experiences a slight decline in year 2000, back to 6.003 in level term. Once again, the significance changes after the privatization of state-owned housing, but not immediately and only in years 1998, 1999 and 2000.

5.2.3 General remarks

All the interaction terms $Year_t \times PublicSize_t$ before the reform are small in magnitude and not statistically different from zero, consistent with the hypothesis that in earlier years, the pre-reform pattern across jurisdictions did not vary with public sector size. These insignificant coefficients prior to 1994 are also consistent with the view that anticipation of the privatization did not affect the pre-reform private housing market. The fact that equilibrium quantity started to respond later shows that the lagged effect did exist, at least for three years.

In general, the results in Table 2.4 and 2.5 provide evidence in support of the hypothesis that the post-reform shifts in the demand for and supply of housing were driven by the pre-reform public-sector size. We can conclude that the 1994 privatization reform did have an impact on the private housing market particularly on the demand side. For every 0.1 unit increase in pre-reform public sector size, the post-reform market price rose by 15.67 percent, and floor space increased by about .3952 square meters. Relative to the average housing quantity consumed in 1994, 10.36 square meters per capita, the percentage change is 3.815 percent.

5.3 Sensitivity to binary group classification

For all the estimations in previous section I use direct measure of pre-reform public sector size to avoid a situation that the dichotomous coding might bias the estimates due to several
reasons\textsuperscript{75}. Now I use the binary code to test the robustness of our findings. The signs of coefficients of the interaction terms in the regressions are expected to be positive.

The results are displayed in Table 2.6, and several remarks are notable. First, consistent with our expectation, the direction of the movements of both equilibrium price and floor space after the reform is positively correlated with pre-reform public sector size.

Second, the number of interaction term in column (1) is directly comparable to the simple difference-in-difference of market price in column (3), row (3) of Table 2.3, and it is clear that there is no discrepancy. The coefficient of .229 is positive and significant at the 10\% level. Similarly, for floor space, a direct comparison between the simple difference-in-difference analyses in column (3), row (6) of Table 2.3 and the regression can be made. While no differences in the magnitude and positive sign are observed, the coefficient of .413 is not statistically significant.

Third, the magnitudes of the effect on both outcome measures are considerably smaller in the binary classification. Compared to the results in Table 2.4, an increase of 0.1 in the public sector size is associated with the price effect of 1.82 percentage points, which is much lower than 15.67; and for floor space, there would be .0595 more square meters consumed by per person, roughly a seventh of .3952.

5.4 Robustness check

In this section, I conduct several sensitivity analyses to address the confounding factors that may potentially invalidate our difference-in-difference estimates.

5.4.1 Alternative measure of housing price

\textsuperscript{75} For this strategy, I run a robustness check to correct for compositional change because Guangxi and Guizhou are observed to switch between these two groups. I drop these two provinces. As expected, the magnitude of the estimated quantity impact of housing reform is smaller than the baseline estimate, .446 relative to .595; the estimated price effect is .206 compared to .182. But neither difference is significant. This analysis shows that my basic estimates are robust.
There are two potential limitations of the purchase-price series. First, it only includes the two years immediately before the reform, so it may omit some important information about any pre-reform trend. Second, the purchase-price series incorporates more information about anticipation of future and long run equilibrium, while the rental price reflects more current activities in the market. It is therefore advisable to test the robustness of our baseline result to different measure of price outcomes. Although the rental market did not comprise a big share of the housing market, this measurement basically reflects the price of housing in the private market76.

Expenditure on housing rent by urban households is published by the National Bureau of Statistics. Using data for total annual expenditure on housing rent and floor space in private market, I construct the average rental value per square meter of residential units from 1990 to 2000, converted into real 1990 RMB.

Results from this specification are reported in column (2) of Table 2.7. The rental price series yields results similar to the baseline estimation, with a coefficient of .818 compared with 1.567 in baseline model. This result is consistent with our analysis that the rental price reflects more of residents' short-run response to changes in the housing market.

5.4.2 Concurrent Tax reform

Several dramatic economic reforms were launched in China in 1994. It is possible that tax reform might have influenced the private housing market if it induced local governments to increase the supply of urban land tenure77. If this is true, our baseline model will overestimate the effect of housing reform.

---

76 See Appendix 2E for a detailed discussion of the validity of this measure.
77 Although the state has the ultimate ownership of land and local governments are responsible for the management of it in urban area, private firms can purchase the use right up to 70 years. The initial prices are set by auction or negotiation. And the land use rights could be transferred and rent
Due to the continuous decline in fiscal revenue relative to GDP, the state launched a fiscal reform – the Tax Sharing System- to raise central government’s share of total fiscal revenue from around 35% to 60% along with a substantial increase in inter-governmental transfers. Meanwhile, expenditure responsibilities were nominally unchanged. Under this drastic change, traditional financial sources proved insufficient for local government to carry out its expenditure responsibilities. These conditions pressed the lower levels of government to rely more heavily (if not exclusively) on the sale of land tenure, creating a new public finance structure often referred to as “land fiscal policy” (Chen 2010). In the most recent decade, the total fiscal revenue derived from the sale of urban land tenure has increased from 0.5 trillion RMB to slightly above 1 trillion RMB, with its share of total local fiscal revenue (not including transfers) rising from 12.99% to more than 52.69%\(^7\)

Figure 2.3 (A) and (B) display the aggregate trends of both revenue share and land areas sold, both of which were relatively flat in most years of 1990s and actually started to take off around 2001. Thus, even if the tax reform generated any effect on the supply of land tenure the private housing market, there was a long lag. Therefore we can discount the potential influence of 1994 tax reform for the sample period of our interest.

5.4.3 Inter-jurisdictional Residential mobility

It may seem that household migration could bias our estimates. However, the central government created a household registration system to control residential mobility. According to this system, every household must officially register to live and work in a specific place, either a city or rural area, in order to gain the access to social services there.

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\(^7\) See the report issued by the Ministry of Land and Resources and Ministry of Finance of China, available at the official website of the Ministry. Because of the complexity in accurately calculating expenditure and revenue in China, these two numbers only give us a rough idea about the share.
Once a household is registered in a given place, it is allowed to move only within that place. This policy largely reduced the migration of rural residents into urban areas, and also reduced inter-city residential mobility. According to Table 2D, total annual percentage of migrants including rural residents contributes less than 3% at province level\textsuperscript{79}, which is not large enough to account for the findings of this study.

6. Conclusion

This paper has found evidence consistent with the view that the 1994 privatization of housing in China increased the demand for private housing with major effects on price and lagged effects on quantity. Cross-sectional variation in the size of the public sector is used to identify the impact of the privatization of public employees’ housing units.

Using panel data collected from the Statistical Yearbook of China for 1990-2000, a difference-in-difference approach serves as the base strategy to test the prediction that the institutional conditions governing the allocation of subsidized housing to public employees (particularly seniority) caused privatization to lead to both a reallocation of existing housing units and an increase in demand. The estimates confirm this prediction. Controlling for jurisdiction fixed effects, it is found that the 1994 privatization reform led to a 15.67 percent rise in price and an increase of 3.815 percent in per capita floor space in the private housing market.

\textsuperscript{79} See Appendix 2F for more information about the migration.
References


Table 2.1 Pre-reform Public Sector Size by Province (1990-1994)

<table>
<thead>
<tr>
<th>Group with larger size</th>
<th>Group with smaller size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tibet</td>
<td>Guizhou</td>
</tr>
<tr>
<td>Hainan</td>
<td>Sichuan</td>
</tr>
<tr>
<td>Yunnan</td>
<td>Inner Mongolia</td>
</tr>
<tr>
<td>Xinjiang</td>
<td>Shanghai</td>
</tr>
<tr>
<td>Hebei</td>
<td>Hubei</td>
</tr>
<tr>
<td>Gansu</td>
<td>Heilongjiang</td>
</tr>
<tr>
<td>Shanxi</td>
<td>Fujian</td>
</tr>
<tr>
<td>Beijing</td>
<td>Tianjin</td>
</tr>
<tr>
<td>Shaanxi</td>
<td>Zhejiang</td>
</tr>
<tr>
<td>Qinghai</td>
<td>Anhui</td>
</tr>
<tr>
<td>Ningxia</td>
<td>Liaoning</td>
</tr>
<tr>
<td>Henan</td>
<td>Jiangsu</td>
</tr>
<tr>
<td>Jiangxi</td>
<td>Shandong</td>
</tr>
<tr>
<td>Guangxi</td>
<td>Jilin</td>
</tr>
<tr>
<td>Hunan</td>
<td>Guangdong</td>
</tr>
</tbody>
</table>

Count | 15 | 15 |
Mean   | .582 | .431 |
Std. dev | .081 | .038 |

2. The sector size is measure by the ratio of public employees to the total urban population.
Table 2.2 Descriptive Statistics of Urban Households in 1993

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Jurisdictions in Group with larger pre-reform public sector size</th>
<th>Jurisdictions in Group with smaller pre-reform public sector size</th>
<th>t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market housing price</td>
<td>Per square meter</td>
<td>167.483 (70.249)</td>
<td>243.971 (82.001)</td>
<td>2.744**</td>
</tr>
<tr>
<td>Floor space</td>
<td>Per capita floor space (m²/person)</td>
<td>10.412 (1.763)</td>
<td>9.448 (2.275)</td>
<td>1.2973</td>
</tr>
<tr>
<td>Disposable income</td>
<td>Per capita annual disposable income (1,000 ¥/person)</td>
<td>1.887 (.370)</td>
<td>2.076 (.615)</td>
<td>-1.0220</td>
</tr>
<tr>
<td>Household size</td>
<td>Number of household members residing in the housing units</td>
<td>3.399 (.204)</td>
<td>3.265 (.153)</td>
<td>2.0213*</td>
</tr>
<tr>
<td>Public sector size</td>
<td>Ratio of public employees to the urban population</td>
<td>.565 (.074)</td>
<td>.413 (.039)</td>
<td>7.0237***</td>
</tr>
</tbody>
</table>

Note: 1. Std. deviations are in parentheses.
2. * denotes the average is significantly different between the two groups at 10% level, and *** denotes 1% level.
3. Disposable income is measured in 1,000 RMB.
Table 2.3 Comparisons of Outcomes by Period and Group

<table>
<thead>
<tr>
<th></th>
<th>All jurisdictions</th>
<th>Housing price(^1)</th>
<th>Floor space</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Pre-reform</td>
<td>Post-reform</td>
</tr>
<tr>
<td>Panel A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group with smaller public sector size</td>
<td>5.396 (0.062)</td>
<td>5.411 (0.026)</td>
<td>.015 (0.015)</td>
</tr>
<tr>
<td>Group with larger public sector size</td>
<td>5.048 (0.103)</td>
<td>5.293 (0.025)</td>
<td>.245 (0.035)</td>
</tr>
<tr>
<td>Difference</td>
<td>-.347 (0.015)</td>
<td>-.119 (0.002)</td>
<td>.228 (0.015)</td>
</tr>
</tbody>
</table>

Panel B

<table>
<thead>
<tr>
<th></th>
<th>Pre-reform</th>
<th>Post-reform</th>
<th>Change over time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group with smaller public sector size</td>
<td>9.143 (.254)</td>
<td>11.152 (.287)</td>
<td>2.008 (.056)</td>
</tr>
<tr>
<td>Group with larger public sector size</td>
<td>10.073 (.192)</td>
<td>12.494 (.267)</td>
<td>2.421 (.130)</td>
</tr>
<tr>
<td>Difference</td>
<td>.930 (.004)</td>
<td>1.343 (.036)</td>
<td>.413 (.141)</td>
</tr>
</tbody>
</table>

Note: 1. For Panel A, housing price is in log term. For Panel B, floor space is in level term.
2. Std. errors are shown in parentheses.
Table 2.4 Estimated Effect of Privatization on the Private Housing Market, Using Direct Measure of Pre-reform Public Sector Size

<table>
<thead>
<tr>
<th>Variable</th>
<th>Housing price</th>
<th></th>
<th>Floor space</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Regime2 * PublicSize</td>
<td>1.836**</td>
<td>1.567***</td>
<td>3.873</td>
<td>3.952***</td>
</tr>
<tr>
<td></td>
<td>(.866)</td>
<td>(.556)</td>
<td>(2.793)</td>
<td>(1.512)</td>
</tr>
<tr>
<td>Regime2</td>
<td>-.817**</td>
<td>-.746***</td>
<td>-.032</td>
<td>-1.583</td>
</tr>
<tr>
<td></td>
<td>(.389)</td>
<td>(.250)</td>
<td>(1.467)</td>
<td>(.747)</td>
</tr>
<tr>
<td>Pre-reform PublicSize</td>
<td>-2.485***</td>
<td>25.166*</td>
<td>.977</td>
<td>-1490.76***</td>
</tr>
<tr>
<td></td>
<td>(.782)</td>
<td>(13.840)</td>
<td>(1.907)</td>
<td>(205.612)</td>
</tr>
<tr>
<td>Disposable Income</td>
<td>.360***</td>
<td>.103</td>
<td>1.038***</td>
<td>1.348***</td>
</tr>
<tr>
<td></td>
<td>(.070)</td>
<td>(.181)</td>
<td>(.220)</td>
<td>(.164)</td>
</tr>
<tr>
<td>Household size</td>
<td>-.331**</td>
<td>-.790</td>
<td>3.723***</td>
<td>-2.256***</td>
</tr>
<tr>
<td></td>
<td>(.163)</td>
<td>(.642)</td>
<td>(.738)</td>
<td>(.622)</td>
</tr>
<tr>
<td>Province FE</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Obs.</td>
<td>238</td>
<td>238</td>
<td>330</td>
<td>330</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>.264</td>
<td>.618</td>
<td>.338</td>
<td>.870</td>
</tr>
<tr>
<td>Wald chi2</td>
<td>106.53</td>
<td>1010.42</td>
<td>151.91</td>
<td>5809.02</td>
</tr>
</tbody>
</table>

Note: 1. Housing price is in log term.
2. Bootstrap standard errors are shown in parentheses.
3. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Table 2.5 Dynamic Effect of 1994 Privatization Reform on the Private Housing Market

<table>
<thead>
<tr>
<th>Variable</th>
<th>Housing price$^1$</th>
<th>Floor space</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991 * PublicSize</td>
<td>.775</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3.519)</td>
<td></td>
</tr>
<tr>
<td>1992 * PublicSize</td>
<td>.263</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3.791)</td>
<td></td>
</tr>
<tr>
<td>1993 * PublicSize</td>
<td>.607</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4.053)</td>
<td></td>
</tr>
<tr>
<td>1994 * PublicSize</td>
<td>1.562 (1.364)</td>
<td>-.732 (3.772)</td>
</tr>
<tr>
<td>1995 * PublicSize</td>
<td>2.290* (1.383)</td>
<td>-.992 (3.313)</td>
</tr>
<tr>
<td>1996 * PublicSize</td>
<td>2.234* (1.257)</td>
<td>.616 (3.550)</td>
</tr>
<tr>
<td>1997 * PublicSize</td>
<td>2.737** (1.336)</td>
<td>1.741 (3.830)</td>
</tr>
<tr>
<td>1998 * PublicSize</td>
<td>2.372** (1.126)</td>
<td>5.002* (3.010)</td>
</tr>
<tr>
<td>1999 * PublicSize</td>
<td>2.261** (1.104)</td>
<td>6.775** (3.439)</td>
</tr>
<tr>
<td>2000 * PublicSize</td>
<td>2.116** (1.088)</td>
<td>6.003* (3.531)</td>
</tr>
<tr>
<td>Pre-reform PublicSize</td>
<td>12.286 (40.096)</td>
<td>-296.136 (219.957)</td>
</tr>
<tr>
<td>Disposable Income</td>
<td>.183</td>
<td>.020</td>
</tr>
<tr>
<td></td>
<td>(.295)</td>
<td>(.215)</td>
</tr>
<tr>
<td>Household size</td>
<td>-.917 (.840)</td>
<td>.991 (.855)</td>
</tr>
<tr>
<td>Year FE</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Province FE</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Obs.</td>
<td>238</td>
<td>330</td>
</tr>
<tr>
<td>Adjusted R$^2$</td>
<td>.612</td>
<td>.906</td>
</tr>
<tr>
<td>Wald chi2</td>
<td>915.58</td>
<td>6223.16</td>
</tr>
</tbody>
</table>

Note: 1. Housing price is in log term, and only in years 1993-2000.
2. Year 1993 is omitted for price estimation, and year 1990 is omitted for floor space estimation.
3. Bootstrap standard errors are shown in parentheses.
4. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Table 2.6 Effect of 1994 Privatization Reform on the Private Housing Market, Using Group Dummy

<table>
<thead>
<tr>
<th>Variable</th>
<th>Housing price</th>
<th></th>
<th></th>
<th>Floor space</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Regime2 * SizeDum</td>
<td>.229***</td>
<td>.258***</td>
<td>.182***</td>
<td>.413</td>
<td>.823***</td>
<td>.595**</td>
</tr>
<tr>
<td></td>
<td>(.120)</td>
<td>(.113)</td>
<td>(.069)</td>
<td>(.520)</td>
<td>(.459)</td>
<td>(.248)</td>
</tr>
<tr>
<td>Regime2</td>
<td>.015</td>
<td>-.073</td>
<td>-.086**</td>
<td>2.008***</td>
<td>1.340***</td>
<td>.139</td>
</tr>
<tr>
<td></td>
<td>(.067)</td>
<td>(.061)</td>
<td>(.043)</td>
<td>(.381)</td>
<td>(.390)</td>
<td>(.184)</td>
</tr>
<tr>
<td>SizeDum</td>
<td>-.347***</td>
<td>-.342***</td>
<td>-.065</td>
<td>.930***</td>
<td>.629**</td>
<td>-1.462</td>
</tr>
<tr>
<td></td>
<td>(.114)</td>
<td>(.102)</td>
<td>(.071)</td>
<td>(.326)</td>
<td>(.304)</td>
<td>(.921)</td>
</tr>
<tr>
<td>Disposable Income</td>
<td>.361***</td>
<td>.152</td>
<td>1.144***</td>
<td>1.363***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.071)</td>
<td>(.193)</td>
<td>(.221)</td>
<td>(.167)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household size</td>
<td>.263*</td>
<td>-.673</td>
<td>3.663***</td>
<td>-2.087***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.142)</td>
<td>(.698)</td>
<td>(.629)</td>
<td>(.709)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Province FE</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Obs.</td>
<td>238</td>
<td>238</td>
<td>238</td>
<td>330</td>
<td>330</td>
<td>330</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>.111</td>
<td>.196</td>
<td>.590</td>
<td>.216</td>
<td>.365</td>
<td>.868</td>
</tr>
<tr>
<td>Wald chi²</td>
<td>20.72</td>
<td>123.23</td>
<td>928.81</td>
<td>98.15</td>
<td>165.20</td>
<td>6590.66</td>
</tr>
</tbody>
</table>

Note: 1. Housing price is in log term.
2. Bootstrap standard errors are shown in parentheses.
3. *** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.
Table 2.7 Specification Tests of Price Effect

<table>
<thead>
<tr>
<th>Variable</th>
<th>Housing price</th>
<th>(1) Purchase price</th>
<th>(2) Rental price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regime2 * PublicSize</td>
<td>1.567***</td>
<td>.818**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.556)</td>
<td>(.399)</td>
<td></td>
</tr>
<tr>
<td>Regime2</td>
<td>-.746***</td>
<td>-.276</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.250)</td>
<td>(.211)</td>
<td></td>
</tr>
<tr>
<td>Pre-reform PublicSize</td>
<td>25.166*</td>
<td>195.738***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(13.840)</td>
<td>(59.574)</td>
<td></td>
</tr>
<tr>
<td>Disposable Income</td>
<td>.103</td>
<td>1.237***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.181)</td>
<td>(.174)</td>
<td></td>
</tr>
<tr>
<td>Household size</td>
<td>-.790</td>
<td>.145</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.642)</td>
<td>(.269)</td>
<td></td>
</tr>
<tr>
<td>Province FE</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Sample</td>
<td>All</td>
<td>a</td>
<td></td>
</tr>
<tr>
<td>Obs.</td>
<td>238</td>
<td>330</td>
<td></td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>.618</td>
<td>.775</td>
<td></td>
</tr>
<tr>
<td>Wald chi²</td>
<td>1010.42</td>
<td>1484.35</td>
<td></td>
</tr>
</tbody>
</table>

Note: 1. Housing price and rental price are both in log term.
2. Specification (1) is the baseline model.
3. Bootstrap standard errors are shown in parentheses.
4. *** significant at the 1% level, ** significant at the 5% level, *
   significant at the 10% level.

Samples:
Figure 2.1 (B) Total Rates of Private Home in Urban Area

Figure 2.2 (A) Trend in Rates of Private Home in Urban Area\textsuperscript{80}

Note: Panel (a) is cited from Wang (forthcoming) and (b) is from Wang (2011).

\textsuperscript{80} See detailed discussion in Appendix 2C.
Figure 2.2 (A) Pattern in Market Housing Price by Group and Year

Figure 2.2 (B) Pattern in Floor Space by Group and Year
Figure 2.3 (A) Aggregate Trend in the Share of Land Tenure Sales to Total Fiscal Revenue at Local Government Level

Figure 2.3 (B) Aggregate Trend in the Total Areas of Land Use Rights Sold

Note: 1. Data source: Fiscal Yearbook of China.
2. Data for 1997 are missing.
CHAPTER THREE

THE TRANSACTION OF PROHIBITED URBAN HOUSING ON RURAL LAND IN CHINA:
A PERSPECTIVE OF LOCAL PUBLIC FINANCE

1. Introduction

Industrialization and urbanization are necessarily associated with transferring rural land from agricultural to non-agricultural sectors in many countries throughout the world, since land is one of the essential factors for economic activities. This was also the case in 20th century for China. However, as central government imposed more restrictions on the use of farmland in recent years, local governments, private construction developers and some urban residents start to form an unlawful housing market on the rural residential land, which is separate from the farmland under the land use laws.

Urban housing on rural residential land, also called “housing with petit title”, refers to the housing built on the rural residential land and sold illegally though informal system to urban residents81; urban buyers cannot obtain a formal title issued by state, instead they can only have one certificate granted by village collectives82. “Prohibited” means that such housing transaction violates legal restrictions on alienability of housing on rural land. Despite the regulatory restrictions and legal risk, the sales of such housing have emerged and developed into a considerable phenomenon in the past decade in many large cities. In 2007, the market share of this housing in the overall supply of residential apartments is

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81 Urban and rural residents are distinguished by their status in Household Registration System.
82 In China, village collective is a special type of corporative economy in rural area with co-ownership of production materials, of which farmers are members. Village council, like a local government, acts as an agent of village collective to provide public service.
reported to have reached approximately 18% in Beijing\textsuperscript{83} and 49% in Shenzhen\textsuperscript{84}. It is notable that central government of China had in general tolerated the expansion of the informal sales in the early 2000s, yet started to take some actions to deter this transaction recently with allowance for regional diversity.

Why did the prohibited sales occur? Why did central government respond differently over time and allow for policy diversity across regions? This paper argues that under the fragmented land property regimes, if facing fiscal pressure, village council has incentive to turn the rural residential land into urban housing use to seize more rents. Concerned about the agriculture output and fiscal tension among different government levels, central government decides to tolerate or restrict at certain critical points.

It is widely believed that this issue is highly correlated with the fragmented property rights regime regarding housing and land in China. Urban residents can purchase a termed tenure over the state-owned urban land as well as complete ownership of housing. Meanwhile, the rural land is owned by the village collectives, of which farmers are members. Individual farmers are assigned tenures over two types of land, farming and residential lands with alienability only among collective members, except when the rural residential land is used for township enterprises\textsuperscript{85}. This is the first degree of diversification. Moreover, under the decentralized fiscal system, despite state’s ultimate ownership of the urban land, the powers of management and right to use are distributed among governments

\textsuperscript{83} See the news report titled —Beijing Government Ordered Suspension of Construction and Sale of Rural Housing with Petit Title, People's Daily (English version), available at \url{http://news.xinhuanet.com/house/2007-06/27/content_6297507.htm}.


\textsuperscript{85} This has almost been the only reason that rural residential land could be turned into urban housing use.
of different lower levels in urban area. In rural area, village council and local government at village level act as agents of collective to manage the use of residential land. This is the second degree of diversification. Agency problem may arise under this degree of diversification in land and fiscal system, especially under fiscal pressure.

Given this property regime, the village council and local government actually enjoy the monopoly power as a holder of “call option”\(^\text{86}\) over the rural residential land. The exercise of the call option is subject to no condition, and the government has unilateral power in setting the exercise price, since Chinese legal system did not have specific law until recent years regarding the compensation to farmers whose lands are condemned\(^\text{87}\). Furthermore, if the rural residential land is turned into urban housing purpose, local government and village council can obtain a large premium. Since local government’s performance largely depends on its fiscal revenues, the increasing fiscal pressure since 1994 tax reform\(^\text{88}\) creates large incentive for local government to substitute toward urban housing use as alternative revenue source.

On the other hand, urban residents are also the victims of this fragmented property regime because they have to pay a high price for the land tenures charged by local governments in urban area. They have motives to seek the rural residence as a cheaper


\(^{87}\) In those legal real estate development projects, only 5 to 10\% of the added value in rural land condemnation goes to farmers for their compensation. Local government obtains 20 to 30\%, while developer takes the largest share, up to 50\%. See Liu and Xie, “Fight over land rents associate with the informal sale of urban housing on rural land”, China Newsweek, 2007 Jul-23, pp. 24-27.

\(^{88}\) The 1994 tax reform centralized the tax revenue with a share of up to 50 percent for central government, while kept the expenditure responsibility nominally unchanged at lower level governments.
substitute. Therefore urban residents and village officials on behalf of collectives start to form an informal market for the urban housing on rural residential land.

However, this transaction has gathered much more concerns than just the violation of current law. Although urban residents benefit from this cheaper housing and it increases local government’s fiscal revenue, some other problems may arise. First, village officials fail to take into account the social cost associated, such as negative spillover effect on preserving farming land, and distortion in labor force between agricultural and non-agricultural sectors. Since agriculture is the primary industry in China and accounts for 17.7% of GDP in 1999, any policy that potentially harms agriculture output would be put into serious consideration. Second, due to lack of market mechanism in rural land, the value of land is not accurately reflected in the housing price as officials usually set it low. So there may exist government failure. Third, more takings by village council are the most likely consequence if this is not restricted. Increase in land supply might depress the price of urban land tenure, which would induce local government in urban areas’ strategic behaviors to compensate for their revenue losses, such as proposal of property tax, or more transfer from central government.

The transaction of such housing actually does no have direct financial impact on central government since it does not derive any rents from land. Then what is the incentive for it to take any action? Usually the first and the third discussed above are the major concerns cited as the justification for central government’s intervention. But these two

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89 According to news reports, the cost of urban housing units on rural land only takes up 1/3 of housing cost in urban area.

90 See Article 62 and 63 in Chapter 5, Land Law of PRC.


reasons yield opposite incentives, which helps explain the different strategies taken by central government over time and across regions.

The paper is organized as follow. Section 2 gives a basic summary and evaluation of existing studies, which are relevant to this issue. The third section applies a formalized model of local government’s opportunistic behavior over the sales of urban housing on rural land, emphasizing on the game strategies between central and local government. Next section provides some empirical evidence to support the argument. Section 5 concludes.

2. Literature Review

The transaction of prohibited urban housing on rural land features in many aspects similar to the problem of excessive farmland conversion, thus an intensive investigation of previous studies in this field would shed some insight on the issue of our interest. In general there are three types of points of view focusing on different aspects of this problem.

The first category argues that under the fragmented property rights regime, the local government’s practice of deriving monopoly rents from urban land tenure is popularly understood as the ultimate economic origin of the persistence of these sales. Nonetheless, Chen (2009) points out that this government monopoly understanding fails for two reasons. First, it cannot explain why the informal sales appeared and developed only in the last decade, while the government’s monopoly power has existed since the formation of the People’s Republic of China about sixty years ago. More importantly, this interpretation also fails to offer any insight into why the government regulatory agencies and courts generally choose to tolerate rather than to sanction these transactions.

The second mechanism takes a look at this problem focusing on price system, which is basically the supply-demand analysis. Regardless of monopoly power, the dramatically
increased demand for housing after 1994 housing reform, together with limited supply of land tenure in urban area makes housing in rural area a cheaper substitute. Furthermore, a collection of authors along this point of view also argues that the social cost is not taken into account when the rural residential land is taken and turned into urban use, which causes overprovision (Qu, et la, 2004). Therefore village council and urban citizens began to direct transactions of housing on rural land when possible. However, we observe that government intervention in the rural land supply does not only leave the market failure unsolved, but also even causes more severe government failure.

A third interpretation of this issue is derived from institutional economics, emphasizing on institutional arrangement. Among the exclusive right to use resource, the right to claim the rent and to transfer, transfer right plays a key role (Cheung, 2002). An institutional economic argument shows that the transaction of prohibited urban housing on rural land just occurred under the circumstance of ill-defined transfer right (Zhou, 2004). In China, free trade of rural land tenure and housing are only allowed among village collective members, except when the rural residential land is used for township enterprise. Nonetheless, this interpretation fails to provide a fundamental explanation for the expansive use of this tool by village councils.

Most of existing literature focuses on the demand side, while leaves the supply of rural housing little examined. Even the local public finance argument, which discusses local governments’ activities in supply of urban land tenure, only demonstrates why the urban housing price has increased so much. Chen (2009) claims that under-compensation for farmers is the driving force for supply. However, we observe that the sales of these prohibited housing is usually conducted by village officials rather than farmers. Although
the rural land is legally owned by the village collective, the real decision maker about the rural residential land provision is indeed official on behalf of collective.

This paper takes an intensive examination at the supply side of the rural housing, emphasizing on the village official’s incentive and the game between central government and village councils. Under the fragmented proper regime and decentralized fiscal system, when lacking alternative fiscal resources, village council has incentive to break its tenure assignment over rural residential land and turn for urban housing use.

Chen (2009) also compares two solutions to this problem, which could be utilized by central government, regulation versus property rights shift. Regulatory solution fixes the problem in a paternalistic way, and tries to maintain current property regimes regarding land but calls for more restrictions on the sales of such housing. On the contrary, property rights solution in favor of privatization of rural land tenure and legalization of rural housing transaction, involves fundamental reform of property rights as well as legal and fiscal system. By analyzing the short run and long run benefits, Chen argues that it is not appropriate to launch such a reform immediately when China is still in its transitional stage, thus concludes that regulatory solution is more compared so far. This paper’s analysis basically follows the idea of paternalism, stating that at certain critical point, central government should intervene and restrict this issue.

3. Theoretical Framework

3.1 The description of the model

Consider an infinite horizon economy in which time is discrete and indexed by $j$, and all players discount the future payoff by the factor $\beta$. There are three players in this game: central government, village council, and farmers. Each of them has different objective
functions, and there are both interest alignment and misalignment between village council and central government, and between farmers and village council. Under this framework, each player’s utility functions and production functions are defined as below:

For farmer, his discounted lifetime after-tax payoff from efficient agricultural production is characterized by:

\[ u = \sum_{j}^{\infty} \beta^j (1 - t) (l_j^a - \alpha l_j) \]

where \( t \) is the tax rate and is exogenously determined in our model. \( l_j \) is the effort or investment in agricultural production, and the term \( \alpha \) is introduced to simplify the algebra. Immediately we can obtain that the superior production would be used and the optimal investment is \( l_j^* = 1 \) if farmers have the option to choose technology. And farmer’s discounted lifetime after-tax payoff is given as:

\[ u^* = \frac{(1-t)(1-\alpha)}{1-\beta} \]

We further assume that if farmers lose their residential land, the agriculture sector would be less productive even though the farming land remains in agricultural use. Two reasons are given: first, farmers might completely give up the farming production and flow into cities for other job opportunities, which they might not be competent. Or further housing location renders farming production more costly. Then farmer could produce using inferior production technology but with certain amount of lump-sum compensation from losing housing land which is denoted as \( C \):

\[ u = C + \sum_{j}^{\infty} \beta^j (1 - t) (b^{1-\alpha} l_j^a - \alpha l_j) \]

In this case, the optimal investment is \( l_j^f = b \), and \( b < 1 \). And his lifetime payoff is

\[ \hat{u} = C + \frac{(1-t)b(1-\alpha)}{1-\beta} \]. So far, we assume that which technology to use is not optional to farmer, which means farmer cannot constraint village council’s behavior by playing trigger
strategy. Later we will analyze a situation where farmers’ voting strategy restrains officials’ behaviors.

Village council, as the agent of village collective to manage the use of rural residential land, tries to collect revenue to carry out its expenditure responsibilities. The fiscal situation basically determines its performance in expenditure responsibility and thus officials’ future promotion, so the village council has the choice to keep land for rural residential use or to turn it into urban housing use to obtain more money. Here to simplify our analysis, we assume that without the option to take the residential land for urban use, village council can only collect the fiscal revenue by only imposing tax on agricultural output.

\[ v = \sum_{j}^{\infty} \beta^j (tt^t) \]

And it would obtain \( v^* = \frac{t}{1-\beta} \) if farmer produces using the superior technology. It implies that \( t > 0 \) if the village council keeps running office. Alternatively, village council can seize a lump-sum premium from land tenure through selling prohibited urban housing on rural land as well as tax revenue from inferior production, which is given:

\[ v = T - C + \sum_{j}^{\infty} \beta^j (tb^{1-\alpha}t^a) \]

where \( T \) is the rent from land tenure included in housing. Surely \( T > C \). In this case, village council’s payoff is:

\[ \theta = T - C + \frac{tb}{1-\beta} \]

The third group of player, central government has its own concerns. On one hand it attempts to maintain the rural residential land for farmers’ housing use so that such transactions are not likely to reduce agricultural output. But on the other hand, central government is also concerned about the local government’s effort in balancing fiscal budget
to avoid financial impact on itself and to prevent political unrest. We use the linear utility function form, which simply adds up total agricultural output and village council’s budget balance together. So the central government’s objective function is given as:

\[ g = \sum_j^\infty \beta^j (l^\alpha_j - \alpha l_j) + \sum_j^\infty \beta^j (t l^\alpha_j - c_j) \]

where \( c \) is the government expenditure occurring in each period. Thus central government’s utility is given as

\[ g^* = \frac{1-\alpha}{1-\beta} + \frac{t-c}{1-\beta} \]

or \( \tilde{g} = \frac{b(1-\alpha)}{1-\beta} + (T - C + \frac{tb-c}{1-\beta}) \) otherwise in the case of farmers using inferior production technology if village council chooses to use the land for urban housing.

And the timing is defined in this way. First, village council assigns tenure over the residential land to farmer. Next, farmer chooses the superior technology to produce agricultural goods. Then tax and consumption take place. This timing of events requires some type of contracts, either implicit or explicit; because village council has incentive to break its commitment over the tenure. If the inherent commitment problem occurs, central government needs to decide whether to restrict such transaction.

3.2 Benchmark and Self-Enforcement

To provide a benchmark, we assume no contracts are written between the village council and farmer when the land is assigned to farmer, and no central government intervention. Immediately we can observe that \((\tilde{u}, \tilde{v})\) is the equilibrium. Village council puts the rural residential land into urban use and earns rents from sales of urban housing built on rural land; farmer takes the compensation and produces using inferior technology.

Since here we assume farmer cannot play trigger strategy, the repeated nature of game does not work in this case. The only way for village council not to use the rural
housing land for urban residence is self-enforcing when no explicit restriction. This condition requires the village council to take the future tax revenue into serious account. Thus we must have \( v^* > \theta \), which gives us:

\[
\frac{t}{1-\beta} \geq T - C + \frac{tb}{1-\beta}
\]

Simplifying (1) yields:

\[
T - C \leq \frac{t(1-b)}{1-\beta}
\]

This inequality shows that only when rents from prohibited sales of rural housing in current period, denoted by \( T - C \) is smaller than long-run tax revenues collected on the technology advantage \( (1 - b) \), village council would keep the land for rural residence. We see that large \( b \) or \( T \), or small \( \beta \) or \( t \) are likely to break this condition. As land rent from urban housing use gets larger, officials become more shortsighted. Or as technology advantage shrinks, village council would be more likely to use the rural residential land for urban housing purpose. \( t \) is also a key determinant of village council’s strategy. This factor is fairly important because village council officials usually care about his current payoff while regular tax from agriculture output is income flow in each period, thus the rents from urban housing use are often quite attractive to them.

3.3 Central Government under Paternalism

The sale of this prohibited housing has apparently impaired the government monopoly on the supply of land tenure in urban area and harmed agriculture output. The government has both economic and financial incentive to deal with this new type of transactions. But to what degree central government should be involved more in this issue and what kind of policy should be implemented to constrain the local government? Being aware of currently decentralized fiscal system in China, it is reasonable to expect the central government to
choose a strategy that best maintains the total output without largely increasing its own fiscal burden or disturbing local government’s efforts in balancing revenues and expenditures.

Let’s have a close look at central government’s utility under the two cases:

\[ g^* = \frac{1-\alpha}{1-\beta} + \frac{t-c}{1-\beta} \quad \text{and} \quad \hat{g} = \frac{b(1-\alpha)}{1-\beta} + \left( T - C + \frac{tb-c}{1-\beta} \right) \]

The central government’s strategy to deter such transaction is given as:

\[ g^* = \frac{1-\alpha}{1-\beta} + \frac{t-c}{1-\beta} \geq \frac{b(1-\alpha)}{1-\beta} + \left( T - C + \frac{tb-c}{1-\beta} \right) = \hat{g} \tag{3} \]

Or written more explicitly it is

\[ T - C \leq \frac{(1-b)(1-\alpha+t)}{1-\beta} \tag{4} \]

Compared to village council’s self-enforcing constraint, this restriction is easier to hold because the term \((1 - \alpha)\) appears in the numerator on the RHS. Similarly, greater \((1 - \alpha)\), \(t\), \(\beta\) or \(C\), smaller \(b\) or \(T\) can make this condition more likely to apply.

At first, this constraint shows central government’s serious concern about agricultural output level, denoted by term \((1 - \alpha)\). This term is the interest misalignment between village council and central government. This concern is directly linked to the preservation of arable land. The best use of farming land is for agriculture production. However, given that rural residential land is often located so closely to farming land, redevelopment of rural residential land could potentially raise the market value of utilizing the nearby arable land for urban use purposes. Thus it is sensible to worry that once the transaction of rural residential land tenure is legalized, it would have a negative spillover effect on restrictions of transferability over arable land. This is the cost of turning rural land for urban housing use.
Second, this constraint implies that central government also cares about local government's fiscal budget balancing. If the tax rate $t$ on the RHS is quite small, which means village council is under much fiscal pressure, it would generate large financial impact on central government because more inter-government transfer may be required for local government to commit to its expenditure liability, especially when there are quite few alternative fiscal resources. As such, central government may choose to tolerate the informal sales in general.

The trade-off between these two concerns gives the central government critical point to take action toward this issue. When the cost of it, threatened total output as shown on the RHS is greater than village's gain, this condition is more likely to hold, meaning that central government should restrict. Vice versa.

Based on this condition, we may also find two ways to deter such informal transaction. Taking other parameters as given, central government can strengthen the constraint by increasing $t$ or $C$. Since tax rate is not expected to increase over time, therefore, a better way is raising the compensation to farmers, given that farmer is usually under-paid for losing land. According to village council’s new constraint, such policy will increase the cost of redevelopment of rural residential land to $C'$, thus collective officials are more likely to commit to the land tenure assignment. Therefore village council’s incentive constraint becomes:

$$T - C' \leq \frac{t(1-b)}{1-\beta}$$

(5)

Now we want to take a look at how the fiscal pressure, presented by $t$ to affect local government's behavior. Holding technology $b$ and discount rate $\beta$ constant, the constraints (2) and (4) give us two cut-off points $t^*$ and $t^{**}$, showing where collective council could
restraint itself and where central government needs to intervene, respectively. Figure 3.0
illustrates these critical regions.

When the tax rate is high, collective would not like to turn the rural residential land
for urban housing use because his fiscal revenue is enough to motivate such behavior. As $t$
decreases to the left of the first critical point $t^*$, sales of informal housing become attractive.
But we know from (2) that rents from selling the informal housing increases in $t$, so village
council still needs to compare to choose strategy. As $t$ further decreases to the left of the
second critical point, $t^{**}$, central government intervention is definitely necessary.

![Figure 3.0](image)

3.4 Further Consideration: Influence of Farmers’ Replacement Strategy

So far, we focus mostly on village council and central government’s choice, assuming farmer
is not a strategy player in this game. This assumption implies that farmers’ total payoff from
selling their housing is greater than not doing that, which gives us

$$u^* = \frac{(1-t)(1-\alpha)}{1-\beta} \leq C + \frac{(1-t)b(1-\alpha)}{1-\beta} = U$$

(6)
But if this condition does not hold, farmers may think about revolt. In this subsection, we discuss how farmers could affect village council’s policy choice under this situation.

First assume that if the village officials use the rural residential land for urban housing use, they would be voted out by in next period with probability $\rho$. Thus village officials have to discount his future net payoff by $\beta (1 - \rho)$. Then his constraint becomes:

$$v^* = \frac{t}{1 - \beta} \geq T - C + \frac{tb}{1 - \beta (1 - \rho)} = v'$$

(7)

and simply it could be written as

$$T - C \leq t\left[\frac{1}{1 - \beta} - \frac{b}{1 - \beta (1 - \rho)}\right]$$

(8)

From this condition, we see that farmer’s replacement strategy has threatening effect on council’s behavior because larger $\rho$ renders constraint (8) more likely to hold. Hence council needs to decide what strategy to take because he is faced high probability to be taken over.

4. Evidence

The model suggests in previous section that: first, without explicit constraints, local government attempts to grab as many rents from land as possible to relieve of its fiscal pressure. Second, the trade-off between concern about agricultural output and that about fiscal tension among different government level would direct the central government’s strategy in this issue. So in this section we provide an example to show that cross-city differences in these two concerns are important determinants of provincial governments’ policy reaction toward this issue.

At we first need to take a look at the local governments’ fiscal situation that drives the supply of rural residential land used for urban housing. The tax reform in 1994 raised
central government’s share of total fiscal revenue from around 35% to 50%\textsuperscript{93}. Meanwhile, expenditure responsibilities were nominally unchanged at local level. Table 3.1 displays the aggregate trends of local public finance. Despite the upward trend of local fiscal revenue shown in column 1, the ratio in total revenue is quite stable over time. However, continuous increases in local expenditure are observed, measured by both level term and ratio. Traditional financial sources proved insufficient for local government to carry out its expenditure responsibilities. These conditions pressed the lower levels of government to rely more heavily (if not exclusively) on the prohibited sale of rural housing, creating a new public finance structure often referred to as "land fiscal policy" (Chen 2010). According to columns 5 and 6, the total fiscal revenue derived from the sale of urban land tenure has significantly increased over years\textsuperscript{94}. In 2009, this source accounted for more than half of the total local fiscal revenue, which was 1.22 trillion\textsuperscript{95} in real RMB. This is consistent with our model’s first prediction of local government’s incentive to derive rents from land.

The central government in China had in general tolerated the expansion of the informal sales in the past decade because of local government’s fiscal intense. Nonetheless, central government started to take some steps to deter the informal sale since 2008. Yet this guideline still gave a wide range of discretion that the provincial governments can enjoy. More specifically, regional policy diversity occurred at the province government level, ranging from issuing a title certificate upon payment of a premium in some province

\textsuperscript{93} Particularly, most of the taxes associated with agriculture production were canceled in 2006, which largely reduced local governments’ fiscal income at village and town levels. News source is from the official website of State Administration of Taxation, available at: \url{http://www.chinatax.gov.cn/n8136506/n8136593/n8137681/n8733545/8741351.html}.

\textsuperscript{94} Data resource: annual reports issued by the Ministry of Land and Resources of China (available at the official website of the Ministry). This ratio is just a rough idea because of the complexity in accurately calculating expenditure and revenue in China.

\textsuperscript{95} See the report issued by the Ministry of Finance of China on March 16, 2009, available at the official website of this ministry: \url{http://www.mof.gov.cn/mof/zhengwuxinxi/caizhengxinwen/200903/t20090316_122544.html}. 
to demolishing the rural houses still under constructions in others. The contrast between Beijing and Shenzhen is a demonstrating example of how cities with similar urban housing market conditions, but different political concerns, may end up with different policies and consequently divergent trends of the prohibited housing sales.

Beijing is the capital of China, while Shenzhen is the first special economic zone founded in 1980, both of which are major developed cities in China. One of those important characteristics both cities have in common is that the two cities are highly urbanized, accompanied with high premium charged for urban land tenure. Thus in the last ten years, the market for the urban housing on rural land had been expanded a lot and the sales accordingly increased by a large amount in both cities. In 2007, the market share of informal apartments within the overall supply of residential condos is reported to have reached approximately 18% in Beijing and 49% in Shenzhen. But in recent two years, two cities have almost been moving on in totally divergent trends in dealing with this issue. In Beijing, the government started to put more restrictions on this informal sale. It made the announcement that the rural housing would never be legalized; the underground market has to be cleared up soon and all of the rural housing projects would be compulsorily demolished. In Shenzhen, however, the government was trying to pass the bill that allows the sales of such housing in the formal market and also considers issuing a title certificate for the owners of this type of housing.

To understand this policies divergence, we need to examine two factors concerned in this paper. The first concern is how much central government cares about agricultural output that might be hurt by the sales of the informal housing. We observe that urbanization has been shrinking agriculture production in Shenzhen since 2003, as shown in Table 3.2. The gross output of agriculture production was real RMB 3.27 billion in 2001;
but in 2009, this figure ended up with only real RMB 1.55 billion. On the contrary, a continuous upward trend is observed in agricultural gross output for Beijing. As we know, however, Shenzhen, as the first special economic zone, has been given more privileges for economic development and less government intervention was introduced, compared to Beijing or other regions. So in general the economy in Shenzhen is market-directed, and thus the agriculture production as well as the housing problem is usually left to market mechanism with central government showing less restriction. While in Beijing, economic development is relatively influenced by government more. In this sense, Shenzhen is less likely to impose restriction on this issue.

The second factor is local public finance, presented in Table 3.3. The local fiscal revenue in Beijing rose from real RMB 26.17 billion in 2001 to 100.61 billion in 2009; and the increase of fiscal expenditure was from real RMB 31.7 billion to 105.95 billion during the same period. While for Shenzhen, the local government revenue reached real RMB 39.47 billion in 2009 compared with 13.7 billion in 2001, with expense real RMB 43.35 billion relative to 13.41 billion in 2001. Table 3.3 suggest that both the revenues and expenditures of local governments grew up over years in these two cities, but Shenzhen generally faced more fiscal pressure since the expenditure grows faster on average than revenue. According to our analysis in previous section, local governments with less fiscal resources have more incentive to break its commitment and central government is more likely to tolerate such issue.

5. Conclusion

This paper argues that under the fragmented proper regime and decentralized fiscal system, village council has incentive to break the tenure assignment over rural residential
land and turn it into urban housing use, especially when there are not many alternative fiscal resources. And central government, concerned both agriculture output and local government’s effort on fiscal balancing, would choose to tolerate or deter such transaction. Also, farmer’s replacement might positively affect collective’s behavior.

This paper examines this issue basically in the perspective of paternalism, which in general requires maintaining current property regime over land and calling for meaningful restrictions on the sales of prohibited urban housing over rural land. This is consistent with central government’s policy right now, even though doing so needs to fix the tension between conflicting social groups. But debate over this issue has been going on all the time. One major point of view favors the privatization of the rural land tenure and formalization of the transaction of this urban housing on rural land, which is similar to the case in Shenzhen. This movement involves fundamental reform of current property regime as well as legal system. The author of this paper agrees with this view based on the market efficiency and the long-run benefit. But given that China is in its transitory period, which would last for a long while, and that also the short-run welfare effect of privatization is uncertain, it probably is not a good idea to launch such reform immediately. Therefore, regulatory solution is more compared to the property-rights solution so far.
Reference


Table 3.1 Local Government’s Fiscal Pressure

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue (billion)</th>
<th>Ratio in total revenue</th>
<th>Expenditure (billion)</th>
<th>Ratio in total expenditure</th>
<th>Revenue from selling Land tenure (billion)</th>
<th>Ratio of land tenure sales in total local fiscal revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>402.25</td>
<td>0.476</td>
<td>677.08</td>
<td>0.695</td>
<td>66.80</td>
<td>0.17</td>
</tr>
<tr>
<td>2002</td>
<td>436.31</td>
<td>0.45</td>
<td>783.02</td>
<td>0.693</td>
<td>123.84</td>
<td>0.28</td>
</tr>
<tr>
<td>2003</td>
<td>491.98</td>
<td>0.454</td>
<td>860.59</td>
<td>0.699</td>
<td>270.78</td>
<td>0.55</td>
</tr>
<tr>
<td>2004</td>
<td>555.56</td>
<td>0.451</td>
<td>961.92</td>
<td>0.723</td>
<td>299.52</td>
<td>0.54</td>
</tr>
<tr>
<td>2005</td>
<td>678.78</td>
<td>0.477</td>
<td>1130.68</td>
<td>0.741</td>
<td>264.48</td>
<td>0.39</td>
</tr>
<tr>
<td>2006</td>
<td>792.57</td>
<td>0.472</td>
<td>1317.71</td>
<td>0.753</td>
<td>349.77</td>
<td>0.44</td>
</tr>
<tr>
<td>2007</td>
<td>948.29</td>
<td>0.459</td>
<td>1542.33</td>
<td>0.77</td>
<td>491.46</td>
<td>0.52</td>
</tr>
<tr>
<td>2008</td>
<td>1069.50</td>
<td>0.467</td>
<td>1838.45</td>
<td>0.787</td>
<td>383.00</td>
<td>0.36</td>
</tr>
<tr>
<td>2009</td>
<td>1224.51</td>
<td>0.476</td>
<td>2292.74</td>
<td>0.8</td>
<td>645.24</td>
<td>0.53</td>
</tr>
</tbody>
</table>

Note: 1. The values are converted into real 1990 RMB.
Table 3.2 Comparison of Gross Agriculture Outputs between Beijing and Shenzhen

<table>
<thead>
<tr>
<th>Year</th>
<th>Beijing</th>
<th>Shenzhen</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>10.42</td>
<td>1.69</td>
</tr>
<tr>
<td>2002</td>
<td>10.94</td>
<td>1.75</td>
</tr>
<tr>
<td>2003</td>
<td>11.22</td>
<td>1.68</td>
</tr>
<tr>
<td>2004</td>
<td>10.97</td>
<td>1.40</td>
</tr>
<tr>
<td>2005</td>
<td>10.76</td>
<td>0.98</td>
</tr>
<tr>
<td>2006</td>
<td>10.40</td>
<td>0.78</td>
</tr>
<tr>
<td>2007</td>
<td>10.95</td>
<td>0.69</td>
</tr>
<tr>
<td>2008</td>
<td>11.34</td>
<td>0.70</td>
</tr>
<tr>
<td>2009</td>
<td>11.83</td>
<td>0.58</td>
</tr>
</tbody>
</table>

Note: 1. All values are converted into real 1990 RMB using the GDP deflator issued by IMF.
2. Data resource: Statistical Yearbooks of Beijing and Shenzhen.
Table 3.3 Comparison of Local Governments’ Fiscal Pressure between Beijing and Shenzhen

<table>
<thead>
<tr>
<th>Year</th>
<th>Beijing Fiscal revenue</th>
<th>Beijing Growth rate</th>
<th>Shenzhen Fiscal revenue</th>
<th>Shenzhen Growth rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>26.17</td>
<td>0.18</td>
<td>13.70</td>
<td>0.01</td>
</tr>
<tr>
<td>2002</td>
<td>30.80</td>
<td>0.11</td>
<td>13.79</td>
<td>0.01</td>
</tr>
<tr>
<td>2003</td>
<td>33.26</td>
<td>0.11</td>
<td>14.94</td>
<td>0.08</td>
</tr>
<tr>
<td>2004</td>
<td>38.77</td>
<td>0.13</td>
<td>15.31</td>
<td>0.02</td>
</tr>
<tr>
<td>2005</td>
<td>45.28</td>
<td>0.12</td>
<td>18.82</td>
<td>0.23</td>
</tr>
<tr>
<td>2006</td>
<td>53.51</td>
<td>0.20</td>
<td>22.01</td>
<td>0.17</td>
</tr>
<tr>
<td>2007</td>
<td>75.71</td>
<td>0.36</td>
<td>35.09</td>
<td>0.59</td>
</tr>
<tr>
<td>2008</td>
<td>85.19</td>
<td>0.08</td>
<td>37.59</td>
<td>0.07</td>
</tr>
<tr>
<td>2009</td>
<td>100.61</td>
<td>0.18</td>
<td>39.47</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Note: 1. All values are converted into real 1990 RMB using the GDP deflator issued by IMF.
2. Data resource: Statistical Yearbooks of Beijing and Shenzhen.
APPENDICES
Appendix 1A Proof of Propositions

**Proof of Proposition 1**

Under unrestricted tax regime, the expected net wealth for individual \( i \) is

\[
E(C_i) = E(Y_i - T_i) = E(Y_i) - E(T_i) = \mu_{Y_i} - \mu_{T_i}
\]

And the variance of that is

\[
Var(C_i) = Var(Y_i) + Var(T_i) - 2Cov(Y_i, T_i) = \sigma_{Y_i}^2 + \sigma_{T_i}^2
\]

since \( Cov(Y_i, T_i) = 0 \) under random tax assignment.

We know that

\[
\mu_{T_i} = E(T_i) = \int_0^{Y_i} T \ dF_i(T, Y) = \frac{R}{N}
\]

While under equal-amount tax regime, we have

\[
E(C_i) = E(Y_i - T_i) = \mu_{Y_i} - T^*
\]

with variance

\[
Var(C_i) = Var(Y_i) = \sigma_{Y_i}^2
\]

If the fixed tax payment is set as \( T^* = \frac{R}{N} \) and if \( E(Y_i) \geq \frac{R}{N} \) \( \forall \ i \in [1, \ldots, N, \ \forall \ i \in [1, \ldots, N] \), then expected net wealth will be the same under both tax regimes. But unrestricted tax is associated with larger variance, therefore equal-amount tax is preferred to random tax assignment.

**Proof of Proposition 2**

We already know for individual \( i \), equal-amount tax yields

\[
E(C_i) = E(Y_i - T_i) = \mu_{Y_i} - T^*
\]

and variance

\[
Var(C_i) = Var(Y_i) = \sigma_{Y_i}^2
\]
Under proportional tax regime, the expected net wealth is

\[ E(C_i) = E(Y_i - T_i) = (1 - t)\mu_{Y_i} \]

with variance

\[ \text{Var}(C_i) = (1 - t)^2 \text{Var}(Y_i) = (1 - t)^2 \sigma_{Y_i}^2 \]

Due to the household-specific uncertainty in future property value, no household can precisely calculate its potential tax burden \( tE(Y_i) \) to compare with \( T^* = \frac{R}{N} \). But the flat rate certainly generates smaller variance. So a uniform tax rate would be supported unanimously, dominating equal tax payment.

*Proof of Proposition 3*

If the tax rate varies with property values, so the \( t = t(Y_i) \), we have for individual \( i \),

\[ E(C_i) = E(Y_i - T_i) = \mu_{Y_i} - E(t_i Y_i) \]

\[ = [1 - t(\mu_{Y_i})] \mu_{Y_i} - \frac{1}{2} [2t'(\mu_{Y_i}) + \mu_{Y_i} t''(\mu_{Y_i})] \sigma_{Y_i}^2 \]

and variance

\[ \text{Var}(C_i) = \text{Var}(Y_i) + \text{Var}(t_i Y_i) - 2 \text{Cov}(Y_i, t_i Y_i) \]

\[ = [1 - t(\mu_{Y_i}) - t'(\mu_{Y_i}) \mu_{Y_i}]^2 \sigma_{Y_i}^2 \]

Compared with flat-rate tax,

\[ E(C_i) = E(Y_i - T_i) = (1 - t)\mu_{Y_i} \]

and

\[ \text{Var}(C_i) = (1 - t)^2 \text{Var}(Y_i) = (1 - t)^2 \sigma_{Y_i}^2 \]

Assume the second order derivative of tax rate in property value \( t''(\mu_{Y_i}) \) is neglect.

If \( t'(\mu_{Y_i}) > 0 \), i.e. under progressive tax, higher future property value indicates lower expected net wealth and lower variance of it.
If $t'(\mu_{Y_i}) < 0$, i.e. tax structure is regressive, higher future property value suggests larger expected net wealth and larger variance as well.

**Proof of Proposition 4**

If the government obtains $L_g$ through (1), its tax budget will be:

$$t' \sum_{i \in S} Y_i = R' = P \cdot Z + \sum_{i \in S} Y^p_i = \left( P \cdot Z + \sum_{i \in S} Y_i \right) + \sum_{i \in S} (Y^p_i - Y_s)$$

$$= c(G) + \sum_{i \in S} (Y^p_i - Y_s)$$

$$= c(G) + \Delta R$$

where $s$ denotes the subgroup of $L_g$ owners whose properties are selected for public use. $Y^p_i$ is the personal valuation of $L_g$ and $Y^p_i > Y_i$.

While under (2) when seizure is allowed, government’s tax budget constraint becomes:

$$t'' \sum_{i \in S} Y_i = R'' = P \cdot Z = \left( P \cdot Z + \sum_{i \in S} Y_i \right) - \sum_{i \in S} Y_i$$

$$= c(G) - \sum_{i \in S} Y_i$$

For $L_g$ type landowners, we can compare their expected net wealth generated by these two ways:

$$(1 - t') \sum_{i \in L_g} Y_i + \Delta R \text{ vs. } (1 - t'') \sum_{i \in L_g \notin S} Y_i$$

where $i \in L_g, \notin S$ denotes the portion of $L_g$ owners whose properties are kept in private use.

We know that since $t'' > t$, where $t = \frac{c(G)}{\sum_i Y_i}$ and $t'' = \frac{c(G) - \sum_{i \in S} Y_i}{\sum_i Y_i - \sum_{i \in S} Y_i}$. 
\[(1 - t'') \sum_{i \in L_g, \notin S} Y_i < (1 - t) \sum_{i \in L_g, \notin S} Y_i + (1 - t) \sum_{i \in S} Y_i = (1 - t) \sum_{i \in L_g} Y_i\]

while

\[
(1 - t') \sum_{i \in L_g} Y_i + \Delta R = [1 - \frac{c(G) + \Delta R}{\sum_i Y_i}] \sum_{i \in L_g} Y_i + \Delta R
\]

\[
= (1 - t) \sum_{i \in L_g} Y_i + \left(1 - \frac{\sum_{i \in L_g} Y_i}{\sum_i Y_i}\right) \Delta R > (1 - t) \sum_{i \in L_g} Y_i
\]

So we have

\[
(1 - t') \sum_{i \in L_g} Y_i + \Delta R > (1 - t'') \sum_{i \in L_g, \notin S} Y_i
\]

For \(L_p\) type owners, similarly we can also calculate and compare their expected net wealth under both channels:

\[
(1 - t') \sum_{i \in L_p} Y_i \text{ vs. } (1 - t'') \sum_{i \in L_p} Y_i
\]

\[
(t' - t'') \sum_{i \in L_p} Y_i = \left[\frac{c(G) + \Delta R}{\sum_i Y_i} - \frac{c(G) - \sum_{i \in S} Y_i}{\sum_i Y_i - \sum_{i \in S} Y_i}\right] \sum_{i \in L_p} Y_i
\]

\[
= \frac{\left[\sum_i Y_i - c(G)\right]\left(\sum_{i \in S} Y_i\right) + \Delta R\left[\sum_i Y_i - \sum_{i \in S} Y_i\right]}{\left(\sum_i Y_i\right)\left(\sum_i Y_i - \sum_{i \in S} Y_i\right)} \sum_{i \in L_p} Y_i > 0
\]

It is easy to see that \(L_p\) type owners' expected net wealth is larger under channel (2), while \(L_g\) type owners' expected net wealth is larger under channel (1). Thus seizure would not be unanimously prohibited since \(L_p\) type owners are tax favored under it.
Appendix 1B Geographic Distribution of Law Enactment

Note: states passing laws are marked as red, and white areas represent states doing nothing.

This map shows that except for HI, these states are either grouped at northeast (MA, NJ, NY and RI), or middle south part (AR, MS and OK). Among these states, NJ, NY, RI and OK used to be leaders of using eminent domain, while MS, AR and HI historically seemed to stay away from condemnations. It suggests that polarized states would like to stay status quo, but intermediate states are more likely to update their eminent domain law. This could be because that in these states, local government’s reliance on eminent domain power might change a lot over time along with economic and political environments, and it is harder for a stable winning group to exist. This generates more symmetric expectation, thus they need more protections. While for those polarized states where they have relatively stable situation, there are either particular winning groups or no groups, so property owners have less incentive to seek for further protection. This on the other hand justifies our theory.
Appendix 1C Brief Overview of States with Law Passed by Referenda

AZ: Legislature responded by passing HB 2675 (2006), an extremely strong piece of blight reform legislation. Unfortunately, the governor vetoed the bill. However, Proposition 207 was filed in response to the veto and the statutory reform was proposed through citizen initiative. This proposition used very similar language to HB 2675, and most importantly, the initiative significantly limited the scope of projects that could be qualified as a public use.

OR: Ballot Measure 39 (2006), the State Legislature did not have a session scheduled for 2006, so a group of citizens organized to get a statute on the ballot. This measure forbids private-to-private transfers by government parties.

LA: Senate Bill 1 (Constitutional Amendment No. 5) (2006) specifically prohibits the taking of private property for tax purposes, or the creation of jobs. In addition, House Bill 707 (Constitutional Amendment No.6) (2006) forbids the government to transfer property expropriated without first offering it to the original owners.

SC: Senate Bill 1031 (2006) stated that except as otherwise provided in Constitution, private property must not be condemned by eminent domain for any purpose or benefit of economic development, except for public use. Further, it requires that private property constituting a danger to the safety and health be condemned by eminent domain.

WA: House Bill 1458 (2007) requires that a condemning authority in Washington provide notice to affected property owners, prior to the public meeting where a final decision on condemnation will be made.

The reforms in AZ and OR are sponsored by citizen initiative and approved by voters. For LA and SC, those bills are enacted by legislature-initiated referendum. But HB 1458 in WA in fact does not really restrict local government’s taking behaviors.
Appendix 1D Assessing the Data for Taking Numbers and Correction

Because there is no official data available on the post-Kelo use of eminent domain for private parties, the data sources in this paper are: (1) The report “Opening the Floodgates: Eminent Domain Abuse in the Post Kelo World” by Berliner and Dana, published by the Institute for Justice. (2) The website: http://lawcrawler.findlaw.com/, and (3) LexisNexis. All the information in these sources comes from news stories, public document and court decisions.

Using news sources potentially has the problem of measurement error. First, there are undoubtedly many other projects that have not been included. On the other hand, media reports may also be biased due to their fueled attention by Kelo decision. As Lopez, Kerekes and Johnson (2007) show, major newspapers coverage of eminent domain issues increased nearly three times in the year following Kelo by searching LexisNexis. So it is difficult to tell whether the post-Kelo taking behaviors were Kelo induced or reporting induced. As we know, measurement error in explanatory variable will generate inconsistent estimate, which attenuates toward zero as the variation of measurement error becomes larger.

Fortunately, the data for pre-Kelo use of eminent domain are available according to the report “Public Power, Private Gain” by Institute for Justice, which are from state records of condemnations filed in court. Therefore we consider using this variable as instrument to correct for the measurement error. As the regression results in Table 1.5 suggest, the estimates in OLS regressions are only .005; but IV-2sls identifications give coefficient of .011, twofold as large as .005. This further validates our use of IV estimation as our baseline strategy.
Appendix 1E Results Using Per Capita Annual Taking

Table 1A Results Using Per Capita Annual Taking
(Robust Std. errors appear in the parentheses)

<table>
<thead>
<tr>
<th></th>
<th>OLS</th>
<th>IV-2SLS</th>
<th>Probit Marginal</th>
<th>IV-Probit Marginal</th>
<th>IV-Probit Marginal</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVG0507 per capita</td>
<td>.021**</td>
<td>.069</td>
<td>-.052</td>
<td>.038</td>
<td>.210</td>
</tr>
<tr>
<td></td>
<td>(.010)</td>
<td>(.141)</td>
<td>(.096)</td>
<td>(.042)</td>
<td>(.345)</td>
</tr>
<tr>
<td>HPI</td>
<td>-.277</td>
<td>-.263</td>
<td>-.300</td>
<td>-.285</td>
<td>-.935</td>
</tr>
<tr>
<td></td>
<td>(.221)</td>
<td>(.216)</td>
<td>(.230)</td>
<td>(.196)</td>
<td>(.727)</td>
</tr>
<tr>
<td>INCOME INEQUALITY</td>
<td>-.302**</td>
<td>-.346*</td>
<td>-.236*</td>
<td>-.312***</td>
<td>-1.123***</td>
</tr>
<tr>
<td></td>
<td>(.115)</td>
<td>(.178)</td>
<td>(.143)</td>
<td>(.125)</td>
<td>(.396)</td>
</tr>
<tr>
<td>Obs.</td>
<td>49</td>
<td>49</td>
<td>49</td>
<td>49</td>
<td>49</td>
</tr>
<tr>
<td>F-statistics</td>
<td>4.39*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wald chi2</td>
<td></td>
<td>9.55**</td>
<td>8.18**</td>
<td>11.75***</td>
<td>13.65***</td>
</tr>
</tbody>
</table>

Note: 1. In specifications 2 and 5, AVG0507 per capita is instrumented by AVG9802ALL per capita.
And for columns 3 and 6, I use real GDP growth rate as additional instrument.

2. Significance levels are indicated by *** for 99%, ** for 95%, and * for 90%.

3. Marginal effects are calculated at sample means.
Appendix 2A Geographic Distribution of Jurisdictions by Public Sector Size

Note: jurisdictions in the group with larger size are marked as yellow, and white areas represent jurisdictions as control group. Hong Kong, Macao and Taiwan are not included in our sample.

This map shows the geographic distribution of jurisdictions in Mainland China according to public-sector size. Clearly most of the jurisdictions with larger public sector size are grouped in northwest, middle and southwest China; while the control group consists of those jurisdictions from east and south China. Jurisdictions from our treatment group, except for Beijing, are economically less developed than the eastern and southern areas. Despite this considerable difference in economic development levels, the treatment group experienced relatively faster growth in its housing markets, which provides us with more evidence that the privatization reform generated significant impact on private housing market.
Appendix 2B Evaluation of Potential Wealth Effect

1. Wealth effect from purchase at a generous price

Data from the Chinese Household Income Project of 1995 indicates the average difference between the market value and the price charged by government was real RMB 15789\textsuperscript{96}. While the present value of rents subsidies in the pre-reform world is estimated to equal to real RMB 13059.4 (Wang Forthcoming)\textsuperscript{97}. The difference between them is real RMB 2729.6. Compared to the annual household disposable income 7494.21 RMB, the ratio is 36.4%. This implies a large potential for wealth effect. Furthermore, this privatization also allowed the households to access to the value associated with properties that they occupied.

2. Effect from HPF

Under the new subsidy system, the Housing Provident Fund, the contribution level by work units was initially set at 5 percent of worker’ monthly salary. Using the dataset by China Health and Nutrition Survey, in 1993 the market rental value of an average apartment was real RMB 107.75 per month, while the monthly household income was 624. The ratio is 17.27 percent. In 1997, the ratio is 15.95 percent. The 5 percent is not binding, so this subsidy increases household’s expenditure on housing by roughly 5 percent.

Moreover, the HPF system also provides mortgage with lower interest rate compared to commercial mortgage. For example, in 1998, the interest rate offered by HPF system was 4.59 percent for long-term loan (5 years above), while the one offered by commercial mortgage was 6.21 percent\textsuperscript{98}.

\textsuperscript{96} This number is calculated on the sample of 6,931 households, drawn from a sample of 35,000 urban households from the National Bureau of Statistics; and is converted into real 1990 RMB.

\textsuperscript{97} Wang’s calculation is based on the assumption that individuals believed the housing allocation system would continue and on an expected life span of 72 years and a real interest rate of 2\% in China in 1994. I convert it into real 1990 RMB.

Appendix 2C Impact of the Reform on Home Ownership

1. Figure 2.1 is cited from Wang (forthcoming) and Wang (2011). It demonstrates that the aggregate trends in home ownership were almost parallel in both private and public sectors before and after the privatization. The rates of home ownership in public sector and in aggregate both experienced a dramatic increase following the 1994 reform, while for households headed by private employees the trend line is relatively flat.


I examine the data provided along with Wang (2011), and find that using only option 3 “rent from a private individual” for the calculation of home ownership generates the same information as Wang’s paper. However, this calculation will bias our estimate upward. True homeownership rate is computed by dividing the by dividing the number of owner-occupied housing units by the number of occupied housing units or households99, which means only option 4 should be used for calculation of home ownership.

2. Supplementary data source

I use the data reported in the Statistical Yearbook at the province level to construct a homeownership series based on 14 provinces. As shown by the triangle-connected line in Figure 2A, the raw data displays the continuous the upward trend in the ratio of private units, from 20.73% to 76.03%. Correspondingly, the ratio of state-owned units declines

99 This is the definition used by United States’ Census Bureau.
from 79.27% in 1989 to 23.97% in 2000. But as we analyze above, the ratio of households living in private units causes upward bias in homeowner calculation. So I also look at only the owner-occupied units, which suggest a continuous increase as well, but lower than the ratio of private units, from 19.07% to 71.18%, as shown by the dotted line.

Figure 2A Trends in Ownership of Housing Units in Urban Area
Appendix 2D Analysis of Waiting Employees

For the in-kind housing units allocation, according to government’s policy before 1994, no employee had more than one apartment. And no evidence suggests there were a sizable number of employees assigned more than one apartments. So the number of public housing units roughly represents how many public employees already benefit from this.

The “public sector” may also include employees in collective work units. This is because the wage and benefit system for a portion of collective employees\(^{100}\) is fairly similar to those of state employees, in particular the housing benefits in collective enterprises were also provided by the government and highly subsidized (may be constructed and managed by the work units, but the funding comes from the government and property rights belong to government). Thus the collective employees' demand for housing was similar to that of state employees: some benefited from the in-kind housing allocation while others kept waiting. So we should include this group of people in our calculation of public employees.

Since there is no direct measure for the portion of waiting people, I construct an indirect proxy for it through the process below:

Step 1: Divide the fraction of public housing units in total stock by the household size, by which we can obtain the ratio of beneficiaries to the total urban population.

Step 2: Calculate the difference between the ratio of public employees and that of beneficiaries, by which we can roughly estimate the size of the waiting group.

Note that this calculation only gives us an upper bound, since if both persons of a couple are in public employment, they probably need only one apartment instead of two.

\(^{100}\) See footnote 14. Since I cannot identify how large the portion is, I do not include this group of employees in our public sector size measure for all regressions. Here I discuss this only to show that the potentially affected employees are larger. So the numbers in column 2 of Table 2A only gives a maximum, not the precise measurement.
The calculation is based on 14 provinces in year 1989, 1990, 1991, 1992, and 1993. The housing shortage is shown by year in Table 2A.

Column 1 represents the fraction of state employees on the waiting list as a fraction of total urban population. Column 2 reports the fraction of state and collective employees on the waiting list in total urban population.

### Table 2A The Fraction of Public Employees on the Waiting List

<table>
<thead>
<tr>
<th>Year</th>
<th>Ratio of waiting state employees to total urban population</th>
<th>Ratio of waiting state and collective employees to total urban population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>0.259</td>
<td>0.426</td>
</tr>
<tr>
<td>1990</td>
<td>0.254</td>
<td>0.418</td>
</tr>
<tr>
<td>1991</td>
<td>0.249</td>
<td>0.412</td>
</tr>
<tr>
<td>1992</td>
<td>0.241</td>
<td>0.393</td>
</tr>
<tr>
<td>1993</td>
<td>0.221</td>
<td>0.359</td>
</tr>
</tbody>
</table>

Data sources: Statistical Yearbook of China, Statistical Yearbook of each province.

As displayed in Table 2A, the waiting list in early 1990 was quite long. For the state employees only, the ratio was 0.245. If the employees in collective work units are included, the ratio rises to 0.402. This table indicates that although it decreased over years, there was substantial excess demand for state-owned housing before 1994.

There are several possible causes of the decline in public employees waiting for housing allocation: government investment, decrease in public sector size, or purchase of private housing. Now we need to compare how long the waiting queue is and how much the government further invested to solve the housing shortage. All variable constructions are based on the 14 provinces in years 1989 through 1993. Table 2B presents the statistics.

The first column lists the ratio of state and collective employees who were waiting for housing allocation to the total urban population.
The second column lists the ratio of total new housing quantities provided to both state and collective employees by government to the existing housing stocks. Take Tianjin as an example: In 1989, the newly built floor space by government was 1949,000 m², and the total housing floor space at the end of 1988 was 50850,000 m², so the ratio is 3.83%. The figures listed in column 2 are the averages of 14 jurisdictions for each year. The quantity measurement is by floor space, not the number of units; but this ratio still reflects the effort of government to solving public employees’ housing problem. From this column we see that government’s annual investment during the sample period is much smaller than the need of waiting group.

Table 2B Comparison between Waiting List and New Investment

<table>
<thead>
<tr>
<th>Year</th>
<th>Ratio of waiting state employees to total urban population¹</th>
<th>Ratio of new housing quantity by government to the total housing stock</th>
<th>Fraction of waiting employees removed from the queue by new investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>0.259</td>
<td>0.039</td>
<td>0.011</td>
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<td>0.254</td>
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<td>0.041</td>
<td>0.013</td>
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<tr>
<td>1992</td>
<td>0.241</td>
<td>0.045</td>
<td>0.014</td>
</tr>
<tr>
<td>1993</td>
<td>0.221</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: 1. Data sources: Statistical Yearbook of China, Statistical Yearbook of each province.

In Column 3 I show the fraction of waiting employees removed from the queue by new investment. The variable is constructed through two steps:

Step 1: The ratio of government’s new investment measured by floor space is roughly the same as is measured by number of units, if the average floor space of state-owned housing is equal to that of the private housing stock¹⁰¹.

\[
\text{Ratio of new floor space} \approx \text{Ratio of new units}
\]

¹⁰¹ This assumption is reasonable because state-owned housing represented at least 40% of the housing stock.
Step 2: Divide the ratio in Column 2 by household size to generate the proportion of waiting employees removed from the waiting list by new government investment:

\[
\text{Fraction of shortened waiting list by gov't} = \frac{\text{Ratio of new units by gov't}}{\text{household size}}
\]

We see that in each year before 1994, public employees receiving the housing benefit due to government investment only account for 1.2% of the total urban population, which was far from enough. This provides evidence that the in-kind housing benefit is financially infeasible, thus the transition of state ownership of housing to a regime of privatization, was quite necessary.
Appendix 2E Evaluation of Housing Rental Price

The average rental price per square meter of residential units is constructed as the total expenditure on housing divided by the total floor space. The rent expenditure is from survey conducted by the National Bureau of Statistics, and includes the self-reported rental value of owner-occupied homes. When a household is surveyed and if the home is owner-occupied, it is asked to estimate and report the market rental values of their apartments. But there arises one potential problem: is this self-reported home value reasonable?

There is a literature in the U.S. that evaluates the validity of households’ reported values of their homes. Robins and West’s study (1977) indicates that the “owner estimate of home value compares favorably to the appraised value in terms of precision”\(^{102}\). Kiel and Zabel (1999) find that the average owner overvalues his house by 5.1%; and the differences between stated sales price and owners’ valuation are not related to particular characteristics of the house, occupants or neighborhood, so the use of owners’ evaluation will result in accurate estimates of house price indexes and provide reliable estimates of the house price\(^{103}\). As a complement, Wang (2011) also contributes to this field of research by her study in China’s case. Using the CHNS dataset, she finds that households in the survey gave reasonable estimates of the market values of their apartments.

Based on the availability of data and relevant research, I compare the rental and purchase price series in those years when both exist (1994-2000). The result, shown in Table 2C, suggests that the rental price is significantly highly correlated with the purchase


price, with a coefficient of .004 significant at 1% level. This also helps validate our use of rental price as our alternative measurement of housing price.

Table 2C Correlation between the Rental Price and Purchase Price

<table>
<thead>
<tr>
<th>Variable</th>
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<tbody>
<tr>
<td>Purchase price</td>
<td>.004***</td>
</tr>
<tr>
<td></td>
<td>(.0005)</td>
</tr>
<tr>
<td>Obs</td>
<td>238</td>
</tr>
<tr>
<td>R²</td>
<td>.201</td>
</tr>
</tbody>
</table>

Note: 1. *** Significant at the 1% level.
2. Standard error is in the parenthesis.
Appendix 2F Residential Mobility

The residential mobility calculation uses the records of residents’ home movement in the household registration system, which only counts households coming to settle down or leaving permanently. These are the people who are at all likely to consider the purchase or sale a housing unit, thus affect the demand and supply in the local housing market.

The shortcoming of this dataset is that these statistics include both urban and rural households. However, given that the major impact of the household registration system was to reduce the migration of rural residents to urban area, and that it is very difficult for rural residents to change their registration status, we can still draw some information about the migration of urban households. All the statistics are averaged using 30 jurisdictions and shown in Table 2D.

The first panel reports immigration rates. Column (2) shows the portion of residents entering one province, relative to the total province population. Column (3) displays the proportion of households who come and live permanently in one locality from another within the same province. Column (1) sums (2) and (3).

Emigration statistics are presented in the second panel. Column (5) represents the fraction of residents moving out of one province, compared to total province population; and column (6) is for those who leave one locality and settle down in another within the same province. Column (4) is the addition of these two. The last panel sums both immigrants and emigrants rates to reflect the total migration.

The migration across provinces was low for all years, only accounting for 4% of the total population. Residential mobility at the city level within one province is not high as well, roughly less than 3%. Moreover, we do not observe migration rate increase over the sample period. On the contrary, except for 1994, there was a decline in residential mobility
at the city level within each province until 2000. In general, this shows that the household registration system did constrain the residential mobility across cities.
<table>
<thead>
<tr>
<th>Year</th>
<th>(1)=</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)=</th>
<th>(5)</th>
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<tr>
<td></td>
<td>(%)</td>
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<td>(%)</td>
<td>(%)</td>
<td>(%)</td>
<td>(%)</td>
<td>(%)</td>
<td>(%)</td>
<td>(%)</td>
</tr>
<tr>
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