The Role of Intergovernmental Aid in Defining Fiscal Sustainability at the Sub-national Level

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Introduction

This paper addresses the concept of fiscal sustainability in the context of a federal system; there are at least three reasons why fiscal sustainability matters in this context. First, the notion of local governments entering bankruptcy proceeds is no longer a theoretical notion. From Vallejo California to Jefferson County Alabama, insolvency is no longer a potential risk—rather, it has been realized. Fiscal sustainability analysis will help to address the future of these types of cases. Second, previous formal sustainability analysis has primarily focused on the aggregate primary balance and debt, with little disaggregation. This paper takes a small step in this disaggregation by examining three different types of budget balances. Finally, there is a need to examine if city and county governments are fiscally sustainable if there is no intergovernmental aid from the state or federal governments. This is particularly the case when public services are devolved from the state to local governments. For example, county jails are now often responsible for accommodating prisoners that used to be housed in state penitentiaries. However, state resources often do not following these new local responsibilities. This paper focuses on this last reason.

Much of the literature on fiscal sustainability at the sub-national level ignores the role of intergovernmental fiscal relations. This distinct lack of attention on inter-governmental aid and its effect on fiscal sustainability of local governments has resulted in a dearth of empirical analysis of fiscal sustainability that focuses on non-national level sustainability. Further, the only paper (Mahdavi & Westerlund, 2011) that examines fiscal sustainability at below the national level aggregates state and all local governments. This paper will explicitly investigate the importance of intergovernmental aid for local government sustainability purposes. The paper

will first put in context and then extend the Ward and Dadayan (2009) definition of fiscal sustainability to introduce the intergovernmental dimension. Our definition will extend the definition of the role of intertemporally balanced debt and add in a formal methodology of the intergovernmental dimension, including a discussion of hard and soft state-local budget relationships. Then, using cointegration analysis, we statistically analyze this more articulated definition and the more accurate disaggregated units of local governments, cities and counties, to measure U.S. city and county long run sustainability. Broadly, we find that intergrovernmental aid is very important in determining some aspects of successful fiscal sustainability.

This paper will be in five parts. The first will examine the history and definition of fiscal sustainability and then extend it. The second section will then briefly discuss intergovernmental fiscal relations and how these can affect fiscal sustainability. The third section of the paper will describe formal statistical tests of sustainability, including stationarity, cointegration, and strong and weak sustainability. The fourth section provides empirical results and analysis, while the last section discusses the implications of these results.

Some Definitions of Fiscal Sustainability

The concept of fiscal sustainability has a long history, although its nomenclature has often changed. In the late 1970's, immediately after the beginning of the tax and expenditure limitation movement, fiscal stress was the term used to explain the pressures that confronted state and local governments (Levine, 1980). But the term fiscal sustainability did not appear in these studies, although Gold (1995) did raise the possibility that states might face a continuing long term crises. After the Brundtland report (also known as Our Common Future) (1987) on environmental sustainability, the term fiscal stress gradually changed into fiscal sustainability. By the mid-1990s, much of this change was complete.

The initial formal work on fiscal sustainability focused on the national level. One of the earliest pieces drew a distinction between government solvency and fiscal policy sustainability, and ultimately related the concept to the permanent fiscal measures needed to stabilize the public debt to GDP ratio (Horne, 1991). However, in her paper, Horne immediately identified several problems with the solvency constraint, including weak restrictions on the behavior of fiscal authorities, the assumed independence of real interest rates, economic growth and fiscal balances, and the interaction between public and private behavior.

The World Bank then published a series of papers, culminating with Burnside (2004) writing the seminal piece in developing the model. In this, he formally styles a model that uses solvency conditions as a measure of sustainability and derives a series of results that indicate the necessary conditions for a country to be fiscally sustainable. However, this model is strictly focused on national accounting, with one of its key variables is the principle balance—the difference between revenues and expenditures. But the principle balance is not disaggregated, and leaves out most of the discussion of federalism. It is a truly elegant model, but needs to be extended for use in analyzing state and local governments.

Concurrently, as noted above, work on state and local fiscal stress was continuing. As summarized in Ward and Dadayan (2009), state structural deficits began to be seriously examined in the mid 1990s. Factors such as growing Medicaid costs, increasing school enrollments, pension problems, and dysfunctional tax systems were identified as some of the principal variables causing these imbalances (Chapman, 2008). Recent work has demonstrated a plethora of definitions of fiscal sustainability at the state and local level. Underlying most of these definitions is the implicit recognition that there is often a disparity between the expenditures that the relevant population wants and the revenue structures that are currently in

place. On both sides of the equation stating that revenues must equal expenditures plus debt service are variables that are essentially fixed in the short run: for example, expenditure commitments to pensions, Medicaid and necessary infrastructure, and revenue bases that are locked in by the tax limitation movement.

There are several concerns with the existing definitions of fiscal sustainability. The definitions ignore all equity considerations; they implicitly assume that any balanced budget sustainable equilibrium is optimal, they ignore any endogeneity between revenues and expenditures, any federalism concerns are either ignored or treated as marginal, and there is no sense of the nuances of state and local finance. Nowhere do these existing definitions acknowledge that balancing a budget is only a necessary condition for fiscal sustainability—it is not a sufficient condition.

Despite these problems, state and local governments are being forced to confront the issues of fiscal sustainability. In 2004, the Governmental Accounting Standards Board (GASB) issued statement No. 44 that focused on the reporting of the economic conditions of the jurisdiction—that is, the jurisdiction's fiscal sustainability. In 2009, GASB announced that it was moving its fiscal sustainability project from its research agenda to its current agenda. In 2011 GASB issued a preliminary views statement for comments on assessing economic conditions (replacing the term fiscal sustainability). The preliminary views statement, while quite sophisticated, did call for long run forecasting and all governmental units need to report these financial projections. This caused a great deal of stir, with many of the state and local public interest groups voicing objections.

In this study, we define fiscal sustainability as a local government's ability to balance revenues and expenditures over a long-term period (Ward & Dadayan, 2009, p.465) with the

additional contribution of explicitly introducing the context of intergovernmental fiscal dependency. By using this definition, we empirically examine fiscal sustainability of the U.S. local governments. There has been some formal statistical work that focuses on fiscal sustainability. Hamilton and Flavin (1986), used a portion of Burnside's (2004) formal model, examine solvency conditions at the national level. Afonso and Jalles (2011) recently examined solvency conditions for 19 countries. Both of these papers use stationarity properties (to be discussed below) to determine if sustainability exits. They find that it generally does, although there are some qualifications attached. Using stationarity and cointegration measures, Mahdavi and Westerlund (2011) and Raju (2011) apply these concepts to the sub-national levels. They first examine the aggregates of state and local governments and find that conditions for sustainability exist for broad measures, although there is some temporizing for some narrower measures. Raju (2011), in examining states in India, finds that there should be some concern about future sustainability. Of note, in both of these papers, there is an explicit recognition of intergovernmental transfers, with the fiscal sustainability results being much more fragile for measures that exclude intergovernmental aid. One of the contributions of this paper is to examine this intergovernmental aid concern. We have not found any published statistical work that disaggregates the questioning of fiscal sustainability to the county and city level and none that examines intergovernmental fiscal aid at these levels.

Intergovernmental Fiscal Relationships

There are at least four different ways that intergovernmental fiscal interdependencies can affect local government finance[1]. The first is that there are tax structure interdependencies. A

[1] The Congressional budget Office (2010) also identifies a variety of responses by the states and federal government to the fiscal stress of local government.

higher level of government can change a tax system and in so doing, affect the revenue receipts of lower levels of government in three ways. First, the higher level of government can change the tax structure itself—for example, elimination of the estate tax at the national level affects state tax revenues that have included offsets against the federal tax. It can also change the tax base, for example, changing the deduction for dependents at the national level affects the tax base of states that have their tax system tied to the federal system. And third, indirectly, the national government can change tax rates, which might change the revenue received, which in turn might influence the amount of revenue available for revenue sharing and grants. If piggybacking occurs, the results of any change can be exacerbated. Esteller-Moré and Solé-Ollé (2002) find that a tax increase by one layer of government leads to a decline in taxes collected by other layers of government. Ultimately, this leads to an increase in the tax rates of the lower level governments.

The second instance of intergovernmental fiscal dependence comes from grants and other revenue flows. There are thousands of grants between levels of governments. These are often given in a relatively uncoordinated manner and often audited only in an accounting sense rather than on an efficiency of use sense. Many are virtually impossible for a non-expert to track. There are times when grants from the same central government agency go to different state agencies and then to different local agencies. These grants may be accounted for under different names and acronyms.

Third, there is the quasi-economic-political relationship between governments that can be described as either a hard or soft budget constraint. Under the soft budget constraint, the sub-national government can confidently expect that the higher-level government will come to its aid when it experiences fiscal stress. When budgets constraints are soft, the sub-national

jurisdictions can increase expenditures without facing the full costs of that increase. In this situation, there are few incentives to constrain overspending. A hard budget constraint is exactly opposite: the sub-national governments are convinced that a bail out will not occur. The basic governance of a decentralized federal system might reflect a game of attempting to extract bailouts (Chapman, 2007). This game has three stages: in stage 1, a higher-level government announces fiscal policies regarding lower level governments. These policies include an explicit declaration that the subnational jurisdictions will never be bailed out. In stage 2, the subnational jurisdictions attempt to assess the higher-level government's credibility toward its no-bailout pledge. After this assessment, they may adopt an unaffordable policy that provides local benefits, deliberately overspending and asking the higher-level government for help. In stage 3, the higher-level government decides whether to bail out the local government. If the local government believes that the higher-level government will not bail them out, then it will live within its means. This is the hard budget constraint. To the extent that the sub-national governments believe that the higher-level governments will come to their aid, they will act in a non-sustainable fashion. This is the example of a soft budget constraint. The way to minimize the non-sustainable influences of this game might follow Inman's (2003) recommendations of constitutional regulations that limit the higher level governments' ability to bail out the lower level government. In the United States, the hard budget constraint is usually dominant, in that cities that have been egregiously sloppy in their fiscal discipline have been forced to entertain going bankrupt.

Finally, there is some evidence that the existence of federalism adds a dimension to economic growth, although its existence alone is an insufficient explanation for growth (Okpanachi, 2010). Additionally, there is also some evidence that decentralization of social

protection expenditures is positively correlated with economic growth (Ezcurra & Rodriguez-Pose, 2009). Economic growth should influence both the supply of revenues and the demand for public services, and therefore have an influence on future fiscal sustainability concerns. However, Okpanachi (2010) also finds that in Nigeria, the central government has not demonstrated credible commitment to fiscal reforms and therefore does not have the respect from subnational governments to force their fiscal reforms.

Although all four relationships are implicit in the discussion of this paper, we principally focus on the existence of the environment of intergovernmental fiscal dependency. This implies that in any discussion of the fiscal sustainability of local governments, we also take the intergovernmental dimension into account. Particularly focusing on the intergovernmental revenue aid, this paper empirically examines fiscal sustainability for United States city and county governments with an explicit identification of intergovernmental revenue transfers.

Local Governments in the U.S.

At the sub-national level, counties and municipalities exist in most states in an overlapping relationship. Because of this relationship between counties and municipalities, they are often represented in econometric work as an aggregate sub-unit of state governments without any careful effort to differentiate between them. This tendency is reflected in the studies of fiscal sustainability; counties and municipalities have been researched conjointly as local governments (Mahdavi & Westerlund, 2011; Sørensen, Wu, & Yosha, 2001); or municipalities are the focus of research on total local government fiscal adjustment (Buetter & Wildasin, 2002). However, counties and municipalities are two separate tiers of local government, and this means that there are several dimensions that make counties and municipalities distinct from each other.

County and municipal governments have different revenue and expenditure structures often because of the variance in the formal systems of government. Both counties and municipalities are equipped with governing entities that can influence the level of local revenue and expenditure to some extent, although their governance is significantly affected by federal as well as state mandates and grants. For example, in Arizona, each of the county and municipal governments have taxing and spending authority with separately elected governing boards, and they make own decisions on revenue and expenditure that affect lives of citizens (Salant 2001, p. 111).

It can be also expected that counties and municipalities have different priorities in expenditure because they play different roles as local governments. It is also true that counties and cities share similar roles in providing local services to their residents. However, counties usually have an additional role since they may act as the administrative arm of the state, delivering many state services. This implies that county governments have different expenditure structures that include mandatory spending on delivering state services. Table 1 shows the difference in revenues and expenditure patterns between cities and counties.

Table 1

Revenue and Expenditure Summary for County and City Governments

Revenue				
Revenue Items (in percent)	County		Municipality	
	2002	2006	2002	2006
Property tax	23.90%	24.26%	17.30%	16.74%
Sales tax	7.60%	7.57%	10.50%	9.68%
Income tax and other taxes	3.10%	3.38%	7.80%	8.46%
User charges	26.30%	24.01%	23.80%	21.63%
Intergovernmental (IG) revenue from state	33.40%	28.41%	18.50%	14.31%
IG revenue from federal sources	2.90%	3.00%	4.50%	4.03%
Other[2]	2.80%	9.36%	17.60%	25.15%
Total	100%	100%	100%	100%
Expenditure				
Expenditure Items (in percent)	County		Municipality	
	2002	2006	2002	2006
Education	15.10%	14.02%	10.70%	8.99%
Social service	29.30%	26.87%	7.80%	6.76%
Transportation	7.40%	6.96%	8.90%	8.42%
Public safety	13.60%	14.45%	16.40%	16.21%
Environment and housing	7.50%	7.22%	15.70%	15.83%
Government administration	10.80%	10.65%	5.80%	6.21%
Debt interest	4.20%	3.28%	4.30%	3.96%
Other in the list	8.20%	7.51%	8.70%	8.39%
Other (utility, liquor store, and insurance trust expenditure)	3.90%	9.03%	21.70%	25.23%
Total (not including capital outlay)	100%	100%	100%	100%

Source: The percentage data are calculated by using the statistics of Local Government Finances by Type of Government and State (2002, 2006) from the U.S. Census of Governments: Finance.

[2] This includes utility revenue, liquor store revenue, employee retirement revenue, and intergovernmental revenue from local government.

With these differences between counties and municipalities, it can be assumed that there could be different patterns of fiscal sustainability in counties and municipalities.

Formal Tests of Sustainability

As early noted, the last decade, many writers have reached the conclusion that fiscal sustainability requires government budget be balanced over time (Afonso & Jalles, 2012; Mahdavi & Westerlund, 2011; Quintos, 1995). To operationalize this concept of an intertemporally balanced government budget, the present value of the existing stock of government debt should be equal to the present value of future primary surpluses (Afonso & Jalles, 2012; Mahdavi & Westerlund, 2011; Quintos, 1995). Otherwise, in the long run the value of debt grows faster than the real interest payment grows, and the unbalanced government debt would result in unsustainable debt accounts (Quintos, 1995). This means that the intertemporally balanced budget implies that the discounted value of debt converges to zero at the limit as time goes to infinity (Quintos, 1995).

Two representative frameworks in the fiscal sustainability literature are used to analyze the intertemporally balanced budget. The first framework (Hamilton & Falvin, 1986; Wilcox. 1989) uses a unit root test to determine if the time series of revenues as well as the times series of expenditures are stationary, defined below. If the time series of a variable has a unit root, the series is not sustainable; there will be no return to a trend line and the equation represents a non-stationary situation. In this framework, stationarity is assumed as an indication of sustainable deficit policy which leads to fiscal sustainability[3]. The second framework used to examine the sustainability hypothesis is the testing of the cointegration of government revenue and expenditure with the discounted debt (Hakkio & Rush, 1991). According to cointegration

[3] As will be later shown, if the root is less than 1, the series is stationary

framework, fiscal sustainability is satisfied even if government revenue and expenditure are non-stationary; cointegration is a necessary condition for the government deficit to be intertemporally balanced in present value term because cointegration makes a linear combination of revenue and expenditure drifting stationary (Hakkio & Rush, 1991).

Stationarity of Governmental Debt

Stationarity refers to a stochastic process whose parameters such as the mean and variance do not change over time even when time or space shifts (Becketti, 2013). A stationary process shows a consistent width of fluctuations along a trend line with a consistent variance. A non-stationary process will show unpredictable fluctuations that are moving away from the trend line over time. Therefore, once a shock occurs, the non-stationary time series deviates more and more from the trend line over time. In most cases, a stationary series has no unit root, I (0), that is integrated of order zero. It means that an error term of the current time period (u_t) does not have a unit autoregressive root that is expressed by previous time period,[4] and there is no need to use a first difference form to show stationarity.

Murray (1994) used a metaphor of the drunkard's random walk as an example of a non-stationary process. According to Murray (1994), the non-stationarity of random walks is characterized by growing variance. To forecast random walks of a time series, the most recently observed value of the variable is "the best forecaster of future values" (Murray, 1994, p. 37). In his illustrative example, observers in a bar are most capable at guessing where the drunkard is by remembering where she/he was most recently. The longer time the observers stay in the bar, the more likely the drunk wanders far from where the observers last saw her/him. Murray (1994)

[4] Let's assume a time series, $Y_t=d_t + u_t$, where dt is a unknown parameter and u_t is an error term. If the error term is characterized by the autoregressive term of yt, $u_t = py_{t-1}$, the error term has a unit root. The autoregressive problem of yt can be resolved by taking first differences to obtain a stationary series (Stock, 1994).

pointed out that if it takes time after seeing the drunkard, "heaven only knows where they've got to by now" (p. 37). We can connect the unchanged parameter and the consequent resilience of stationary processes to the concept of sustainability in that sustainability assumes the long term recovery of a balanced budget after an economic shock or crisis despite a financial loss in the short-term.

A non-stationary process denotes either first order integrated or second order integrated, I (1) or I (2) respectively (Mahdavi & Westerlund, 2011; Quintos, 1995). The first order of integration, I (1), indicates that the time series must take first-differences to obtain a stationary series. If the series must be differenced two times to achieve stationarity then the series is I (2). In a fiscal sustainability context, the sustainability hypothesis is proved by testing whether debt is stationary, I (0), in its first-differences as below (Mahdavi & Westerlund, 2011, p. 955):

$$\Delta B_{it} = B_{it} - B_{it-1}(1+r) = G_{it} - R_{it} \qquad (1)$$

where B_{it} is the stock of government debt of jurisdiction i at time t and r is the mean of the real interest rate on the debt, r_{it}. G_{it} is government expenditure including interest payments and R_{it} is government revenue for the ith local government in period t.

Cointegration of Governmental Revenue and Expenditure

The main analytical procedures used to assess fiscal sustainability on the basis of the intertemporal debt balance is first to confirm if there is a stationary process, I (0), in series of government expenditures and revenues. Alternatively, utilizing the second framework, even if government revenue and expenditure series follow a non-stationary process, fiscal sustainability still holds if they are cointegrated with each other (Hakkio & Rush, 1991; Haug, 1991; Mahdavi & Westerlund, 2011; Quintos, 1995; Smith & Zin, 1991; Trahan & Walsh, 1988, 1991). Formally speaking, two or more non-stationary variables, which are integrated of the same order,

are cointegrated if there exists a linear combination of these variables that is stationary or I (0) (MacDonald & Murphy, 1989). Even though two series may seem to drift in random walk pattern, they seem to drift in a way that they do not drift too far apart from each other because of a long-run equilibrium (or structural) relationship (Afonso & Jalles, 2012; MacDonald & Murphy, 1989).

Returning to the drunkard illustration by Murray (1994), an analogy of the relationship between the drunkard and his/her dog explains the concept of cointegration. The drunkard and his/her unleashed dog wander aimlessly. Even though the dog is seemingly not in the drunkard's control, the puppy can smell each new scent of the drunkard that crosses his nose and dictates a direction for the next step (Murray, 1994, p. 37). Thus the wanderings of both the drunkard and the dog along a real line can be modeled by the random walk. Therefore, the drunk and his/her dog wander aimlessly (non-stationary), but they make sure that they have an eye on each other and do not separate by more than a certain distance (a linear combination). Even though both of them do not know where they are going, they do know that they are going together. In this way, the drunkard and his/her dog are cointegrated.

The cointegration results will allow us to decide if government revenue and expenditure for the set of governments are moving together within a long-run relationship. To examine the long-run structure between government revenue and expenditure for fiscal sustainability, a cointegration test is conducted by running the following cointegration regression using panel data where R_{it} is government revenue for the *i*th local government in period *t*, G_{it} is government expenditure inclusive of interest payments, and ε_{it} is a mean zero error term (Mahdavi & Westerlund, 2011, p. 955).

$$R_{it} = \alpha_i + \beta \cdot G_{it} + \varepsilon_{it} \qquad (2)$$

Even if government revenue, R_{it}, and government expenditure, G_{it}, are non-stationary, there may be a number, β, that makes the linear combination of two variables, $R_{it} - \beta \cdot G_{it} = \varepsilon_{it}$, stationary (Hakkio & Rush, 1991, p. 433). In this case revenue and expenditure variables are cointegrated; they cannot move far apart each other because their difference is stationary (Hakkio & Rush, 1991). Following Hakkio and Rush's cointegration test on governmental revenue and expenditure, we employ the Engle-Granger (1987) cointegration test that tests whether the estimated residuals, ε_{it}, are stationary, meaning the two variables are cointegrated. The Engle-Granger cointegration test conducts a two-step residual-based method to test the null hypothesis that the least squares residuals, ε_{it}, are nonstationary[5]. If the lagged residual term is significant, we can reject the null of no cointegration.

Strong and Weak Sustainability

In his interpretation of β in equation (2), Quintos (1995) extends the empirical framework on deficit sustainability by introducing "strong" and "weak" sustainability conditions. Quintos (1995) argues that "strong sustainability" corresponds to the strict requirements of sustainability in previous literature: stationarity in debt (Hamilton & Flavin, 1986) and cointegration between revenue and expenditure (Trehan & Walsh, 1991). "Weak" sustainability, which is both an extension and a relaxation of the condition for sustainability, considers the cointegration condition as a "sufficient condition" but not as a "necessary condition." It means that sustainable revenue and expenditure are not necessarily always cointegrated with each other. According to this weaker condition, the deficit could be still sustainable as long as "the growth rate of debt

[5] See Appendix B for details.

does not exceed the growth rate of the economy" although "the debt process grows slower than the growth rate of mean interest rates" (Quintos, 1995, p. 410).

Like many other economic time series that follow non-stationary process, Quintos (1995) assumed that the government debt series also follows a non-stationary process, that is, either I (1) or I (2). As mentioned above, the sustainability hypothesis is proved by testing whether debt is stationary in its first-differences (Quintos, 1995). In this case, he argued that fiscal sustainability could be distinguished into two types of sustainability; strong and weak sustainability. The debt balance in a strong sustainability situation goes to zero at a rate faster than the debt in a weak sustainability situation (Quintos, 1995).

The underlying assumption for deficit sustainability or intertemporal budget balance is that the government should run "future surplus equal to its current market value of debt (Quintos, 1995, p. 410)". In econometric terms, when time goes to infinity, the first differenced government deficit in expected present value terminology converges to zero, as below.

$$\mathrm{E_t} \lim_{\mathrm{j}\to\infty} \frac{\Delta \mathrm{B_{it+j}}}{(1+\mathrm{r})^{\mathrm{j}+1}} = 0 \qquad \text{where } \Delta \mathrm{B_{it+j}} = (1-\beta)G_{it} - \alpha_{\mathrm{i}} - \varepsilon_{\mathrm{it}} \qquad (3)$$

Strong sustainability holds when there is no unit-root in the time series of revenue and expenditure variables respectively. However, even if both variables have a unit-root, meaning non-stationarity in these variables, ΔB_{it} still can be stationary when the necessary and sufficient conditions for sustainability is satisfied: i) ε_{it} is stationary, meaning *R* and *G* are cointegrated and ii) $\beta = 1$ (Quintos, 1995). As we can see in equation (3), since the expenditure variable that is non-stationary becomes zero if $\beta = 1$, as long as ε_{it} is stationary, ΔB_{it} can be stationary. Therefore, strong sustainability can be held either when both *R* and *G* follow stationary process or *R* and *G* are cointegrated with $\beta = 1$.

In defining "weak sustainability," Quintos (1995) relaxes the condition of strong sustainability. He argues that $0 < \beta \leq 1$ in equation (2) is both a necessary and sufficient condition, and cointegration is just a sufficient condition for being weakly sustainability. This means that as long as β is between zero and one, $0 < \beta < 1$, the condition of weak sustainability still holds regardless of cointegration condition (Quintos, 1995). In this case, the process ΔB_{it} can follow a trend including a unit root with drift, but it still goes to zero at a rate slower than strong sustainability. Therefore, according to Quintos (1995), when $\beta = 1$, weak sustainability can be satisfied without cointegration, whereas strong sustainability can be satisfied with cointegration.

To examine whether it is strong or weak fiscal sustainability, the regression results from the equation (2) provide various explanations of the sustainability according to the values of β. To investigate these possibilities, we follow Quintos' (1995) tests of sustainability. The tests first begin with a unit roots test to the revenue and expenditure variables which indicates whether or not the variables are stationary. In this paper, we apply the unit roots test of Im, Peseran, and Shin (2003) which was originally developed for the analysis of dynamic heterogeneous panels. If the null hypothesis of the unit root test is rejected, one can say the tested variable is stationary. For fiscal sustainability, if both variables are stationary or both are found to be I (0) then one can conclude that strong sustainability holds. If the null is accepted, the tested variable is non-stationary or found to be I (1) it becomes necessary to proceed to the cointegration regression described in equation (2) above. In other words, non-stationarity is a necessary condition for cointegration.

Next, in the case that the null hypothesis of the unit roots test is accepted, an additional t-test on the values of β from equation (2) must be conducted to distinguish between strong and

weak sustainability: $\beta = 1$ with cointegration for strong sustainability and $0 < \beta < 1$ regardless of cointegration for weak sustainability. In this situation, the first null hypothesis is $\beta = 0$ when the one-sided alternative is $\beta > 0$. If the null is accepted and $\beta = 0$, it means that deficit is growing and the conditions of fiscal sustainability are not satisfied. If the null hypothesis of $\beta = 0$ is rejected, then a second null hypothesis of $\beta = 1$ is tested with the two-sided alternative of $\beta \neq 1$. If the null is rejected to the left which means $0 < \beta < 1$ then sustainability is weak because expenditures are growing faster than revenue. If the null is rejected to the right meaning that $\beta > 1$ then revenue are growing faster than expenditures. When the null of $\beta = 1$ is accepted then the condition of cointegration becomes meaningful for there to be strong sustainability; if cointegration holds, this indicates strong sustainability; if it does not, this means weak sustainability. This implies that cointegration is a necessary condition of strong sustainability and a sufficient condition of weak sustainability.

To summarize, if $\beta = 1$ and the cointegration results imply stationarity, then there is strong sustainability. If the cointegration results imply non-stationarity, then there is weak sustainability. If $0 < \beta < 1$, under both stationarity and non-stationarity, there exists weak sustainability. Finally, if $1 < \beta < 2$, regardless of the cointegration results, we have a situation of sustainability which is unstable.

Empirical Approach

This next section describes the data set, measures of the debt balances, and empirical results of the sustainability analysis. Table 2 summarizes the data, which come from two different sources. For counties, we use 37 years of data (1970-2006) for 610 U.S. counties. We use Annual Survey of Local Government Finances and Census of Governments provided by the

U.S. Census Bureau for the estimation. For cities, we also have panel data; however, we have data for only 12 years (1995-2006). This estimation will use the data set provided by the Government Finance Officers Association. The city data come from their Comprehensive Annual Financial Reports, and all of the cities have received the GFOA's Certificate of Achievement for Excellence in Financial Report. We note that this is a biased sample because of the awarding of the certificate and thus our conclusions must be interpreted in a very constrained fashion, since these cities have the best accounting practices. There are over 22,000 county observations and over 7,000 city observations.

Table 2

Description of Data

	County	City
Number of Observation	Total **22,570** observations [610 counties **for 37 years**, from 1970 to 2006]	Total **7,032** observations [586 cities **for 12 years**, from 1995 to 2006]
Source	U.S. Census Bureau, Annual Survey of Local Government Finances and Census of Governments	The Comprehensive Annual Financial Reports (CAFRs) of the municipalities by GFOA's Certificate of Achievement for Excellence in Financial Reporting

In this study, we define fiscal sustainability of the local government as local government's fiscal ability in context of intergovernmental fiscal dependency, particularly local

government's dependency on intergovernmental revenue aid from state government. To consider the intergovernmental aid, we create three different measures of governmental balances that are calculated with and without intergovernmental aid in revenue side.

The following Table 3 defines three different measures of governmental balances for testing fiscal sustainability. The first is the difference between the jurisdiction's total revenues and total expenditures. The second is the difference between general revenues and general expenditures. The final case subtracts intergovernmental revenues from general revenues, thus attempting to begin to determine the impacts of intergovernmental aid on the local jurisdictions' fiscal sustainability.

Table 3

Three Measures of Governmental Balances by County and City

Balance	County	City
Balance1	Total revenue – total expenditure	Total revenue in the General Fund and funds other than the general fund – total expenditure in the General Fund and funds other than the General Fund
Balance 2	General revenue – general expenditure	Total revenue in the General Fund - total expenditure from the General Fund
Balance 3	General revenue – total intergovernmental revenue – general expenditure	Total revenue in the General Fund – total intergovernmental revenues in the General Fund – total expenditure from the General Fund

Table 4 shows the descriptive statistics for these variables, calculated using the described data sets.

Table 4

Descriptive Statistics for Revenue and Expenditure Variables by County and City

	County					City				
	Mean	S.E.	Median	Min	Max	Mean	S.E.	Median	Min	Max
TR	430,033	1,131,625	151,141	1,070	21,600,000	123,000	373,000	45,200	23	5,380,000
TE	413,107	1,021,840	148,273	2,118	18,700,000	129,000	388,000	47,400	23	5,800,000
GR	399,379	948,427	146,437	1,070	17,000,000	81,500	250,000	28,800	12	3,810,000
GE	392,704	934,449	144,898	2,118	16,900,000	76,800	238,000	27,100	9	3,590,000
GR-IGV	249,982	543,833	91,428	1,069	7,838,274	69,700	220,000	25,500	12	3,770,000
IGV	149,397	457,247	45,879	0	9,177,144	11,800	44,700	2,686	0	701,000
GE	392,704	934,449	144,898	2,118	16,900,000	76,800	238,000	27,100	9	3,590,000
N	610 counties (in 2006)					586 cities (in 2006)				

Empirical Results

To examine fiscal sustainability of these balanced budgets, especially strong fiscal sustainability, we first determine if the revenue series and expenditure series are stationary. If they are not stationary, then their relationships need to be further analyzed through cointegration analysis. We use the Im, Peseran, and Shin (IPS) unit root test for all revenue and expenditure variables to determine whether they have unit root, I (1), or not, I (0). In Appendix A, we show

our results which demonstrate that we have failed to reject the unit root hypothesis. Because this occurs, we can then proceed in analyzing the relationships between the various measures of revenue and expenditures. Since strong sustainability can be held under two conditions of i) cointegration and ii) $\beta = 1$, we can first test cointegration for checking one of the conditions for strong sustainability and then test whether $\beta = 1$ within the cointegration condition.

To see if revenues and expenditures are co-integrated for each of the three balances, we use the Engle-Granger test (See Appendix B). It is conducted in two-step residual-based method to test the null hypothesis of no cointegration. If the lagged residuals from equation 2 are stationary along the first differenced residual, it implies that these two variables are cointegrated. To test cointegration, the regression is conducted with the one year lagged residuals as a right hand variable and the first differenced residuals as a left hand variable. The null hypothesis of no cointegration is rejected when the estimated t-statistic on the right hand side variable is greater than critical t-value at 1% significance level, $\hat{t} > |\pm t_c|$. As Appendix B indicates, the assumption of no cointegration is rejected in all balances since all estimated t-statistics are greater than the absolute value of critical t-statistic at the 1% critical value, 2.576. Therefore, in each of the three cases, revenues and expenditures seem to be cointegrated, and one of conditions for strong sustainability is satisfied.

We next undertake t-tests for distinguishing strong sustainability ($\beta = 1$) and weak sustainability ($0 < \beta < 1$). We estimate the regression equation (2) and use a t-test for the null hypothesis that $\beta = 0$ versus the one-sided alternative that $\beta > 0$. If we do not reject the null hypothesis, then the relevant system is not sustainable. Table 5, below, indicates that all of the null hypotheses ($\beta = 0$) are rejected. The next test is to determine whether or not there is weak or strong sustainability. This is testing $\beta = 1$ versus the two-sided alternative of $\beta \neq 1$. If we accept

the null of $\beta = 1$, then there is strong sustainability because we can satisfy both conditions of the cointegration condition and $\beta = 1$. Even if we reject the null to the left, then β is between 0 and 1, and there still exists weak sustainability. According to Mahdavi and Westerlund (2011), $0 < \beta < 1$ implies that the jurisdiction is sustainable now, but expenditures are growing more rapidly than revenues. If the null is rejected to the right, the jurisdiction is sustainable as long as β is between 1 and 2, $1< \beta < 2$. In this case, revenues are growing more rapidly than expenditures. However there is a strong possibility that this situation will not exist in the long run because of political pressures to either reduce revenues or increase expenditures because of the growing surplus. We call this situation "politically unsustainable" to differentiate it from the fiscal sustainability concept. As the results in Table 5 indicate, counties are sustainable for Balances 1 and 2. None of them do not accept the null of $\beta = 1$. Therefore, strong sustainability does not hold in these balances for both counties and cities. However, they become weakly sustainable for Balance 3 for both counties and cities. In this analysis, debt balances are always weakly sustainable at the best.

Table 5

A Summary of Strong/Weak Sustainability Results

Balance	County	City
Balance1 (TR_TE)	β= 1.0607 (0.00065)** → Politically unsustainable but fiscally sustainable	***β* = 0.04058** **(0.00235)**** → Weak sustainability
Balance 2 [GR_GE]	β = 1.0255 (0.000449)** →Politically unsustainable but fiscally sustainable	***β* = 0.01891** **(0.00166)**** → Weak Sustainability
Balance 3 [(GR-IGR)_GE]	***β* = 0.4992** **(0.0013256)**** → Weak Sustainability	***β* =0.01614** **(0.00142)**** → Weak Sustainability
N	22,570 (610 county * 37 years)	7,032 (586 cities * 12 years)

* The number in parenthesis is standard deviation

* The bolded means $0 < \beta < 1$ and weak sustainability following Mahdavi and Westerlund (2011)'s interpretation.

An additional interpretation of Table 5 is Table 6. It calculates revenue changes for each $1 increase in expenditures of three balances. Subtracting intergovernmental revenues from general revenues reduces the effects by about half for both cities and counties; that is for each $1

change in expenditures in Balance 1 revenues go up by about a $1 and 4 cents for counties and cities respectively while in the case of subtracting intergovernmental aid, revenues increase by about 50 cents and 1.6 cents respectively. It also illustrates the magnitude of the effects of increasing government expenditures. Note that for counties, a one dollar increase in expenditures generates increases in the relevant balances of anywhere from 15 to 50 times those of cities.

Table 6

A Summary of Revenue Changes for Each $1 Increases in Expenditure

Balance	County Revenue Change For Each $1 increase in Expenditures	City Revenue Change For Each $1 increase in Expenditures
Balance 1	Increase by $1.06	Increase by 4¢
Balance 2	Increase by $1.03	Increase by 1.9¢
Balance 3	Increase by 50¢	Increase by 1.6¢

Implications

The analysis results of county governments are roughly consistent with the result from Mahdavi and Westerlund (2011). They found "weak sustainability" in the narrowly defined balance, balance of "own-source general revenues without intergovernmental aid" less "current operation expenditures. According to them, the different level of sustainability in the fiscal balance reveals "a potential area of vulnerability masked by relatively broader balances including intergovernmental grants" (p.963).

There are three implications of the results of this paper. The first is that intergovernmental aid is quite important for county and city fiscal sustainability. We find that examining counties alone, the dependence on intergovernmental revenue flows is crucial to their sustainability. When intergovernmental revenue aid is included in Balance 1 and Balance 2, county revenues and expenditures are cointegrated with coefficients that are greater than 1. It means that even though county's Balance 1 and Balance 2 do not satisfy the strong sustainability conditions, revenues grow faster than expenditures. In Balance 3, however, when intergovernmental aid is taken out from the revenue side, the sustainability condition becomes weak with $0 < \beta < 1$. It means that revenues grow slower than expenditures when state governments do not aid county governments. When it comes to fiscal sustainability of city governments, city governments show weak sustainability in all balances, meaning that there will be slower growth in all three definitions of revenues compared to expenditures. However, the estimated betas are smaller in Balance 3 when compared to balance 1 and balance 2 betas. The smaller coefficients in Balance 3 simply imply that once intergovernmental aid is taken out from a revenue measure, the revenue grow is slower compared to the case that takes intergovernmental aid into account. Thus, while cites are always weakly sustainable, they are still dependent on intergovernmental revenues, and the hard versus soft budget position of the state decision makers[6]. If a state therefore adopts a hard budget constraint philosophy in terms of its aid to local governments, then local governments need to be very careful in their budget protocols. This implication is partially consistent with the decade old findings of Pagano and

[6] There is some case study evidence of the importance of this philosophical decision. Proposition 13 was a dramatic local property tax cutting initiative that passed in California in 1978. The state's initial response was a soft-budget response—it bailed out the cities and school districts. However, recently the state has moved to a hard budget constraint and at least one city in California—Vallejo—is in bankruptcy.

Johnston (2000) that intergovernmental aid does not necessarily totally mitigate the burdens of local fiscal stress.

The second implication is that there is a difference in the importance of intergovernmental aid between cities and counties. The analysis results show that county governments show weak sustainability only in Balance 3 whereas city governments show weak sustainability in all three balance measures. In the case of counties, the subtraction of intergovernmental aid significantly changes the pattern of revenue and expenditure growth. As intergovernmental aid is subtracted from revenue side, revenues grow slower than expenditures, implying a weak sustainability condition. However, the subtraction of intergovernmental aid does not generate a significant change in the revenue growth pattern in cities. In the case of cities, revenues always grow slower than expenditures across the three balances, regardless of the existence of intergovernmental aid. Instead, intergovernmental aid just changes the magnitude of growth in city revenue. It implies that role of the intergovernmental aid is more critical to the fiscal sustainability of counties compared to cities. The difference in importance of intergovernmental aid between counties and cities appears in the simple comparison of the revenue structures of the different local governments as well. In comparison of revenue structures between county and city governments as shown in Table 1, intergovernmental aid from state government accounts for 28.41% of total county revenue, twice that of the city revenue portion from intergovernmental aid, 14.31%.

The third implication is that given the findings of weak sustainability at the city level, if intergovernmental aid is reduced, the necessary constraints on local spending become increasingly important. This could then lead to a reduction in economic growth that occurs because of the reduction in such categories as infrastructure, police, and social services. The

endogenity of revenues and expenditures could lead to a downward spiral, stimulated by the change in intergovernmental aid. This may be a strong downside to the hard budget constraints in our intergovernmental system.

Fiscal sustainability is a concept that is becoming more explicitly recognized in the field of local government finance. This paper has examined this concept, both theoretically and empirically. It found that there are differences between cities and counties in the application of this concept and that intergovernmental revenue flows may be a crucial element in the future sustainability for both units of government.

Appendix A: IPS (Im, Peseran, and Shin 2003) Unit-root Test for Non-stationarity

It is widely known that there is high level of heterogeneity among local governments in their organizational structures, economic environments, and financial conditions. To address the heterogeneity of local governments' revenues and expenditures, this paper adopts the IPS panel unit root test. Their panel unit root test is designed to allow for heterogeneity of the dynamics and error variances across unit groups (Hall & Mairesse, 2005; Im et al., 2003). The IPS test has an alternative hypothesis assuming "some panels are stationary" against the null, "all panels contain unit roots." With p-value that is greater than 0.05 significance level, all data indicate that the null is not rejected so these fiscal series include unit root, non-stationarity.

IPS Unit Root Test Results

Variables		**County**		**City**	
		N=610, T=37		N=586, T=12	
		Test statistic[a]	p-value[b]	Test statistic	p-value
Balance 1	Total Revenue	81.1038	1.000	54.950	1.000
	Total Expenditure	72.3297	1.000	41.6617	1.000
Balance 2	General Revenue	82.1196	1.000	49.4144	1.000
	General Expenditure	71.9644	1.000	44.8136	1.000
Balance 3	General revenue – IGV aid	76.4848	1.000	52.4408	1.000
	General expenditure	71.9644	1.000	44.8136	1.000

a. Test statistic on Z ˜t
b. Empirical probability of rejection of the null hypothesis, existence of unit-root

Appendix B: Engle-Granger Cointegration Test

This study employs the Engle and Granger cointegration test because of potential heterogeneity across local governments. This test has been widely applied to heterogeneous panels, specifically allowing "as much member-specific heterogeneity as possible" (Pedroni, 1999, p.668). It is conducted in two-step residual-based method to test the null hypothesis of no cointegration. At the first stage, a simple regression with two variables of interest is conducted, $R_{it} = \alpha_i + \beta \cdot G_{it} + \varepsilon_{it}$; at the second stage, another regression is conducted with one year lagged residual on first differenced residuals, which are calculated from the first stage regression, $\Delta\varepsilon_{it} = -\rho\varepsilon_{it-1} + e_{it}$. If the lagged residuals are stationary along the first differenced residual, it implies that these two variables are cointegrated. The Engle and Granger cointegration test has the null hypothesis of no cointegration. The null hypothesis of no cointegration is when the estimated t statistic is greater than critical t value at 1% significance level, $\hat{t} > |\pm t_c|$. The assumption of no cointegration is rejected in all balances since all t-statistics are greater than the absolute value of critical t-statistic at the 1% critical value, 2.576. Therefore, in each of the three cases, revenues and expenditures seem to be cointegrated.

Engle-Granger Cointegration Test Results

Variables	**County**			**City**		
	Coefficient[a]	Std. Err	t statistics	Coefficient	Std. Err	t statistics
Balance 1	-0.3893	0.00712	-54.64	0.0452	0.0041	11.09
Balance 2	-0.3685	0.0064	-57.26	0.0511	0.0029	17.56
Balance 3	.01183	0.0018	6.55	.05761	0.0028	19.93

a. These statistics are on the lagged value of eˆ.

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