Order Number 9325761

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Texas Tech University, 1993

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THE EFFECT OF TAXATION ON RESIDENTIAL REAL ESTATE: AN EMPIRICAL ANALYSIS OF REAL ESTATE CONSTRUCTION

by

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A DISSERTATION

IN

BUSINESS ADMINISTRATION

Submitted to the Graduate Faculty
of Texas Tech University in
Partial Fulfillment of
the Requirements for
the Degree of

DOCTOR OF PHILOSOPHY

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May, 1993

ACKNOWLEDGEMENTS

This dissertation was made possible through the help of many individuals. I am especially grateful to my chairperson, Dr. Mary Sue Gately. Dr. Gately has been a constant source of encouragement throughout the dissertation and the entire program. I am also grateful to my other committee members: Dr. Ronald H. Bremer, Dr. Jane O. Burns, Dr. Paul R. Goebel, and Dr. Richard M. Walter. Additionally, I wish to thank Jeff Bryant for comments on my proposal.

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ABSTRACT

The Economic Recovery Tax Act of 1981 (ERTA) included generous capital recovery provisions for investment in rental real estate. Provisions of the Tax Reform Act of 1986 (TRA 86) eliminated these generous capital provisions and enacted other provisions that decreased the attractiveness of investment in rental real estate.

It was hypothesized that ERTA was associated with an increase in multi-family housing starts and increased vacancy rates, while TRA 86 was associated with a decrease in multi-family housing starts and decreased rental vacancy rates. It was also hypothesized that ERTA and TRA 86 did not have a statistically significant effect on single-family housing starts.

A pooled time-series analysis was performed on both multi-family and single-family starts. The time period covered the years 1974 through 1991 and observations for each of the four main census regions of the country--the Northeast, Midwest, South, and West--were pooled together. Separate models were also examined for each of the regions. An analysis of covariance model was used and the intercept and slopes were allowed to change over the three time periods: pre-ERTA, ERTA to TRA 86, and post-TRA 86.

The results suggest ERTA was associated with increased multi-family starts and TRA 86 was associated

with decreased multi-family starts. Additionally, ERTA was associated with decreased single-family starts and TRA 86 was not associated with a change in single-family starts. The covariates with the most significant contributions were the availability of money in both models and the before-tax cost of capital in the single-family model.

Finally, a review of various graphs indicate that rental vacancy rates may have increased as a result of ERTA and then decreased as a result of TRA 86. Analysis of the results suggest that ERTA may have aided in the economic recovery of the United States in the early eighties, but that this resulted in an overbuilt real estate market, contributing to poor economic conditions in later periods. To avoid such a situation in the future, demand and supply conditions should be considered before providing tax incentives for real estate investment.

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CHAPTER I

INTRODUCTION

The 1980s was a decade of substantial tax reform. In 1981, the Economic Recovery Tax Act (ERTA) was enacted [P.L. 97-34]. As the name suggests, the primary objective of this tax act was to help the economic recovery of the United States. Substantial changes to depreciation rules were enacted as a means of stimulating capital formation [Senate Rep. No. 97-144, 1981, p. 47]. Among these changes were provisions that allowed the rapid write-off of investment in real property.

Brueggeman, Fisher, and Stern [1982] simulated potential responses to the capital recovery provisions of ERTA. Their results indicated that a long-term decline in rent-to-value ratios of 20 to 33 percent for residential rental real estate (rental realty) may have occurred if the provisions of ERTA had been left intact [p. 222]. An implicit assumption made in determining this decline was that investment in rental realty would have increased.

The generous capital recovery provisions enacted by ERTA were eliminated by the Tax Reform Act of 1986 (TRA 86) [P.L. 99-514]. Numerous other provisions that substantially eliminated the tax benefits of investments in rental realty also were added by TRA 86. These changes were projected to substantially reduce the investment in

rental realty [Hendershott, Follain, and Ling, 1987, p. 85]. The impact of this decreased investment is an expected increase in the long-run equilibrium rent level. A conservative estimate of this long-run increase is a rise in rents of between 11 and 19 percent [Hendershott, Follain, and Ling, 1987, p. 84].[1]

During this period of reform, tax provisions related to owner-occupied housing had only minimal revision. Revised tax rate schedules were the only tax changes that may have had an impact on owner-occupied housing. The highest tax rate was lowered from 50 to 28 percent by TRA 86. The highest rate then was increased from 28 to 31 percent for years after 1990. Most likely, new homeowners are in middle income groups and their marginal tax rate, which is relevant for interest and real estate tax deductions, had only minimal change. Thus, ERTA and TRA 86 probably had minimal impact on homeownership.

The current study addresses the effect of these major tax reforms on investment in rental realty. An analysis of multi-family housing starts is performed to examine this relationship. The effect of taxes on single-family housing starts is also examined. Single-family starts are hypothesized to be primarily determined by the demand for

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[1]Hendershott et al., [1987] indicate that estimates made by others suggest rent level increases as high as 40 percent.

homes by new homeowners. Also, a theoretical development of the residential real estate market is provided. This theory provides a foundation for the current study and future research.

The remainder of this chapter is divided into five sections. First, the real estate income tax provisions are reviewed. An overview of the equity and efficiency considerations in the federal income tax treatment of rental realty and owner-occupied housing is provided in the second section. After this, research questions are discussed. An overview of the methods used in addressing some of these questions is then provided. In the final section of this chapter, an overview of the organization of the remainder of the study is given.

Overview of Real Estate Tax Law

Federal income tax provisions that have the largest impact on rental realty are discussed below, with a focus on the provisions that were added or modified by either ERTA or TRA 86. These provisions include capital recovery rules, limitations on the deductibility of passive losses, taxation of capital gains, and the alternative minimum tax (AMT). Other tax provisions affecting real estate have changed over the years, but the impact of these other

changes will not be discussed here because their impact was likely to be minimal.[2]

The recovery period for rental realty was reduced from 33 to 15 years with the enactment of ERTA. Prior to ERTA, four methods of depreciation were available for new property: 200 percent declining balance, sum-of-the-years-digits, straight-line, and component depreciation. Two methods were available for used property: 125 percent declining balance and straight-line. After ERTA, only 175 percent declining balance or straight-line depreciation could be used for both new and used property. For purposes of the AMT, straight-line depreciation was required for pre-ERTA as well as post-ERTA rental realty.

The recovery period was extended to 18 years for rental realty placed in service after March 15, 1984, and before May 5, 1985, and to 19 years for rental realty placed in service after May 5, 1985, and before the effective date of TRA 86 [P.L. 98-369 and P.L. 99-121, respectively]. The provisions of TRA 86 are effective for rental realty placed in service after 1986 and require the use of straight-line depreciation over 27.5 years. TRA 86 requires the use of straight-line depreciation and a 40

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[2]For example, TRA 86 extended the at-risk rules to some real estate investments and required the capitalization of construction period interest and taxes.

year recovery period for AMT.[3] This is an important consideration because the AMT rate is currently 7 percentage points lower than the highest maximum tax rate. Prior to TRA 86, the highest regular tax rate was 50 percent, while the AMT rate was 20 percent.

There were minimal limits on a taxpayer's ability to deduct rental realty losses prior to TRA 86. However, TRA 86 enacted passive loss rules that severely limit the use of rental realty losses. The passive loss rules require individuals, estates, trusts, and most closely held corporations to classify all income and loss items into one of three categories--passive, active, or portfolio. The essence of these rules is that passive losses, which include rental realty losses, cannot be used to offset active or portfolio income until the disposition of the activity producing the passive losses.

A special rule provides that an individual can use $25,000 of passive losses from rental realty to offset other active and portfolio income as long as the person has active participation in the activity. The benefit of this provision is phased-out for high income individuals.

Gains from the disposition of rental realty generally received favorable tax treatment prior to 1987 because the

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[3]Depreciation now results in an adjustment item for purposes of the AMT. Prior to TRA 86, a preference item rather than an adjustment item was relevant for AMT purposes.

majority of such gain is capital gain. This type of gain has been historically taxed at a lower rate than other income.[4] For example, the maximum rate on a net long-term capital gain was 20 percent prior to 1987, while the maximum rate on other income was 50 percent. After 1987, a net capital gain is generally taxed in the same manner as ordinary income. However, for years after 1990, the maximum rate on a net long-term capital gain is limited to 28 percent, while the maximum rate on other income is 31 percent.

The capital recovery changes were the primary provisions of ERTA that affected rental realty investment. These changes provided a substantial subsidy for this type of investment and are hypothesized to be associated with increased rental realty investment. The TRA 86 tax law changes related to real estate all reduced the tax benefits of rental realty investments and are hypothesized to be associated with decreased rental realty investment.

Equity and Efficiency Considerations

In 1949, the U.S. Congress set as a national goal "a decent home and a suitable living environment for every American family" [Weicher, 1979, p. 470]. One method that has been employed to help reach this goal is the use of

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[4]Prior to 1987, some part of the gain may have been subject to ordinary income treatment because of depreciation recapture.

tax incentives for owner-occupied housing.[5] These tax incentives include the deductibility of home mortgage interest and real property taxes, deferral and exclusion of capital gains on sale, and the exclusion of imputed rent.

The results of prior research show a strong correlation between tax incentives and increased consumption of owner-occupied housing in the United States [Rosen, 1979; Rosen & Rosen, 1980; and Hendershott & Shilling, 1982]. This research is consistent with the user cost of capital framework. That is, as the cost of homeownership relative to the cost of renting is decreased, homeownership will increase.

It can be argued that an increase in homeownership above its otherwise natural level is efficient. The primary efficiency argument is the creation of positive externalities. Rosen [1988] provides an excellent discussion of positive externalities that may be created by homeownership. He states:

> Homeowners take good care of their property, keep it clean, etc., all of which make the other people in the neighborhoods better off, hence, the externality. In addition, homeownership provides an individual with a stake in the nation. This tends to increase

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[5]If all tax preferences related to owner-occupied housing, other than the exclusion of imputed rent, were eliminated, it is estimated that all personal marginal tax rates could be reduced by ten percent without any loss of revenue [Congressional Budget Office, 1981, p. 40].

> social stability, another desirable spillover effect. [p. 144]

If the positive externality effects of homeownership are true, they must be weighed against equity effects. Since homeowners tend to have a median income about twice as high as renters [U.S. Bureau of The Census, 1985, p. 733], tax subsidies for owner-occupied housing decrease the vertical equity of the tax law. Prior research has examined the equity effects of tax benefits for homeownership [Woodward and Weicher, 1989; Pierce, 1988; Lerman and Lerman, 1986; and White and White, 1965].

Most prior literature dealing with the equity and efficiency considerations of the tax treatment of residential real estate have dealt with owner-occupied housing. These studies largely ignored rental properties despite generous tax subsidies that have also been provided to investors in rental realty. To the extent these incentives have helped to improve living conditions for renters, externality arguments similar to those for owner-occupied housing can be offered to support these subsidies.

The impact of tax subsidies on the level of rent to be paid by renters also is of interest. If real estate investors use a discounted cash flow approach in determining rent levels, these rent levels will be impacted by tax subsidies, or the removal of subsidies,

for real estate investments. Consequently, as the tax laws change, so will the rent levels. Because renters, on average, are in lower income groups than homeowners, tax law changes may indirectly impact the equity of the tax law through changes in rent charges.

Basic supply and demand principles suggest that these rent charges will only adjust over a period of time, as the stock of rental realty changes. More (less) investment is likely to take place as tax subsidies are increased (decreased) resulting in an increased (decreased) stock of rental realty available. This increase (decrease) in investment may also increase (decrease) the quality of rental units available and indirectly impact the equity of the tax law through rent level decreases (increases).

Research Questions

Based on the tax law changes enacted by ERTA and TRA 86 and on the prior discussion, a number of questions can be raised. These questions include the following:

1. What was the impact of ERTA on investment in owner-occupied housing and single-family housing starts?

2. What was the effect of ERTA on investment in rental realty?

3. What was the effect of TRA 86 on investment in owner-occupied housing and single-family starts?

4. What was the effect of TRA 86 on investment in rental realty?

5. If there was a change in rental realty investment associated with ERTA, how did this impact the supply available?

6. If there was a change in rental realty investment associated with TRA 86, how did this impact the supply available?

7. What is the impact of TRA 86 on the equilibrium rent level of rental realty?

8. Do tax subsidies for rental realty increase the quality and quantity of rental housing consumed?

The importance of these questions, except number five and six, was discussed earlier. The importance of the fifth question is directly related to the economy. At least one economist has suggested that the current recession is attributable to excess investment in real estate and various facilities related to manufacturing [Burns, 1991, p. 1H]. If excess investment in real estate and other capital was partially attributable to ERTA, the implication is that the current sluggish economy also may be partially attributable to ERTA. The consequence for basic fiscal policy is that real estate tax incentives may disturb the normal equilibrium process. Since equilibrium is hypothesized to be determined by supply and demand

principles, fiscal policy may need to be based on a careful analysis of supply and demand conditions.[6]

In this study, the first six questions are examined. The final two questions are not addressed in this study. Instead, they are left for future research. Six hypotheses are developed in an effort to address the first six questions.

Based on questions one and three, it is hypothesized that ERTA and TRA 86 were not associated with a change in single-family starts. The rationale is that the provisions of ERTA and TRA 86 resulted in no substantial changes to the tax treatment of owner-occupied housing.[7] To address questions two and four, it is hypothesized that ERTA was associated with increased multi-family housing starts and that TRA 86 was associated with decreased multi-family housing starts.[8] Questions five and six suggest that ERTA and TRA 86 affected the supply of rental real estate available. To examine supply, the vacancy rate is examined. It is hypothesized that ERTA is

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[6]It is currently expected that annual household formation will fall to less than two-thirds of the 1984-87 average in the 1990s [U.S. Housing Markets, 1988, p. 1]. If this expectation holds, the demand for rental housing is likely to decrease in the next decade.

[7]It is assumed that demand for owner-occupied housing is the primary determinant of single-family starts.

[8]Multi-family starts is the best available measure for investment in rental realty.

associated with increased rental vacancy rates and that TRA 86 is associated with decreased rental vacancy rates.

Prior research documented the anticipated responses of real estate values and rent levels to tax law changes in the 1980s [Brueggeman et al., 1982; Hendershott and Ling, 1984; and Hendershott et al., 1987]. These studies used a discounted cash flow approach to predict responses. Implicit in this approach is a change in the supply of new real estate as a reaction to tax reform. The responses suggested by these simulations are examined in this study.

Overview of the Methodology

An analysis of multi-family housing starts is provided in the study. An analysis of covariance approach is used in an effort to isolate the effect of ERTA and TRA 86 on multi-family housing starts. The overall design is as follows:

Multi-family starts: o x o x o.

The first o includes the years 1974 through 1980 (pre-ERTA). The second o includes the years 1981 through 1986 (period when ERTA was in effect). The third o includes the years after 1986 (post-TRA 86 period). Each x represents a tax act being examined, with the first signifying ERTA and the second representing TRA 86, respectively.

The dependent variable in this model is the number of multi-family housing starts. The independent variables (covariates) include the nominal interest rate, real rent level, vacancy level, unemployment rate, and credit availability. A pooled time series approach is used including observations for the four main census regions of the country, the Northeast, Midwest, South, and West. Additionally, individual models are developed and examined for each region.

In the first part of the pooled analysis, tests are performed to determine if the slopes for any of the covariates change across time periods. In the pooled analysis, the slopes do not show significant changes across time periods. Thus, to examine the effect of ERTA and TRA 86 on multi-family starts the model allows for three intercepts--one for each time period. F-tests are performed to determine if the intercepts change over time periods. Any significant differences in the intercepts is an indication that ERTA or TRA 86 had an impact on multi-family housing starts. The testing procedures used in this analysis are discussed in greater detail in Chapter IV.

In analyzing the regional models, similar procedures are used. Two variations of the procedure warrant discussion. First, due to multicollinearity and a small sample size, detailed analysis of the independent

variables is performed to isolate the variable(s) which provide the most efficient models for hypotheses testing. Based on these results, reduced form models are then analyzed. The analysis of these reduced form models shows that some of the slopes change over the time periods examined. Thus, to examine the impact of the tax law changes, the slopes are allowed to change (across time periods) in the reduced form models. Next, the coefficients of the intercepts and slopes in the models examined are used to estimate multi-family housing starts at various levels of the independent variables. Tests are then performed to determine if the estimated level of multi-family starts is significantly different across the three time periods. If the estimated level of starts is significantly different across time periods, this is an indication that the tax acts affected starts. Further details of this procedure are discussed in Chapter IV.

Single-family housing starts are examined in a similar fashion. The dependent variable is single-family housing starts, while the independent variables include a measure of the cost of capital for homeownership, vacancy rate, unemployment rate, income level, and credit availability. The analysis includes a pooled time series analysis and regional models.

Organization of the Study

A review of the literature is provided in Chapter II. Only the literature most directly related to the study is reviewed.

In Chapter III, a theoretical framework for the study and additional research is discussed. The supply and demand aspects of residential real estate are stressed.

The details of the methodology and data used is provided in Chapter IV. Chapter V presents the results of the analysis and Chapter VI summarizes the results of the study and presents the research conclusions. Limitations and suggestions for future research are also presented in Chapter VI.

CHAPTER II

REVIEW OF THE LITERATURE

The literature most directly related to the proposed study and theoretical development is reviewed in this chapter. The literature is divided into four groups, with a separate section of the chapter devoted to each of these groups. Studies using a simulation approach to examine changes to real estate tax law are the focus of the first section. In the second section, the literature related to real estate starts is reviewed. These two sections provide background for the empirical analysis in the current study. The simulations provide support for the hypothesized relationships between ERTA and TRA 86 and changes in multi-family housing starts. Background for the development of independent variables (covariates) is provided in the starts studies discussed.

The third section emphasizes literature related to the rental adjustment process of rental realty. The primary reason for the inclusion of this section is to provide background for the theoretical development of the rental adjustment process. Although this process is not empirically investigated in this study, the theory is a natural extension of the empirical analysis and will be the background for future empirical analysis.

Finally, the fourth section reviews additional literature that does not fit one of the previously mentioned categories, but is directly related to the proposed study. The first two studies examined in this section deal with homeownership and the factors that are relevant to the demand for homeownership. These factors are relevant in the analysis of single-family starts, since the theoretical model developed is based on the demand for homeownership. The final two studies discussed provide an empirical analysis of real estate tax law changes. The results of these final two studies are consistent with the simulation studies and the theory developed in the next chapter.

The Simulation Approach

Generally, these studies and other simulations are based on a discounted cash flow model, which allows for insight into the potential reactions to tax law changes. Simulations illustrate the process by which the real estate market likely reacts to tax law changes. This process develops as follows. First, an increase (decrease) in tax subsidies to rental realty decreases (increases) the cost of investment in real estate. It is generally assumed that this decreased (increased) cost will stimulate increased (decreased) investment and will be capitalized into the value of the property. The result

will be higher (lower) property values. As real estate investment continues to increase (decline), rents will decrease (increase). Eventually, rent charges and property values will return to equilibrium. This process is further illustrated in Chapter III.

Brueggeman, Fisher, and Stern [1982] simulated the impact of ERTA on rental realty by using a discounted present-value approach to examine the short-run and long-run responses to the tax law changes. The tax law changes are discussed below. Their model required assumptions about a typical real estate investment and real estate investor, with initial assumptions about a pre-ERTA investment. These initial assumptions included a typical real estate investor in the 50 percent marginal tax bracket, expensing of 100 percent of construction period interest during the construction period, and depreciation of the real estate over a 30-year period using the double-declining balance method.

These assumptions were then changed to take into account the provisions of ERTA. Specifically, construction period interest was amortized over 10 years and the capital recovery period was changed to 15 years with the 175 percent declining balance method being applied.

Their results suggest that, if the provisions of ERTA had been left intact, a decline in rent-to-value ratios of

approximately 20 to 33 percent could have been expected. This potential decline was attributed to the generous capital recovery provisions of ERTA, and was sensitive to changes in the expected rate of inflation and the response of mortgage interest rates to changes in the inflation rate.

In anticipation of the tax law changes enacted in 1984 and 1985, Hendershott and Ling [1984] calculated the impact of changing the capital recovery period of real estate from 15 to 20 years, by using a discounted cash flow approach to simulate potential responses. The model allowed the long-run supply price to respond to demand changes and also the long-run rent levels to adjust to their long-run equilibrium, with a lag. The future sales price and optimal holding period were determined endogenously.

Assumptions about the typical investment and investor were incorporated into the model, with the key assumptions including a baseline investment consistent with the ERTA provisions allowing a 15-year depreciable life, an investor in the 45 percent marginal tax bracket, and a marginal tax rate on capital gains of 18 percent. This baseline case was compared to an investment with a capital recovery period of 20 years. As in the previous simulation, the AMT was ignored.

Results were shown for various expected inflation rates, discount rates, and supply elasticities. A short-run decline in the price of new residential properties of between 3 and 4 percent was estimated, and the long-run estimate of the increase in real rents was 10 to 12 percent.

Hendershott, Follain, and Ling [1987] used a discounted cash flow approach to analyze the anticipated impact of TRA 86 on real estate. The critical characteristics assumed for the post-TRA 86 investor included a lengthening of the tax depreciation life to 27.5 years, construction period interest and taxes recovered over 27.5 years, the use of straight-line depreciation, and elimination of the capital gains deduction. However, AMT and passive loss restrictions were not considered. They used a marginal tax rate of 33 percent for post-TRA 86 provisions and two pre-87 marginal tax rates, 49 and 42 percent. State and local income taxes were incorporated into these marginal tax rates.

A decline in interest rates, an expected result of the general decreased incentive effects of TRA 86, was also incorporated into the model. Based on their results, the authors predicted a long-run increase in the equilibrium rent level of 11 to 19 percent and suggested that this long-run increase would be reached in 4 to 12 years depending upon the market, with equilibrium being

reached sooner in growth markets. Estimates for anticipated decreases in the initial value of real estate properties resulting from TRA 86 were also provided.

Generally, these studies and other simulations are based on a discounted cash flow model which allows for insight into the potential reactions to tax law changes. However, some limitations of this approach warrant discussion. For example, assumptions about the typical real estate investment and investor are required, with the results being sensitive to the possible inaccuracy of these assumptions because verification may not be possible. It is interesting to note that these simulations generally ignore the impact of the AMT. Also, Hendershott, Follain, and Ling [1987] do not incorporate the passive loss rules.[1]

Several implicit assumptions are also incorporated into the simulations. First, it is assumed that real estate investors are rational profit maximizers with perfect information and understanding of the tax law. Second, transaction costs involved in the purchase and disposition of real estate properties are ignored.

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[1]The importance of the passive loss rules and AMT were discussed with a tax manager at a national accounting firm who specializes in the real estate tax area. This manager pointed out that most real estate developers/ owners with whom he is familiar are only paying income taxes due to the AMT and the passive loss provisions. Thus, regular tax rates may not be an important consideration for a number of real estate investments.

Nevertheless, two empirical studies that are reviewed in the fourth section of this chapter provide support for the assumption that real estate investors use an approach consistent with a discounted cash flow model. If this assumption is true, the supply of rental housing should increase (decrease) as tax incentives are increased (decreased). The theoretical development in the next chapter is based on this proposition, the real estate starts literature discussed below, and general supply and demand principles.

Real Estate Starts

The simulation studies discussed above suggest that multi-family housing starts should increase when owners/developers have an opportunity to increase their profits through increased tax subsidies. Prior studies have included various components of owners' profits such as rent and the cost of credit. However, none of these studies has directly examined the impact of tax law changes on private residential construction. Variables generally considered relevant in these studies include various components of the cost of capital, the vacancy level, and the cost of credit.

Rosen [1979] provides an empirical analysis of multi-family housing starts on a regional basis. He examined the four census regions by using data that was primarily

from government publications. Rosen developed a recursive three equation framework to examine housing starts on a quarterly basis from the second quarter of 1966 through the second quarter of 1978.

Multi-family housing starts were determined endogenously in the first equation. The exogenous variables included the vacancy rate, construction costs, mortgage supply in real terms, the desired stock of multi-family units lagged one period, and the expected rental price over expected occupancy costs. In the second equation, the completion of multi-family housing starts was determined endogenously as a function of prior period starts. Finally, the third equation was an identity relating the current stock to the stock in the prior period adjusted for depreciation of units, plus the completions in the current period.

Rosen's results indicated that almost all variables in the starts equation were significant, the only exception being construction costs. Interestingly, housing starts were highly sensitive to the price of rents and the vacancy rate. Also, the parameter values across regions were substantially different, indicating the richness of a regional model.

Jaffee and Rosen [1979] were primarily interested in examining the impact of credit availability on residential construction. Two separate construction models were

estimated. The first model was employed to estimate single-family housing starts, while the second model was used to estimate multi-family housing starts. Both models were estimated on a quarterly basis at the national level. Single-family housing starts were estimated for the period from the second quarter of 1965 through the second quarter of 1978, while multi-family housing starts were estimated from the first quarter of 1964 through the second quarter of 1978.

In the single-family estimation, the number of single-family housing starts was the dependent variable. Independent variables included: (1) the change in the number of occupied single-family housing units in the current period, (2) the number of existing single-family units in the previous period, (3) the number of vacant single-family units in the prior period, and (4) a vector of variables representing mortgage cost and credit availability. The first three variables were proxies for demand, and the second variable was included as a proxy for the part of production that replaced depreciated or removed units. The number of vacant single-family units was dropped from the equation because it had a high correlation with the number of occupied single-family units, precluding a statistically significant coefficient.

The vector of credit availability variables included the nominal interest rate, the flow of deposits into thrift institutions, and a measure of the flow of mortgage credit from federal agencies. The model fit fairly well, although the coefficients were generally of borderline significance. However, of special interest is the fact that the nominal mortgage interest rate had the expected negative sign and the deposit flow term had the expected positive sign.

In the multi-family starts model, the number of multi-family housing starts was the dependent variable. The independent variables included the profit margin, the real mortgage interest rate, the vacancy rate, and a mortgage fund rationing variable. All of these variables were weighted by the outstanding stock of multi-family units. Thus, outstanding stock of multi-family units was also included in the model. The profit margin variable was the rental component of the consumer price index divided by the overall consumer price index. The mortgage fund rationing variable was the real flow of funds to thrift institutions. All of these variables were significant and had the expected sign.

DiPasquale and Wheaton [1989] extended prior research by incorporating income taxes in the cost of capital. They performed a yearly time series on a national basis for the period 1960 through 1988. The model was estimated

using ordinary least squares, with the number of multi-family starts per year being the dependent variable. The independent variables included prior-period construction, rent in the current period, vacancy rate in the current period, construction costs, and the rental cost of capital.

The most interesting result of their study was that the rental cost of capital was significant and negative (as expected), the implication being that as the rental cost of capital increased, the number of multi-family starts decreased. However, it is impossible to determine from their model which of the various components of the rental cost of capital drove the results.

Clements [1989] examined the impact of tax incentives on low-income housing starts. The study was divided into two parts. In the first part, an internal rate of return model was developed and divided into a tax and a non-tax component. In the second part, Clements constructed a regression model with the tax and non-tax components of the internal rate of return model as independent variables. The dependent variable in the regression was the number of multi-family subsidized housing starts during the current period. The other independent variables included the level of direct subsidy provided to multi-family subsidized housing starts for the current year and the average return available on tax-free

long-term municipal bonds. The latter variable was included to allow for alternative uses of funds.

Clements conducted the analysis at the national level on a quarterly basis for the period 1970 through 1985. No association was found between tax preferences and low-income housing starts. There are a number of explanations for this unexpected result. First, there may be no relation between tax incentives and investment in low-income housing. On the other hand, the model may have been misspecified since demand for low-income housing was not considered. Finally, the internal rate of return model required assumptions about the typical investor and investment project. These assumptions may have been inaccurate.

Private residential construction was examined in the first three studies discussed and, generally, the findings indicate that the demand for housing, cost of credit, and the rental cost of capital are all important considerations in explaining private housing starts. Surprisingly, construction costs were not found to be highly correlated to housing starts. An important variable not directly considered in these studies was income tax effects. However, DiPasquale and Wheaton [1989] did incorporate income taxes into the rental cost of capital.

Clements [1989] attempted to directly estimate the impact of taxes on low-income housing starts, but the findings do not support any relation. In summary, Clements provides the only starts study that has directly examined income tax effects and found that income tax provisions were not correlated with public housing starts.

The Rental Adjustment Process

Studies that examine the rental adjustment process find that rents generally rise as the landlord's costs rise, and thus support a discounted cash flow or user cost of capital determination for rental charges. Costs in these studies affect the discounted cash flow or user cost of capital and are generally found to be passed to consumers in the form of higher rents. To the extent that taxes are part of the user cost of capital or impact the user cost of capital, the results of these studies support the simulation studies suggesting that an increase (decrease) in tax subsidies will first result in an increase (decrease) in property values and will be followed by a decrease (increase) in the real rent level. The rental studies discussed below, plus the simulation studies previously discussed, provide the background for the theoretical development of the rental adjustment process discussed in Chapter III.

DeLeeuw and Ekanem [1971] empirically estimated the determinants of rent charges for rental housing by using the 1967 U.S. Bureau of Labor Statistics (BLS) survey to analyze the differences in rents between various metropolitan areas. Since sizable differences exist in rent levels for comparable units in different areas, the authors suggested that studying differences among cities amounts to studying the long-run behavior for the rental housing market.

The dependent variable used in several specifications of the model was the rent level. It was drawn directly from the BLS study. The independent variables examined were the price of capital inputs (measured by annual mortgage payments), the price of operating inputs, the general price level for the metropolitan area (excluding the rental component), the median income per household, the vacancy rate, and the number of households in the metropolitan area. The price of operating inputs was taken directly from the survey and included the price of utilities, property taxes, insurance, and repairs.

The results indicated that rent levels were higher in cities with higher capital costs and operating costs. This finding is consistent with the user cost of capital framework: the higher the general price level and the capital costs in an area, the higher the rent level. The vacancy rate was found to be insignificant. The authors

suggested that this was a result of each metropolitan area possibly having a normal vacancy rate. The normal rate was hypothesized to be higher in areas of fast growth, due to construction preceding demand.

Smith [1974] examined the impact of the vacancy rate and the change in property taxes on the change in rent levels for each of five Canadian cities, using yearly data for the period from 1961 through 1971. Separate regressions were run for each city and an additional pooled regression was run. In both the separate and pooled regressions, the vacancy rate and property tax variables were found to be highly significant. The results suggest that landlords are able to pass property tax increases on to their tenants and that each city has a different natural vacancy rate.

Eubank and Sirmans [1979] examined the price adjustment mechanism for rental housing in the United States, using rate of change in rents as their dependent variable. The two independent variables were the vacancy rate and the rate of change in total operating expenses. Data for four cities and four apartment types were examined. The analysis was performed on yearly data for the period 1967 through 1974. Separate regressions were run for each building type and for each city. A pooled regression was also performed. Generally, the rate of change of operating expenses was significant and had the

correct sign. Current vacancy rate and vacancy rate lagged one period were both considered, but generally, neither specification of the vacancy rate was significant. Eubank and Sirmans concluded that landlords shift operating expenses to tenants.

Rosen and Smith [1983] examined both the rental adjustment process and the natural vacancy rate for seventeen U.S. cities. In estimating the rental adjustment process, the rate of change for the rent level was the dependent variable. The rate of change for the operating expenses and vacancy rate were the independent variables. Separate regressions were performed for each of the 17 cities. A pooled regression was also implemented for the period 1969 through 1980.

Data on the vacancy rate and expenses were obtained from the Institute of Real Estate Management, Annual Income/Expense Analysis for Apartments. Rental information was obtained from the BLS Apartment Rents for each city. The vacancy rate variable was significant and negative for both the separate regressions and the pooled regression, thus supporting the view that the vacancy rate is critical in determining the rental adjustment process. The rate of change of operating expenses was found to be significant in some of the cities and in the pooled regression.

In the second phase of the study, the natural vacancy rate was estimated.[2] The results indicated that the natural vacancy rate was higher in areas that experienced a higher degree of turnover and had a higher dispersion in rents. The growth of housing stock was significant and positive in explaining the vacancy rate. These findings were consistent with the hypothesis that vacancy rates were higher in areas of rapid construction. Population growth was found to be insignificant because, as Rosen and Smith [1983] explain, population growth reduced the natural vacancy rate once construction was taken into account.

The above studies support the process of rents rising as the landlords' costs rise, and thus support a discounted cash flow or user cost of capital determination of rental charges. Generally, the vacancy rate also impacts the rent adjustment process, even though the cross-sectional study performed by DeLeeuw and Ekanem [1971] showed no relation between the vacancy rate and the rent level. However, this lack of a relationship is consistent with the findings of Rosen and Smith [1983], in that each city has a different natural vacancy rate. Both the studies by Smith [1974] and by Rosen and Smith [1983]

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[2]The natural vacancy rate refers to the vacancy rate that will occur with no market imperfections.

found that the vacancy rate was significantly related to the rental adjustment process.

Other Studies

Rosen [1979] examined the impact of the structure of the income tax on housing decisions by performing a study on a cross-sectional basis using 1970 data. First, a probit model was used to estimate the likelihood that a family chose to own rather than rent. The independent variables included the ratio of the price of housing to the price of other goods, the ratio of the price of renting to the price of other goods, a permanent income measure, and a vector of demographic variables. The demographic variables included the age, race, and sex of the household head, and the number of minor children in the household.

The results of the Rosen study indicated that income had a positive relationship with the decision to own and, in contrast, the after-tax price of housing had a significant negative influence on the decision to own. The results also indicated that the probability of owning increased as the number of children and the age of the household head increased.

Using the information from the empirical analysis, a simulation was performed to show the efficiency and distributional effects of the tax treatment of

owner-occupied housing. Specifically, Rosen showed that favorable tax treatment of owner-occupied housing lowered the price of housing and increased the homeownership rate and the demand by homeowners for additional housing unit consumption.

Rosen and Rosen [1980], following the work of Rosen [1979], used a time series to examine the impact of federal taxes on homeownership. The model was estimated on a national basis for the years 1949 through 1974, with the dependent variable being the overall proportion of households that desired to rent in a given period. Based on the results, Rosen and Rosen concluded that the relative price of owning to renting was significantly related to the proportion of households that own. The authors estimated that, if all the tax benefits related to homeownership were eliminated, the long-run proportion of homeowners would have been about 4 percent lower. Further, Rosen and Rosen estimated that approximately one-fourth of the increase in the homeownership rate from 48 to 64 percent since World War II was attributable to federal income tax law.

Other variables in the model included permanent income, the real growth rate of deposits in thrift institutions, the proportion of the population between the ages of 35 and 64, the percentage of families without children, and the female labor force participation rate.

However, all these variables (except permanent income) were found to be insignificant. As expected, permanent income had a positive relation with the homeownership rate.

The two studies just discussed dealt with the demand for housing and the tenure choice decision. The results of both studies support the notion that tenure choice and housing demand are sensitive to the after-tax price of housing.[3] These two studies also support each other, since one study used a cross-sectional approach and the other study used a time series approach.

Nourse [1987] examined the impact of tax law changes on real estate investment returns from 1966 through 1984. The data used was mortgage commitments on multi-family and nonresidential properties reported to the American Council of Life Insurance by life insurance companies, with nonresidential properties forming the largest part of this survey.

The measure used for real estate returns was the capitalization rate, which is essentially equivalent to net operating income divided by property value. It was the dependent variable. The independent variables included mortgage variables and the expected price appreciation. Nourse also included two dummy variables

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[3]Tenure choice refers to the choice to own or rent.

for periods of varying tax laws. The periods were all periods prior to April 1977, April 1977 through March 1983, and April 1983 through 1984. The 1977 date was chosen to reflect changes in the tax law which required the capitalization and amortization of construction period interest and taxes. The 1983 date was chosen to reflect changes made by ERTA to capital recovery.

The reported results suggest that the 1976 Tax Act did not significantly change the capitalization rate, but that ERTA did significantly reduce the capitalization rate.[4]

Sanger, Sirmans, and Turnball [1990] used an event study approach to examine the impact of the 1976 tax act [P.L. 94-455] and TRA 86. They analyzed the weekly stock returns of real estate investment trusts (REITs) and other non-REIT real estate firms. To examine the 1976 Act, all listed REITs for the period from 1973 through 1978 were included. To analyze TRA 86, all listed REITs for the period from 1981 through 1986 were included.

An intervention analysis was used to measure reactions to news concerning tax legislation. Dummy variables were used to compare information weeks to

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[4]These results are consistent with an initial increase in property values as a result of the tax act. The implication for the long-run is that competition will force the level of rents down, until the capitalization rate is back to its initial level.

non-information weeks. The results showed that the market interpreted the 1976 tax act to be favorable to REITs and other real estate firms. The results for TRA 86 showed that the market interpreted TRA 86 as unfavorable to REITs and other real estate firms.

These last two studies provided an empirical analysis of tax law changes in recent years, both of them supporting the discounted cash flow approach used in many simulation studies. The results found in the second of these two studies were quite strong, supporting the hypothesis that the stock market quickly impounds the long-term effects of tax law changes related to real estate.

Conclusions

Overall, the literature reviewed in this chapter is consistent with the theory that will be developed in the next chapter, a theory that is largely based on a supply and demand analysis of the housing market. In general, it is expected that increased (decreased) tax subsidies will lower (raise) the cost of rental real estate and increase (decrease) real estate starts. This increased (decreased) supply will, in the long-run, decrease (increase) the equilibrium rent level. A decrease (increase) in the

equilibrium rent level will indirectly increase (decrease) the vertical equity of the tax law.[5]

The real estate start studies conclude that starts are higher when the rent level is higher and costs are lower. This conclusion is consistent with the discounted cash flow approach used in the simulation studies. The studies on the rental adjustment process are also consistent with a discounted cash flow approach: as operating expenses rise, the rent level appears to adjust accordingly. The Nourse study [1987] and the Sanger, Sirmans, and Turnball study [1990] are also consistent with a discounted cash flow approach. The Sanger, Sirmans, and Turnball [1990] study is of special interest. The response of the stock market as investigated in that study is consistent with investors in real estate using a discounted cash flow approach.

Based on this prior research and general economic theory, hypotheses regarding the impact of ERTA and TRA 86 can be introduced. However, before this is done, a more detailed discussion of the theory relevant to the supply and demand of real estate is provided in Chapter III.

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[5]When tax benefits for rental real estate are decreased, it is expected that this cost is passed on to renters. Since renters tend to have a lower income than homeowners, the result is a decrease in wealth for lower income individuals because of the tax law changes. This indirectly decreases the vertical equity of the tax law.

CHAPTER III

THEORETICAL DEVELOPMENT

A theoretical framework for the relationship between taxes and real estate is developed in this chapter. This framework is the basis of the proposed study and also provides a foundation for future research in the real estate area. The life-cycle hypothesis and tenure choice are discussed in the first section. Both of these concepts are directly related to the demand for rental and owner-occupied units. Tenure choice refers to the decision to own or rent. The factors influencing owner-occupied housing starts are discussed in the second section.

A supply and demand analysis of rental realty is provided in the third section, with a primary focus on the determinants of multi-family housing starts. Against this background, the fourth section provides an analysis of the expected response of rent levels to TRA 86. Although the fourth section is not directly related to the empirical analysis in this study, it is a natural extension of the theory discussed in the third section and provides a foundation for future empirical analysis. Tax equity is incorporated into the discussion because the analysis provided has implications for the distribution of the tax burden. Finally, concluding comments are given.

Life-Cycle Theory and Tenure Choice

Once the decision to form a household is made, it must be decided whether to rent or own. The analysis of this decision is first and foremost based on the life-cycle model. The typical life-cycle model proceeds as follows. The first stage is that of marriage and the pre-child period, followed by a child-rearing period, and, finally, by an empty-nest period [Rudel, 1987, p. 259].

Along with this life-cycle model come changes in housing demand. Generally, a life-cycle change will cause a change in housing demand. Growth in family size has been found to be one of the primary determinants of the move from rental to owner-occupied units [Roistacher, 1974, p. 12]. Once a unit is owned by a household, and the head is middle aged, the decision to move is largely based on neighborhood amenities [Clark and Onaka, 1983, p. 50].

This discussion of the life-cycle model has so far ignored new household formation by young single individuals, even though they comprise a large portion of new households. The life-cycle process may start for many individuals as a one-member household. New households formed by singles and by newly married couples most likely cause an increase in the demand for rental units as opposed to housing units. Thus, members of the youngest households are likely to be renters.

Jaffee and Rosen [1979] provided an interesting examination of the age distribution of the population for the period from 1960 through 1978. Of primary interest in their analysis is the fact that the age distribution of the population changed significantly over these years. They used this information to provide an analysis of the owner-occupancy rates for these years. Based on 1960 homeownership rates by age groups, they projected homeownership rates through 1978 and compared them to actual homeownership rates. The actual homeownership rates increased significantly during this period as compared to the projected numbers. Thus, forces besides the life-cycle, such as the cost of capital, may have been impacting the tenure choice decision.

Owner-Occupied Housing Demand and the Cost of Capital

One explanation for the homeownership rates noted by Jaffee and Rosen [1979, p. 345] is the cost of capital for homeowners. As discussed in the previous chapter, empirical research has indicated that the price of housing has a significant impact on the tenure choice decision. As the after-tax cost of housing goes down, the demand for initial housing and quantity of housing increases. One method of examining the after-tax cost of housing is through the user cost of capital framework originally

developed as part of neoclassical economics by Hall and Jorgenson [1971].

Hendershott and Shilling [1982] used this framework to demonstrate the trend in homeownership rates illustrated by Jaffee and Rosen [1979, p. 345]. Hendershott and Shilling [1982] showed that the unexpected increase in the homeownership rate, from 1960 through 1978, was highly correlated with a decreased cost of capital for homeowners.[1]

As it relates to homeownership, the cost of capital includes inflation, interest rates, property taxes, depreciation, and the federal income tax. To the extent that housing is used as an investment alternative, inflation favors housing over other investments. This is primarily due to the tax-favored treatment of capital gains on owner-occupied housing.[2]

The notion that taxpayers use owner-occupied housing as an investment during inflationary times is supported by prior research. Rudel and Neaigus [1984, p. 137] showed

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[1]The cost of capital for homeowners is equivalent to the user cost of capital for homeowners. The homeowner is the user in this instance.

[2]A substantial amount of capital gains on the sale of a personal residence are excluded from gross income. First, all taxpayers can defer gain on the sale of a personal residence to the extent the net proceeds received from the sale are reinvested. Second, a taxpayer over the age of 55 can permanently exclude up to $125,000 of gain from the sale of a personal residence.

that current homeowners increased their housing consumption by purchasing larger, more expensive units, in periods of high inflation. New homeowners decreased the amount of initial housing purchased over the same period [Rudel and Neaigus, 1984, p. 137]. Considering their study, along with that of Hendershott and Shilling [1982], high housing inflation may lead to higher homeownership rates, with first-time buyers likely downgrading and purchasing less housing. This latter phenomena is probably due to income and downpayment constraints.

A basic formulation for the cost of capital for homeowners is suggested in equation 1.

$$OCC = [d + (1 - tr)\ (i + pt) - inf] \qquad (1)$$

where,

OCC = cost of capital for homeownership;
d = housing economic depreciation rate;
tr = marginal income tax rate of new homeowner;
i = nominal interest rate;
pt = property tax rate; and
inf = expected housing inflation rate.

As the marginal tax rate for a homeowner increases, the cost of capital will decrease.

The theoretical demand for owner-occupied housing (D) is expressed in equation 2. This expression is based on the life-cycle hypothesis and the cost of capital for homeownership.

D = f(OCC, Household Size, Real Income, Rent). (2)

A higher cost of capital for the homeowner will decrease the demand for ownership. As household size increases, so will the demand for new housing. It follows that, as real income rises, housing will be more affordable and the demand for owner-occupied housing will rise. Real income refers to income adjusted for inflation. Rent is included in the demand function, as tenure choice decisions are based on the price of renting versus the cost of owning.

Residential Rental Real Estate: Supply and Demand

Rental realty starts will primarily depend on the supply side [Jaffee & Rosen, 1979, p. 340]. A theoretical model of the supply and demand of rental realty will be developed, based on the assumption that rental realty starts are primarily supply side determined. Unless an owner/developer foresees a profit, new construction will not be undertaken. Demand is also critical because profit is partly based on rent charges, and total rent collected is a function of the number of units that can be rented.

Demand

The demand function for rental units is specified in equation 3.

$$D = f(H, OCC, R, POP, RIN) \quad (3)$$

where,

H = number of households;

OCC = cost of capital for homeownership;

R = rent;

POP = size of household; and

RIN = real income.

First and foremost, the quantity of rental units demanded is a function of the number of households at any given point in time. The other four variables, as previously discussed, are relevant to the tenure choice decision. If the number of households is treated as exogenous, rent and the cost of capital for homeownership are only relevant to the tenure decision.[3]

Supply and Vacancies

The rental vacancy rate is jointly determined by the demand for rental units and the stock of rental units at any point in time. This joint determination is shown in the disequilibrium specification of equation 4.

$$L(1-RVR) = D(H, OCC, R, POP, RIN), \quad (4)$$

where,

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[3]Recent research has shown that, if the number of households is treated endogenously, the rent level and income level of an individual directly impact on the decision to form a household [Haurin et al., 1990, p. 1]. As the price of renting goes up, individuals are slower to form a housing unit.

L = stock of rental units; and

RVR = rental vacancy rate.

The stock of rental units, at any point in time, can be represented as follows:

$$L_t = L_{t-1} - RE + CC. \quad (5)$$

The stock of rental units available is simply the stock available in the previous period, reduced by stock currently removed (RE), and increased by construction currently completed (CC).

Disequilibrium is required in the housing market due to an optimal vacancy level. Vacant units are necessary to allow new householders and movers time to search for housing. Owners need vacant units to allow for maintenance and a chance to adjust rental rates.

New construction depends on the return that can be earned by owners/developers. The starts equation is provided in equation 6 as:

$$St = f(RCC, RVR, G) \quad (6)$$

where,

St = starts of rental realty;

RCC = rental cost of capital;

RVR = rental vacancy rate; and

G = expected growth in new households.

The rental cost of capital is of primary interest in equation 6. The rental cost of capital includes operating expenses, interest payments, and rental income. These

items are directly related to the profits that can be earned by an owner/developer. Vacancy rate is included because total rent collected on a rental development will be equal to the number of units rented times the rental rate per unit.[4] Theoretically, an owner will set the rent at an amount to maximize the total rent collected. The acceptable vacancy level depends on the rent that can be collected on the rented units. Expected growth is included as owners/developers are hypothesized to foresee profit opportunities of a growth market.

Market Imperfections and Interruptions

The rental realty market operates under basic supply and demand principles with a disequilibrium due to an optimal vacancy rate. However, market imperfections exist. For example, the optimal rent to be set by a landlord is limited by contracts with tenants. Even when an owner may be able to collect a higher rent, rents are likely to be sticky as a result of contracting.

A market interruption of primary interest is the impact of an exogenous shock to the housing market. The exogenous shocks to be considered in the current study are tax law changes. First, the Economic Recovery Tax Act of 1981, as its name implies, was enacted to encourage

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[4]Note that the demand function of equation 4 enters the starts equation through the vacancy rate.

economic growth. This tax act provided incentives to the real estate industry in the form of shorter depreciable lives and accelerated depreciation methods. To the extent this lowered the costs for real estate developers, new construction of rental realty should have increased.

Simulations [Brueggeman, Fisher, & Stern, 1982] suggest that the impact of ERTA should have been to raise property values in the short-run and lower the rent level in the long-run. To the extent that rents are slow to adjust, incentives existed to earn abnormal returns on rental realty investments. Furthermore, construction should have continued above its optimal level. The result of this above-normal construction should have been an overbuilt market and abnormally high vacancy rates. It is hypothesized that the strong incentives to invest in rental realty caused increased starts and abnormally large vacancy rates due to the slow nature of the adjustment process.

This process is illustrated in Figure 3.1. The rent level and other variables are held constant. The difference between points A and B represent the initial disequilibrium that should occur in the real estate market. At the rent level P1, Q0 units will be demanded

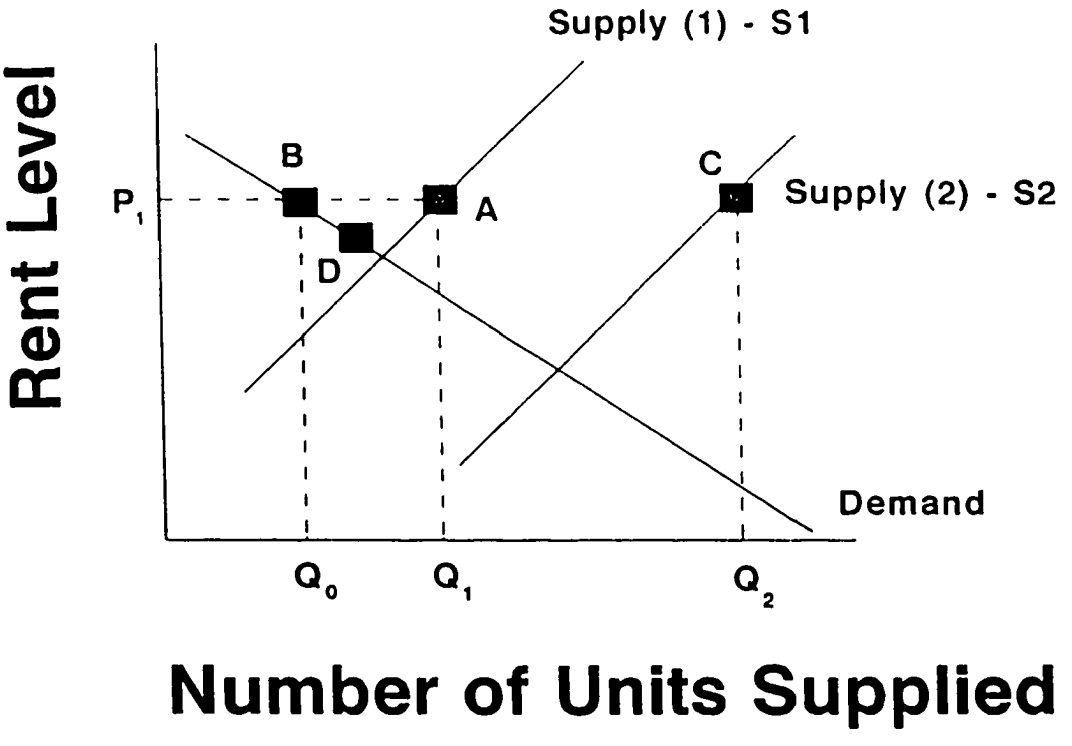

FIGURE 3.1

Supply of Rental Housing

and Q1 units will be supplied. The optimal vacancy rate is Q1 minus Q0.

Now assume a tax law change similar to that of ERTA. If the tax subsidy is not immediately capitalized into rent charges, starts should increase, and the supply curve should shift out to S2, with Q2 units being supplied. The vacancy rate has now risen to Q2 minus Q0 units. In order for the vacancy rate to return to the initial level, rents must decline. As rents decline, demand should shift from point B, to a point below B on the demand curve (such as point D) and the supply curve should shift from point C to the left, until once again the optimal vacancy level is reached. The oversupply and above normal vacancy rate will persist to the extent that rents do not adjust.

Generally, ERTA did not substantially alter the incentives to purchase a new home. Thus, ERTA should have had an insignificant impact on the starts of single-family homes. With the prior discussion as the background, hypotheses regarding ERTA are made. These hypotheses, stated in the null form, are:

H01: ERTA was not associated with an increase in new construction of rental realty.

H02: ERTA was not associated with vacancy rates rising above their natural level.

H03: ERTA was associated with a change in single-family housing starts.

Vacancy rates are hypothesized to be above their normal level as a result of ERTA. TRA 86 was enacted at about the same time (or shortly after) vacancy rates reached above normal levels. As previously discussed, this act provided disincentives to new capital investment in rental realty. Thus, the number of rental realty starts after the effective date of TRA 86 should have declined substantially.

The supply curve is projected to shift back to the left, as a result of this decline in starts.[5] A decline in the number of starts should continue until a normal return can be earned on a new rental realty investment. Vacancy levels should decrease as a result of this decline in rental realty starts. The new long-term equilibrium for vacancy levels should be obtained when the rent-to-value ratio reaches equilibrium.[6]

It is anticipated that TRA 86 had minimal impact on the demand for single-family units. With this background, hypotheses are made with regard to TRA 86. These hypotheses, stated in null form, are:

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[5]This assumes that the rent level and other components of the owners/developers profits remain constant.

[6]A discussion of the rent and value responses to TRA 86 is provided in the following section.

H04: TRA 86 was not associated with a decline in starts of rental realty.

H05: TRA 86 was not associated with a decline in vacancy rates.

H06: TRA 86 was associated with a change in single-family housing starts.

The Rental Adjustment Process and TRA 86

In this section, the relationship of TRA 86 to equilibrium rent and value levels is discussed. A partial equilibrium approach is used to analyze the impact of TRA 86 on rental realty and the rent adjustment process. As a result of the tax disincentives provided by TRA 86, the initial response should be a decrease in the value of rental realty. The response of owners/developers should be a decrease in the start of new units. Also, rents should rise as owners/developers attempt to maintain satisfactory profit levels. As the supply decreases, values should start to increase. Eventually, values should obtain their pre-TRA 86 levels and rents should increase.[7]

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[7]It may take a long time for rents to fully respond, due to the expected oversupply of rental realty when TRA 86 was enacted.

Rents and Equity

The rental cost of capital framework suggests that rents will rise as the owner's operating expenses rise. This rise in rents is consistent with prior research discussed in Chapter II. Another part of the rental cost of capital is the tax costs imposed on, or benefits derived by, a real estate owner or investor. If owners pass the changes of TRA 86 to tenants, the rent level will rise substantially. This process is analyzed below.

A partial equilibrium approach is used, with the enactment of TRA 86 considered to be the removal of a substantial subsidy to real estate. This analysis illustrates who is likely to bear the burden of the removal of the tax subsidy. It is concluded that, in the short-run, real estate owners and investors will bear the burden. In the long-run, the burden will be borne by tenants in the form of higher rents.

The impact that the removal of the subsidy may have on tax equity is based on economic tax incidence. The fundamental consideration in economic tax incidence is that taxes induce changes in relative prices.[8] Referring to Figure 3.2, assume that rental realty has an initial

[8]For a basic discussion of tax incidence and supply and demand, see Rosen, Harvey S., Public Finance Homewood, Illinois, Irwin (1989).

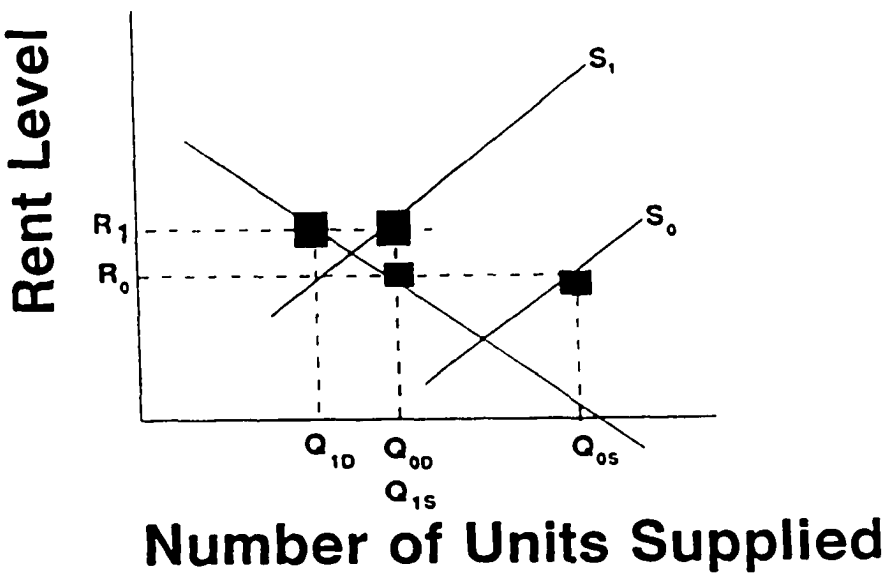

FIGURE 3.2

Short-Term Reaction to TRA 86

rent level of R0. At this level the initial units available for rent is Q0S and the initial units demanded is Q0D. The disequilibrium allows for a natural vacancy level. After tax subsidies are reduced, starts should decrease, as illustrated by a shift to S1, as a short-run response and the number of units available should be reduced to Q1S. The gap between the number of units demanded and the number of units available should be reduced and upward pressure should be put on rents. The short to midrange response should be an increase in rents to R1. At this level of rents, Q1S units should be available and Q1D units should be demanded. Notice that the vacancy level has been decreased.

At this point, real estate owners/investors should still be earning a profit below that earned before TRA 86. Thus, the number of new starts should continue to be low and the vacancy rate should continue to decrease, until rents adjust to a higher level in the long-run. This long-run level is at R2 in Figure 3.3. At this rent level, the quantity of rental units demanded is Q2D and the quantity available is Q2S. The difference is the new vacancy level.

In summary, the short-run response to TRA 86 should be a partial shift of the lost tax subsidy to tenants, with the majority of the loss being absorbed by the owners/investors in real estate. This effectively will

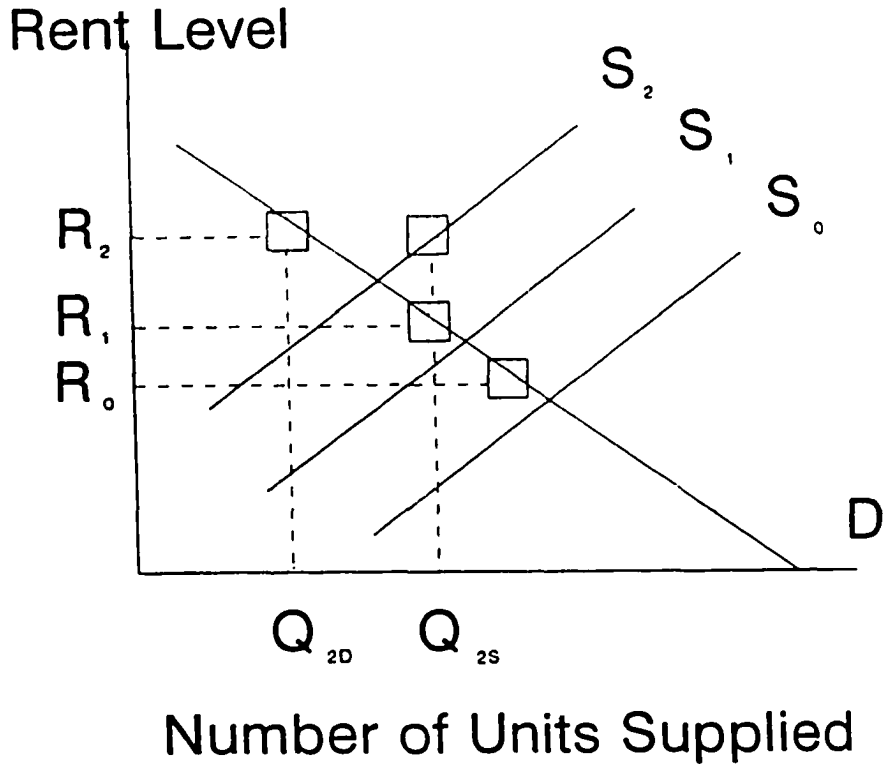

FIGURE 3.3

Long-Term Reaction to TRA 86

reduce the supply of new real estate and decrease the value of existing real estate. This process will continue until the supply is at such a level that values will once again increase and normal profits can be earned. At this point, rents and values will have increased.

Imperfections

The long-run rise in rents can be computed using a discounted cash flow approach. As discussed in Chapter II, the amount of this rise is expected to be in the nature of 11 to 19 percent [Hendershott, Follain, & Ling, 1987, p. 84]. Since the analysis of these researchers largely ignored the passive loss rules and the AMT provisions, these estimates may be conservative.

Several factors may prevent rents from rising by as large an amount as anticipated. First, if abnormal returns were earned on real estate before the enactment of TRA 86, part of the adjustment process may be the elimination of these abnormal returns. Second, to the extent that substantial transaction costs were incurred prior to TRA 86 and are no longer incurred in real estate developments, the rise in rents may not be as large as anticipated.[9] Third, some landlords may hold the rent

[9]Substantial transaction costs may have been incurred in the past due to costs of developing and selling real estate investments on a large scale as tax shelters. Such tax shelter promotion and the large transaction costs

charged constant as other forces behind earning a return are present.[10]

Finally, it has been suggested that the optimal form of holding real estate will be in the corporate form after TRA 86 [Lentz & Fisher, 1989, p. 314]. To the extent that corporations are able to earn a normal profit without raising rents, the impact of TRA 86 may be reduced. Remember that corporations are generally not subject to the passive loss rules. Additionally, corporations currently have a wider gap between the regular tax rate and the AMT rate. Nevertheless, these forces are not anticipated to override the expected rise in the equilibrium rent levels.

Summary and Conclusions

The cost of capital and life-cycle features are the primary determinants of the decision to move from a rental unit to owner-occupied housing. These demand side features are the primary determinants of single-family housing starts.

The supply side is more important for rental realty starts because a comfortable return must be earned before

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associated with tax shelters are likely to have been eliminated or greatly reduced by TRA 86.

[10]Landlords of one, two, and three unit rentals may have motives other than profits in setting rent levels. For example, they may have long-term relationships with tenants and a commitment not to raise rents.

such an investment will be initiated. Of course, to earn such a return, there must be a demand for rental units.

An optimal vacancy rate is necessary to allow for the movement of households and for a rental adjustment. The number of real estate starts in a given period should adjust around the vacancy rate, assuming a perfect market with no interruptions. When the cost of an investment is changed through the use or elimination of tax incentives, the ideal vacancy rate, from the investors perspective, may initially change.

The available supply of rental realty should change as the number of starts adjust to new tax laws. This change in supply should force a change in the vacancy level. Eventually the tax law changes should be impounded in the rent level. This shifting of the tax burden to renters has an indirect impact on the equity of the tax law.

CHAPTER IV

RESEARCH METHODOLOGY

A summary of the methodology to be used in the empirical analysis is provided in this chapter. Two general models are discussed, one for multi-family housing starts and one for single-family housing starts. The period from 1974 to 1991 will be examined.

The models to be used and variables within these models are provided in the next section. After this, data sources and variable construction will be discussed. The chapter will then be concluded with a summary of the procedures used in the statistical analysis.

The Starts Models

The first part of the study is an analysis of multi-family housing starts. The design is as follows:

Multi-family starts: o x o x o.

The first x represents ERTA and the second x represents TRA 86. Starts are expected to increase as a result of the generous capital recovery provisions of ERTA. For the period after TRA 86, starts are expected to decrease for two reasons. First, the generous capital recovery provisions were eliminated by TRA 86. Second, TRA 86 enacted other tax provisions, such as the passive loss rules, that increased the tax burden associated with rental realty investments.

Single-family housing starts are examined in the second part of the study. ERTA and TRA 86 are expected to have had only minimal impact on single-family starts. The starts models to be estimated in the pooled analysis are based on the theoretical development provided in Chapter III. These models are constructed as follows.

$$MFS = b0 + b1(R) + b2(RVR) + b3(UN) + b4(NIR) + b5(DEP) + b6(ERTA) + b7(TRA86) + b8(ERTA*RVR) + b9(TRA86*RVR) + e; \text{ and} \quad (7)$$

$$SFS = b0 + b1(RCC) + b2(HVR) + b3(UN) + b4(RIN) + b5(DEP) + b6(ERTA) + b7(TRA86) + e \quad (8)$$

where,

MFS = multi-family starts;

R = real rent;

RVR = rental vacancy rate;

UN = unemployment rate;

NIR = nominal interest rate;

DEP = total deposits in SAIF-insured institutions;

ERTA = 1 if period is post-1981 and pre-1987, otherwise ERTA = 0;

TRA86 = 1 if period is post-1986, otherwise TRA86 = 0;

SFS = single-family starts;

RCC = ratio of real rent level to the cost of capital for homeownership;

HVR = housing vacancy rate;

RIN = real income level; and

e = error term.

Multi-Family Equation--Variable Discussion

The real rent (R) should be positively related to multi-family housing starts because it represents part of the profits for owners/developers.[1] This result was found in prior research [Dipasquale & Wheaton, 1989; Jaffee & Rosen, 1979; Rosen 1979]. Consistent with this prior research the rental vacancy rate (RVR) should be negatively related to multi-family housing starts. This result is expected because RVR is an indication of demand. A low vacancy rate is an indication to builders that rent charges should increase, allowing for additional profits.[2] This should also be an indication to builders that total rents collected will be high.

The nominal interest rate (NIR) is included for two reasons. First, interest payments directly affect the profits of owners/developers. Second, the interest rate is an indicator of the cost of capital. Consistent with prior research [Jaffee & Rosen, 1979], it is anticipated that a high nominal interest rate is associated with decreased starts. A separate measure of money

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[1]The term real rent refers to rent adjusted for inflation.

[2]Some cities have rent controls which interfere with the equilibrium process.

availability (DEP) is also included. Higher deposits in SAIF-insured (savings association insurance fund-insured) institutions should be associated with higher starts. This variable is included in the model because prior research has shown that the availability of money/credit has a direct impact on housing starts [Goebel, Guntermann, & Koch, 1986; Jaffee & Rosen, 1979].

Unemployment rate (UN) is included because it allows for the impact of general economic conditions on real estate development and potential growth in demand for rental realty. The interaction terms are entered into equation 7 to allow for the possibility that owners/ developers reacted differently to rental vacancy rate across the three time periods.

The equation to be estimated for multi-family starts is based on the theoretical starts model developed in Chapter III (equation 6). The theoretical model included the rental cost of capital, vacancy rate, and expected growth. Various components of the rental cost of capital are included in the starts equation to be estimated. These components include the real rent, interest rate, and tax costs or subsidies.[3] Major tax cost or subsidy

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[3]Construction costs were initially considered, but prior start studies indicated these costs were insignificant in explaining real estate starts. After some consideration, including a discussion with a builder, it was concluded that construction costs are very unpredictable and change very rapidly, which explains why

changes are incorporated in the model through dummy variables. The use of the dummy variables allows for the intercept to change across the three time periods. Further discussion of the intercepts and hypotheses testing are provided in the final section of this chapter. The vacancy rate is entered directly. Expected growth is captured by the unemployment rate variable.

It is quite likely that owners/developers were slow to respond to the generous capital recovery provisions of ERTA. This slowness may have been a result of time needed to comprehend the impact of new tax provisions and plan for additional construction. Thus, the multi-family starts model is also estimated with 1981 excluded.

To allow for regional differences, models are also examined for each of the four regions--the Northeast, Midwest, South, and West. The models used to test the hypotheses for each region are reduced-form models based on analysis of the data by region. This procedure is discussed in detail in the final section of this chapter.

Single-Family Equation--Variable Discussion

RCC incorporates both the real rent level and the cost of capital for homeownership. The ratio (RCC) is the cost of renting relative to the cost of capital for

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these costs have not been highly correlated to real estate starts.

homeownership. This is the theoretical specification of this variable, based on the discussion in Chapter III. This variable is directly related to the tenure decision and is expected to be positively related to single-family starts. Equation 1 (developed in Chapter III) is the starting point in determining the cost of capital for homeownership. As will be seen in Chapter V, various versions of this variable are examined and the reduced-form variable includes only the nominal interest rate less current housing price inflation.

Housing vacancy rate (HVR) is included to allow for the possibility that builders will build in advance when the number of single-family homes on the market is low. Unemployment rate (UN) is entered into the equation to allow for general economic conditions. Real income level (RIN) is entered into the model because substantial increases in income are hypothesized to be associated with increased demand for single-family homes. All variables are examined; however, due to multicollinearity, only reduced-form models are presented in Chapter V.

The equation to be estimated for single-family starts is based on the theoretically derived model for owner-occupied housing in Chapter III (equation 2). Two differences between the theoretical model and the equation to be estimated require explanation. First, the estimation is based on single-family starts, while the

theoretical equation is expressed in terms of demand for owner-occupied housing. It is expected that new single-family homes are built as a result of demand for new owner-occupied housing. Although some of these units may be built due to increased demand for single-family rental units, data is not available that separates single-family starts into rental and non-rental units. However, it is expected that a change in the demand for single-family rental units, resulting from tax law changes, will have an insignificant effect on single-family starts. The use of dummy variables for ERTA and TRA 86 provide a test for this expectation. This testing procedure is detailed in the final section of this chapter.

Second, household size is hypothesized to be related to the demand for owner-occupied housing. However, this variable is not specified in the equation to be estimated for single-family homes. This decision was based on a review of prior research. Rosen [1979] found demographics such as household size to be significant in a cross-sectional analysis of the tenure decision. However, Rosen and Rosen [1980] used a similar model in a time series study and found demographics such as household size to be unrelated to the tenure choice decision. Together these findings indicate that demographics are important in the tenure choice decision, but are overridden by income and

general economic conditions when comparing one year to the next.

To examine the different regions of the country, models for each region are examined separately. The models chosen are based on an analysis of the variables and their contribution to reducing the variation in explaining housing starts. The procedures used in determining these models is discussed in the final section of this chapter.

Data Sources and Variable Construction

A summary of the data sources used in the empirical analysis is provided in this section. Also provided is a discussion of the manner in which all variables are constructed. The time period covered in the analysis is 1974 through 1991. Yearly data is accumulated for the four census regions of the United States. A listing of the states in the four regions is provided in Table 4.1.

The discussion of variables and data sources is divided into three categories. First, multi-family housing starts, single-family housing starts, rental vacancy rates, and housing vacancy rates will be discussed. Second, the components of the cost of capital for homeownership will be discussed. These components include the property tax rate, the economic depreciation rate, the marginal tax rate of a new homeowner,

TABLE 4.1

States by Region

Northeast	Midwest	South	West
Connecticut	Illinois	Alabama	Alaska
Maine	Indiana	Arkansas	Arizona
Massachusetts	Iowa	Delaware	California
New Hampshire	Kansas	Florida	Colorado
New Jersey	Michigan	Georgia	Hawaii
New York	Minnesota	Kentucky	Idaho
Pennsylvania	Missouri	Louisiana	Montana
Rhode Island	Nebraska	Maryland	Nevada
Vermont	North Dakota	Mississippi	New Mexico
	Ohio	North Carolina	Oregon
	South Dakota	Oklahoma	Utah
	Wisconsin	South Carolina	Washington
		Tennessee	Wyoming
		Texas	
		Virginia	
		West Virginia	

expected housing price inflation. Finally, a discussion of the unemployment rate and variables that require the use of real numbers will be provided. Real deposits in SAIF-insured institutions, real rent level, and real income level are in this latter category. A summary of the data sources are provided in Table 4.2.

Housing Starts and Vacancy Rates

Information for single-family starts, multi-family starts, rental vacancy rate, and housing vacancy rate is obtained from the U.S. Department of Commerce series on construction.[4] All of this information is published on a yearly basis by census region.

The housing starts series is based on housing units authorized by building permit for each year and includes almost all permit issuing locations in the United States. Data is published for structures with one housing unit, two housing units, three and four housing units, and five or more units. Structures with one housing unit are used in the single-family equation and structures with five or more units are used in the multi-family equation. Of some concern is the possibility that multi-family starts will contain some condominiums which may be built for

[4]The series on construction includes the housing starts series, vacancy rate series, and housing price inflation series.

TABLE 4.2

Summary of Data Sources

VARIABLE	DATA SOURCE
1. Multi-family housing starts	Housing units authorized by building permit--construction report series, U.S. Department of Commerce, series C40.
2. Single-family housing starts	Housing units authorized by building permit--construction report series, U.S. Department of Commerce, series C40.
3. Rental vacancy rates	Construction report series, U.S. Department of Commerce, series C27.
4. Housing vacancy rates	Construction report series, U.S. Department of Commerce, series C27.
5. Population age 18 and over	Current Population Reports, U.S. Bureau of the Census.
6. Property tax rate	The rate of 1.7 percent is used (see discussion).
7. Economic depreciation rate	The rate of 1.8 percent is used (see discussion).
8. Marginal tax rate	Derived from Ernst & Young panel tapes for ERTA and pre-ERTA period. The rate of 15 percent is used for TRA 86 years (see discussion).

Table 4.2 (Continued)

VARIABLE	DATA SOURCE
9. Nominal interest rate	Rates and terms on conventional home mortgages, Federal Housing Finance Board, various issues.
10. Housing price inflation	Construction report series, U.S. Department of Commerce, series C27.
11. Unemployment rate	U.S. Bureau of Labor Statistics, Employment and Earnings.
12. Rent level	Consumer price index, detailed report.
13. Deposits in SAIF-insured institutions	Office of Thrift Supervision, Savings and Home Financing Source Book.

owner-occupancy. However, the fraction of multi-family units (five or more units) that are renter-occupied has grown slightly over the years [DiPasquale & Wheaton, 1989, p. 10]. To further mitigate this problem, structures with two housing units and three or four housing units are not included in the analysis of multi-family starts because they may contain a large number of condominiums built for owner-occupancy. In contrast, multi-family starts of five or more units are more likely to be primarily apartment starts.

Due to population growth, housing starts should have increased over the time period examined. To account for this growth, models are constructed with housing starts weighted by total population age 18 and over. Population information is available by region of the country from the U.S. Bureau of the Census, Current Population Reports. This information is available for all years except 1991. An estimation procedure is used for 1991. The same percentage increase in population that occurred from 1989 to 1990 is assumed to have occurred from 1990 to 1991.

Housing vacancy rates and rental vacancy rates are available by region of the country from the U.S. Department of Commerce series on construction. This series is based on a survey conducted by the Department of Commerce and is published yearly.

Cost of Capital Components

The cost of capital is represented by equation 1 from Chapter III. An analysis of the various components of this equation is done and a final formulation is then used in the models used in the statistical testing procedures. Components of this equation are the property tax rate, the economic depreciation rate, marginal tax rate of a new homeowner, nominal interest rate, and expected housing inflation. The property tax rate and economic depreciation rate are estimated. The property tax rate used is 1.7 percent and the economic depreciation rate used is 1.8 percent. These estimates are consistent with estimates used in prior research [Hendershott & Shilling, 1982, p. 112].

Marginal Tax Rate. The marginal tax rate of a new homeowner is estimated from the University of Michigan, Ernst & Young Individual Taxpayer Panel Data for the pre-ERTA and ERTA period. For the TRA 86 period the rate of 15 percent is used. This latter rate is based on the 1985 American Housing Survey [DiPasquale, 1989]. DiPasquale estimated this rate based on the income of new homebuyers in the 1985 survey.

The marginal tax rates were derived from the Ernst & Young panel tapes as follows. Using the panel, which contains observations for the years 1979 through 1986, each set of two consecutive years was examined [i.e., 1979

and 1980, 1980 and 1981, etc.]. Taxpayers not contained in both years of a two-year set were eliminated from that set. Next, an estimation of the marginal tax rate of new homeowners for the second year in each set was determined. To be considered a new homeowner, the taxpayer must have deducted home interest in the second year of the set, but not in the first year of the set.

This procedure provided samples of first time homeowners for the years 1980 through 1986. The marginal tax rate and state of residence for each of these new homeowners was then determined. The observations were classified by region and the average marginal tax rate by year was calculated.

Nominal Interest Rate. Information on nominal interest rates is not published by region of the country; however, this information is published by the Federal Housing Finance Board by state. The states were grouped by regions and an average rate by region was determined. Each state's interest rate was weighted by its percentage of population in the region. The interest rate used is the effective home mortgage interest rate since it includes both the contract rate and the initial fees and charges.

Expected Housing Inflation. Expected housing inflation rate is the final component of the cost of capital for homeownership. An estimation of this

expectation is used because expectations cannot be measured. The price index of new one-family houses sold was used in this procedure. Prices in this index are for constant quality homes and are available by region of the country for all years.[5]

Various estimates of housing price inflation were examined. These estimates included a weighted average of prior years', last year's housing price inflation, and the current year's housing price inflation. These estimates are further discussed in Chapter V.

Unemployment Rate and Variables With Real Numbers

For the years 1978 through 1991, the monthly unemployment rate is available by region of the country. The yearly rate used is simply an average of the monthly rates. These rates were obtained from the U.S. Bureau of Labor Statistics and are published in various issues of Employment and Earnings.

Regional rates are not available for the years 1974 through 1977. However, rates are available by state for these years. To estimate the regional unemployment rate, each state's unemployment rate is weighted by the state's contribution to total population in the region.

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[5]A constant quality home refers to a home with the same housing characteristics such as number of bedrooms, overall size, and location.

Real numbers are used for mean family income, rent, and deposits in SAIF-insured institutions. Although mean family income in real numbers is unpublished, these numbers were obtained directly from the Department of Commerce.

The nominal index published by the Bureau of Labor Statistics is the starting point in computing the real rent index. Regional amounts are available for the years 1978 through 1991. For the years 1974 through 1977, indexes for available cities are used to derive regional indexes. In deriving these indexes for the earlier years, weights obtained from the Bureau of Labor Statistics are used. Nominal rate by region is then divided by the overall consumer price index by region to obtain a measure of the regional real rent level.

The final variable that requires the use of real numbers is total deposits in SAIF-insured institutions. Total deposits are available by state from the Savings and Home Financing Source Book. Total deposits for the region are obtained by adding the deposits for the states in a region. These amounts are then weighted by the population age 18 and over in each region. This eliminates any long-term trend in deposit growth due to population growth. To convert this nominal number into a real number, deposits are then divided by the consumer price index.

Statistical Methodology

In this section, an overview of the statistical methodology used in the analysis is provided. First, a general discussion of the statistical method is provided. A discussion of the procedures used in the pooled analysis is provided after this. Finally, the procedures used in the regional models are detailed.

The statistical procedure used is analysis of covariance (ANCOVA).[6] Three levels are examined in this study for all models. The three levels correspond to the three periods examined, the pre-ERTA period, the ERTA period, and the TRA 86 period. In the models examined, the intercepts are allowed to change across these three time periods. Also, ANCOVA allows for the introduction of additional variables into the model. These additional independent variables are generally referred to as covariates, and the slopes of the covariates are allowed to change across the three time periods.

The covariates are introduced into the model to control for the impact other variables have on multi-family and single-family housing starts. Controlling for the other variables is important, since the intent of the study is to isolate the impact of ERTA and TRA 86 on

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[6]See Chapter 14 of An Introduction to Statistical Methods and Data Analysis (Ott, 1988) for a basic introduction to ANCOVA.

multi-family and single-family starts. The p-value used in all statistical testing is .10.

In the pooled models, the statistical procedures begin by testing to see if the slopes of the covariates are significantly different across the three time periods examined. Testing in the multi-family model shows no significant differences in the slopes of the covariates across the three time periods. Because of these constant slopes, testing for the impact of ERTA and TRA 86 on multi-family starts involves a comparison of the intercepts. If the ERTA period intercept is significantly higher then the intercept for the pre-ERTA period, hypothesis one, that ERTA was not associated with an increase in new construction of rental realty, can be rejected. If the TRA 86 intercept is significantly lower then the ERTA intercept, hypothesis four, that TRA 86 is not associated with a decline in starts of rental realty, can be rejected.

Testing in the pooled single-family model is performed in a similar fashion. In this model, the slope of the cost of capital variable is significantly different across time periods. Thus, tests are performed to determine if the intercepts change at various levels of the cost of capital variable. A statistically significant difference between the pre-ERTA and the ERTA intercept, at various levels of the covariates, is consistent with

hypothesis three, that ERTA is associated with a change in single-family starts. A statistically significant difference between the ERTA and TRA 86 intercepts, at various levels of the covariates, is consistent with hypothesis six, that TRA 86 is associated with a change in single-family starts.

As a result of multicollinearity and the small sample size, the procedures involved in the analysis of the regional models is more complex then the analysis of the pooled models. The details of these procedures are discussed below. Overall, this analysis has three steps. In the first step, the covariates are examined to determine problems with multicollinearity. After this, models which best control for factors other than tax law changes are isolated. Finally, coefficients are estimated for these models and hypotheses testing is performed.

First, pearson correlation coefficients comparing each covariate to the dependent variable and comparing each covariate to the other covariates are determined for each time period and region combination. Based on these coefficients and a factor analysis, reduced-form models are developed.[7]

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[7]The factor analysis allows for a determination of which covariates contribute the most to an underlying factor driving the relationship between the covariates and the dependent variable.

To provide further support for the reduced-form models used in the analysis, regressions with various combinations of the covariates are examined. Of primary interest in this analysis is the variance inflation factors (VIF). The VIF scores provide a formal method of detecting the presence of multicollinearity. These factors measure how much the variance of the estimated regression coefficients are inflated as compared to when the independent variables are not linearly related (Neter, Waserman, & Kutner, 1989). A high VIF score is an indication that multicollinearity may be influencing the least squares estimates.

In summary, when the pearson correlation coefficient shows a high correlation between two covariates, a regression including the two covariates is then examined. If the VIF scores in the regression are high, the conclusion is made that the covariates have a strong linear relationship and generally contain the same information. Thus, inclusion of both in the analysis of covariance model is not necessary.[8] The factor analysis is also useful in picking which covariates best represent the underlying factor driving the multicollinearity.

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[8]Recall that ANCOVA is used in an effort to control for the effect of variables other then the tax acts under examination. Thus, the objective of this procedure is to provide the best models to test the hypotheses.

Once single-family and multi-family reduced models for each region are isolated, statistical testing is performed. First, slopes are examined to determine if a significant difference exists in the three time periods. It is generally found that a significant difference exists in the slopes across the three time periods. Thus, the models generally contain different slopes and intercepts for each time period. Next, regression estimates are determined for these reduced models. Based on these regression estimates, the estimated starts for each time period are determined. These estimates are determined for three levels of the covariates, the mean level, the 25 percent quartile, and the 75 percent quartile. F-tests are performed to determine if a significant difference exists in starts at each of these levels.

For example, the estimated starts for the South is determined in the multi-family model for the pre-ERTA and the ERTA period, holding the covariates at a certain level. An F-test is then performed on the estimated starts for the pre-ERTA and ERTA period. If a significant difference exists, hypothesis one, that ERTA is not associated with a decline in starts of rental realty, can be rejected for the South region of the country. These procedures are used for each region of the country for both single-family and multi-family housing starts.

One additional part of the analysis involves the comparison of slopes across time periods. As previously mentioned, in some of the models examined the slopes for different time periods are significantly different (as determined by F-tests). The difference in slopes may result for a couple of reasons. An increase in the slope from one time period to the next may be a result of the changing tax law or it may be the result of a changing economic environment. An example will help to illustrate this point.

Assume the coefficient for the deposits variable in one of the multi-family models has a slope of 3 in the pre-ERTA period and a slope of 3.8 in the ERTA period. The interpretation of this coefficient is that 3 units are built for each additional dollar of per capita deposits in the pre-ERTA period. In the ERTA period, 3.8 units are built for each additional dollar of per capita deposits. This heavier building in the ERTA period may result because of the tax law changes. As an alternative explanation, the amount of deposits alone may not fully capture the change in money availability in the ERTA time period. In the later case, the higher coefficient may result because at the same level of deposits in the ERTA period, in contrast to the pre-ERTA period, money may be

more readily loaned out.[9] The analysis is discussed further and results are presented in Chapter V.

[9]For this second interpretation to hold, it must be assumed that some loans that were made during the ERTA period would not have been made during the pre-ERTA period.

CHAPTER V

DATA ANALYSIS

The data analysis and hypotheses testing is discussed in this chapter. The first step in the analysis is an examination of the full models developed in Chapter IV. A pooled longitudinal analysis, including the four main census regions of the country without allowing for regional differences, is used. After analyzing the results and considering some of the possible explanations, it is determined that regions should be examined separately because some of the variables are likely to behave differently across regions. Thus, the analysis is extended to the regional level and separate conclusions are drawn for each region.

The remainder of this chapter is divided into several sections. In the first section, the analysis of the multi-family model without allowing for regional differences is provided. Next, the analysis at the regional level is presented for multi-family starts. After this, the single-family analysis is given. First, a pooled analysis and then the regional models are presented. Following this discussion, a summary and conclusions are presented.

Multi-Family Models Without Regional Differences

Time interactions are first examined so that the multi-family model can be tested. These tests show that the slopes of the covariates do not change over the three time periods. Because no significant difference exists in the slopes of the independent variables across time periods, the models used for hypotheses testing have only one slope for each covariate. Next, two regressions are analyzed. The first regression (Model 1) includes all years, 1974 through 1991, and the second regression (Model 2) includes these same years with the exception of 1981. The second regression omits 1981 because it may take a period of time for owners/investors to incorporate tax law changes into their investment decisions. A summary of the two models and their coefficient of correlation is provided in Table 5.1. The parameter estimates, T values, and probabilities greater than T for Models 1 and 2 are provided in Tables 5.2 and 5.3.

TABLE 5.1

National Model Summary

Model	Years included	R-SQ
1 (n=72)	1974-1991	.8903
2 (n=68)	1974-1991 (1981 omitted)	.8965

TABLE 5.2

National Model--All Years (n=72)

Variable	Parameter Estimate	T Value	Prob > T
Time 1	7.38155	1.57	.1213
Time 2	8.136876	1.671	.0996
Time 3	6.242742	1.316	.1929
RVRL	.072508	.745	.4589
DEP	.783845	7.498	.0001
R	-5.191356	-1.591	.1165
NIR	-.153583	-1.276	.2065
UR	-.180801	-1.893	.0628

Time 1 = intercept for the pre-ERTA period;

Time 2 = intercept for the ERTA period;

Time 3 = intercept for the TRA 86 period;

RVRL = rental vacancy rate lagged one year;

DEP = deposits;

R = real rent;

NIR = nominal interest rate; and

UR = unemployment rate.

TABLE 5.3

National Model--Without 1981 (n=68)

Variable	Parameter Estimate	T Value	Prob > T
Time 1	6.645174	1.403	.1657
Time 2	7.375827	1.505	.1376
Time 3	5.485138	1.148	.2557
RVRL	.079591	.815	.4181
DEP	.788939	7.531	.0001
R	-5.051771	-1.538	.1292
NIR	-.087355	-.688	.4943
UR	-.197987	-2.016	.0483

Time 1 = intercept for the pre-ERTA period;

Time 2 = intercept for the ERTA period;

Time 3 = intercept for the TRA 86 period;

RVRL = rental vacancy rate lagged one year;

DEP = deposits;

R = real rent;

NIR = nominal interest rate; and

UR = unemployment rate.

Deposits (money availability) is positive and highly significant (at the .001 level) in both models. This suggests that as deposits increases, there is an associated increase in multi-family housing starts. Unemployment rate is generally negative and significant (at the .06 and .05 level in Models 1 and 2, respectively), suggesting that as the unemployment rate increases, starts decrease. In both models, the rental vacancy rate lagged, rent, and nominal interest rate are not significant.

For each of the two models, tests of significant changes in the intercepts are performed for each time period. The results are shown in Table 5.4.

TABLE 5.4

Test of Time Period Differences

Model	Test	F value	Prob > F
1	Time 1 vs. Time 2	3.5643	.0636
1	Time 2 vs. Time 3	17.3523	.0001
2	Time 1 vs. Time 2	3.4061	.0699
2	Time 2 vs. Time 3	17.587	.0001

The Time 1 intercept is significantly different from the Time 2 intercept in both models (p=.06 in Model 1 and p=.07 in Model 2). A significant difference is also shown between the Time 2 and Time 3 intercepts (p=.0001 in both Model 1 and Model 2). The direction of the change is as expected for both models.[1] These results are consistent with the rejection of Hypothesis One (ERTA is not associated with an increase in the starts of rental realty). Based on these results, Hypothesis Four (TRA 86 is not associated with a decrease in the starts of rental realty) can also be rejected. ERTA appears to be associated with a rise in rental realty starts and TRA 86 appears to be associated with a decline in rental realty starts. Tests show that no significant difference exists in the rental vacancy rate coefficient in going from Time 1 to Time 2 and in going from Time 2 to Time 3.

Based on these results, Hypotheses Two (ERTA was not associated with an increase in vacancy rates) and Five (TRA 86 is not associated with a decline in vacancy rates) cannot be rejected. However, regional differences are likely to exist as areas of high growth should have higher starts at high vacancy levels compared to areas of low growth with a similar vacancy rate. Also, increased

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[1]The coefficient for the Time 2 intercept is larger than the coefficient for the Time 1 intercept and the coefficient for the Time 3 intercept is smaller than the coefficient for the Time 2 intercept.

(decreased) rental vacancy rates as a result of ERTA (TRA 86) may not occur for several years after the increase (decrease) in starts. In such a situation, the change in rental vacancy rates caused by the tax acts may not show up in a comparison of slopes. Thus, the regional models and graphical analysis discussed in the next section should allow for additional examination of Hypotheses Two and Five.

Multi-Family Regional Models

Analysis of the data indicates that regional differences are likely to exist. Thus, the data and models for each of the four regions are analyzed separately. A correlation analysis of each independent variable with the dependent variable (multi-family starts) is conducted for each of the four regions and each of the three time periods. Also, the correlation of the independent variables with one another is examined. This is also done by region for each time period. The Pearson correlation coefficients indicate that multicollinearity is very high among the independent variables.

Various regressions are performed with different combinations of variables for each time period and region. The variance inflation factors (VIF) are analyzed for these various regressions and indicate that very high multicollinearity exists in the models. Thus, the VIF

scores and adjusted R-squared for various models, a factor analysis, and graphs were all examined in selecting the best models to be used in testing the hypotheses for each region. This approach is acceptable since the objective of the study is to examine the impact of the tax acts on real estate starts and to determine how the vacancy rate is affected. Other variables must be considered to properly accomplish this.

Not all independent variables can be included in the regional models because of high multicollinearity and the small sample size. Thus, models that fit well and allow hypotheses testing are used. A summary of the results and models used to test the hypotheses are provided below.

Correlation Coefficients

Table 5.5 provides the Pearson correlation coefficients and related p-values between the dependent variable (multi-family starts) and the independent variables (deposits, real rent, nominal interest rate, unemployment rate, rental vacancy rate lagged one year, and rental vacancy rate). Deposits generally have a high correlation with starts in all periods and rent has a high correlation with starts in periods two and three in most regions. Other variables have a high correlation in some time periods and some regions. In Table 5.6, correlations between the independent variables are shown. Deposits and

TABLE 5.5
PEARSON CORRELATION COEFFICIENT
(STARTS BY INDEPENDENT VARIABLES)

Time	Region	DEP.	RENT	NIR	UR	RVRL	RVL
1	1	+.02564 (.9565)	+.31163 (.4963)	-.35333 (.4369)	-.58117 (.1712)	+.13302 (.7762)	+.21006 (.6512)
	2	+.75846 (.0481)	+.18535 (.6907)	-.424 (.3431)	-.66161 (.1055)	-.46284 (.2956)	-.79317 (.0333)
	3	+.58549 (.1672)	+.00332 (.9944)	+.38612 (.3922)	-.19938 (.6682)	-.92426 (.0029)	-.54036 (.2105)
	4	+.87496 (.0099)	+.34889 (.4431)	-.18308 (.6944)	-.67294 (.0976)	-.59670 (.1573)	-.78612 (.0361)
2	1	+.87240 (.0234)	+.78750 (.0692)	-.81195 (.0497)	-.78385 (.0650)	-.50428 (.3077)	-.32487 (.5298)
	2	+.92880 (.0074)	+.87110 (.0239)	-.92933 (.0073)	-.73547 (.0957)	-.38862 (.4464)	+.47596 (.3400)
	3	+.08993 (.8655)	+.17540 (.7396)	-.18395 (.7272)	+.42738 (.3980)	-.20395 (.6983)	+.09056 (.8645)
	4	+.93909 (.0002)	+.92958 (.0073)	-.91778 (.0099)	-.63002 (.1800)	+.44950 (.3712)	+.64959 (.1627)
3	1	+.93915 (.0179)	+.74436 (.1491)	-.39271 (.5132)	-.84187 (.0737)	-.89074 (.0426)	-.95696 (.0106)
	2	+.96790 (.0069)	+.91805 (.0278)	-.07223 (.9081)	+.16594 (.7897)	+.92050 (.0266)	+.71906 (.1710)
	3	+.97039 (.0061)	+.88415 (.0465)	+.02094 (.9733)	-.12348 (.8432)	+.93317 (.0205)	+.82512 (.0854)
	4	+.94186 (.0167)	+.97848 (.0038)	-.24480 (.6915)	-.46256 (.4328)	+.69314 (.1944)	+.89023 (.0429)

(p-values are in parentheses)

where: DEP = deposits;
RENT = real rent index;
NIR = nominal interest rate;
UR = unemployment rate;
RVRL = rental vacancy rate lagged one year; and
RVR = rental vacancy rate

rents have a strong positive correlation in periods two and three, indicating that no additional information is likely to result from including both variables in a model. Because of this high correlation and the lack of any relationship between rents and starts in the first time period, rents is deleted from the model.[2]

Deposits and nominal interest rate have a strong negative correlation in the second time period. This is the only time period in which nominal interest rate and multi-family starts have very high correlations. Because of the high correlation between deposits and starts in this time period, including the nominal interest rate in a regression model adds very little explanatory power to the model but significantly increases the multicollinearity. Nominal interest rate is deleted from any further consideration in the regional models because of these relationships.

The unemployment rate is generally not highly correlated with starts in the various regions and time periods. In the periods and regions of reasonably high correlation, the unemployment rate is highly correlated

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[2]Regression models with rents and deposits as the only independent variables indicate very high VIF scores, suggesting that these two variables contain the same information.

Table 5.6

PEARSON CORRELATION COEFFICIENTS -- INDEPENDENT VARIABLES

Time	Region	RVR * DEP	DEP. * RENT	DEP. * NIR	DEP. * U.R.	RENT * NIR	RENT * UR	RENT*RVRL
1	1	+.92917 (.0211)	X	X	X	-.9505 (.001)	-.53626 (.2147)	-.43007 (.3355)
	2	-.83016 (.0208)	X	X	X	-.90672 (.0049)	-.51634 (.2356)	+.37493 (.4073)
	3	-.83507 (.0194)	X	X	X	-.89854 (.006)	-.80367 (.0294)	+.25513 (.5808)
	4	-.84522 (.0166)	X	X	X	-.71686 (.0699)	-.57046 (.1811)	+.26423 (.5669)
2	1	+.07834 (.8827)	+.93422 (.0063)	-.97465 (.0010)	-.72340 (.1042)	-.93469 (.0063)	-.75422 (.0832)	-.74250 (.0909)
	2	+.30037 (.5630)	+.84480 (.0343)	-.95020 (.0037)	-.80582 (.0529)	-.85411 (.0304)	-.76799 (.0745)	-.4222 (.4043)
	3	+.99244 (.0001)	+.95020 (.0037)	-.98584 (.0003)	-.36984 (.4705)	-.95677 (.0028)	-.09763 (.8540)	+.87334 (.0230)
	4	+.64601 (.1658)	+.94632 (.0042)	-.95323 (.0032)	-.57898 (.2286)	-.97887 (.0007)	-.49541 (.3177)	+.69948 (.1219)
3	1	-.98851 (.0015)	+.91529 (.0292)	-.06485 (.9175)	-.95670 (.0107)	+.22617 (.7145)	-.97441 (.0049)	-.79950 (.1045)
	2	+.76012 (.1358)	+.91892 (.0274)	-.00474 (.9940)	.00552 (.9930)	-.39786 (.5071)	+.36224 (.5491)	+.77698 (.1221)
	3	+.87320 (.0532)	+.91757 (.0281)	-.13942 (.8231)	-.03945 (.9498)	-.43013 (.4697)	.34120 (.5742)	+.81454 (.0932)
	4	+.90217 (.0362)	+.97637 (.0512)	-.09010 (.8854)	-.69726 (.1906)	-.41883 (.4828)	-.28243 (.6452)	+.58448 (.3007)

(p-values are in parentheses)

TABLE 5.6 (continued)

Time	Region	NIR * UR	NIR * RUR	UR * RVR	RVR * RVRL
1	1	-.54199 (.2088)	-.39557 (.3797)	+.24337 (.5990)	+.54910 (.2017)
	2	+.47422 (.2823)	+.31736 (.4880)	+.32054 (.4834)	+.43245 (.3325)
	3	+.74124 (.0566)	-.37378 (.4088)	-.12395 (.7912)	+.71069 (.0735)
	4	+.00594 (.9899)	-.32331 (.4794)	+.30516 (.5057)	+.78133 (.0380)
2	1	+.76487 (.0764)	-.20507 (.6967)	+.26788 (.6078)	-.31431 (.5441)
	2	+.65036 (.1620)	-.49276 (.3207)	-.17901 (.7344)	-.33859 (.5115)
	3	+.31937 (.5372)	-.97449 (.001)	-.32975 (.5233)	+.94514 (.0044)
	4	+.53502 (.2740)	-.78931 (.0619)	-.49011 (.3237)	+.81232 (.0495)
3	1	-.08889 (.8870)	+.12893 (.8363)	+.90386 (.0353)	+.87112 (.0545)
	2	-.88527 (.0458)	-.59412 (.2908)	+.45816 (.4378)	+.57145 (.3142)
	3	-.86714 (.0570)	-.52151 (.3675)	+.44398 (.4539)	+.75479 (.1403)
	4	-.56843 (.3174)	-.49136 (.4006)	-.38396 (.5234)	+.59664 (.2882)

with deposits.[3] Accordingly, including the unemployment rate in the regional models adds little explanatory power to the models but significantly increases multicollinearity and the VIF scores. Because of these relationships, deposits and rental vacancy rates are the only variables considered in the multi-family starts regional models.

Graphical Analysis and Hypotheses Testing

Midwest. For the Midwest, a plot of starts by year (Figure 5.1) shows that in 1977 and 1978 starts were extremely high. The plot of rental vacancy rate by year (Figure 5.2) shows that the rental vacancy rate for these years was quite low. For time period one, the vacancy rate appears to have a significant negative relationship with starts; however, this relationship disappears in time periods two and three. The plot of deposits by year and starts by year (Figures 5.3 and 5.1) shows a strong positive relationship between starts and deposits. The graphical analysis and various regression runs indicate that the best model to use in testing the multi-family

[3]For example, in region one, the unemployment rate has a relatively high correlation with starts in the second and third time period (p-values=.07). In the same periods, unemployment rate and deposits are also highly correlated (p-values=.1 and .01 for the second and third periods, respectively).

starts hypotheses should include deposits and/or rental vacancy rate for the Midwest.

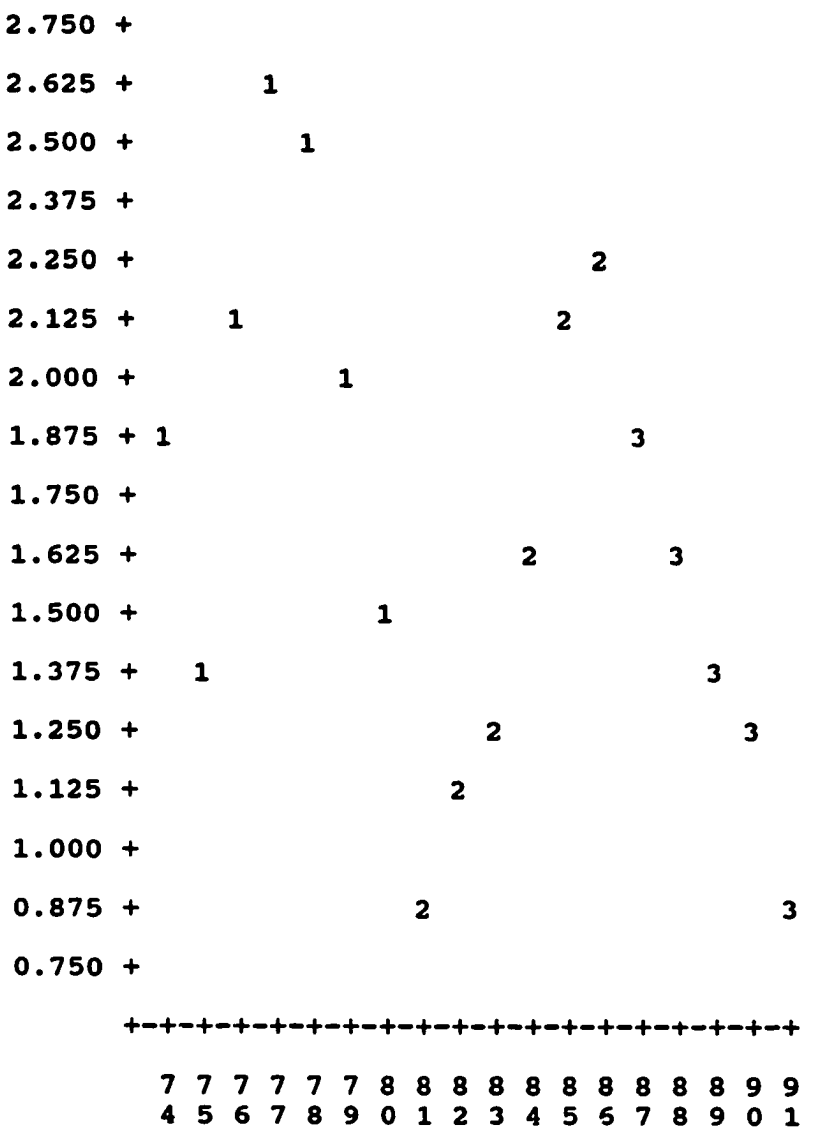

FIGURE 5.1

Starts by Year--Midwest

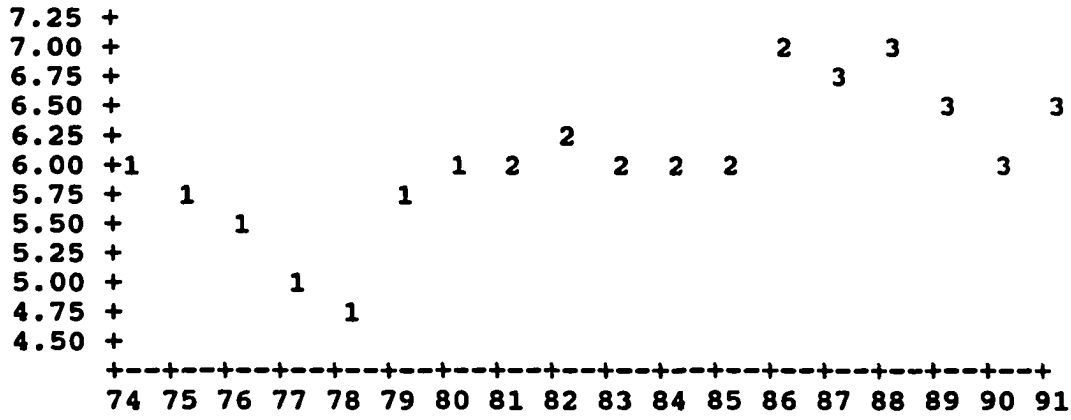

FIGURE 5.2 Rental Vacancy Rate by Year--Midwest

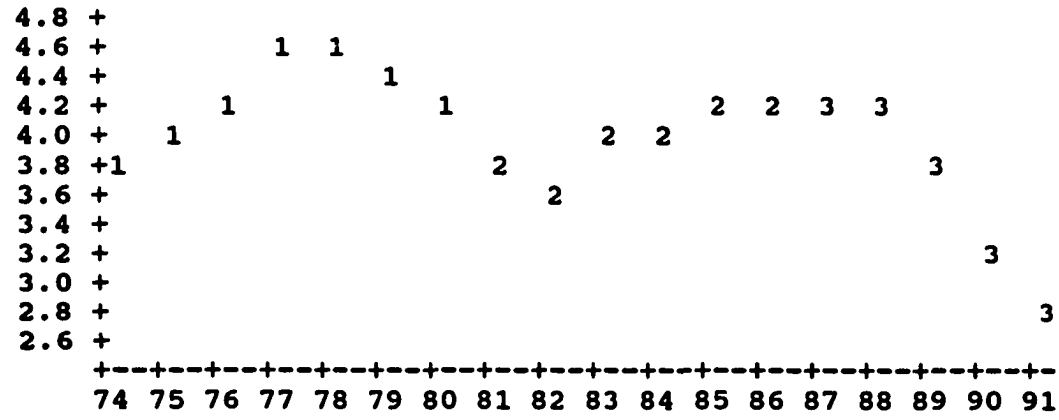

FIGURE 5.3 Deposits by year--Midwest

In Tables 5.7 and 5.8, the results of a model that includes only deposits is examined.[4] Another model with rental vacancy rate was analyzed, but the vacancy rate was found to be insignificant in all three time periods.

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[4]Other variables were included in the model in an effort to improve the predictability. However, the addition of other variables did not improve predictability.

TABLE 5.7

Deposits Only Model Midwest (R-Squared = .9859)

Parameter	Parameter Estimate	T value	Prob > T
Time 1	-2.73	-1.907	.0807
Time 2	-8.028	-3.829	.0024
Time 3	-.892	-1.16	.2685
DEP 1	1.123	3.307	.0063
DEP 2	2.399	4.567	.0006
DEP 3	.6287	2.998	.0111

DEP 1 = deposits in the pre-ERTA period;

DEP 2 = deposits in the ERTA period; and

DEP 3 = deposits in the TRA 86 period.

TABLE 5.8

Actual Starts and Regression Estimates--Midwest

		Deposit Level Used		
		Mean	25%	75%
Period	Actual Mean	(3.971)	(3.839)	(4.225)
Time 1	1.993	1.73	1.58	2.01
Time 2	1.5356	1.50	1.18	2.11
Time 3	1.387	1.61	1.52	1.77

Thus, for the Midwest, hypotheses two and five cannot be rejected.

This model with deposits only explains almost 99 percent of the variation in multi-family starts. A review of Table 5.7 shows that the coefficients for deposits change significantly between time period one and time period two (p-value=.064) and between time period two and time period three (p-value=.0087). In time period one, owners/developers build 1.123 units for each additional dollar of real deposits per capita. In time period two, this increases to 2.3999 and, for time period three, it decreases to .6287. These significant changes in the coefficient for deposits indicates that, at the same level of deposits, more starts occurred in time period two and less starts occured in time period three. This may be a result of increased willingness to lend money in time period two and decreased willingness to lend money in time period three. This may also be attributable to the tax law changes.

In Table 5.8, the actual mean starts is provided in the second column. Estimated starts, at various levels of deposits, is provided in columns three through five (in the bottom three rows).[5] The three deposit levels used

[5]The estimated starts are computed with the coefficients provided in Table 5.7. This same procedure is used for the other regions and also the single-family regional models.

are the overall mean for the Midwest for the years 1974 through 1991, the 25 percent quartile for the same period, and the 75 percent quartile for the same period. These levels of deposits will be used throughout the remainder of this chapter. F-tests show no significant difference in estimated starts for these various levels of deposits. This finding suggests that ERTA and TRA 86 were not associated with increased multi-family housing starts and decreased multi-family housing starts respectively, in the Midwest. Hypotheses one and four cannot be rejected based on these tests. However, the change in the deposits coefficient across the three time periods may be attributable to tax law changes.

Although statistical testing does not allow the rejection of hypotheses two and five, a review of Figure 5.2 suggests that vacancy rates rose during the ERTA period. For the Midwest, rental vacancy rate reached the highest point in 1986 and then remained relatively high through 1988. This is likely a result of heavy construction in the late ERTA period being completed in these later years. The results are similar when this model is examined with 1981 omitted, and with 1981 and 1982 omitted.

West. For the West, a plot of starts by year (Figure 5.4) shows that starts hit a peak in the later ERTA years and then drop off significantly during the TRA 86 period.

The plot of deposits by year (Figure 5.5) generally follows the same trend, except that starts drop in the early TRA 86 period, while deposits remain relatively high. In Figure 5.6, it can be seen that the rental vacancy rate rose significantly during the later years of the ERTA period and the early years of the TRA 86 period, and then dropped during the later TRA 86 period. The increase is likely a result of the heavy building started in the later ERTA period, and completed in this period and the early TRA 86 period. The drop off in vacancy rate is probably a result of the decreased starts in the TRA 86 period, which results in less vacant units.

A review of various regressions indicates that the best models in explaining starts in the West includes only deposits. The deposits-only model is summarized in Tables 5.9 and 5.10.

This model explains almost all of the variation in starts. Deposits is highly significant in all time periods. An F-test indicates that there is no significant difference in the deposit coefficient for time periods one and two. However, there is a significance difference in comparing this coefficient for time periods two and three (p-value = .0358). This suggests that, at the same level of deposits, starts decreased in time period three. This may be an indication that TRA 86 was associated with decreased starts in the West or that the willingness to

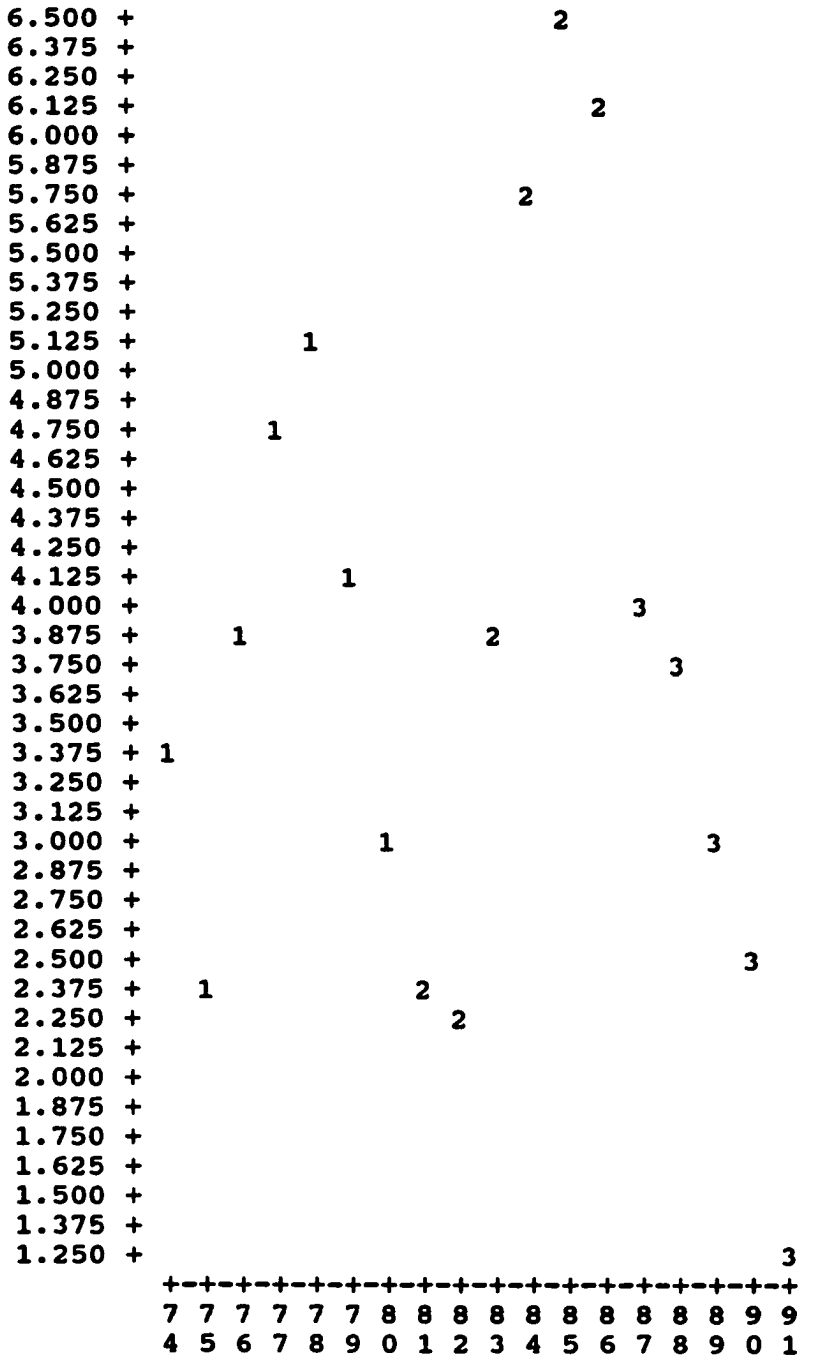

FIGURE 5.4

Starts by Year--West

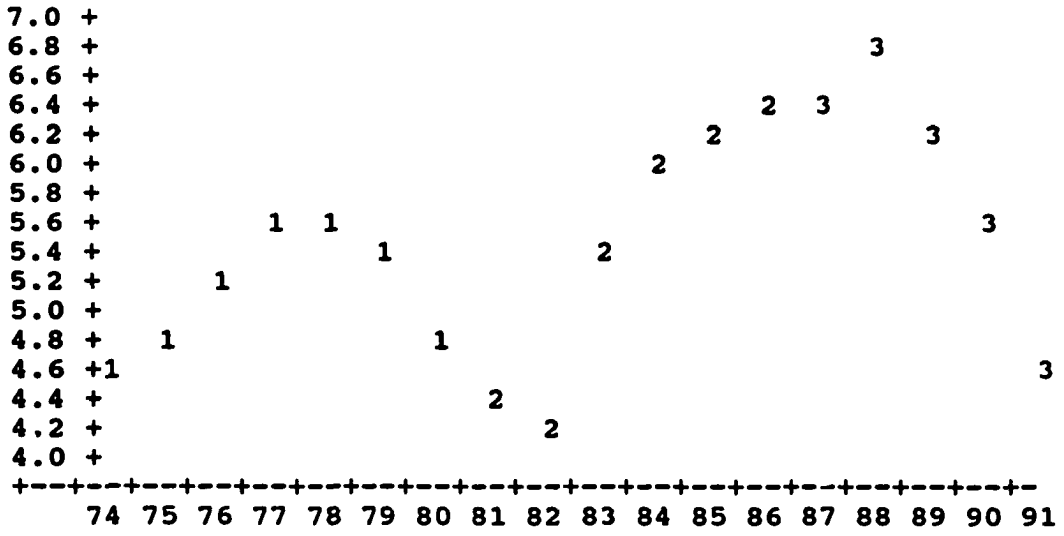

FIGURE 5.5 Deposits by Year--West

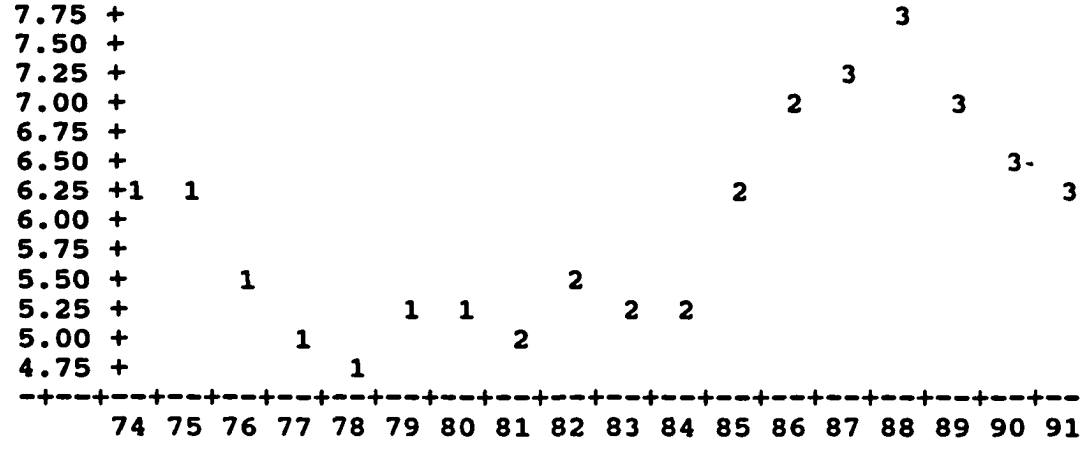

FIGURE 5.6 Rental Vacancy Rate by Year--West

TABLE 5.9

Deposits Only Model--West (R-Squared = .9921)

Parameter	Parameter Estimate	T value	Prob > T
Time 1	-6.32	-3.014	.0108
Time 2	-6.15	-5.495	.0001
Time 3	-4.077	-2.71	.0190
Dep 1	1.974	4.838	.0004
Dep 2	1.94	9.594	.0001
Dep 3	1.182	4.682	.0005

TABLE 5.10

Actual Starts and Regression Estimates--West

		Deposit Level Used		
		Mean	25%	75%
Period	Actual Mean	(5.451)	(4.741)	(6.221)
Time 1	3.798	4.44	3.04	5.96
Time 2	4.45	4.47	3.08	5.97
Time 3	2.91	2.37	1.53	3.28

lend money, at the same level of deposits as before TRA 86, decreased during this time period.

This model is further examined in Table 5.10. The actual mean starts is provided in the second column. In

columns three through five estimated starts is provided, holding the level of deposits constant. F-tests show no significant difference in starts between time period one and time period two, after controlling for deposits. However, at all levels of deposits a significant difference exists between time periods two and three. Overall, these results suggest that, in the West region TRA 86 was associated with a decline in starts but that ERTA was not associated with a change in starts. For the West region, hypothesis one cannot be rejected based on these results, however, hypothesis four can be rejected. These results do not change when the model is run with 1981 omitted, and with 1981 and 1982 omitted.

The next model examined includes the rental vacancy rate (RVR) only. A summary of the results of this model is provided in Table 5.11.

As expected, the sign of the vacancy rate is negative in the first period and significant and then reverses sign in the second period. There is a significant difference between RVR 1 and RVR 2 (p=.0113). This is consistent with the rejection of hypothesis two. However, RVR 3 is still positive and not significantly different from RVR 2. This latter finding is not consistent with the rejection of hypothesis five. However, this is a result of the high vacancy levels in the early TRA 86 period, which coincide with higher deposits and starts. These high vacancy

TABLE 5.11

Rental Vacancy Rate Only Model--West (R-Squared = .9529)

Parameter	Parameter Estimate	T Value	Prob > T
Time 1	11.4598	2.657	.0209
Time 2	-4.417	-1.278	.2254
Time 3	-8.416	-1.346	.2032
RVR 1	-1.408	-1.785	.0996
RVR 2	1.556	2.587	.0238
RVR 3	1.637	1.817	.0943

RVR 1 = rental vacancy rate in the pre-ERTA period;
RVR 2 = rental vacancy rate in the ERTA period; and
RVR 3 = rental vacancy rate in the TRA 86 period.

levels are a result of heavy building in the late ERTA period. Figure 5.6 is consistent with what is expected; vacancy rates rose during the ERTA period and declined in the TRA 86 period for the West region. The results do not change when the model is run with 1981 omitted, or with 1981 and 1982 omitted.[6]

South. Figure 5.7 shows that starts were generally much higher in the South during the middle of the ERTA period. In the early years of this period, 1981 and 1982,

[6]A model with both rental vacancy rate and deposits was examined. However, due to multicollinearity the results are not worth reporting here.

starts were generally very low. This was likely a result of the poor economy, along with the slow reaction to the tax law changes. As can be seen in Figure 5.8, deposits were also low in 1981 and 1982. In Figure 5.7, it can be seen that starts dropped off drastically in the TRA 86 period, which Figure 5.8 illustrates was also a period of low deposits (money availability). As expected, Figure 5.9 shows that the rental vacancy rate rose dramatically over the ERTA period and continued to rise in 1987. This rise in 1987 is likely a result of ERTA starts being completed. Over the TRA 86 period, the rental vacancy rate dropped.

Various regressions were performed which included the rental vacancy rate and deposits. Overall, the best model includes deposits and the rental vacancy rate. Table 5.12 provides a summary of the results.

The parameter estimate for deposits changes significantly when going from time period one to two and time period two to three ($p = .0013$ and $p = .0035$, respectively). Unexpectedly, the rental vacancy rate becomes more negative in time period two ($p = .01$). A review of Figures 5.7 and 5.9 shows that this is a result of decreasing starts from 1983 through 1986, while the vacancy rate is increasing. To further examine these results, a reduced model without deposits for time period one and rental vacancy rate for time period three is

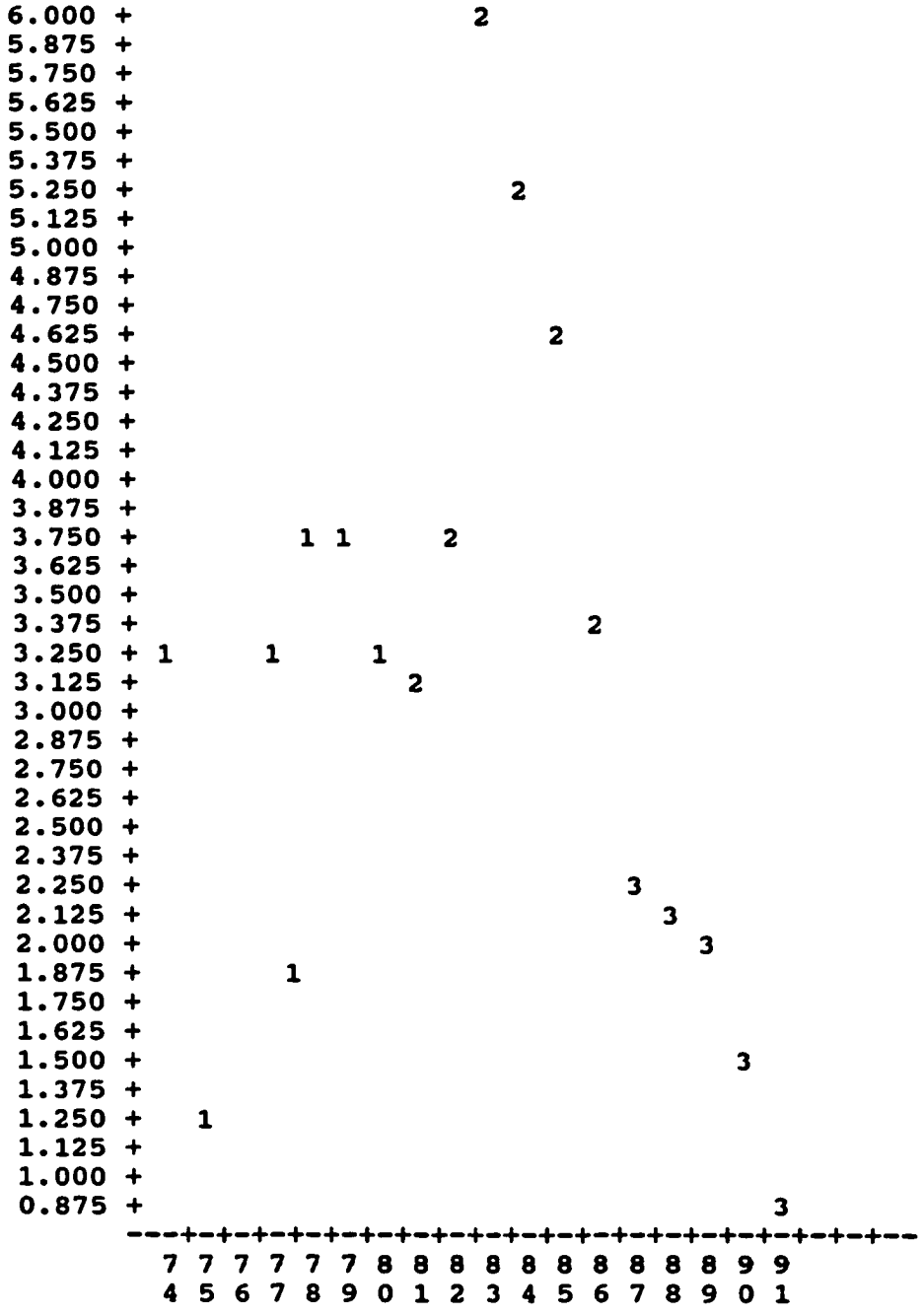

FIGURE 5.7

Starts by Year--South

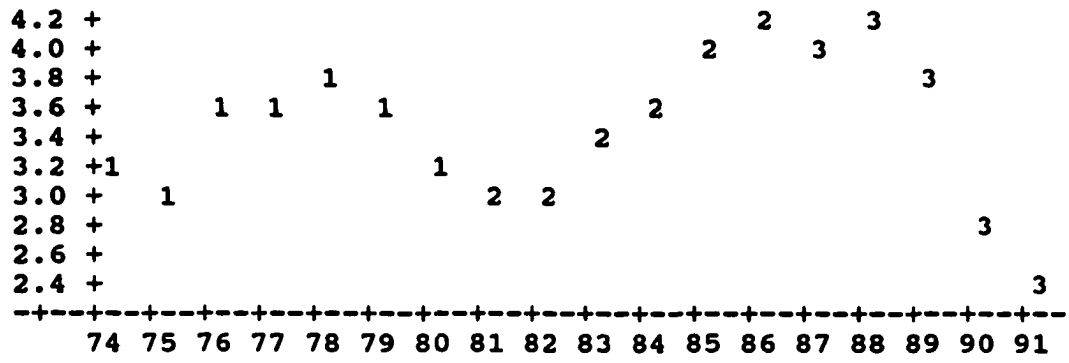

FIGURE 5.8

Deposits by Year--South

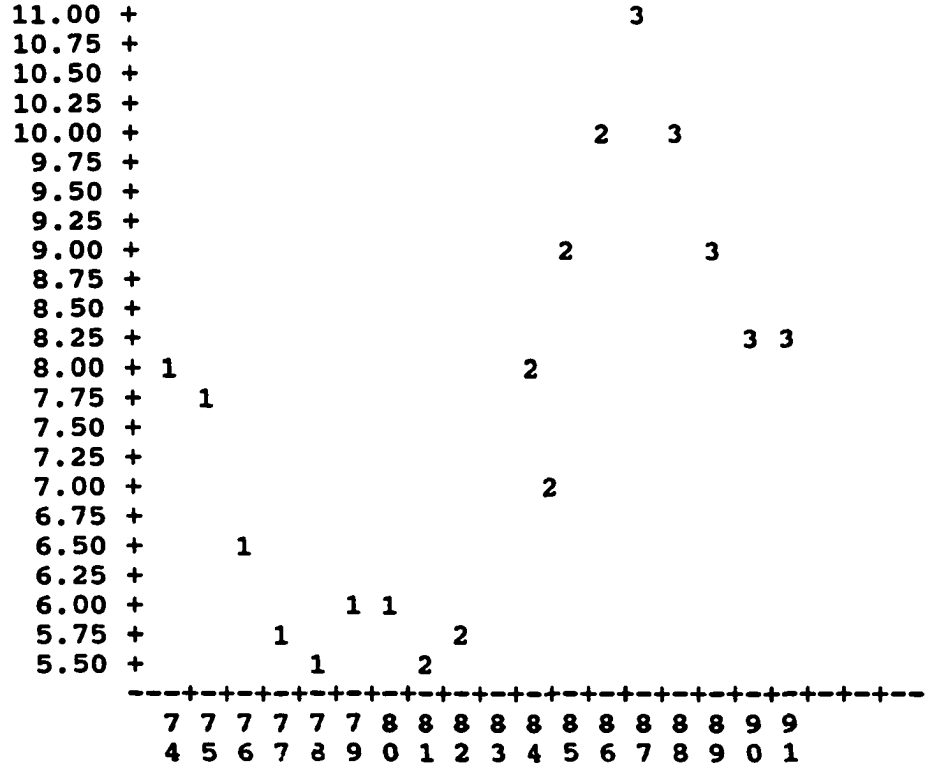

FIGURE 5.9

Rental Vacancy Rate by Year--South

TABLE 5.12

Deposits and Vacancy Rate Model--South (R-Squared = .992)

Parameter	Parameter Estimate	T value	Prob > T
Time 1	9.28	2.223	.0535
Time 2	-4.122	-2.098	.065
Time 3	-.008	-.082	.9362
DEP 1	-.0085	-.01	.9925
DEP 2	7.182	5.545	.0004
DEP 3	.7287	.719	.4903
RVR 1	-.95	-4.154	.0025
RVR 2	-2.452	-5.653	.0003
RVR 3	-.042	-.053	.9586

examined. The adjusted R-squared increases from .984 for the full model to .987 for the reduced model, indicating a reduction in multicollinearity. At the same time, the correlation coefficient does not change. The results of this model are shown in Tables 5.13 and 5.14.

A comparison of the actual number of starts to the estimated number of starts, at the three levels of deposits and rental vacancy rate, precludes the reliability of drawing conclusions based on tests of the differences in the estimated level of starts for the three

TABLE 5.13

Reduced Model I--South (R-Squared = .992)

Parameter	Parameter Estimate	T Value	Prob > T
Time 1	9.242	8.614	.0001
Time 2	-4.122	-2.319	.0406
Time 3	-.5947	-.727	.4823
DEP 2	7.182	6.129	.0001
DEP 3	.6764	2.89	.0147
RVR 1	-.9497	-5.934	.0001
RVR 2	-2.4517	-6.248	.0001

TABLE 5.14

Actual Starts and Regression Estimates I--South

		Deposit and Vacancy Level Used		
		Mean	25%	75%
Period	Actual Mean			
	Deposits:	(3.456)	(3.045)	(3.763)
	RVR:	(7.622)	(6)	(9.1)
Time 1	2.933	2.003	3.5435	.59943
Time 2	4.365	2.0123	3.0373	.5937
Time 3	1.3873	1.7429	1.4649	1.9506

time periods.[7] Overall, support exists for the rejection of hypotheses one and four for the South region because of the significant change in the coefficient for the deposits variable.

Overall, the results do not change with 1981 omitted. A reduced form model with 1981 and 1982 omitted, and including only rental vacancy rate for time periods one and two and deposits for time period three, provides fairly good estimated values. The correlation coefficient and adjusted correlation coefficient of this model have values of .9945 and .9912, respectively, indicating that almost all of the variation in starts is explained. Regression estimates for this model are provided in Table 5.15. The estimated starts, holding deposits and rental vacancy rate at their mean, 25 percent, and 75 percent levels, are provided in Table 5.16.

This model provides more realistic estimates than the previous model. At all levels, highly significant differences exist in starts between time periods one and two and also between time periods two and three. The results of this model suggest that, once 1981 and 1982 are removed from the analysis, ERTA is associated with a significant increase in starts and TRA 86 is associated with a significant decrease in starts. Based on this

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[7]Other variations of this model and the inclusion of other variables do not provide better predictions.

TABLE 5.15

Reduced Model II--South (R-Squared = .9945)

Parameter	Parameter Estimate	T Value	Prob > T
Time 1	9.241658	10.507	.0001
Time 2	10.592815	10.944	.0001
Time 3	-.594658	-.887	.3959
DEP 3	.676398	3.525	.0055
RVR 1	-.949691	-7.238	.0001
RVR 2	-.77654	-6.037	.0001

TABLE 5.16

Regression Estimates II--South

	Deposit and Rental Vacancy Rate Level Used			
	Actual Mean			
	Deposits:	(3.456)	(3.045)	(3.763)
	RVR:	(7.622)	(6)	(9.1)
Period		Mean	25%	75%
Time 1	2.933	2.003	3.5435	.59943
Time 2	4.365	4.6743	5.9338	3.5267
Time 3	1.3873	1.7429	1.4649	1.9506

model, hypotheses one and four can be rejected for the South.

Northeast. Unlike the other regions of the country, the Northeast does not show a significant increase in starts throughout the ERTA period. Furthermore, the decline in starts in the TRA 86 period is slow (see Figure 5.10). Figure 5.11 shows that starts follows deposits fairly well. In Figure 5.12, it can be seen that the rental vacancy rate did not increase over the ERTA period and that, in fact, it rose in the later TRA 86 period. This later rise is likely attributable to starts in the mid to late 1980's being completed. Also, significant unemployment in 1990 and 1991 may have led to lower household formation and demand for rental units, which in turn may have resulted in many vacant units.

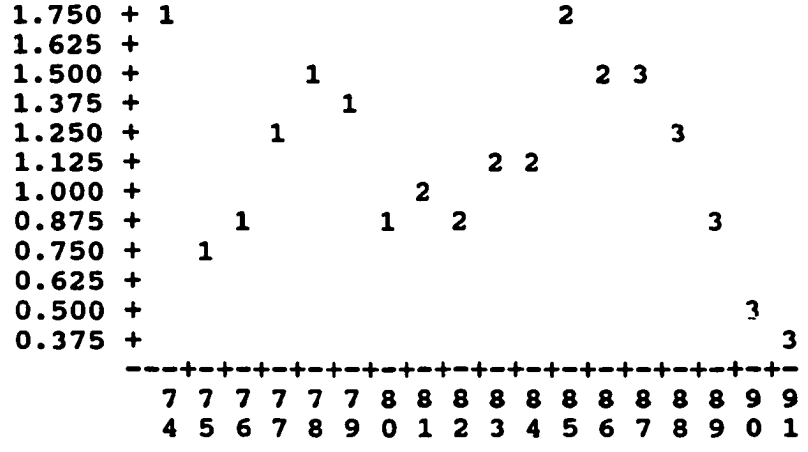

FIGURE 5.10 Starts by Year--Northeast

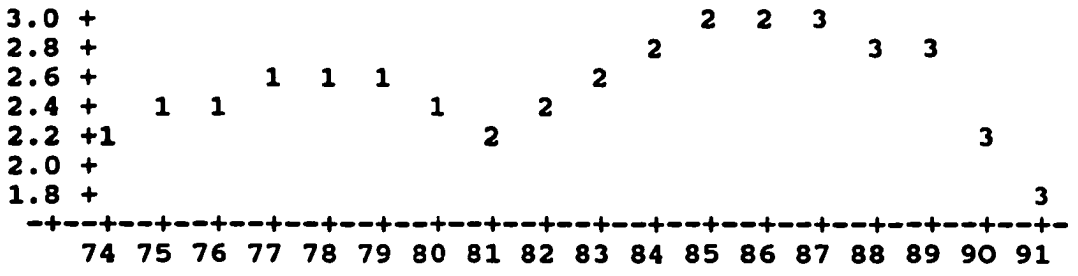

FIGURE 5.11 Deposits by Year--Northeast

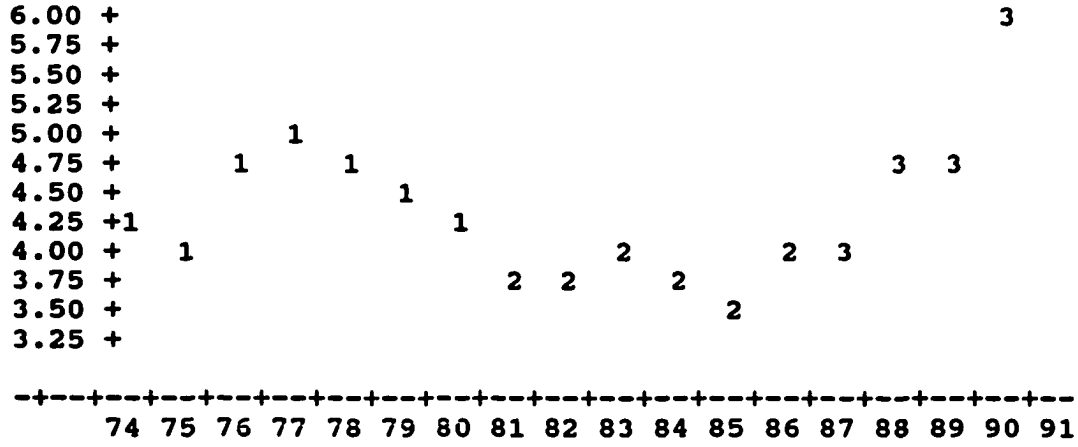

FIGURE 5.12 Rental Vacancy Rate by Year--Northeast

Various models were analyzed which included the unemployment rate, deposits, and rental vacancy rate. The best model in explaining the variation in starts includes deposits only. A summary of this model is provided in Tables 5.17 and 5.18.

Deposits are significant in the second and third time periods, but not in the first time period. The F-tests do not show a significant difference in the parameter estimate for deposits in going from the first to second time period or from the second to third time period. As

TABLE 5.17

Deposits Only Model--Northeast (R-Squared = .9626)

Parameter	Parameter Estimate	T Value	Prob > T
Time 1	1.08	.666	.5181
Time 2	-1.30	-1.237	.2397
Time 3	-1.54	-1.992	.0696
DEP 1	.0499	.076	.9406
DEP 2	.9566	2.421	.0323
DEP 3	.964	3.198	.0077

TABLE 5.18

Actual Starts and Regression Estimates--Northeast

		Deposit Level Used		
		Mean	25%	75%
Period	Actual Mean	(2.538)	(2.31)	(2.787)
Time 1	1.2036	1.200	1.207	1.22
Time 2	1.2249	1.1312	.913	1.369
Time 3	.8972	.9108	.691	1.151

in the other regions, deposits are generally very significant in explaining starts.

Tests for significant differences in the estimated starts, in going from the first time period to the second

time period and from the second time period to the third time period, show no significant difference. Generally, these results do not support the rejection of hypotheses one and four for the Northeast. These results are generally consistent across all models and nothing suggests that ERTA or TRA 86 had much impact on multi-family starts in the Northeast. An analysis of the vacancy rate does not support the rejection of hypotheses two and five. Omitting either 1981, or 1981 and 1982, does not change these results.

Single-Family Starts National Model

In analyzing the data, various models and correlations are considered. The cost of capital variable proposed (the ratio of rent to the cost of capital for homeownership) is examined closely. The variable as originally suggested and other forms of this variable are considered. It is found that the best measure of the cost of capital for homeownership is simply the nominal interest rate less current housing price inflation (adjust). This may result because builders pay attention to profits and build when interest rates are low and values high. Thus, single-family starts may be driven by potential profits for builders rather than by owner-occupancy demands. Rent is found to generally have a weak positive correlation with single-family housing starts.

Thus, rent is not included in the ratio used. The addition of the marginal tax rate, economic depreciation rate, or property tax rate, results in a decrease in the correlation between the adjust (ADJ) variable and single-family starts.

Various models and time interactions are examined. The best model includes the variables adjust and deposits.[8] Tests for differences across time periods show that adjust has a significant difference across time periods, while deposits does not. Thus, the model examined includes an intercept term for each time period, a separate adjust variable for each time period, and deposits as a variable. This model allows for statistical testing of hypothesis three (ERTA was associated with a change in single-family housing starts) and hypothesis six (TRA 86 is associated with a change in single-family housing starts). The results of this regression are shown in Table 5.19.

F-tests were performed to test for significant differences between the Time 1 and Time 2 intercepts and the Time 2 and Time 3 intercepts. In performing these tests, ADJ 1, ADJ 2, and ADJ 3 are held constant at various levels. It is generally found that the Time 1 intercept is significantly higher than the Time 2

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[8]Housing vacancy rate and mean family income are insignificant and are dropped from any further analysis.

intercept and that the Time 2 intercept is not significantly different from the Time 3 intercept. A summary of these results is provided in Table 5.20.

TABLE 5.19

Single-Family Starts National Model (R-Squared = .9394)

Parameter	Parameter Estimate	T Value	Prob> T
Time 1	1.667	2.507	.0147
Time 2	1.581	1.823	.0729
Time 3	1.166	1.094	.2780
ADJ 1	-.4772	-5.396	.0001
ADJ 2	-.0983	-1.264	.2107
ADJ 3	-.0265	-.275	.7838
DEP	.9888	5.985	.0001

ADJ 1 = adjust in the pre-ERTA period;
ADJ 2 = adjust in the ERTA period;
ADJ 3 = adjust in the TRA 86 period; and
DEP = deposits.

The adjust variable itself is significant in Time 1, but not in Time 2 and Time 3. This is likely a result of builders and homeowners taking advantage of the high housing price inflation that existed in the late 1970s. Deposits is highly significant in all three time periods. Generally, it appears that, once the high housing

inflation of the 1970s is controlled, there is a significant decrease in housing starts during the ERTA period and no change in the TRA 86 period. This finding

TABLE 5.20

Test of Time Period Differences

ADJ Level	Time Periods Examined	F value	Prob > F
-1.1	Time 1 vs. Time 2	.3812	.5391
-7.0	Time 1 vs. Time 2	4.0361	.0487
5.0	Time 1 vs. Time 2	6.4838	.0133
-1.1	Time 2 vs. Time 3	.1909	.6636
-7.0	Time 2 vs. Time 3	.2491	.6194
5.0	Time 2 vs. Time 3	.0111	.9164

is consistent with the rejection of hypothesis six; but hypothesis three cannot be rejected. However, it is important to note that the direction of change during the ERTA period--a decrease in single-family starts--is opposite of the direction of change for multi-family starts. This is possibly a result of resources being shifted to multi-family housing to take advantage of the tax incentives offered by ERTA and is consistent with the theoretical development of this study.

Single-Family Regional Models

Once again, the analysis is extended to the regional level. Correlation analysis of each independent variable with the dependent variable (single-family starts) by region and time period is conducted. Also, the correlation of the independent variables with each other is examined. This was done by region for each time period. The Pearson correlation coefficients indicate that multicollinearity is very high among some of the independent variables.

Various regressions are performed with different combinations of variables for each time period and region. The VIF scores and adjusted R-squared for various models, a factor analysis, and graphs are all examined to help in choosing the best models to be used for each region in testing the hypotheses. Provided below is a summary of the results and models used to test hypotheses three and six at a regional level. Consistent with the national model, the adjust and deposits variables are used in the following analysis.

Graphical Analysis and Hypotheses Testing

Midwest. Figure 5.13 shows that single-family starts are highest in period one, decrease in period two, and show a slight increase at the beginning of period three. Figures 5.14 and 5.15 indicate that a strong association

exists between single-family starts and the variables adjust and deposits. The relationship between adjust and starts is negative and is strongest in the first period. Deposits appears to have a strong relationship with starts in all three time periods.

Three regression models are examined. These models include deposits only, adjust only, and a model with both deposits and adjust. The latter model appears to be the best in explaining single-family starts for the Midwest. The regression results for this model are presented in Table 5.21.

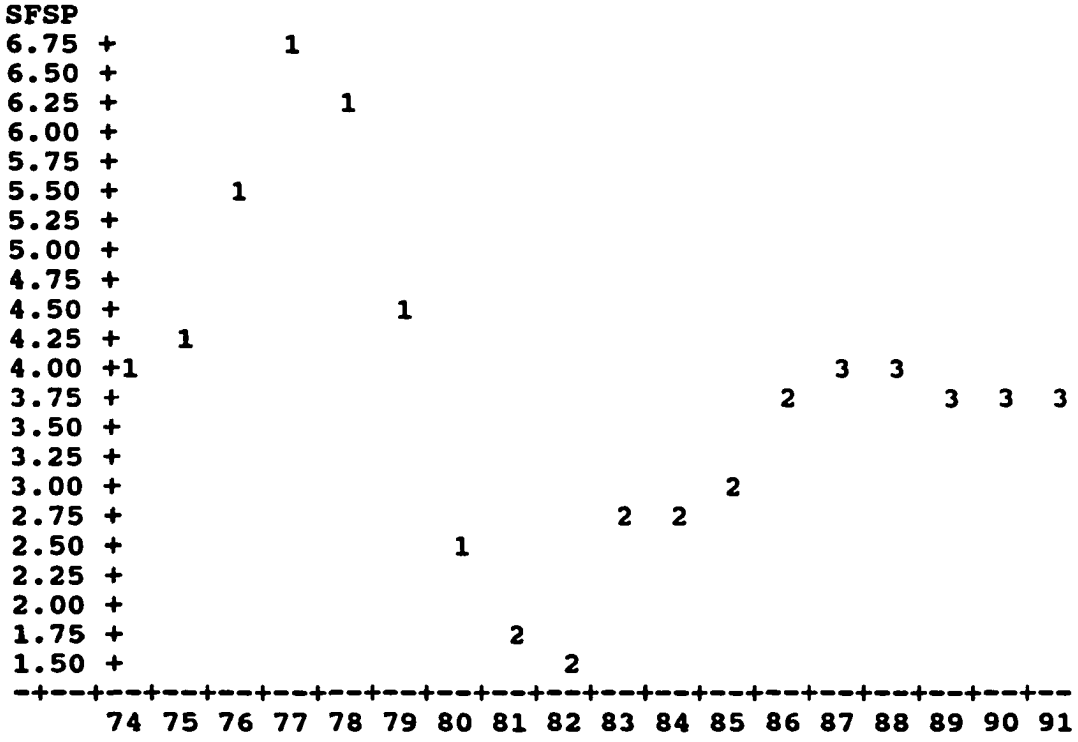

FIGURE 5.13 Single Family Starts by Year--Midwest

```
 13 +                           2     2
 12 +
 11 +                        2
 10 +
  9 +                                                3
  8 +                                             3
  7 +                  1           2                    3
  6 +                     2
  5 +                                    2     3
  4 +
  3 +                                       3
  2 +
  1 +1
  0 +   1  1
 -1 +               1
 -2 +            1
 -3 +
 -4 +
 -5 +               1
-+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
    74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91
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FIGURE 5.14

Adjust by Year--Midwest

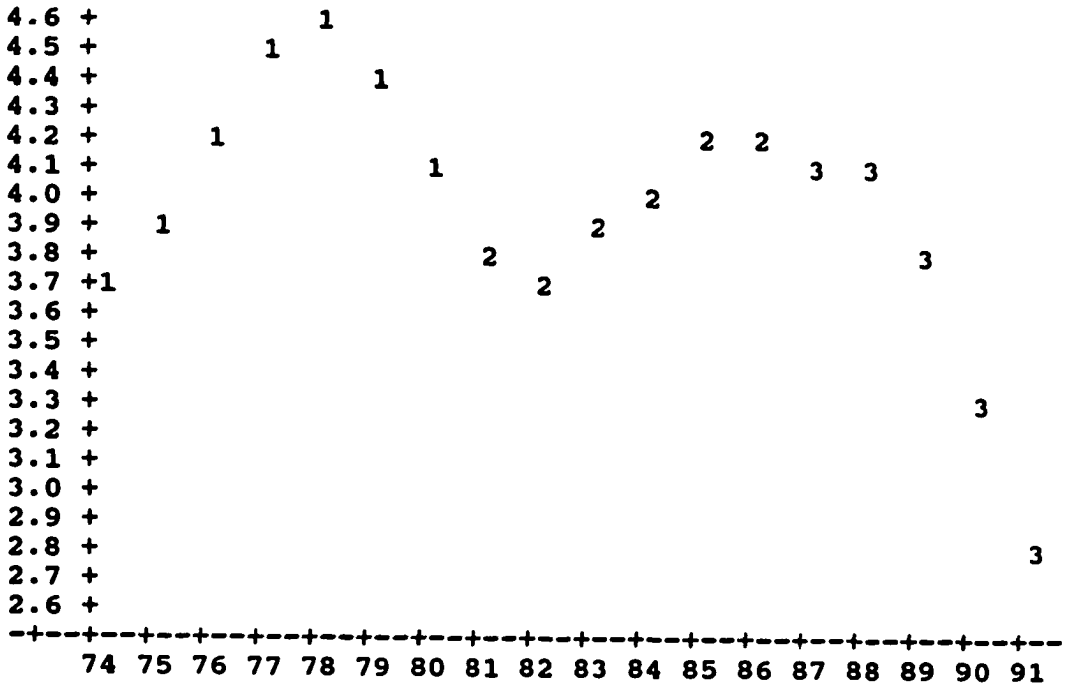

FIGURE 5.15

Deposits by Year--Midwest

TABLE 5.21

Deposits and Adjust Model--Midwest (R-Squared = .9914)

Parameter	Parameter Estimate	T Value	Prob > T
Time 1	-1.2276	-.349	.7348
Time 2	-11.2302	-2.475	.0353
Time 3	3.745	1.486	.1715
Dep 1	1.43	1.714	.1207
Dep 2	3.52	3.171	.0113
Dep 3	.1203	.224	.8278
ADJ 1	-.2854	-3.999	.0031
ADJ 2	-.0172	-.266	.7959
ADJ 3	-.0452	-.352	.7327

Consistent with the national model, the adjust variable is only significant in the first time period, an indication that high housing inflation in the decade of the 1970s resulted in increased single-family housing starts. F-tests show that the coefficients for ADJ 1 and ADJ 2 are significantly different (p-value=.0211), while the coefficients for ADJ 2 and ADJ 3 are not significantly different.

For the deposits variable, F-tests show no significant difference between time periods one and two, but a significant difference is found between time periods two and three (p-value=.0223). The decrease in housing

starts from time period one to time period two can likely be attributed to decreased housing price inflation or possibly to resources being directed to multi-family housing starts.

To further analyze this region, a reduced model without deposits in the third time period and without the adjust variable in the second time period is examined. The elimination of these variables helps to reduce multicollinearity, as evidenced by an increased adjusted correlation coefficient (from .9827 to .9857). The results of this model are presented in Table 5.22.

Statistical testing is not performed at the 75 percent level of deposits and adjust because the adjust variable in time period one is clearly misrepresented at this level, because this was a period of very high housing price inflation, leading to a very low adjust level. F-tests for differences between the time periods were performed at the mean and 25 percent levels. A comparison of the estimated starts for time periods one and two show a significant difference at the 25 percent level ($p=.0003$), but not at the mean level ($p=.19$). The first test appears to be more relevant, because the adjust level was quite low in time period one.

A comparison of time periods two and three is done at all three levels. F-tests indicate a significant difference in the estimated level of starts when deposits

and adjust are held constant at the mean and 25 percent levels (p-values = .0014 and .009, respectively). No significant difference is noted at the 75 percent level.

TABLE 5.22

Actual Starts and Regression Estimates--Midwest

		Deposit and Adjust Level Used		
		Mean	25%	75%
Period	Actual Mean Deposit Adjust	(3.971) (4.716)	(3.839) (.05)	(4.225) (7.93)
Time 1	4.818	3.11	4.25	2.55
Time 2	2.6356	2.58	2.11	3.48
Time 3	3.8935	3.99	4.28	3.80

Based on the statistical testing hypotheses three and six cannot be rejected. It appears that ERTA may have been associated with a decline in single-family starts and that TRA 86 may have been associated with an increase in single-family starts. The results for TRA 86 are more difficult to interpret, because neither the adjust nor the deposit variable are highly significant in explaining starts in this period. This model is also examined with 1981 omitted, and with 1981 and 1982 omitted and found to be quite similar to the results of the model presented.

West. Figure 5.16 shows that starts were significantly higher in years 1976 through 1979 than in any other years in the study. Figure 5.17 indicates that a strong negative relationship exists between starts and the adjust variable. This is particularly noticeable in the years 1977 and 1978 where adjust was at the lowest point and starts was at the highest point. Figure 5.18 indicates that starts and deposits have a very strong positive relationship.

Various regressions were examined that includes deposits, adjust, and both of these variables. The best model includes both adjust and deposits and is summarized in Table 5.23.

The VIF scores for this model indicate that high multi-collinearity exists. Therefore, a model with deposits, and adjust in the first time period only, is examined. The results are presented in Tables 5.24 and 5.25.

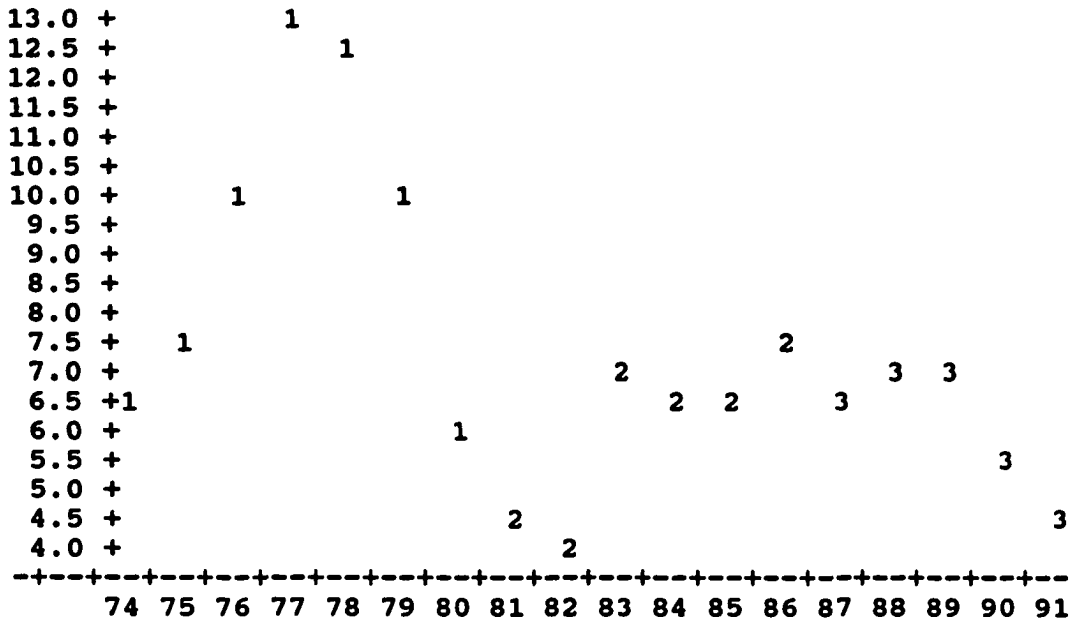

FIGURE 5.16

Single Family Starts by Year--West

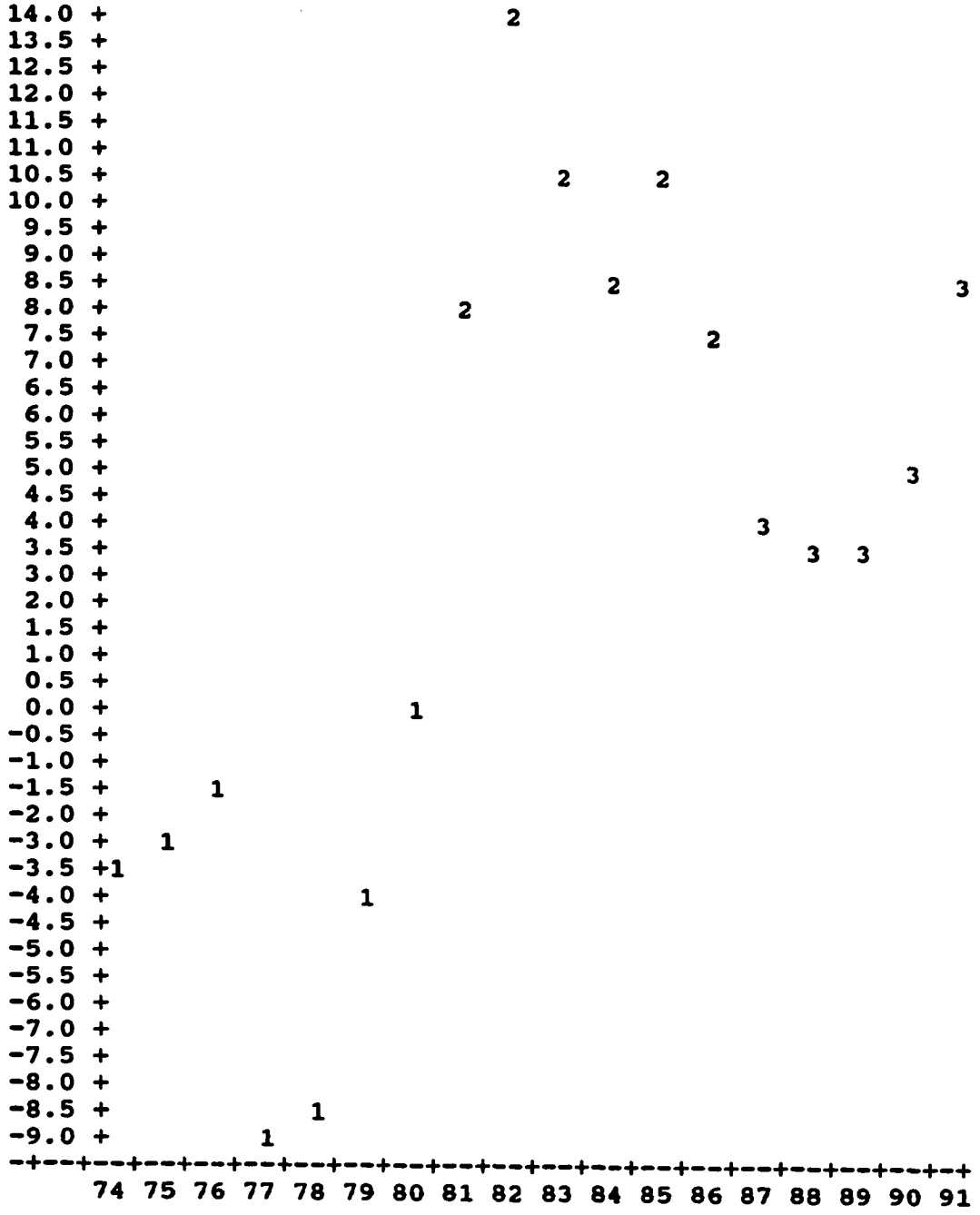

FIGURE 5.17

Adjust by Year--West

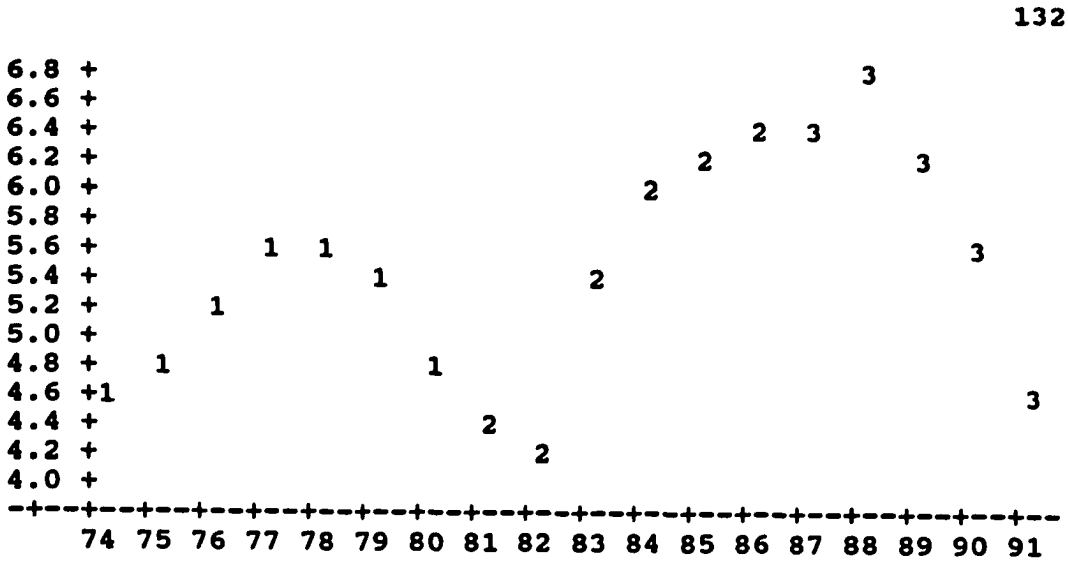

FIGURE 5.18

Deposits by Year--West

TABLE 5.23

Adjust and Deposits Model--West (R-Squared = .9964)

Parameter	Parameter Estimate	T Value	Prob > T
Time 1	-14.578	-3.319	.0106
Time 2	6.844	.920	.3846
Time 3	3.348	.311	.764
DEP 1	4.454	4.808	.0013
DEP 2	.5008	.616	.555
DEP 3	.6468	.479	.6451
ADJ 1	-.2623	-2.142	.0645
ADJ 2	-.3298	-1.115	.2974
ADJ 3	-.2005	-.347	.7372

TABLE 5.24

Deposits and Adjust 1 Model--West (R-Squared = .9959)

Parameter	Parameter Estimate	T Value	Prob > T
Time 1	-14.578	-3.593	.0042
Time 2	-.872	-.538	.6013
Time 3	.306	-.14	.8911
DEP 1	4.4538	5.205	.0003
DEP 2	1.2651	4.304	.0012
DEP 3	1.0958	2.998	.0121
ADJ 1	-.2623	-2.319	.0406

TABLE 5.25

Actual Starts and Regression Estimates--West

		Deposit Level Used		
		Mean	25%	75%
Period	Actual Mean			
	Deposits	(5.451)	(4.741)	(6.221)
	Adjust	(3.016)	(-3.04)	(8.47)
Time 1	9.3878	8.9091	7.335	10.91
Time 2	6.0148	6.0236	5.1254	6.998
Time 3	6.1727	5.668	4.890	6.512

The above model is almost as good in explaining the variation in starts and also does not have the problem of multicollinearity. As can be seen, deposits are significant in all periods in explaining single-family housing starts. F-tests performed on the values in Table 5.25 show a significant difference in the estimated level of starts between time period one and time period two, when deposits and adjust 1 are held constant at the mean or 25 percent levels (p-values=.024 and .0008, respectively). At the 75 percent level, the difference in estimated starts is marginally significant (p-value=.111). As in the Midwest, the 75 percent level makes little sense because of the very high housing inflation in the first time period, which resulted in very low values of adjust for this time period. F-tests performed for the differences in starts between the second and third time periods show no significant difference at all levels.

Both the statistical testing and the graphical analysis suggest that ERTA was associated with a significant decrease in single-family starts for the West region. However, TRA 86 does not appear to be associated with a change in single-family starts in the West region. Hypothesis three cannot be rejected for the West region. However, hypothesis six can be rejected. These results are the same with 1981 omitted, and with 1981 and 1982 omitted.

South. A review of single-family housing starts for the South (Figure 5.19) shows that periods one and two represent both times of high and low starts, while period three is generally a period of declining starts. Figures 5.20 and 5.21 indicate that starts appears to be highly correlated with deposits, but only correlated with adjust in the first time period.

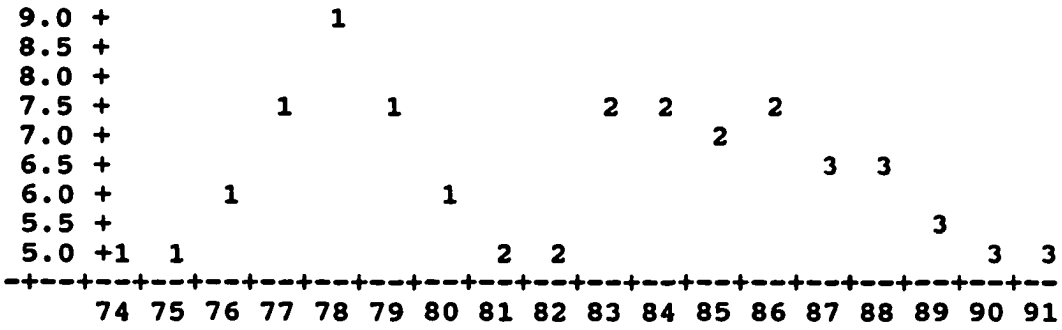

FIGURE 5.19 Single Family Starts by Year--South

A review of various model specifications shows that a model with deposits only is the best in answering hypotheses three and six. This model is presented in Tables 5.26 and 5.27.

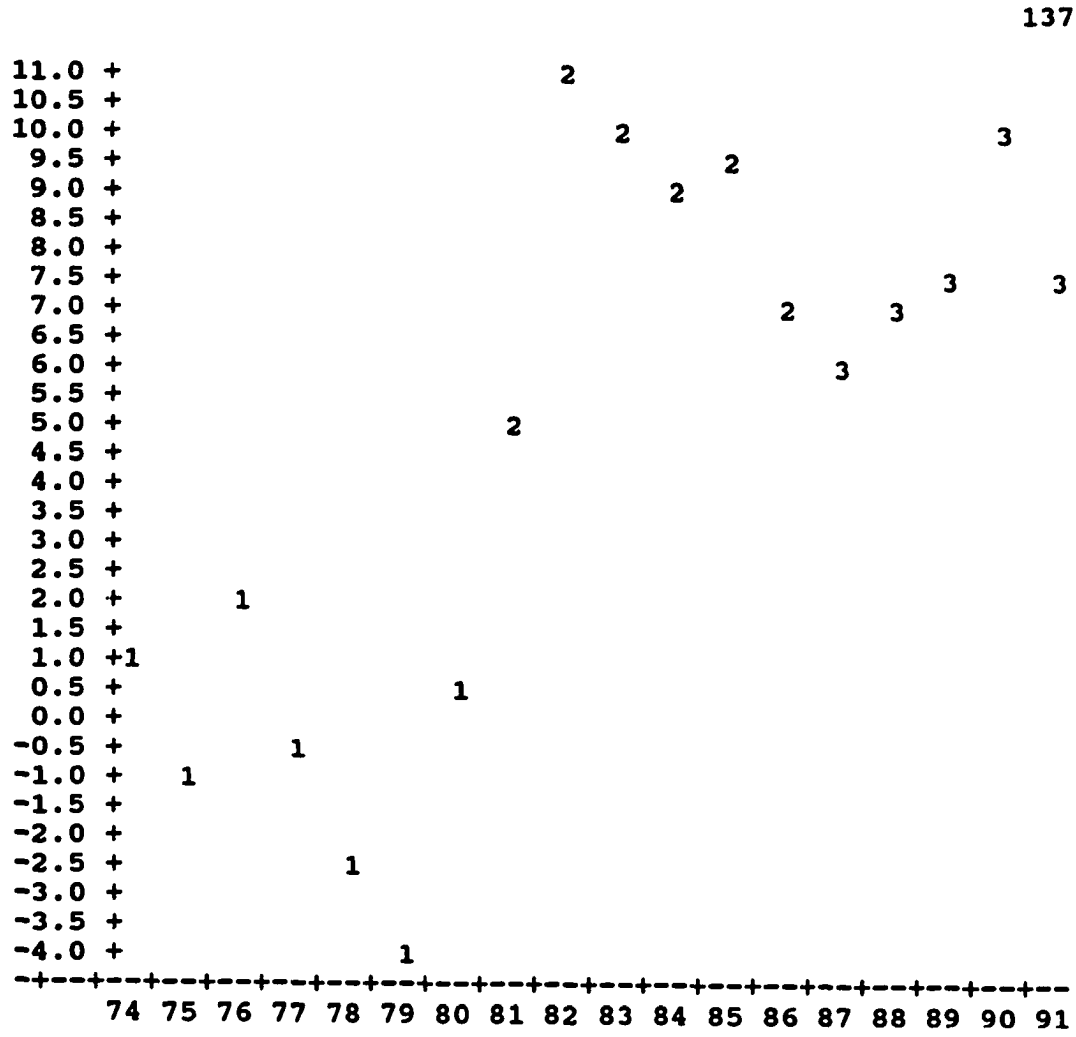

FIGURE 5.20

Adjust by Year--South

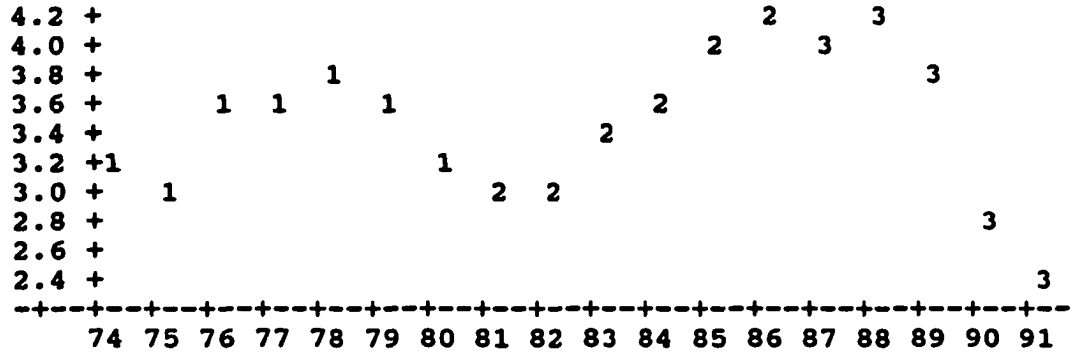

FIGURE 5.21

Deposits by Year--South

TABLE 5.26

Deposits Only Model--South (R-Squared = .9921)

Parameter	Parameter Estimate	T Value	Prob > T
Time 1	-12.3049	-3.14	.0085
Time 2	-.4976	-.212	.8358
Time 3	2.3578	1.566	.1434
DEP 1	5.515	4.837	.0004
DEP 2	2.004	3.026	.0105
DEP 3	.9766	2.266	.0428

TABLE 5.27

Actual Starts and Regression Estimates--South

		Deposit Level Used		
		Mean	25%	75%
Period	Actual Mean	(3.456)	(3.045)	(3.763)
Time 1	6.6059	6.756	4.489	8.449
Time 2	6.558	6.429	5.605	7.044
Time 3	5.694	5.733	5.332	6.033

This last model explains almost all of the variation in single-family starts for the South region. The coefficient for deposits shows a significant decrease in going from time period one to time period two (p=.0207). F-tests of the estimated starts, holding deposits constant, show no significant difference at the mean or 25 percent level of deposits, when comparing the difference between time period one and time period two. The same result holds when comparing time period two and time period three. Holding deposits at the 75 percent level, a significant difference is shown between time periods one and two, as well as between time periods two and three (p-values=.03 and .06, respectively). However, a review of Table 5.26 indicates that the 75 percent level does not provide good estimates of the number of starts.

In summary, the graphical analysis and statistical testing generally suggest that ERTA and TRA 86 are not associated with a change in the level of single-family starts for the South region of the country. These results support the rejection of hypotheses three and six for the South region of the country. It is interesting to note that the coefficient for the deposits variable decreases significantly in going from time period one to time period two. This result is in contrast to the significant increase in this coefficient, between the same two time periods, in the multi-family starts analysis. This finding supports the notion that resources were shifted from single-family unit production to multi-family unit production in the South during the ERTA period.

These results generally do not change when 1981 is omitted from the analysis. When 1981 and 1982 are omitted, the results change but are not interpretable because the deposits variable in time period 2 is not significant. Accordingly, these results will not be discussed here.

Northeast. Figure 5.22 shows that single-family starts in the Northeast increase in the ERTA period and then decrease during the TRA 86 period. Unlike the other regions, starts are generally higher in time periods two and three than they are in time period one. Once again strong correlations exist between deposits and starts, and

between adjust and starts (see Figures 5.23 and 5.24). However, the relationship between adjust and starts appears to be stronger in time periods two and three than in time period one.

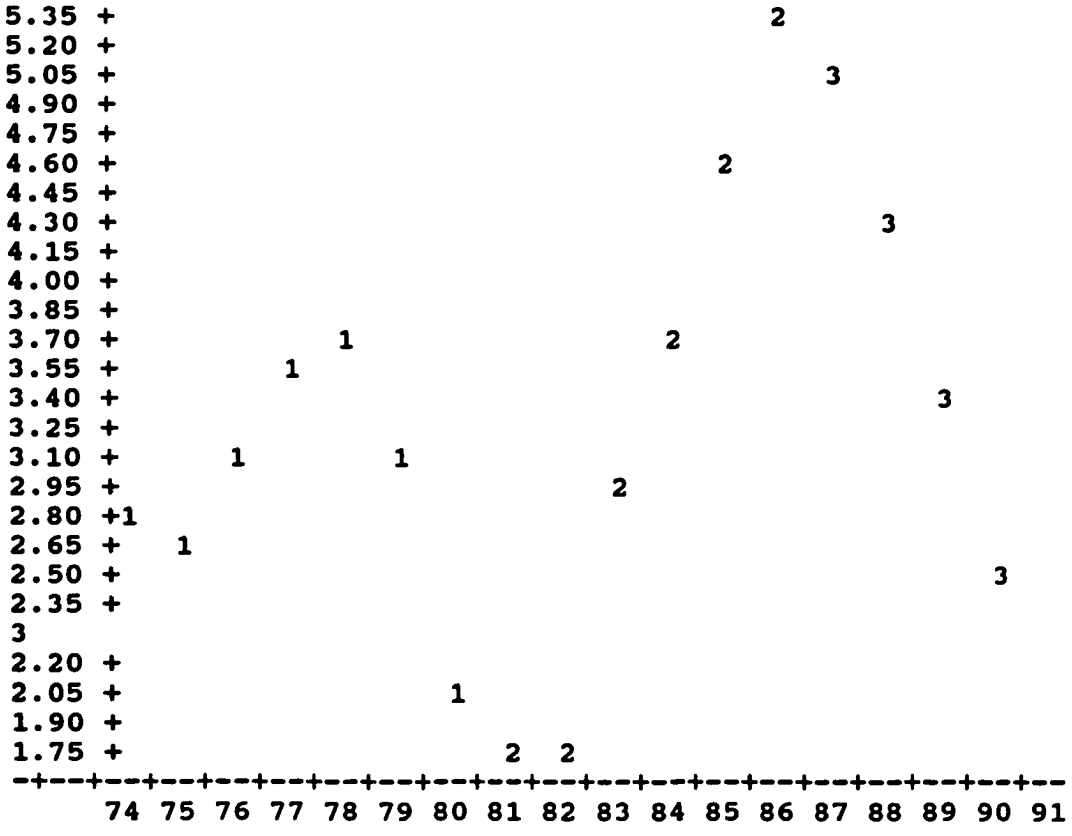

FIGURE 5.22

Single Family Starts by Year--Northeast

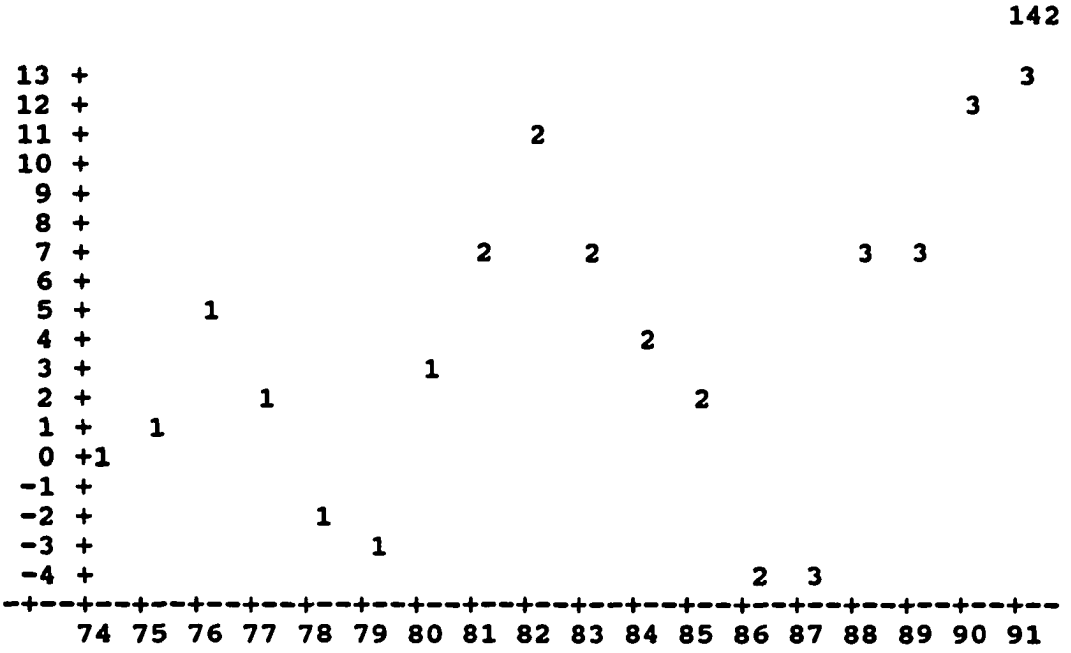

FIGURE 5.23 Adjust by Year--Northeast

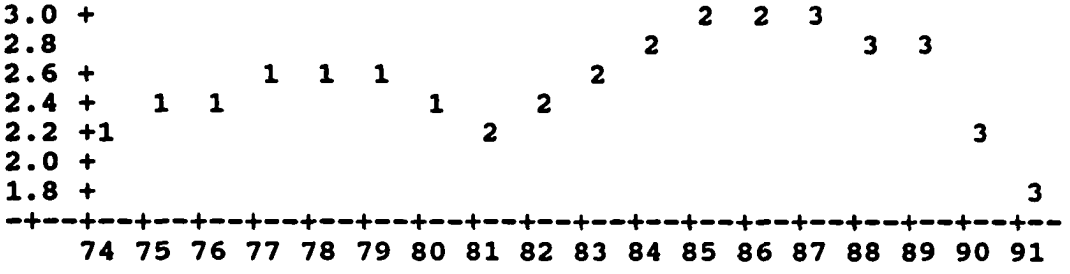

FIGURE 5.24 Deposits by Year--Northeast

Models with adjust, deposits, and both adjust and deposits are examined. The best model includes both adjust and deposits. However, the model with deposits provides almost the same results in explaining the variation in starts for the Northeast and is presented in Table 5.28.

TABLE 5.28

Deposits Only Model--Northeast (R-Squared = .9872)

Parameter	Parameter Estimate	T Value	Prob > T
Time 1	-2.417	-.881	.3958
Time 2	-8.576	-4.838	.0004
Time 3	-1.921	-1.473	.1664
DEP 1	2.206	1.986	.0704
DEP 2	4.539	6.791	.0001
DEP 3	2.157	4.232	.0012

Consistent with the figures discussed above, deposits is significant in explaining starts in all three time periods examined. The parameter estimate increases during the ERTA time period and then decreases during the TRA 86 period. The increase during the ERTA period is marginally significant (p-value=.09). The significance increases slightly when 1981 is omitted (p-value=.07). The decrease from the ERTA period to the TRA 86 period is also significant (p-value=.015).

This model and other models do not provide accurate predictions of single-family starts. Accordingly, the results for this region are based on the graphical analysis and change in the slope coefficient for the deposit variable. ERTA appears to be associated with increased single-family housing starts and TRA 86 with

decreased single-family housing starts for the Northeast section of the country.

Summary and Conclusions

Generally, the results are as expected. The analysis of the multi-family starts model at the national level indicates that ERTA and TRA 86 are associated with increased and decreased starts, respectively. In analyzing the single-family starts model at the national level, starts appear to decrease during the ERTA period and show no change during the TRA 86 period. The decrease during the ERTA period offers further support that ERTA had an impact on multi-family starts. Factors such as general economic conditions, that cannot be sufficiently controlled for in the model, are likely to impact single-family and multi-family starts in similar manners. Thus, the increase in multi-family starts, with the simultaneous decrease in single-family starts, supports the rejection of hypothesis one at the national level. The strong decrease in multi-family starts during the TRA 86 period supports the rejection of hypothesis four. Hypothesis three cannot be rejected since single-family starts and ERTA may be associated. However, hypothesis six can be rejected since single-family starts did not change during the TRA 86 period.

Two alternative explanations can be offered for the decrease in single-family starts during the ERTA period. First, it is possible that high housing inflation drove single-family starts in the pre-ERTA period, while, in later periods, the elimination of high housing price inflation had a dampening effect on single-family starts. The adjust variable was introduced into the single-family model to control for this situation. Second, resources may have been shifted from single-family to multi-family starts during the ERTA period. This would be consistent with the idea that ERTA was associated with increased investment in rental properties.

Hypotheses two and five cannot be rejected at the national level since no time by rental vacancy rate interaction is present. However, this may be a weak test of these two hypotheses since it may take time for the rental vacancy rate to adjust to new construction. Also, regional differences likely exist because, in areas of fast growth, the rental vacancy rate is probably not as important to builders as it is in areas of low growth.

The results from the regional models support the rejection of hypothesis one for the South. The statistical testing does not support the rejection of hypothesis one for the West. Hypothesis one cannot be rejected for the Northeast, while weak support exists for the rejection of hypothesis one in the Midwest. The

provisions of ERTA appear to have been associated with increased multi-family starts in the South and possibly in the Midwest. However, the provisions do not appear to have affected multi-family starts in the Northeast region of the country. The results in the national model are primarily driven by what happened in the South and Midwest regions during this time period.

The analysis and statistical testing at the regional level generally supports the rejection of hypothesis four for the Midwest, South, and West regions. This hypothesis cannot be rejected for the Northeast. TRA 86 appears to be associated with a decrease in multi-family starts for all regions except the Northeast.

Hypothesis three cannot be rejected for the Midwest and West. However, ERTA appears to be associated with a decrease in single-family starts for these regions. This finding supports the results in the multi-family model for the Midwest. In the South, it appears that ERTA was not associated with a change in the level of single-family starts. In the Northeast, hypothesis three cannot be rejected. However, the direction of change for the Northeast is one of increased single-family starts.

Overall, it appears that resources were possibly shifted from single-family starts to multi-family starts in all regions of the country, except the Northeast, as a result of ERTA. In this region, single-family starts

increased, while multi-family starts did not increase during the ERTA period. However, the Northeast is a region with limited availability of land in the large cities, where most rental apartments are generally built. Also, some areas of the Northeast are subject to rent controls. These conditions may explain the unexpected results for this part of the country.

Hypothesis six can be rejected for the West and South. The provisions of TRA 86 do not appear to be associated with a change in single-family starts. Once again, this provides further evidence that the decrease in multi-family starts in these regions can be attributed to TRA 86. In the Midwest, it appears that single-family starts increased during the TRA 86 period. This finding also provides support for the argument that decreased multi-family starts in the Midwest can be attributed to TRA 86. In the Northeast, hypothesis six cannot be rejected. Single-family starts apparently decreased during the TRA 86 period.

Overall, the results are not surprising, except for the Northeast region of the country. This region appears to react differently from other regions. There may be a number of reasons for this result. First, more single-family units may be rented in the Northeast. Second, rent controls and limited availability of land may drive the real estate industry in this region of the country as

opposed to profits and tax laws. Third, the Northeast is probably the area of the country with the least growth potential and tax law changes may not impact the potential profits of builders enough to change their behavior.

Hypotheses two and five are evaluated with both statistical testing and graphical analysis. The statistical testing is weak as indicated by a review of the graphs. The graphs show that rental vacancy rates appear to have risen during the ERTA period in the Midwest, West, and South regions of the country. However, in the Northeast, this does not appear to be the case. The graphical analysis is consistent with the rejection of hypothesis two for all regions except the Northeast. However, the increased availability of money must be considered as an explanation for the rise in the vacancy levels, especially in the Midwest and West regions.

A further review of these graphs shows that the rental vacancy rate appears to have declined as a result of the TRA 86 provisions in the West and South. This analysis is consistent with the rejection of hypothesis five for these two regions. These findings are consistent with the findings of decreased multi-family starts and the rejection of hypothesis four for these regions. In the Midwest, the rental vacancy rate has not shown a substantial decrease. However, this decrease is not surprising as the Midwest is an area of low growth, which

likely has not yet absorbed the over-building of the earlier years. Consistent with the other findings for the Northeast, the rental vacancy rate did not decrease as a result of TRA 86.

A summary of the results is provided in Table 5.29. The summary provided in Table 5.29 for hypotheses two and five (related to the vacancy rate), are based on statistical testing. However, as previously discussed the testing is unlikely to pick up the change in the rental vacancy rates as a result of ERTA and TRA 86. A review of some of the graphs seems to indicate that for some of the regions and in the national model the rental vacancy rate changed as expected. It should also be noted that hypothesis three and six (related to single-family starts) are not rejected in some situations where the findings are still consistent with the underlying theory of this project.[9]

Overall conclusions will be addressed in Chapter VI. This chapter will include a discussion of the use of tax policy for real estate and the impact it has on the economy. Also, limitations of the study will be

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[9]Some of the regions showed a decrease in single-family starts associated with ERTA and an increase in single-family starts associated with TRA 86. Generally, such findings suggest that resources were shifted to multi-family starts in the ERTA period and away from multi-family starts in the TRA 86 period.

addressed. Finally, suggestions for follow-up research will be provided.

TABLE 5.29

Summary of Results

	Models				
Hypothesis	National	Midwest	South	West	Northeast
1.	R	R	R	X	X
2.	X	X	X	R	X
3.	X	X	R	X	X
4.	R	R	R	R	X
5.	X	X	X	X	X
6.	R	X	R	R	X

R = evidence exists to reject the hypothesis; and

X = hypothesis cannot be rejected.

CHAPTER VI

FINAL COMMENTS

The overall conclusions and implications for tax policy are discussed in this chapter. After this discussion, limitations of the study are provided. Finally, the dissertation is concluded with a discussion of suggested follow-up research in the real estate area.

Summary of Analysis

The primary purpose of this study was to examine how ERTA and TRA 86 may have interfered with the equilibrium process in the rental real estate market. It was anticipated that ERTA would be associated with overbuilding in the rental real estate market and that TRA 86 was associated with a substantial decline in the construction of new rental real estate. At the same time, it was expected that single-family starts were not impacted by either of these tax acts.

The analysis was first done at the national level and then at the regional level. The national model indicates that ERTA was associated with an increase in multi-family housing starts and a decrease in single-family housing starts. Two features of the results of these models support the notion that ERTA was associated with increased multi-family starts. First, to control for money

availability, a deposits variable was used in both the single-family and multi-family models. Even after controlling for the changing availability of money, multi-family starts showed a significant increase in the ERTA period. Second, the decrease in single-family starts in the same period provides further support for this conclusion, because both types of construction are part of the same market. The decrease in single-family starts, with the simultaneous increase in multi-family starts, suggests that resources were shifted to the rental market to take advantage of the tax incentives offered by ERTA.

A review of the regional models suggests that the South region of the country had the largest increase in multi-family starts during the ERTA period, while the West region also had increases. For single-family starts, the large decreases were in the West and Midwest.

The regional analysis suggests that rental vacancy rates increased as a result of the overbuilding in the ERTA period. This increase was primarily in the South region of the country and to some extent also in the West region.

The results of the TRA 86 analysis, performed at the national level, suggest that this act was associated with a decline in multi-family starts and no change in the level of single-family starts. The regional analysis

suggests that the South and West regions of the country had a large decrease in multi-family starts.

These conclusions are strongly supported for two reasons. First, these conclusions hold even after controlling for the availability of money. Second, single-family starts and multi-family starts are in one related industry and factors that affect single-family starts should also affect multi-family starts. Thus, outside influences likely affect these two different types of starts in similar manners. The change in the level of multi-family starts, without a corresponding change in the level of single-family starts, provides evidence that the change was a result of TRA 86, as opposed to other factors. Consistent with the analysis of multi-family starts, the rental vacancy rate declined in the West and South regions of the country during the TRA 86 period.

Policy Implications

The results discussed above suggest that the changing tax law interferes with the equilibrium process of the real estate market. First, increased tax incentives contained in ERTA for rental real estate appear to be related to increased investment in rental housing, and decreased tax incentives contained in TRA 86 appear to be related to decreased investment in rental housing. Second, resources may be shifted from one sub-market

(single-family housing) to be used in another sub-market (multi-family housing).

The original intention of the ERTA provisions related to rental real estate was to stimulate the short-term economic recovery of the United States. It appears that this intention was met through increased investment in rental real estate. However, this increased investment resulted in overbuilding which contributed partially to the current poor economy which relies heavily on the construction and housing industry. Currently, multi-family housing starts are quite low, likely a result of the earlier overbuilding and the tax provisions of TRA 86. The implication is that tax policy which interferes with the natural equilibrium process should only be used after an analysis of the supply and demand conditions of that market.

Limitations

As with any empirical analysis, limitations exist that reduce the strength of the conclusions drawn. The limitations of this study are primarily related to the data. Of principal concern is the fact that the multi-family starts series contains some units built for owner occupancy and that the single-family starts series contains some units that are built for rental purposes. Additionally, the economic depreciation rate, property tax

rate, and marginal tax rate used in the study are estimates. These rates are originally used as part of the owner cost of capital for new single-family homes. However, this second limitation is likely not a problem because the inclusion of these items in the cost of capital for new homeowners reduced the explanatory power of this variable.

The analysis of the data at the regional level showed very high multicollinearity. Because of this relationship, reduced forms of the models are used for each region. This problem is mitigated by the fact that the deposits variable explains most of the variation in both multi-family and single-family starts. Deposits is generally highly correlated with other variables originally proposed. Accordingly, the addition of these other variables adds very little explanatory power to the models and increases multicollinearity and makes the interpretation of the results less clear. Also, the data set for each region of the country is quite small. This reduces the statistical significance of the results.

Follow-up Research

The theoretical analysis and the results of this study provide some interesting ideas for additional research in the real estate area. First, the theoretical development suggests that tax incentives (disincentives)

may be passed to tenants in the form of lower (higher) rents. This indirectly affects the equity of the tax law. Closely related to this idea is the theory that the impact of these incentives (disincentives) may be in the form of better (worst) living conditions for renters. This change in living conditions would indirectly result in a positive (negative) externality.

Additional research ideas follow from the results of the current study. Prior research has suggested that taxes have a large effect on owner-occupancy demands and rates. However, an analysis of various components of the traditional cost of capital suggests that the components with the most significant impact on single-family starts are housing price inflation and the nominal interest rate. Furthermore, this relationship was strongest in the 1970s, a period of high housing price inflation. Additional research should separate the federal income tax from the other components of the cost of capital for homeownership to determine how the corresponding homeownership rates are affected. Changes in the tax rates by ERTA and TRA 86 provide an ideal setting for such an analysis.

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