THE ROLE OF TAX POLICY IN THE BOOM/BUST CYCLE OF THE TEXAS CONSTRUCTION SECTOR

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The boom and bust of the Texas construction sector is well known, yet its causes and effects are less well understood. At first glance the rise and fall of the Texas construction sector seems to have followed the movements in oil prices. However, a closer look at the data suggests that there may have been other factors which exacerbated the effects that oil price swings had on the construction industry. Of particular interest are the effects of the tax law changes in 1981 and 1986 which made real estate investing more lucrative in the first half of the decade. In this article we attempt to determine how much of an impact such factors had on the excessive buildup and subsequent crash of the Texas construction industry. We use a vector-autoregressive (VAR) model to analyze the roles tax laws, interest rates and oil prices played in the movements of both residential and nonresidential construction in Texas[2].

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[2]In this article, we do not examine nonbuilding construction, which includes roads, highways and sewer systems. Data for this series were unavailable.

BACKGROUND: THE BOOM AND BUST OF THE TEXAS CONSTRUCTION SECTOR

The Texas construction boom began in the mid-1970s and continued for almost ten years (Chart 1). At first, the strength in construction activity seemed justified by economic fundamentals. Between early 1974 and early 1981, inflation-adjusted oil prices nearly tripled and the Texas economy expanded rapidly (Chart 2). During this period, nonresidential construction activity more than quadrupled, while office vacancy rates tightened.

In 1982, however, the construction sector diverged from the rest of the economy. While oil prices fell and the Texas and U.S. economies turned downward, Texas construction activity --especially residential construction-- surged (Chart 3). Throughout the mid-1980s, the high level of construction activity did not seem to be supported by the Texas economy's weak growth. Although declining interest rates may have motivated some construction activity, the amount of space added during this period far exceeded the demand, as shown by the rising vacancy rates for all types of real estate (Table 1).

In 1986, a plunge in oil prices and a sharp recession in the Texas economy helped push an already weakening construction sector into a prolonged decline. While construction accounted for only 6.7 percent of employment, it accounted for 40 percent of the job decline in 1986, or almost 100,000 jobs. By 1987, the Texas economy was on the upswing again and oil prices had stabilized, but the state's construction sector remained extremely weak. Not until the early 1990s did Texas see a rebound in construction activity, and even today, construction activity in Texas remains well below the levels of the early 1980s.

As the previous discussion suggests, oil prices seem to have been an important factor in the boom and bust of the Texas construction sector. Recent studies suggest that tax policy changes may have also been responsible for some of the volatility in certain segments of the construction industry, namely the multifamily and nonresidential sectors. The data supports such a view. As Chart 1 shows, dramatic movements in residential and nonresidential building permit values occurred after major changes in tax policy in 1981 and 1986. Browne and Case (1992) show that The Economic Recovery Tax Act of 1981 (ERTA) favored real estate over other investments, boosting construction of nonresidential properties in the early 1980s. Brueggeman, Fisher and Stern (1982) find that ERTA boosted investment multifamily housing during the same time period.

Several other papers shed light on the impact of the 1986 Tax Reform Act (TRA) on certain types of real estate. Work by Follain, Leavens and Velz (1993), DiPasquale and Wheaton (1992), and Poterba (1990) finds a significant negative impact of TRA on multifamily construction. TRA's impact on nonresidential construction is less clear according to Follain, Hendershott and Ling (1992) and Browne and Case (1992). These studies show that the overbuilding of the 1980s may have swamped the long-run effects of TRA on the nonresidential sector. The authors argue that other factors --such as easier credit-- likely contributed to the mid-1980s overbuilding.

The volatility in multifamily construction may have been even stronger in Texas. Follain, Leavens and Velz (1993) note that while the passage of the Tax Reform Act of 1986 caused a large decline in multifamily construction across the nation, the decline was much larger in Dallas than in other cities and began before the passage of the 1986 law. The authors suggest that this may be a result of unrealized oil price expectations. As chart 1 shows, multifamily construction in Texas ballooned in the early 1980s, and virtually disappeared in 1987. We believe that the buildup and eventual drop-off was likely due to a combination of factors such as the oil boom and bust, oil price expectations, tax law changes, interest rates, financial deregulation and fraud. In this paper, we attempt to determine how much of this impact was due to factors such as tax law and interest rate changes.

POLICY CHANGES

Provisions of ERTA which may have led to the construction boom

The passage of the Economic Recovery Tax Act of 1981 may have boosted construction beyond what could be supported by the underlying demand. In an effort to stimulate investment, the act created significant tax breaks for investors in income-generating properties, such as apartments and office buildings. The most noteworthy elements in ERTA centered around methods of depreciation and capital recovery periods.

Under the new law, tax lifetimes of real estate properties other than single-family housing were significantly reduced. For example, ERTA shortened the tax lifetime for residential rental property from 32 to 15 years. This change had the effect of reducing the effective tax rate on the lifetime income generated by the property and allowed for accelerated recovery of investments. The tax law was especially attractive to high-income investors who could invest in real estate through a limited partnership and use any losses to shelter taxes on other income. In addition, commercial properties could be resold and depreciated several times --or "churned"-- which increased the incentive to invest in real estate.

Provisions of TRA that may have led to the construction bust

While several factors may have initiated the Texas construction bust, the Tax Reform Act of 1986 was a major catalyst. TRA removed the tax depreciation advantages given to real estate investors five years earlier by extending the tax lifetime for income-producing real estate, and requiring straight-line depreciation. This method replaced the more accelerated 175 percent declining-balance method used under ERTA. These changes significantly reduced the tax savings generated by depreciation allowances to real estate investors.

In addition, the 1986 act eliminated the distinction between capital gains and other types of income and raised the top capital gains tax rate to 28 percent. It eliminated the tax exemption for capital gains on income-producing property (a large part of the returns on property investments are capital gains). The higher capital gains rate in 1986 further magnified the reduction in depreciation tax benefits.

TRA also included several provisions designed to restrict tax shelter investment. Passive-loss limitations were enacted which disallowed income tax deductions from active income for net losses of passive income, such as limited partnership investment. Passive-loss limitations likely had the largest impact on multifamily real estate, which had benefited greatly from limited partnership deals under ERTA.

Easy credit

Follain, Leavens, and Velz (1993) and Browne and Case (1992) suggest that the buildup of real estate in the 1980s may have been exacerbated by what some have identified as a "lending frenzy". In the early 1980s, when tax law changes made real estate investing more profitable, several events occurred that gave financial institutions a larger pool of available funds to lend to real estate investors. The Depository Institutions Deregulation and Monetary Control Act of 1980 accelerated the deregulation of deposit interest rates by providing an eventual phase-out of interest rate ceilings on deposits of banks and thrift institutions. The act also broadened the lending powers of federally chartered thrifts. In addition, the Garn-St Germain Depository Institution Act of 1982 created a new account, the money market deposit account, and as these accounts became available, a flood of money poured into them.[3] Meanwhile, a monetary easing initiated a decline in interest rates and added to banks' liquidity.

The increase of available funds and the pursuit of real estate lending by thrifts and commercial banks may have led to the financing of income-producing real estate to a point of oversupply. For instance, in Texas, although apartment vacancy rates rose rapidly during the during the period 1981-83, Texas apartment construction more than tripled. Texas lending institutions that had been badly burned by energy loans were searching for different investments, and they chose real estate. Hence, the lending frenzy may have been even more pronounced in Texas than elsewhere in the country.

EMPIRICAL ANALYSIS

Model

To examine the relationship between the construction sector and other variables, we employed a VAR methodology, where lagged values of the dependent variables are used as

[3]Spong (1990).

explanatory variables. We studied the interrelationships between the regional construction sector, interest rate and tax law changes, the overall regional economy, oil prices, and the national business cycle. The VAR methodology allows for external factors such as interest rates and tax laws to affect construction independently of changes in the state's economy.

We used variance decomposition to measure the impact that shocks to the different variables had on the Texas construction sector and vice versa. Variance decomposition apportions the variance of forecast errors in a given variable to shocks to itself and shocks to the other variables. The method we used to calculate the variance decomposition is the Choleski decomposition, which decomposes the residuals (μ) into sets of impulses that are orthogonal to each other (ν). Orthogonalization takes the covariance between the residuals into account. If the covariance between the residuals is sufficiently high, the ordering of the dependent variables can affect the results[4]. The structure we employed for the variables is specified such that it allows a one-way contemporaneous relationship between the construction variables and Texas economic activity variables. The structure is as follows:

$$\mu_{oil} = \nu_{oil} \qquad (1)$$

[4]In general, the covariance between the residuals in the VAR were small. In the few cases where the Pearson correlation coefficient was statistically significant there was economic justification for the ordering of the equations. For example, the correlations between the shocks to the U.S. and Texas economies were particularly high, but it was reasonable to assume that the shocks were transferred from the nation to Texas rather than the opposite. In one instance, however, the direction was not as clear. Because the policy variable is measured in present value terms it is affected by interest rate changes, thus the ordering of these two variables is unclear. Because of this uncertainty and a statistically significant correlation in the errors of the two equations, we reversed the order of the two equations. We found that changing the order of the policy variable and the interest rate had no significant impact on the results.

$$\mu_{dep} = c_{21}\mu_{oil} + \nu_{dep} \quad (2)$$

$$\mu_{int} = c_{31}\mu_{oil} + c_{32}\mu_{dep} + \nu_{int} \quad (3)$$

$$\mu_{us} = c_{41}\mu_{oil} + c_{42}\mu_{dep} + c_{43}\mu_{int} + \nu_{us} \quad (4)$$

$$\mu_{tx} = c_{51}\mu_{oil} + c_{52}\mu_{dep} + c_{53}\mu_{int} + c_{54}\mu_{us} + \nu_{tx} \quad (5)$$

$$\mu_{cons} = c_{61}\mu_{oil} + c_{62}\mu_{dep} + c_{63}\mu_{int} + c_{64}\mu_{us} + c_{65}\mu_{tx} + \nu_{cons} \quad (6)$$

where (*oil*) is refiner's acquisition cost, adjusted for inflation, (*int*) is a ten-year utility bond rate minus expected inflation[5], (*dep*) is the present value of the tax savings generated by depreciation allowances (from Follain, Leavens, and Velz, 1993), (*us*) is U.S. personal income minus Texas personal income and is used as the measure of U.S. economic activity, and (*tx*), the measure of Texas economic activity, is Texas personal income.[6] We use quarterly data spanning the years 1976-90. All variables are expressed in dollars and are deflated by the U.S. consumer price index.

To capture the different types of Texas construction activity, we used single-family (*sfpv*), multifamily (*mfpv*), and nonresidential (*nrespv*) permit values, as this data is the most consistent across the different types of residential and nonresidential construction activity. A separate system of equations was estimated for each of these three different measures of Texas construction activity. The variable (*cons*) refers to the construction measure used in

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[5]The expected inflation rate is a ten-year expected inflation series based on a survey of economists, prepared by the Federal Reserve Bank of Philadelphia.

[6]We also used total nonagricultural employment as a measure of U.S. and Texas economic activity to analyze the sensitivity of results to the measure of economic activity employed. The results were not qualitatively different.

each system of equations.

In equations 1 through 6, μ_i represents the current innovation in variable i and the innovation process ν is assumed to be orthogonal. An innovation is a shock, or a change in a given variable that is not anticipated by the model. The above structure implies that unexpected changes in oil prices do not contemporaneously arise from any of our specified variables. Innovations in oil prices, depreciation rates, and interest rates affect the innovations in the U.S. economy contemporaneously, but the U.S. economy does not affect these variables contemporaneously. Current innovations in the Texas economy variables are affected by current innovations in oil prices, depreciation rates, interest rates, and the U.S. economy variables but not the construction variables. Although innovations in the construction variables affect the Texas economy variables, they are not contemporaneous--they work their effects through the system over time.

To examine the long-run dynamics of the shocks to construction we calculated impulse response functions. The impulse response function traces over time the effects on a variable of a given shock to another variable. The persistence of a shock tells us how fast the system adjusts back to equilibrium. The faster a shock dampens, the faster the adjustment. The Choleski decomposition was used to calculate the impulse response functions. We analyzed the effects of a one-time, one standard-deviation shock to the first difference of each variable. We then traced the effects of this shock on each of the variables.

Diagnostic checks

Prior to estimating the VARs, we performed several diagnostic checks to assess the correct specification for the various series. We tested for stationarity using Dickey-Fuller tests and found that all of the series are integrated of order of one. Thus, the first differences of the series are stationary and any shock to the series is permanent.

We also checked for cointegration in the three systems of equations in which each system is distinguished by a different construction variable and found cointegration in all three systems. We accounted for cointegration by specifying an error-correction model in which changes in the dependent variable are explained by past changes in both the independent and dependent variables plus an error-correction term.[7] The error-correction term specifies the adjustment to deviations from the long-run equilibrium relationship.

RESULTS

Variance decomposition results

Our results show that tax policy indeed played a significant role in the volatility of the Texas construction industry --especially the income-producing sectors-- during the 1970s and 1980s. The variance decomposition results show that the changes in tax laws in the 1980s had a significant impact on multifamily construction and, to a lesser degree, on nonresidential construction. Tax policy had a very slight effect on single-family construction, however this sector responded strongly to changes in interest rates.

The two major tax laws enacted in the 1980s, ERTA and TRA, affected income-

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[7]Engle and Granger (1987).

producing real estate by changing depreciation schedules and capital recovery periods. Multi-family construction was strongly impacted by changes in the tax policy variable. Although oil prices and the Texas economy had the largest effects on this sector, tax policy changes accounted for 12.2 percent of the forecast error variance in the multifamily sector from 1976 to 1990. These results are consistent with the predictions of Follain, et al. (1987) that multifamily construction, which had benefitted from ERTA, would decline substantially after TRA.

Our results indicate that tax policy also played a significant role in the volatility of nonresidential construction in Texas, a result that other studies have not been able to identify. As in multifamily construction, oil price shocks were the major cause of volatility in the nonresidential construction sector. Innovations in oil prices explained 57 percent of the forecast variance in nonresidential construction. Tax policy shocks were secondary to oil price shocks and explained 7.1 percent of the volatility of the nonresidential sector. These results are consistent with the view that oil price shocks influenced investors' expectations about future growth in the Texas economy. These expectations were likely the strongest impetus to build nonresidential property such as industrial warehouses and office buildings in the early 1980's.

Changes in tax policy had a slight affect on single-family construction, accounting for only 1 percent of the volatility in this sector. ERTA and TRA affected single-family housing by lowering personal income tax rates which reduced the value of homeowners' deductions for mortgage interest payments and property taxes. However, these effects were small and were dwarfed by the effects of interest rates changes.

Long-term interest rates played a large role in the volatility of the single-family housing sector. As Table 2 shows, while shocks to long-term real interest rates generally were important for all construction sectors, they accounted for 34.4 percent of the forecast error variance in single-family construction. This is likely because residential borrowers have limited sources of financing (such as savings and loans, mortgage companies, and banks), and swings in real interest rates can have a large impact on the number of individuals qualified to borrow.

Finally, much of the source of volatility in the three different construction sectors is explained by shocks to the sectors themselves. This implies that much of the movements in these sectors is unexplained by the other variables included in the models. Factors such as fraud[8] and the "lending frenzy" suggested by other researchers may have had an important impact on construction during this period.

Impulse response results

An impulse response function describes the pattern and duration of the response of a given variable to a one standard deviation shock in another variable. We find that changes in the tax variable lead to very persistent responses for all types of construction.

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[8]The most famous case of fraud was the I-30 condominium scandal in the Dallas area. More than 100 people were convicted in the case, including developers, bankers, appraisers and investors. At the core of the scheme were land flips in which a series of quick sales of a piece of property among interrelated buyers artificially drove up the price to as much as 10 times its original price. The scheme was based on a phony condominium sales boom. Several dozen large condominium developments, involving hundreds of units, were started and many were left incomplete or vacant and eventually torn down. The scheme involved more than $300 million in loans, most based on false appraisals. Five thrifts involved in the scheme eventually failed.

Our results show that a shock to the tax policy variable has a generally positive but unstable effect on multifamily construction. The effect of a tax policy shock is very persistent and shows little sign of dying out even after 30 quarters. However, multifamily construction also has an unstable response to shocks in each of the other variables in the model. This general instability in the multifamily sector responses is likely due to the unusual pattern of multifamily construction activity in the period under study.

As shown in Table 1 and Chart 2, a surge in multifamily construction in the early 1980s caused the vacancy rate for rental housing to double and, combined with economic weakness in the mid-1980s, resulted in almost no new multifamily construction from 1987 to 1992. Thus the data suggests that the factors which influenced the decline in multifamily construction from 1984 to 1987 had very long-lasting effects. As mentioned earlier, however, at least part of the overbuilding in the early 1980s could be attributed to the "lending frenzy" and fraud. It is hard to quantify the fraction of overbuilding due to these factors, but it is likely that they had an important impact on the recovery time in this sector and thus on our measured impulse responses.

In the case of nonresidential construction, the response to an increase in the tax variable is negative. This means that an increase in the savings from depreciation leads to lower levels of nonresidential construction. Others studies such as Browne and Case (1992) obtain similar results and suggest that changes in depreciation rules were offset by the reduction in the corporate income tax rate. Follain, Hendershott and Ling (1992) suggest that overbuilding in the middle 1980s, swamps the results of the long-run effect of the 1986 tax act on nonresidential construction.

An increase in the tax policy variable results in increased single-family construction activity. Although the tax policy variable as specified in our model does not directly pertain to single-family housing, it affects this sector indirectly. An increase in tax savings generated by depreciation allowances leads to increased multifamily housing construction. The pick-up in economic activity because of increased construction likely leads to increased demand for single-family housing, thus generating the positive response to the tax variable. The response of single-family housing to an increase in the interest rate is negative as expected.

The estimated positive response of single-family construction to a tax policy shock peaks in the first quarter after the shock and persists for roughly three quarters, suggesting that a tax policy shock works its way through the single-family sector in 9 months. Interest rate shocks are less persistent and work their way through the single-family construction sector in about 2 quarters.

CONCLUSION

While factors related to the Texas economy, such as oil prices, played a major role in the volatility of the Texas construction sector over the past twenty years, tax policy and interest rates were also significant factors in the escalation and eventual downfall of the Texas construction sector. Tax policy had a significant impact on multifamily and nonresidential construction while interest rates were the most important factor for the single-family housing sector.

We also find, however, that between 20 percent and 50 percent of the shocks to the

Texas construction sectors were not explained by shocks to the interest rate, tax laws, oil prices, Texas personal income, or U.S. personal income. This finding leaves room for other explanations for the large swings in construction, such as the lending frenzy theory proposed by some economists, as well as fraud that took place in the real estate industry in Texas during the 1980s.

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TABLE 1. VACANCY RATES

	Percent									
Rental Housing										
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
United States	5.0	5.3	5.7	5.9	6.5	7.3	7.7	7.7	7.4	7.2
Dallas	5.4	4.7	9.0	7.7	13.9	17.2	16.2	17.9	14.6	12.3
Houston	6.4	7.6	13.9	15.4	18.1	18.0	18.3	14.4	12.5	9.6
Homeowner										
United States	1.4	1.5	1.5	1.7	1.7	1.6	1.7	1.6	1.8	1.7
Dallas	2.2	1.4	2.0	2.2	1.6	2.1	3.7	3.9	4.1	2.1
Houston	2.2	4.1	3.4	5.4	3.6	3.7	3.4	2.3	2.4	2.1
Office - Downtown Areas										
United States	4.8	10.3	12.4	14.7	16.5	16.4	16.3	16.2	16.7	17.1
Dallas	4.8	10.0	14.6	17.2	17.5	21.6	24.5	23.5	22.4	24.7
Houston	1.3	5.8	14.6	20.9	20.2	20.0	21.9	19.4	18.5	17.7
Industrial										
United States	3.8	4.8	4.9	4.7	5.0	5.8	5.5	6.0	6.4	7.4
Dallas	8.1	7.3	6.9	4.6	6.1	7.0	6.9	8.4	7.2	8.8
Houston	5.7	4.6	5.6	7.7	14.1	14.9	12.7	9.6	9.8	9.3

SOURCE: Taken from Browne (1992, 37). Indirect sources: Housing--U.S. Bureau of the Census; office and industrial--Coldwell Banker.

TABLE 2. SOURCES OF LONG-RUN FORECAST ERROR VARIANCE IN CONSTRUCTION VARIABLES (1976-90)

	NRESPV	MFPV	SFPV
OIL	56.9%	31.1%	7.2%
DEP	7.1	12.2	1.1
INT	7.2	10.3	34.4
US	6.9	4.3	0.7
TX	0.3	14.8	2.4
CONS	21.5	27.2	54.2

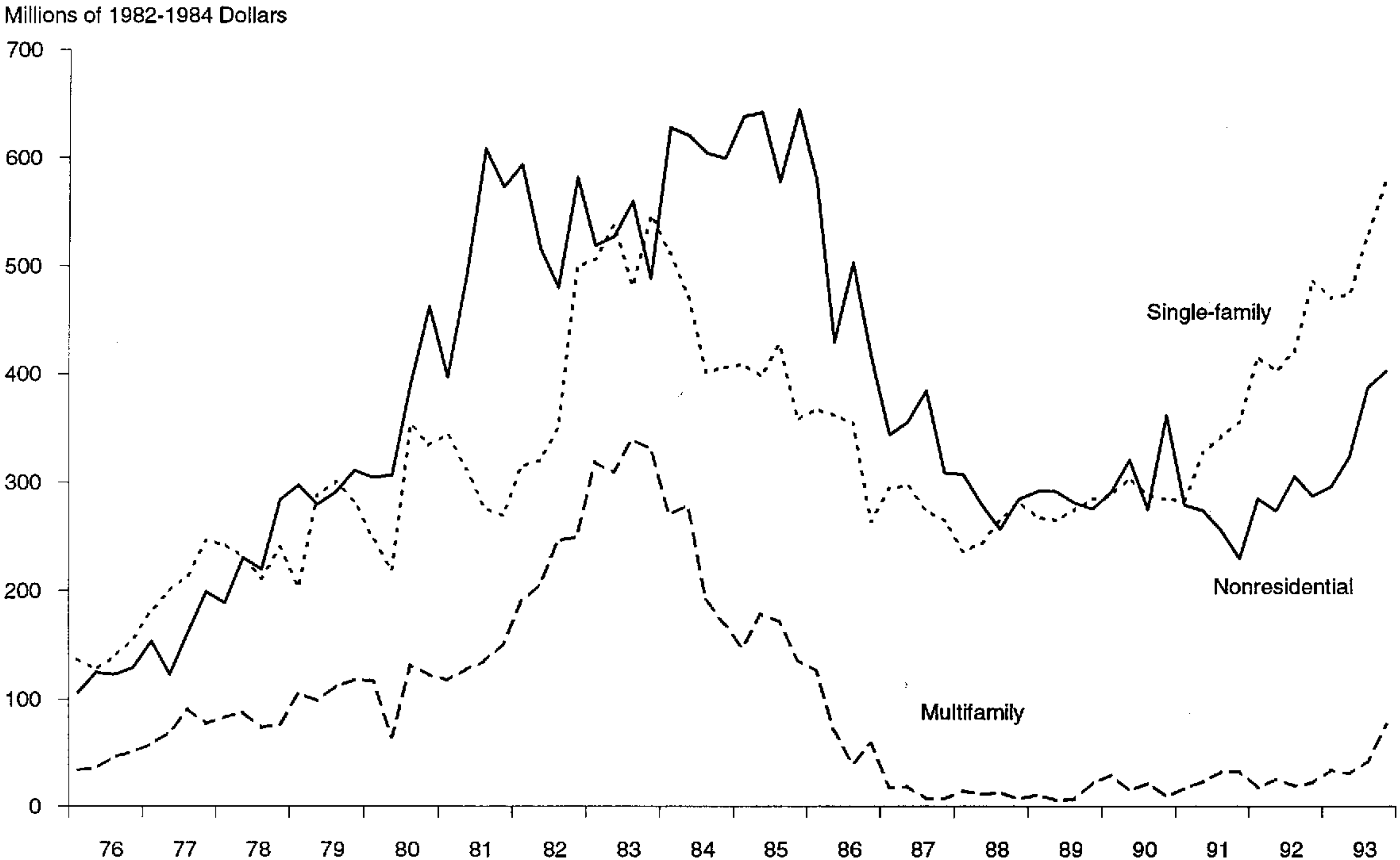
Each column shows the source of variance for the respective construction variable used in the model. The variable CONS refers to the construction sector listed at the top of the column. For example, the first column shows that 21.5 percent of the forecast error variance in nonresidential construction was due to shocks in itself.

TABLE 3. SOURCES OF LONG-RUN FORECAST ERROR VARIANCE IN THE TEXAS ECONOMY 1976-90

	NRESPV	MFPV	SFPV
OIL	40.9%	28.9%	16.0%
DEP	4.6	10.4	9.0
INT	13.9	9.7	0.8
US	34.4	21.7	19.4
TX	1.8	17.9	0.8
CONS	4.3	11.5	54.0

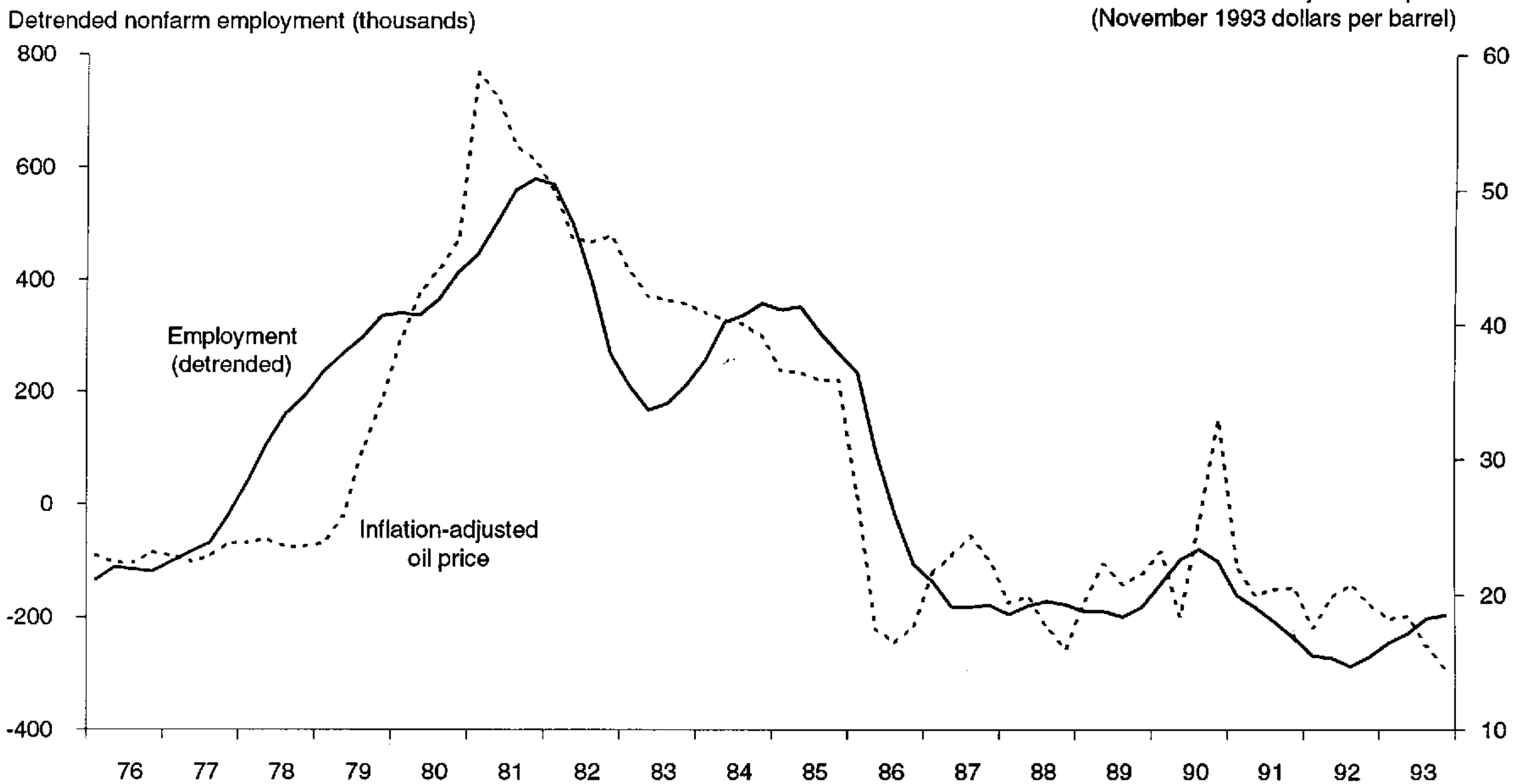
Each column shows the source of variance for Texas personal income for the three different construction variables used in the model. For example, the first column shows that 40.9 percent of the forecast error variance in Texas personal income was due to shocks to oil prices when nonresidential permit values are used as the construction variable. The variable CONS refers to the construction sector listed at the top of the column.

Chart 1
Texas Real Building Permit Values



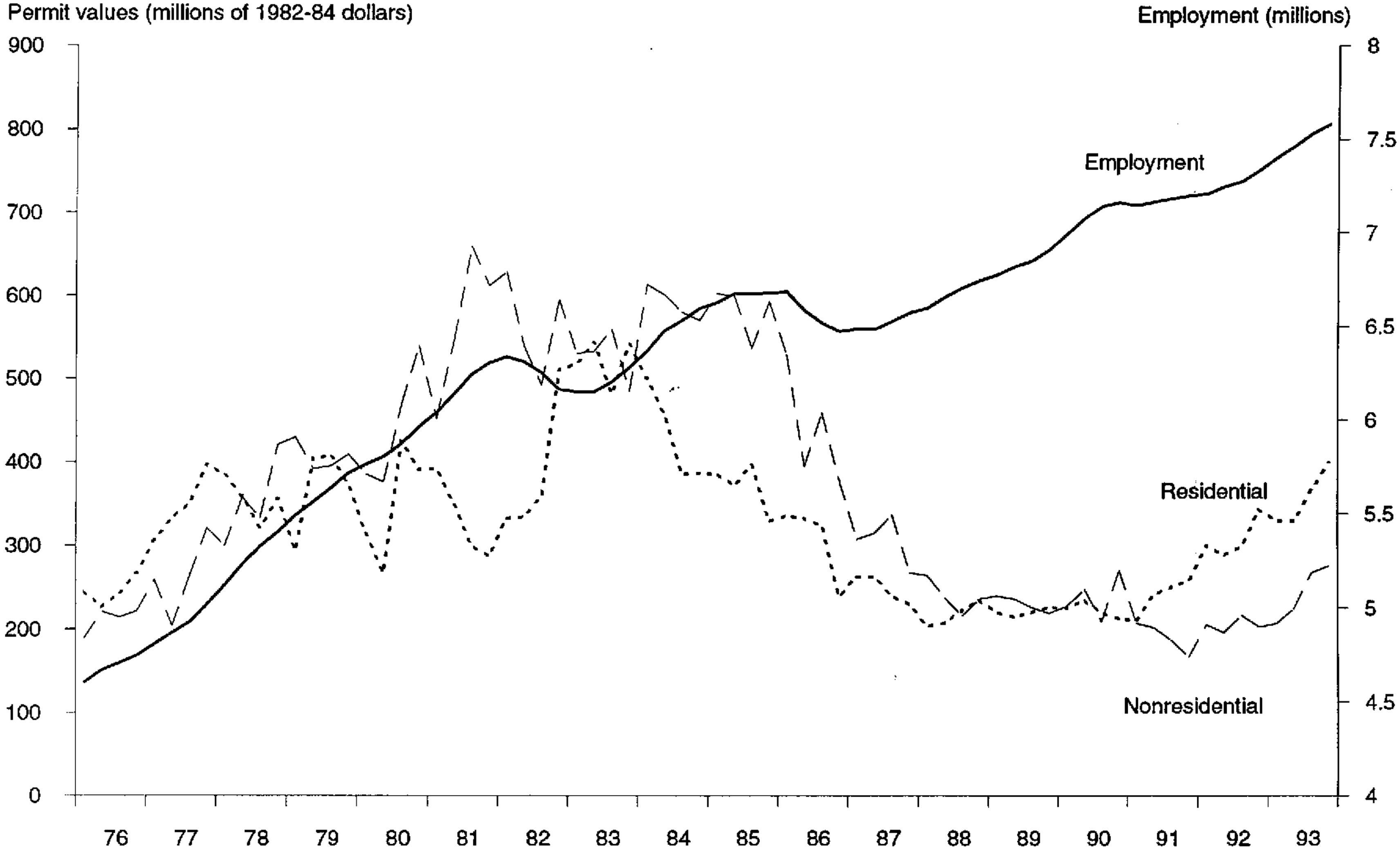
Sources: U.S. Department of Commerce, U.S. Department of Labor

Chart 2
Real Oil Prices and Texas Employment



Sources: U.S. Department of Labor, Federal Reserve Bank of Dallas

Chart 3
Texas Real Permit Values and Nonagricultural Employment



Sources: U.S. Department of Labor, U.S. Department of Commerce, Federal Reserve Bank of Dallas

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