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TAX AMNESTY AND TAX REVENUE: EVIDENCE FROM IRELAND

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ABSTRACT

Endogenous break date tests were utilized to determine if quarterly tax revenue data from Ireland (1957-2001) exhibits a break in trend. The test confirms a trend break around 1996Q2. However, this break in trend occurs eight years after the successful 1988 Irish tax amnesty program. Test results using revenue to GDP ratio indicate a possible break in the series in 1984, several years before the 1988 tax amnesty program. Both of these tests provide evidence that the 1988 Irish tax amnesty program did not significantly alter the time path of tax revenues in Ireland.

INTRODUCTION

The purpose of this note is to add to the body of empirical literature on the long run impact of tax amnesties on tax revenues. Using a test to endogenously determine the trend break date in an univariate time series for Irish data, the findings presented in this note suggest that while the time path of tax revenue may have changed in Ireland, this change is not linked to the 1988 Irish tax amnesty. When only the tax revenue data series is used to endogenously test for structural break, a break is confirmed in 1996. If the revenue to GDP ratio data are used to test for structural break, a break is confirmed in 1984. Thus, evidence of break is found either before or several years after the 1988 Irish tax amnesty program. The results presented below support the conclusions of Alm and Beck (1993), and Lopez-Laborda and Rodrigo (2003) who also show that tax amnesty did not alter the time path of tax revenues, respectively, in the State of Colorado and in Spain.

The arguments for and against tax amnesties are many and have been explained in detail by Leonard and Zeckhauser (1987). On the positive side, an amnesty program allows governments to collect unpaid tax revenue from tax delinquents and encourages previous non-filers to file and pay future taxes. However, a tax amnesty can also encourage current filers to withhold tax payments particularly if they anticipate future amnesties. The incentive to withhold tax payments is particularly strong, when, as in many instances, tax amnesties waive both penalties and interest payments on delinquent taxes. In such cases, unpaid taxes effectively become a zero interest loan from the government to the delinquent taxpayer, creating the perverse incentive for a taxpayer to withhold payment. Tax amnesty, therefore, has the potential to either increase or decrease tax revenue. How a tax amnesty affects taxpayer behavior and government revenue is then an empirical issue.

Despite the uncertainty about how amnesties affect long run revenue, budget crises have forced many governments to announce tax amnesty programs. As in the early to mid-eighties, 27 of the U.S. states have announced temporary tax amnesties since 2001 in order to raise additional revenue (Wells (2002), Federation of Tax Administrators (2005)). Several other countries other than the US have used some form of tax amnesty; Austria, Australia, Belgium, Finland, France, Greece, Ireland, Italy, Portugal, and Switzerland among OECD countries, and Argentina, Bolivia, Chile, Colombia, Ecuador, India, Pakistan, Panama, Peru, Mexico and the Philippines among developing countries (World Bank (2002)). In a recent comment, Laffer (2003) suggests that the use of such tax amnesties is not only proper, but should be further extended. Arguing for a US federal tax amnesty program, Laffer states that a federal tax amnesty could increase revenue by $100 billion immediately and up to $175 billion over 10 years. Thus, Laffer argues that an amnesty program will not only have immediate effect, but also a beneficial long run effect on federal revenue.

Whether Laffer's observation turns out to be correct remains to be seen. Thus far, evidence indicates that a tax amnesty may not result in increased long run tax revenue. Christian, Gupta, and Young (2002) look at subsequent filing behavior of taxpayers who took advantage of the Michigan 1988 tax amnesty program. Their estimates indicate that over two-thirds of new filers and ninety percent of those who filed amended returns in response to the amnesty continued to file returns in years following the tax amnesty. However, the authors also report that the incremental tax revenue collected from these filers was not significant, suggesting that a tax amnesty has little impact on long run government revenue. Alm, McKee, and Beck (1990) use experiments to assess the impact of tax amnesty on post-amnesty taxpayer compliance. They report that unless a tax amnesty is accompanied by stricter enforcement efforts, a tax amnesty could actually lower compliance. This would suggest that a tax amnesty could result in lower government revenue in the long run.

Time series data can be analyzed to provide empirical support for or against the proposition that tax amnesty can result in increased future tax revenue. However, few papers exist that empirically test for the long run effect of tax amnesties on revenue using time series data. Exceptions include Alm and Beck who studied the impact of the1985 tax amnesty on revenues in Colorado, and Lopez-Laborda and Rodrigo who analyzed the impact of the1991 tax amnesty in Spain. Both papers follow similar procedures to detect if tax amnesty had significantly altered the time path of tax revenues. For example, both utilize the Chow (1960) test, with sub-samples separated at the time of amnesty, to detect any break in trend in the government revenue time series data. While Alm and Beck report that the Chow test fails to detect any break for

Colorado, Lopez-Laborda and Rodrigo report evidence in favor of a structural break around the 1991 tax amnesty in Spain. Both sets of authors also test if the pre-amnesty data generating process can be used to forecast the post-amnesty time path of revenues. Once again, the authors present contrasting results. Alm and Beck conclude that the pre- and post-amnesty data generating processes are the same, and that the pre-amnesty data can be fruitfully used to forecast post-amnesty revenue for Colorado. Lopez-Laborda and Rodrigo provide evidence that pre- and post-amnesty tax revenue data for Spain follow different ARIMA processes, and pre-amnesty tax data cannot be used to make reliable forecasts of post-amnesty tax revenue.

The Chow Test and the ARIMA procedures used by the authors above call for the use of a exogenously determined break date to detect structural break. In the case of Spain, the use of the exogenously determined break date clearly biased results in favor of finding a break in trend around that exogenous break date. As Lopez-Laborda and Rodrigo subsequently show, once the break date is treated as one of the unknowns and determined endogenously from the data, evidence of structural change linked to the Spanish tax amnesty program of 1991 disappears. Instead, structural change is linked to pre-amnesty reform measures of individual income tax in Spain. Thus, eventually Lopez-Laborda and Rodrigo reach the same conclusion as Alm and Beck: tax amnesty did not have any impact on the time path of tax revenues.

Lopez-Laborda and Rodrigo clearly demonstrate the importance of endogenously determining the break dates in a test for structural break in the context of tax amnesties. Therefore, this study applies the endogenous trend break test of Vogelsang (1997) to data from Ireland to test the hypothesis that tax amnesty has a long run effect on tax revenue. Ireland is chosen because the Irish tax amnesty of 1988 is often cited as an example of a very successful tax amnesty program The design of the amnesty program had all the elements that are considered important for such programs to succeed: the program was well advertised, the program was publicized as an one time opportunity (though the amnesty was repeated later in 1993). Tougher post-amnesty enforcement was also promised. The tax amnesty program was considered a success: instead of the 50 million pounds of anticipated additional revenue, the actual additional revenue raised was close to 750 million pounds. Amnesty programs typically raise additional revenue of 1-2% of tax revenue base; however, the Ireland tax amnesty of 1988 raised additional revenue equal to 2.5% of the country's GDP. Comparing the Irish amnesty program to tax amnesty programs in other countries, Bartlett (1997) commented, "The Irish program in 1988 was by far the most successful, raising revenue equal to 2.5 percent of gross domestic product —more than enough to completely wipe out Ireland's budget deficit that year." Similar assessment of the Irish amnesty program is also found in Alm (1998) and in Torgler and Schaltegger (2003). The highly successful nature of the amnesty program makes the Ireland tax amnesty program a natural candidate to test if the tax amnesty significantly altered the time path of revenue in Ireland.

DATA AND METHODOLOGY

Quarterly government revenue data and Consumer Price Index (CPI) data for Ireland was collected for the period 1951Q1 to 2001Q1 from the *International Financial Statistics* of the IMF. There was one missing observation, 1966Q2. The average of 1965Q2 and 1967Q2 was used to replace the missing 1966Q2 data point. Since Irish data beyond 1998 is in Euros, data beyond 1998 was converted to pounds using the fixed conversion exchange rate of 0.787564 pounds/euro. Data was converted to real values by deflating with the CPI, and transformed to log values for testing purposes.

The impact of the tax amnesty program on the time path of revenue is tested using the SupF test, described below, suggested in Vogelsang. Consider the following data generating process (corresponding to p = 1 in Vogelsang, p. 820):

$$Y_t = N_t + X_t \tag{1}$$

$$A(L)X_t = \varepsilon_t \tag{2}$$

$$N_t = \pi_0 + \pi_1 t + \gamma_0 1(t > Tb) + \gamma_1 1(t > Tb)(t - Tb) \tag{3}$$

$$A(L) = (1 - \alpha_1 L - \ldots - \alpha_k L^k) \text{ and is } \varepsilon_t \text{ iid } (0, \sigma^2).$$

Thus Y_t is autoregressive, and Y_t may or may not possess a unit root around a trend. γ_i (i = 0, 1) are dummy variables, and Tb is the endogenously determined break date. For i = 0, 1, $\gamma_i = 1$ for t > Tb, but zero otherwise. Therefore, for t < Tb, the intercept and the growth rate in Y_t are given by π_0 and π_1, while for t > Tb, the intercept and the growth rate in Y are $(\pi_0 + \gamma_0)$ and $(\pi_1 + \gamma_1)$ respectively.

Applying A(L) to (1) yields,

$$Y_t = \beta_0 + \beta_1 t + \delta_0 1(t > Tb) + \delta_1 1(t > Tb)(t - Tb) + \Sigma^k_{j=1} \alpha_j Y_{t-j} + \varepsilon_t \tag{4}$$

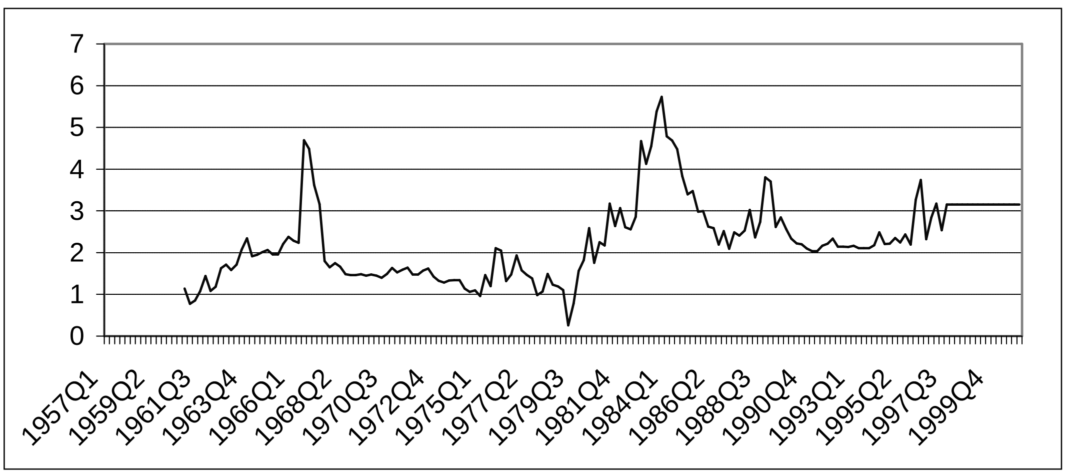
where $\beta_0 + \beta_1 t = A(L)(\pi_0 + \pi_1 t)$, and $\delta_0 + \delta_1 t = A(L)(\gamma_0 + \gamma_1 t)$. There is no break in trend if $\gamma_0 = \gamma_1 = 0$, or, equivalently, $\delta_0 = \delta_1 = 0$. If Tb were known with certainty, then (4) could be estimated with OLS and the Wald test applied to test the restrictions $\delta_0 = \delta_1 = 0$. With Tb unknown, the following testing procedure is used: first, to avoid problems with estimating (4) around end points, a trimming parameter λ^* is chosen. Since the data set consists of a total T = 177 observations, λ^* is chosen to leave out 15 observations. Thus, the break date, Tb, would fall in the interval $(\lambda^*, 1 - \lambda^*)$, though all T observations are used to estimate Tb. The lag length, k, is selected using the significant k method suggested by Vogelsang and Perron (1992). Equation (4) is estimated via OLS starting with an initial value of k = 12. If the 12th lag is insignificant, the lag length is reduced by one until a significant lag (at 10%) is found. This selection procedure resulted in a choice of k = 9. With the trimming parameter and the lag length selected, (4) is estimated by OLS for all possible breakdates $Tb = \lambda T$, $\lambda = (\lambda^*, 1 - \lambda^*)$. For each of the possible break-dates, the Wald statistic is computed to test the restrictions $\delta_0 = \delta_1 = 0$. The SupF statistic is the maximum of the Wald statistic computed for all possible break-dates in the interval $(\lambda^*, 1 - \lambda^*)$.

Vogelsang provides critical values for the SupF statistic to test for a break in the trend. The critical values are computed for both stationary and non-stationary error processes, using $\lambda^* = .01$, $.15$. The λ^* chosen for this note lies between these two numbers. But as Vogelsang points out, the SupF statistic is not very sensitive to the choice of λ^*, and the trimming parameter should not affect the results reported. Since it is not known a priori whether the revenue data are stationary or non-stationary, Vogelsang advocates the more conservative approach of using the critical values computed under the assumption that Y_t is I(1).

RESULTS

The Figure 1 below shows the SupF statistic computed for each possible break in the data.

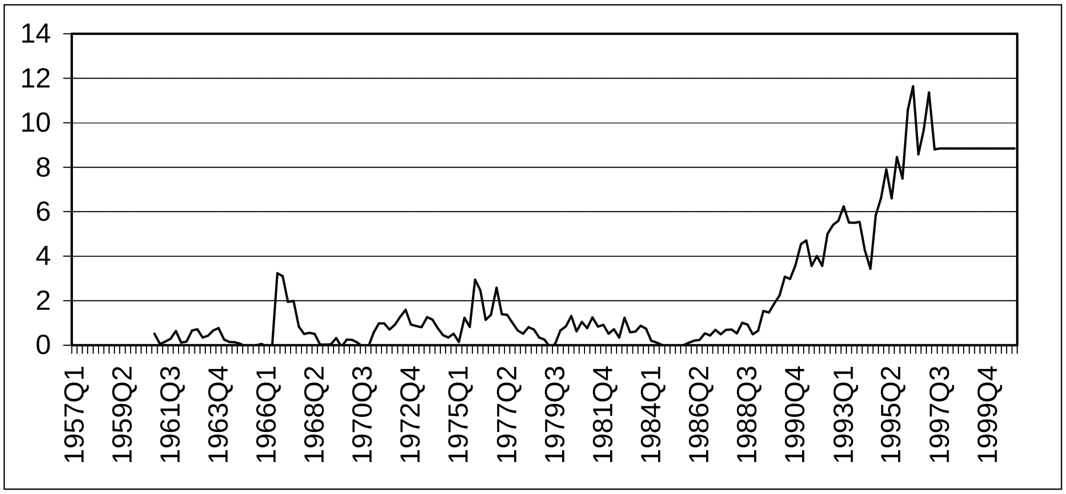
Figure 1
SupF Statistic Real Revenue Level Data



The SupF statistic reaches a maximum of about 6 during Q4 of 1983. Since the 95% critical value is equal 25.27 for $\lambda^* = .01$ and 25.10 for $\lambda^* = .15$ (taken from Table 2 with p = 1 of Vogelsang (1997)), the SupF statistic falls well below the critical values. Thus, the test shows that there is no break in the break in trend in the government revenue time series, and the hypothesis that tax amnesty affects the time path of tax revenue is clearly rejected.

Vogelsang also shows that the trend break test has higher power if the test is conducted in first differences. However, in first differences, the test only detects the shift in intercept but not in the slope. The significant k method is once again used to determine lag length and k is set equal to 12. Figure 2 below shows the SupF Statistic computed for break dates Tb in the $(\lambda^*, 1 - \lambda^*)$ interval.

Figure 2
SupF Statistic – Real Revenue Differenced Data

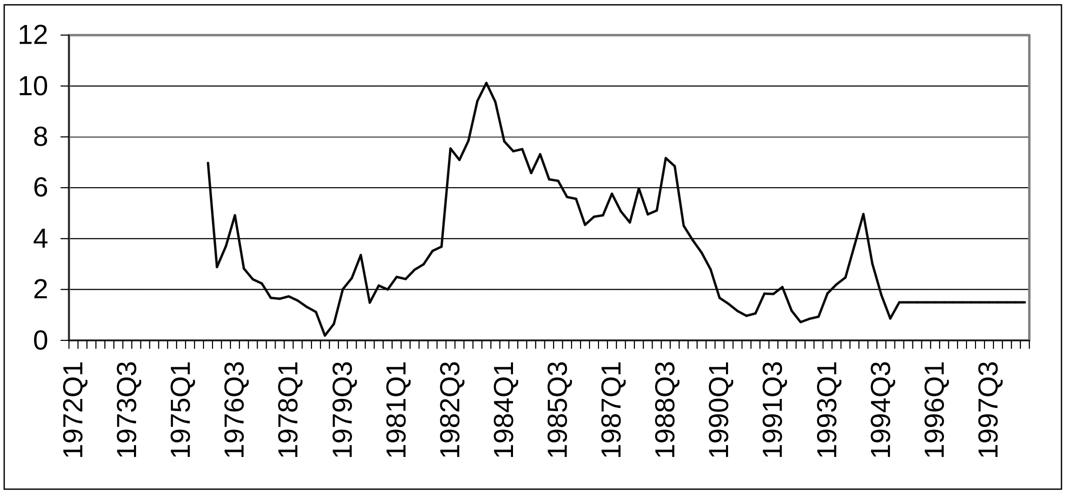


Since first differences of the tax revenue data series is likely to be stationary, the critical values, (taken from Table 1 of Vogelsang with p = 0) are 10.85 and 9.00 for λ* = .01 and λ* = .15 respectively. With λ* approximately set to .10, the SupF statistic of 11.64 indicates that there is a possible break in the revenue series in 1996Q2. Vogelsang had suggested using the same k as with the level data. If k is set to 9, the SupF statistic is equal to 9.75. The SupF statistic continues to indicate a break in trend in 1996Q2. However, this potential break occurs much after the 1988 tax amnesty program, and is unlikely to be related to either the 1988 or the 1993 tax amnesty programs in Ireland.

Since tax revenue is affected by normal business cycle fluctuations, further test of structural break were conducted with tax revenue measured as a percentage of GDP. The quarterly data for the revenue to GDP ratio spans the 1972Q1 to 1998Q3 time period. Since the Vogelsang test-statistic and critical values depend on the data generating process, the Augmented Dickey-Fuller (1981) test was used to test if the revenue to GDP ratio is non-stationary. ADF test results, conducted using 6 to 11 lags (test results available from author), clearly indicated that the revenue to GDP ratio is non-stationary in levels but stationary in first differences. Thus, the first difference version of the Vogelsang test, described above, is used to test for structural break in the data (test conducted using levels did not detect the presence of structural break). Once again, the significant t method was used to determine the lag length of 11 quarters. The SupF statistic is presented in the Figure 3 below.

The SupF statistic peaks at 10.12 in 1983Q3. Since in first differences, the tax revenue to GDP ratio series is stationary, the critical values, (taken from Table 1 of Vogelsang with p = 0) are 10.85 and 9.00 for λ* = .01 and λ* = .15 respectively. Out of

Figure 3
Supf Statistic–Revenue to GDP Ratio, Differenced Data



the 108 available observations, 15 from each tail were trimmed before testing for structural break.

Therefore, λ* approximately was set to 15/108 = .14, and the critical value of 9.00 was deemed appropriate. The SupF statistic of 10.12 indicates that there is structural break in the revenue to GDP ratio in 1983Q3. Interestingly, this is the same date at which the SupF statistic for the revenue only series peaks (Figure 1 above), though the revenue series in levels does not indicate the presence of a structural break. In summary, these tests suggest a possible break in both the revenue data series and the revenue to GDP ratio data series. However, the breaks occur either prior to the 1988 tax amnesty (1984 for the revenue to GDP data series) or much after the 1988 tax amnesty (1996 for the revenue data series). Evidence presented above suggests that the 1988 Irish tax amnesty did not alter the time-path of tax revenue in Ireland.

Several reasons could account for the failure to find that the Irish tax amnesty did not have a significant impact on the time-path of tax revenue. The structural break results, for example, may have been affected by a series of tax reform measures taken by successive Irish governments beginning in the mid- to late1980's. As described in Honohan and Walsh (2002) and Powell (2003), a key component of the successive national wage agreements, beginning the late eighties, were tax reform measures, designed to reduce tax burden, including reduction in personal income tax rates. For example, the top marginal income tax rate was reduced from 65% in 1985 to 42% in 2001 while the standard rate of taxation was reduced from 35% in 1989 to 22% in 2001. Corporate income tax rates also were reduced during this time period: the standard corporate income tax rate was reduced from 50% to 16%. It is always possible that the reduction in tax revenues following decreases in tax rates offset the increase in tax revenue from the 1988 tax amnesty. However, it seems more likely that while the amnesty program in Ireland had a temporary or short run impact on tax revenue, the amnesty did not alter the long run trend or rate of growth in tax revenue. Honohan and Walsh, for example, state "that taxation as a percentage of GNP peaked in 1984 (apart from a spike in tax receipts under the amnesty of 1988) …(p.8)." The structural break results are consistent with this description.

CONCLUSION

In conclusion, analysis of revenue data shows that tax amnesty did not affect the long run path of government revenue in Ireland. Endogenous break date methods utilized in this paper indicates a possible break in the tax revenue time series somewhere around 1996, much after the highly successful 1988 amnesty program in Ireland. Tests using the revenue to GDP ratio data indicate a structural break in 1984, three years before the 1988 tax amnesty program. Thus, as Honohan and Walsh note, the tax amnesty program resulted in a temporary increase in tax revenue, but the amnesty program did not permanently alter the time path of tax revenue in Ireland. The evidence from Ireland data is consistent with findings reported by both Alms and Beck and Lopez-Laborda and Rodrigo, who earlier found that tax amnesty programs in Colorado and in Spain, respectively, did not significantly alter the time path of government revenue.

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