

**The Impact of Revenue Diversification and Economic  
Base on Revenue Stability:  
The Empirical Analysis of State Governments**

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**ABSTRACT**

Revenue stability has been an important policy objective for state and local government administrators. This study explores whether the effect of revenue diversification on revenue volatility varies in terms of the instability of a jurisdiction's economic base. To empirically answer the question, an econometric model that explores a series of factors that could affect revenue stability is estimated using a pooled cross-sectional time series dataset on 47 state governments during the years 1986-2004. The findings indicate that revenue diversification significantly reduces revenue instability of the states that have stable economic bases while marginally increases revenue instability of the states that have unstable economic bases. Although revenue diversification has been advocated as a desirable practice for sub-national governments, this study implies that the utilization of revenue diversification should be constrained by the conditions of a jurisdiction's economic base.

*Keywords: revenue diversification; revenue stability; economic base instability*

## INTRODUCTION

Over the past half century, state and local governments have been increasingly relying on multiple sources of revenue. One reason for utilization of multiple tax sources is the benefits of revenue diversification. However, the effects of revenue diversification on revenue stability have been largely unexplored. This paper investigates how revenue diversification affects the revenue stability of sub-national governments as it interacts with the corresponding economic base. The research question is examined in the context of 47 U.S. state governments.

If we compare the aggregated own-source revenue structure of U.S. state governments between 1957 and 2002<sup>1</sup> as is shown in Figure 1, there is a discernable pattern of revenue diversification in state finance in general. For example, property taxes as a portion of state own-source revenue decreased slightly from about 4% to 2% between 1957 and 2002, total sales taxes decreased from 51% to 35%, license taxes decreased from 13% to 5%, income taxes increased from 13% to 25% and other revenues rose from 19% to 33%. In all, the distribution of different revenue shares for state governments became more even between 1957 and 2002, which provides descriptive evidence of the trend towards revenue diversification in state governments.

[Figure 1 about here]

As revenue diversification has been a prevailing practice for recent decades, sub-national governments start using multiple revenue sources and decrease the reliance on property taxes either out of strategic consideration or practical constraints. The strategic

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<sup>1</sup> Source: Census of Government.

use of revenue diversification relates to its revenue-stabilizing effect as is advocated by many sub-national governments and governmental organizations. Meanwhile, the current literature largely acknowledged the positive impact of revenue diversification on revenue stability as it is measured by fiscal performance.

However, the empirical study of Yan (2008) based on the county revenue data of Georgia suggests that the effect of revenue diversification on revenue instability varies conditional on the instability of a jurisdiction's economic base. To be specific, revenue diversification significantly increases the revenue instability of a county that has a stable economic base while decreases the revenue instability of a county that has an unstable economic base.

It should be noted that there is significant difference between localities and states in terms of economic base and revenue structure. A state government normally has a more diverse economic base than a local government does. Also different from local governments, state governments have gradually relegated property tax to local governments since the beginning of the twentieth century (Howe & Reeb, 1997), which implies that the move toward reliance on multiple revenues in state governments behaves in a different way than it does in the local government. Therefore, the research findings that can guide a local jurisdiction may not be necessarily applicable to state practices. Adopting the similar theoretical framework developed by Yan (2008), this study investigate the effect of revenue diversification on the revenue stability of state governments and whether the effect varies according to the nature of the state's economic base. This study helps to expand the literature in revenue diversification and

provide important policy guidance for state governments that aim to adjust the tax structure to achieve the policy goal of revenue stability.

The next section briefly reviews the literature on revenue diversification. Section three provides the theory that explains the relationship among economic base, revenue diversification and revenue stability. Section four empirically tests the theory with financial and socio-economic data for 47 U.S. state governments. The final section concludes with findings and policy implications.

## **LITERATURE REVIEW**

### **Revenue Diversification in Public Finance**

Diversification refers to the process of changing the level of revenue diversity and selecting assets to minimize risk (Siegel & Johnson, 1995), so a jurisdiction with a diversified revenue structure can be described as relying on a variety of revenue sources. This diversified revenue structure will avoid the imbalanced use of a given revenue source at the cost of other revenue sources (Suyderhoud, 1994).

The greatest advantage of revenue diversification as it is practiced in public finance is the perceived stability and predictability of revenue flow brought by the various revenue sources. The theoretical and empirical verification of the relationship between revenue diversification and revenue stability will be further discussed in the theory section. Since the uncertainty of revenue sources or fluctuations in revenue streams can cause disruption in service delivery and other long-term inefficiencies (Hendrick, 2002), revenue diversification comes into play as a remedy. Furthermore, government budgets are usually made before the actual revenues are realized and

legislators make expenditure decisions “based on the assumption of predictable and steady growth over time”(White, 1983). In addition, state and local governments are expected to maintain a balanced budget and many of them are facing constraints in borrowing power. As such, stability plays a critical role in fulfilling both the long term and short term commitments of a government entity. With the additional funding sources, sub-national governments have greater capacity to accommodate the increased demands of spending as a result of economic cycles, natural disasters, judicial mandates or political actions (Suyderhoud, 1994; White, 1983). Expanding the repertoire of revenues may also help to achieve greater stability in cash management and more flexibility in budgetary planning.

The positive effect of revenue diversification on fiscal performance has been empirically examined and agreed on by much of the recent literature. For example, Suyderhoud (1994) examines how revenue diversification affects fiscal performance. With a robust quantitative measure of diversification, he shows that revenue diversification and a balanced use of revenue sources as a policy goal has a positive impact on fiscal performance, measured by the level of spending, revenue adequacy, equity and efficiency (Suyderhoud, 1994). In another study investigating whether state and local fiscal structure plays a role in determining fiscal stress, local revenue diversification is found to lower fiscal stress (Shamsub & Akoto, 2004). Since a tax effort index is often perceived as a good indicator of fiscal stress, similar findings are found in Hendrick (2002). Her study models the impacts of revenue diversification on tax effort using data from the Chicago metropolitan region, and the findings suggest that revenue diversification is associated with lower tax effort (Hendrick, 2002).

In general, a majority of the existing literature in revenue diversification has more or less accepted the view that revenue diversification should be an important policy goal for state and local government finance inasmuch as it helps to achieve the goal of equity and efficiency, plus it improves fiscal performance (Carroll, 2005; Shannon, 1987; Suyderhoud, 1994; Ulbrich, 1991). Many governmental organizations like ACIR, GFOA and NACSLB advocate the practice of revenue diversification for similar reasons.

### **The Piece That Has Been Missing**

Although the positive effects of revenue diversification on public financial management have been well acknowledged in the current literature, the traditional debt management research and practice pay a greater attention to a closely related but different concept: economic base diversity. As such, the theoretical and empirical verification with respect to the effects of revenue diversification on revenue stability has been largely ignored.

An economic base refers to the variety of businesses and employers found in an area and their relative proportions. Clearly, the unique mix of industries or sectors of each region serves as economic drivers of the regional economy and it could be partially attributed to the region's comparative advantages, such as natural resources and geographical advantages (Froeschle, 2005).

Debt management researcher and credit raters particularly emphasize on the importance of economic base in that government revenues rely on income, which is generated from a wide range of economic activities or an economic base. Large and random swings in economic activities can jeopardize a stable inflow of tax money (Loviscek & Crowley, 1990), thus affecting a jurisdiction's debt-repayment capacity.

Past research holds the view that “revenue variables are less important in bond ratings than the base from which the revenues are taken” (Hildreth & Miller, 2002). A similar view is also held by rating agencies. Standard & Poor’s rating criteria (2005) perceives the strength of the local economy is a determining factor of revenue volatility and financial growth prospects, so economic base is a critical consideration in credit rating assessment.

However, Yan (2008) and this paper suggest that a diverse economic base is only one important condition that equips a government with the strong capacity in managing all of its financial obligations. A diverse economic base helps to generate stable tax revenues only when acting with its compatible tax structure. The effect of revenue structure, particularly its degree of diversification, on revenue stability, has been largely understated in the existing literature. This study is a continuing effort of Yan (2008), which uses state finance data to empirically prove that both tax structure and economic conditions are important in affecting revenue stability, and revenue stability can be improved through an appropriately selected tax structure.

## **THEORETICAL FRAMEWORK**

### **Overview of the Theory**

In general, a regional economic base with a variety of industries and sectors provides the foundation for a given government tax structure. The interaction between this tax structure and the regional economy which is reflected by the level of outputs from the economy base will generate different levels of revenues that are used for various government functions. Whether the inflow of revenue is stable has great implications for the fiscal administration of a particular government as discussed in the previous section. This study adopts the similar theoretical framework as Yan (2008), which prescribes how revenue structure, indicated by the degree of diversification, and economic conditions, indicated by the varying nature of economic bases, act together to affect the revenue stability of a jurisdiction. Since the details of the theory have been well discussed in Yan (2008), the rest of the section first briefly reviews the direct relationship between revenue structure and revenue stability without taking into account the effect of economic base and then it summarizes the relationship between revenue diversification and stability while considering the intermediate influence of economic base.

### **Revenue Structure and Revenue Stability**

In government finance, revenue diversification can be applied in a similar way as investment diversification according to Yan (2008). We could perceive the various revenue sources as a government's investment portfolio and each revenue source as one of the assets in the portfolio. The instability of tax revenue is similar to the volatility of returns in corporate finance. In terms of portfolio theory, the stand-alone risk is no longer

a major concern for a well-diversified portfolio but the market or systematic risk coming from the general economy. The market risk of an entire portfolio is determined by the individual market sensitivity or market risk of each security in the portfolio. Therefore, a policy maker should consider how to adopt different combinations of taxes to alter the systematic risk, which is determined by the general economic condition.

In government finance, the elasticity of each tax indicates that individual tax revenues have different degrees of sensitivity to the general economic condition by nature. Therefore, the revenue risk subject to economic cycles can be reduced by altering the tax structure to include inelastic taxes. The trade-off is that returns or revenue growth will not increase as much during periods of economic growth as it would for a tax structure with more elastic taxes.

In summary, Yan (2008) suggests the strategies that are employed to reduce revenue volatility should vary in terms of the unsystematic and systematic risk. To be specific, diversification can eliminate the nonsystematic risk if there are a large number of revenue options, which are imperfectly correlated. To reduce systematic risk, the elasticity ( $\beta^*$ ) of the entire revenue portfolio can be adjusted by selecting a mix of taxes with low elasticity ( $\beta_i$ ).

However, Yan (2008) points out that the actual effect of revenue diversification varies in the practice of government finance. Sub-national governments are oftentimes constrained by limited revenue options, which imply that the nonsystematic risk can be alleviated to some extent but can hardly be eliminated as it is in the investment portfolio. In addition, the correlation between these revenue sources could be another potential concern. The effect of revenue diversification on systematic risk is hinged on how

revenue diversification alters the elasticity of the entire government revenue portfolio. Revenue diversification can increase the overall elasticity and reduce the revenue stability by having a combination of elastic taxes, though it may lead to revenue growth. Alternatively, revenue diversification can improve revenue stability by creating an inelastic revenue portfolio through the appropriate tax selection. As such, the overall effect of revenue diversification is not necessarily clear without analyzing the specific tax portfolio.

### **Revenue Diversification, Economic Base and Stability**

The unique composition of economic sectors in a region drives its economy and offers the government with possible revenue sources. Furthermore, the fluctuations in a regional economy can affect the revenue streams. Since economic bases differ greatly in terms of their nature, the varying nature of economic bases makes the regional economic outputs more or less susceptible to business cycles or other external fluctuations.

Following Yan (2008), the study uses economic base instability to describe the nature of an economic base by capturing the extent to which economic bases are influenced by the external risk, including nonsystematic risk caused by random or exogenous shocks and systematic risk from business cycles. By taking into account the factor of economic base, the specific effect of revenue diversification on revenue volatility is discussed in terms of nonsystematic and systematic risk and the theoretical framework as a whole is provided at the end of the discussion.

### ***Revenue Diversification and Nonsystematic Risk***

Since sub-national governments face the constraint of limited revenue options, it is hard to eliminate nonsystematic risk through revenue diversification. Furthermore, the constraint of limited revenue sources implies that most of these governments are subject to similar degrees of non-systematic risks. To better address the concern of revenue volatility, strategy should be focused on lowering the systematic risk by adjusting the relative share of each source in the government revenue portfolio (Yan, 2008).

### ***Revenue Diversification and Systematic Risk***

As regional business cycle theory proposes, regional differences in economic instability resulting from national business cycles can be attributed to a region's composition of stable (eg. population-serving sectors) and unstable sectors (eg. export-oriented sectors) (Siegel & Johnson, 1995).

If a given region is dominated by unstable sectors, the employment and income of the economic base is more sensitive with respect to changes in the general economy. According to (Yan, 2008), the government can employ a diversified tax structure, in that a more balanced mix of tax revenues can decrease the elasticity of the government tax portfolio and enhance the overall revenue stability by reducing the heavy reliance on elastic revenues out of the unstable sectors in the area.

If an economic base contains more stable sectors than unstable ones in its sectoral mix, the level of the regional economic outputs should be relatively stable or less sensitive to the economic swings. In this case, Yan (2008) argues that adopting a diversified tax structure can raise the elasticity of the tax portfolio because diversification

will lower the proportion of inelastic revenues from the stable sectors. That is to say, a naive pursuit of a balanced mix of many unstable small taxes may not be the desirable strategy to pursue because doing so would increase the volatility of overall revenue.

***Theoretical Framework of Revenue Stability Determination***

In all, a regional economy is generally affected by both nonsystematic risks and systematic risks, and both risks can jeopardize revenue stability by affecting the regional employment and income. When both risks are taken into consideration, regional differences in economic instability can also be explained by a region's mix of stable and unstable sectors.

If we conveniently categorize economic bases into two types in terms of their nature: unstable economic bases within, which the economy is dominated by unstable sectors, and stable economic bases if it has more stable sectors in the industry mix. According to Yan (2008), a diversified revenue structure under an unstable economic base could enhance revenue stability; while a less diversified revenue structure may bring in more stable revenues than a diversified one if a region has a relatively stable economy or the primary tax base is less sensitive to external fluctuations.

As such, the theory of Yan (2008) suggests revenue stability can be enhanced through choosing an appropriate tax structure in terms of the given characteristics of the economic base.

## **STATE LEVEL EMPIRICAL ANALYSIS**

### **Research Hypotheses and Model Specification**

Different from local governments, state governments have devolved property tax to local governments since the beginning of the twentieth century (Howe & Reeb, 1997). Since the era of tax revolt in the 1970s, although the primary target of the taxpayer opposition was the local property tax, state governments have been constrained by limitations on revenue and expenditure or the size of their growth (Joyce & Mullins, 1991). The relegation of property tax to localities and the limitations on revenue and expenditure resulting from tax revolt largely changed the fiscal environment of state governments. Therefore, the move toward reliance on multiple revenues in state governments behaved in a different way than it does in the local government. The goal of this section is to explore the interactive effect of revenue diversification and economic base on revenue stability.

The theoretical framework developed in the previous section suggests the effects of revenue diversification on revenue volatility vary conditional on the instability of economic base, three testable hypotheses are raised: 1) under a stable economic base, revenue diversification increases revenue instability; 2) under an unstable economic base, revenue diversification reduces revenue instability; 3) the revenue-stabilizing effect from diversification is more significant as an economic base becomes more unstable. The following equation is proposed to test the above three hypotheses with relevant data for U.S. state governments. The measurement issue will be specifically discussed in a later section.

$$\mathbf{RS} = \mathbf{f}(\mathbf{RD}, \mathbf{ES}, \mathbf{RD} * \mathbf{ES}, \mathbf{RC}, \mathbf{POP}, \mathbf{NSR}, \mathbf{FS}, \mathbf{PC}) \quad (1)$$

**RS:** revenue instability

**RD:** revenue diversification

**ES:** economic base instability

**RD\*ES:** interaction of revenue diversification and economic base instability

**RC:** tax and revenue capacity

**POP:** population

**NSR:** reliance on non-sales tax sources of revenue (property tax, license taxes, income taxes, and general charges)

**FS:** financial slack

**PC:** political control

In this model, the key factors are revenue diversification, economic base instability and their interaction. The other components control for the conditions that might also influence revenue stability. The influence of party competition is taken into account for the reason that political heterogeneity greatly exists across states and within a particular state.

### **Data and Research Design**

The data for the financial variables in the state level analysis come from U.S. census of governments and National Association of State Budget Officers (NASBO). Government Finances from U.S. Census Bureau provides comprehensive and longitudinal state revenue data which covers the years from 1957 to 2004. This state area data base provides information of all revenue sources for state governments in great detail. However, the study only focuses on the portion of general own-source revenues

(GOSRs), which includes taxes and nontax revenues<sup>2</sup>. To analyze the tax structures of states, this state level study aggregates all GOSRs into five main revenue categories: property taxes, income taxes, total sales and gross receipts taxes with general sales and selected sales taxes included, license taxes, and all other revenues including general charges, death and gift tax, taxes NEC and miscellaneous revenue.

The political variable data are from National Conference of State Legislatures (NCSL). The sources of socio-economic data are Bureau of Economic Analysis and County Business Patterns provided by U.S. Census Bureau. Since complete County Business Patterns series data are available only for 1986-2005, the study has to constrain its observation period to 19 years (1986-2004) to accommodate this limitation.

In the state level model, a time series cross section dataset is created to estimate the relationship between revenue diversification and revenue stability under different types of state economic bases. Alaska and Wyoming are excluded because of their unusual tax structure: both states heavily rely on severance taxes due to natural resources (Misiolek & Harold, 1988). Nebraska is not included for its unique unicameral and nonpartisan state legislature. The resulting sample retains 893 observations from 47 states during the 1986-2004 time period. The unit of analysis is an individual state government each year it is observed.

It should be noted that all financial data have been converted to year 2000 constant dollars using the implicit price deflator for gross domestic product provided by the Bureau of Economic Analysis.

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<sup>2</sup> For detailed information regarding all revenue categories, please refer to \\Govs05\PEB\Historical Data\Finance\Publication\_Data\Documentation\Finance\_Publication\_Data\_Guide.xls

## The Variables

### *Revenue Instability*

Instability can be defined as the degree to which actual revenue deviates from predicted revenue. The greater the variation around the expected growth rate, the greater the revenue instability (Gentry & Ladd, 1994).

Consistent with Yan (2008), the study measures revenue instability by the portfolio standard deviation which defines instability as “the short-run variability of the tax portfolio around its expected growth rate and accounts for both the variance of the trend-adjusted residuals of individual taxes and their covariances” (Gentry & Ladd, 1994). The reason for choosing this measure is that it captures the overall instability in the revenue sources without separating cyclical variability (Brien, 2006; Holcombe & Sobel, 1995). The following equation defines the portfolio standard deviation:

$$\sigma_T = \sqrt{\sum_{i=1}^n \sum_{j=1}^n R_i R_j \rho_{ij} \sigma_i \sigma_j} \quad (1)$$

where  $R_i$  and  $R_j$  are the level of revenue from tax  $i$  and  $j$ ,

$\sigma_i, \sigma_j$  are the standard deviations of taxes  $i$  and  $j$ , and

$\rho_{ij}$  is the correlation coefficient between the two taxes.

Here the revenue instability is estimated as the above tax portfolio standard deviation in million dollars.

### *Revenue Diversification*

Given that the Hirschman-Herfindahl Index (HHI)<sup>3</sup> has been widely accepted as

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<sup>3</sup> HHI is calculated by summing the squares of each revenue share (Suyderhoud, 1994).

a measure for risk-reducing revenue diversification, this study adopts a revised measure of HHI, which considers the five revenue categories as discussed previously (property taxes, income taxes, total sales and gross receipts taxes, license taxes, and all other revenues) and it is defined as

$$RD = \frac{1 - \sum_{i=1}^5 R_i^2}{0.8} \quad (2)$$

where  $R_i$  is the share of revenue<sup>4</sup>. The value of the index ranges from zero to one with increasing values of RD implying more balanced government total revenue among the designated revenue categories or higher levels of diversification.

### ***Instability of Economic Base***

The differing instability of an economic base makes the economic activities in a region more or less subject to business cycles or other external fluctuations. This in turn affects the tax revenues of a government. The instability of an economic base can be further interpreted by regional economic instability (REI).

Consistent with Yan (2008), REI here is measured by the coefficient of variation of the trend-adjusted residuals of annual employment which was developed by Conroy (1972, 1975) and it is defined as follows:

$$ES_k = \sqrt{\frac{\sum_{t=1}^T \left[ \frac{Y_t^k - \widehat{Y}_t^k}{\overline{Y}_t^k} \right]^2}{T - 1}} \quad (3)$$

Where  $ES_k$  is economic instability for state k

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<sup>4</sup> This equation can be expressed in an alternative way as  $RD = (1 - \sum R_i^2) / (1 - \sum R_i^{*2})$ , where  $R_i^* = 0.2$  in the context of this study when a government achieves the maximum diversification under the scenario of five revenue categories.

$Y_t^k$  is observed employment in state k for period t,

$\widehat{Y}_t^k$  is a linear approximation of long-run growth trend in employment in that state and period,

$\overline{Y}_t^k$  is the arithmetic average of the respective time series, and

$T$  is the number of time periods included in the analysis.

The variation from a predicted level of employment is a standard way to understand economic instability. Here the estimation uses the state level annual employment data from 1986 through 2004. Because the measure of economic instability is constructed in a way to reveal a common attribute of a unit over the time it is observed, the value of the index is constant throughout the observation period for each state but it varies across states.

As discussed earlier, the effect of revenue diversification on revenue volatility may change according to the instability of the economic base. An interaction term of revenue diversification and economic instability is included in the model to explore this conditional relationship. According to Yan (2008), the coefficient of RD is the effect of RD on revenue instability when ES=0 and the expected effect on revenue instability is positive. The interactive variable RD\* ES is expected to have a negative effect on revenue instability.

### ***Other Variables***

Additional control variables are included in the model to isolate the effects of other conditions that also affect the dependent variable. Log of state per capita personal income is chosen to control for the influence of the varying tax capacity of a state

government on its revenue stability. However, there is no prior expectation of relationship between income and revenue instability.

The size of a state is captured by population (in thousands) and the square of population (in thousands). Since the size of a jurisdiction can have a positive impact on economic stability (Brewer & Moomaw, 1985; Thompson, 1965), a larger population is assumed to reduce revenue instability, but the direction of the marginal impact indicated by the quadratic term is unclear.

Besides revenue diversification, financial slack of a government can also serve as a means to mitigate the negative impact of revenue instability and uncertainty by providing an alternative revenue source (Hendrick, 2002). Therefore, according to Yan (2008), slack resources could reduce the imperative for revenue stability. In the state model, the slack resources are measured by the amount of budget stabilization funds in million dollars and it is expected to be positively associated with revenue instability.

The variables of revenue shares for property tax, license taxes, income taxes, charges and other revenues in the state case are used to distinguish their different contributions to revenue stability relative to sales taxes given that two distinct tax structures may be likely to have the same value of diversification index. Here the revenue shares are indicated as the percentage of general own source revenues from each non-sales tax source with total sales and gross receipts as the omitted category and their signs need to be explored.

In the state level analysis, besides all factors mentioned above, political factors might also have an influence on revenue variability and the effects particularly salient during the process of tax and expenditure adjustment when governments face unexpected

deficits. When sub-national governments face fiscal crises, the unexpected deficits are usually expected to be corrected within the same fiscal year, through changing taxes and spending. Among a series of factors that explain the magnitude of the fiscal adjustment, Poterba (1994) suggests that political factors are also important: states with single party control of both the state house and governorship react faster to fiscal shocks through raising taxes and cutting spending by greater amounts than divided governments do. This finding implies political control can affect the degree of fiscal adjustment to unplanned revenue shocks, which in turn can alter the revenue stability. In this study, the political control factor is captured by a dichotomous variable with a unified government equal to one and zero otherwise. The expected sign of the variable is positive.

Table 1 provides the detailed description of variables, expected signs of coefficients and data source.

[Table 1 about here]

### **Regression Results**

Given the panel structure of the data set, the model is estimated using fixed effect model with robust standard error because there is a strong correlation (-0.742) between the residuals and the fitted values using other explanatory variables in the model, which is a test of the hypothesis that random effects would result in unbiased estimation, and the Breusch-Pagan/Godfrey LM test revealed the existence of heteroskedasticity. Since economic instability is a non-varying state characteristic, it does not appear in the fixed effects estimation, i.e. it becomes part of the fixed effect.

Table 2 gives the descriptive statistics of all variables used in the analysis. As we can see from the table, the mean value of revenue diversification is 0.829 which implies

that the 47 states are fairly diversified in their revenue structures as a whole. From the revenue share variable, we can see that the omitted category, total sales and gross receipts still accounts for about 37% of the GOSRs, which is still the largest share among all revenue sources. The second and third largest share, service charges (with other sources included) and income taxes take about 29% and 27% of the GOSRs respectively.

The fixed-effect regression results of the state level model are listed in Table 3. All of the variables except for population, license tax share, income tax share, service charge share and unified government show statistical significance at the five percent level. Different from what is expected, revenue diversification by itself is negatively related to revenue volatility with the absence of economic base instability. Stated another way, a diversified revenue structure tends to decrease the overall risk of revenue when the economic base of a state is entirely stable or immune to general economic fluctuations and other external shocks.

Since revenue diversification and economic base instability are scale measures, the magnitude of the effects of these variables should be interpreted in terms of a change of one standard deviation of the variable. According to Table 3, a one standard deviation (0.1) increase in revenue diversification, for example, RD is moving from the mean RD 0.8 to 0.9, can lead to an average decrease in revenue variability by 625.8 ( $-6258 * 0.1$ ) million dollars over time.

Given the theory suggests that the effect of revenue diversification on revenue volatility changes according to different economic base instability, it is important to explore the effect of their interaction (RD\*ES) as well. According to Table 3, the positive coefficient of the interaction term indicates that the revenue stabilizing effect from

revenue diversification decreases as the instability of state economic base gets higher, which contradicts with the hypothesis. When both the instability of a state's economic base and revenue diversification are taken into account, the negative effect of revenue diversification on revenue instability decreases by 155.552 ( $155552*0.1*0.01$ ) million dollars on average for every unit increase in the interaction term ( $0.1*0.01$ ) when both RD and ES are equal to zero. The effect is larger, the larger either RD or ES, and is always positive, which gradually offsets the negative effect of revenue diversification on revenue instability.

Consistent with the study of Yan (2008), the study calculate the marginal effect of revenue diversification across the range of different economic base instability to capture the overall effect of revenue diversification on revenue risk, which includes the effect of RD in isolation and the interacting influence of revenue diversification and economic base instability. The marginal effect of revenue diversification on revenue volatility is presented in Table 4, and it is computed in terms of the economic base instability in different percentiles found in the 47 states. Table 4 shows that revenue diversification has a negative effect on revenue variability for a majority of states along the ES spectrum (up to the 75th percentile or  $ES \leq 0.04$ ) while it has a positive effect from about the 90th percentile. The negative effect on revenue volatility is most statistically significant for states that are at or below the 10th percentile of economic base instability or when economic base instability is lower than 0.02. For states in these categories, as is shown in Table 4, every 0.1 increase in revenue diversification is estimated to at least decrease revenue instability by 297.37 million dollars. The positive effect is found to be statistically significant (at the 10 percent level) for states at the higher end of the ES

spectrum (the 99th percentile and above) or when economic base instability is greater than 0.06. For states in these categories, every 0.1 increase in revenue diversification is estimated to at least decrease revenue instability by 297.37 million dollars. As is shown in Table 4, revenue diversification significantly reduces revenue risk for a portion of states that have relatively low economic instability. This negative effect is desirable for governments with the stability concern. However, the magnitude of the negative effect decreases as the economic base instability increases until the effect becomes positive.

The findings contradict the first two hypotheses and the findings of Yan (2008) by suggesting that revenue diversification significantly reduces revenue volatility under a stable economic base, while revenue diversification marginally increases revenue volatility under an unstable economic base. In addition, the effect of revenue diversification on the revenue instability of states along the ES spectrum is shown in Figure 6 by a continuous and upward trend, and it suggests that the revenue stabilizing effect of diversification becomes less significant when an economic base gets more unstable, which also contradicts the third hypothesis and the corresponding finding of Yan (2008).

There are two possible reasons that could explain the inconsistent findings. First, on average, the states have smaller economic instability than localities and the variation of economic instability among states is relatively smaller than that of local jurisdictions as well. Furthermore, states are generally really diverse in their industry composition. Therefore, the economic instability at the state level is more likely to reflect the risk from economic fluctuations rather than the non-systematic risk from some random factors given that this risk can be largely absorbed by the diverse industry mix. This also

explains the greater homogeneity or smaller dispersion in economic instability that is found across states. Second, the contents of revenue diversification are different between states and counties. Although local governments have reduced their reliance on property tax, property tax is still a major revenue source for counties and other local jurisdictions. Furthermore, property tax is a more inelastic and more stable source of revenue for local governments compared to income and sales taxes. Diversifying local revenue structures essentially increases the revenue shares from other sources but retains property tax as an important revenue component. With property tax as a major revenue component, the local revenue structure could be more immune to the economic cycles. Since states handed the property tax revenue to local jurisdictions about a century ago, property tax is no longer a significant revenue source for state governments. Therefore, revenue diversification at the state level implies the efforts of striving for a balance between the three major revenue sources of states: sales taxes, income taxes and general charges. Given that sales and income taxes are more sensitive to cyclical changes than property tax, revenue diversification efforts in states essentially increase the overall elasticity of the tax structures. Under a stable economic base, the negative impact of the elastic tax structure can be largely contained and revenue diversification mainly manifests its risk-reducing effect through addressing the nonsystematic risk. To be more specific, the nonsystematic fluctuations in economic outputs can be well balanced by a diverse regional economy. To further avoid the negative impacts of nonsystematic risk on tax revenues, a diversified revenue structure is also required to act with the diverse economy. While economic instability gets higher, the negative impact of the elastic state tax structure can be more

salient and outweigh the benefits of addressing the nonsystematic risk, which is shown by the upward trend of revenue variability.

For the control variables, income is positively correlated with revenue instability. The effect of income implies that tax smoothing is a less of a concern for a wealthy state. In other words, wealthier jurisdictions could have more tolerance for risk. None of the revenue share variables except for property tax share which shows statistical significance are found to be important factors in changing the level of revenue risk. Stabilization fund also adds to the revenue instability but the magnitude is small. The population variable is not a good predictor of revenue instability, which is different from the expectation. In addition, the square of population contributes to revenue instability but the effect is negligible. Also different from the expectation, unified government does not show statistical significance in predicting the level of revenue instability.

[Table 4 about here]

[Figure 2 about here]

## **CONCLUSION AND POLICY IMPLICATIONS**

Drawing from the portfolio theory in corporate finance and the regional science literature, the study of Yan (2008) from both theoretical and empirical perspectives explores how revenue diversification affects revenue stability through interacting with a jurisdiction's economic base. Using the similar theoretical framework and the relevant data from 47 states, this study examines the interactive effect of revenue diversification and state economic base on its revenue stability.

As a summary, the findings of the state level analysis do not support the hypotheses: revenue diversification significantly reduces the revenue instability of a state which has a stable economic base, while revenue diversification marginally increases revenue volatility of a state which has an unstable economic base. Furthermore, the revenue stabilizing effect of diversification decreases when an economic base gets more unstable. The inconsistent findings between the county analysis (Yan, 2008) and the state analysis may be explained by the inherent difference between localities and states in terms of the nature of economic base and revenue structure. To be specific, the state economic bases that are built on a diverse industry structure are more stable than those of localities. Therefore, the instability of state economic bases is more likely to reflect the cyclical fluctuations. On the other hand, because of the absence of property tax in state revenue structure, the state revenue structures as a result of revenue diversification will be more sensitive to cyclical changes. Given the significant difference between localities and states, the interactive effect of revenue diversification and economic base on the

revenue stability of states behaves differently from what has been found in Georgia counties (Yan, 2008).

With the findings from Yan (2008) , this study further confirms that the effect of revenue diversification on revenue instability varies conditional on the instability of a jurisdiction's economic base. The findings imply that the practice of revenue diversification should be moderated by the conditions of economic base. To achieve the goal of revenue stability, the degree of revenue diversification should match the nature of a jurisdiction's economic base. In the context of state governments, a more diversified tax structure should be adopted to enhance the revenue stability when a state has a high economic stability. But when the economic stability decreases, the risk-reducing effect of revenue diversification will be diminishing.

From the public financial management perspective, policy-makers should still pay more attention to revenue diversification, given its controllability and short-term impact. For the long term, the policy direction should still focus on bringing in growing industries that promise to diversify the economic base through appropriate development strategies.

It should be noted that this study does not incorporate the effects of the adjustments made to tax rates or bases which could also alter the revenue stability and growth. The results should be interpreted with caution and it may require some adjustments based on the corresponding realities.

As many regional science researches believe that there is a causal relationship between industrial diversification and the regional economic stability, it will be interesting to investigate the differential impacts of revenue diversification, industrial

diversification and their interaction on the revenue stability or even further, credit ratings of sub-national governments.

Figure 1

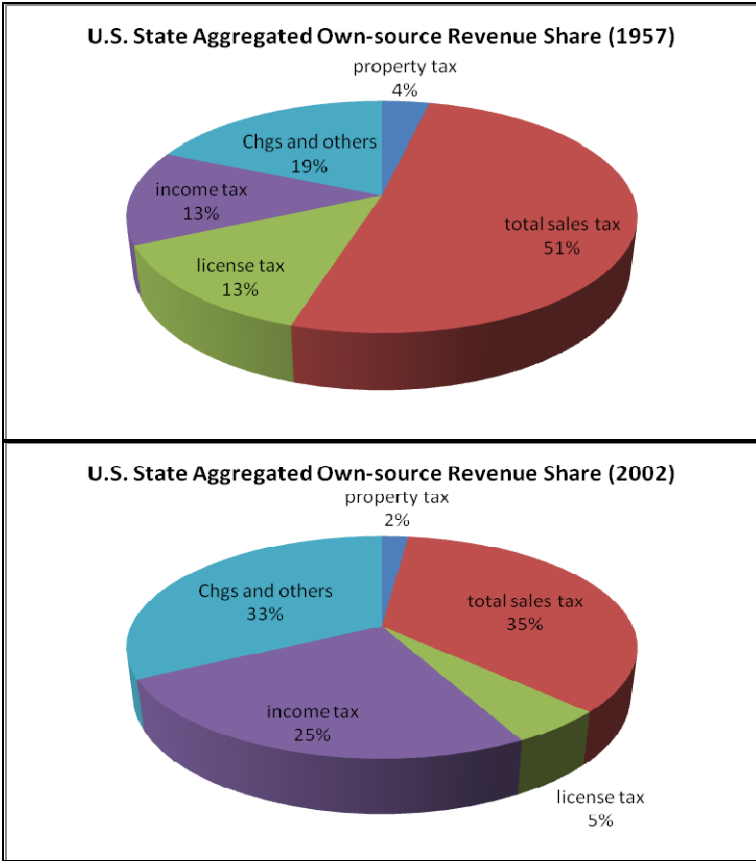
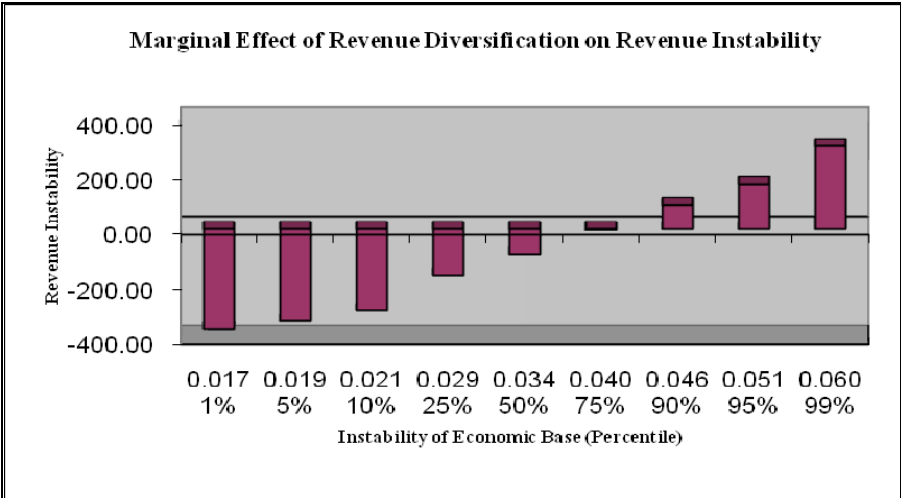


Figure 2



**Table 1: Variable Information for Revenue Stability Estimation**

<b>Variable</b>	<b>Description</b>	<b>Expected Signs</b>	<b>Data Source</b>
<b>RS</b>	Revenue instability measured by portfolio standard deviation in million dollars (White,1983)		Census of Governments: Government Finances
<b>RD</b>	Revenue diversification measured by modified Hirschman-Herfindahl Index	+	Census of Governments: Government Finances
<b>ES</b>	Regional economic instability measure by coefficient of variation of annual state employment	+	County Business Patterns (U.S. Census Bureau)
<b>income</b>	Log of state per capita personal income	?	Bureau of Economic Analysis
<b>pop_ths</b>	Population in thousands	-	Census of Governments: Government Finances
<b>pop_ths_sq</b>	The square of pop_ths	?	Census of Governments: Government Finances
<b>ptxshare</b>	Percent revenue from property tax	?	Census of Governments: Government Finances
<b>ltxshare</b>	Percent revenue from license tax	?	Census of Governments: Government Finances
<b>intxshare</b>	Percent revenue from income tax (including personal income tax and corporate income tax)	?	Census of Governments: Government Finances
<b>servshare</b>	Percent revenue from service charges and other sources	?	Census of Governments: Government Finances
<b>SF</b>	Budget stabilization fund in million dollars	+	The National Association of State Budget Officers (NASBO)
<b>unified</b>	Unified government=1 and 0 otherwise	+	National Conference of State Legislatures (NCSL)

**Table 2: Descriptive Statistics**

Variable	Mean	Std. Dev.	Min	Max
<b>RS</b>	818.441	1047.391	40.046	9960.797
<b>RD</b>	0.829	0.068	0.536	0.952
<b>ES</b>	0.034	0.009	0.017	0.060
<b>RD*ES</b>	0.028	0.008	0.011	0.051
<b>pop_ths</b>	5,592.585	5,873.414	534	35,842
<b>pop_ths_sq</b>	65,700,000	163,000,000	285,156	1,280,000,000
<b>income</b>	9.997	0.277	9.230	10.723
<b>ptxshare</b>	0.014	0.031	0.000	0.203
<b>ltxshare</b>	0.054	0.031	0.009	0.234
<b>incshare</b>	0.269	0.122	0.000	0.527
<b>servshare</b>	0.291	0.080	0.150	0.604
<b>SF</b>	163.153	449.273	-3535	8666
<b>unified</b>	0.415	0.493	0	1

Note: N=893

**Table 3: Fixed-effects Estimates for Revenue Instability(in Million Dollars)**

Variable	Coef.	Robust Std. Err.	t	P> t
<b>RD</b>	-6258.21	2215.21	-2.83	0.007
<b>RD*ES</b>	155552.20	48223.08	3.23	0.002
<b>pop_ths</b>	-0.02	0.08	-0.23	0.822
<b>pop_ths_sq</b>	0.00	0.00	5.44	0.000
<b>income</b>	403.37	79.66	5.06	0.000
<b>ptxshare</b>	3632.00	1078.42	3.37	0.002
<b>ltxshare</b>	-504.28	1554.72	-0.32	0.747
<b>incshare</b>	1408.92	1352.89	1.04	0.303
<b>servshare</b>	660.67	751.69	0.88	0.384
<b>SF</b>	0.14	0.01	10.79	0.000
<b>unified</b>	-1.83	19.11	-0.10	0.924
<b>Constant</b>	-3464.95	833.83	-4.16	0.000

Number of observation = 893; Number of groups = 47

Observations Per Group (Min = 19; Avg = 19; Max = 19)

R-squared: within = 0.7993; between = 0.3864 ; overall = 0.3984

corr(u<sub>i</sub>, Xb) = -0.7423

F(11,46) = 66.69

Prob&gt;F = 0.0000

**Table 4: Marginal Effect of Revenue Diversification on Revenue Instability(in Million Dollars)**

Percentiles of				
ES	ES	F-value	Prob>F	Marginal Effect of RD
1%	0.0167	5.23	0.0268	-365.50
5%	0.0187	4.75	0.0344	-335.32
10%	0.0211	4.11	0.0485	-297.37
25%	0.0295	1.72	0.1965	-167.67
50%	0.0343	0.57	0.4553	-91.75
75%	0.0400	0.00	0.9790	-3.18
90%	0.0460	0.50	0.4811	88.96
95%	0.0508	1.51	0.2251	164.47
99%	0.0597	3.71	0.0603	303.32

Note: 1) N = 893

2) Marginal effect is calculated based on fixed-effect estimates of RD and RD\*ES

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