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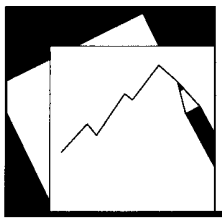

IMF Working Paper

Asset Booms and Structural Fiscal Positions: The Case of Ireland

Daniel Kanda

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Asset Booms and Structural Fiscal Positions: The Case of Ireland

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Abstract

Asset booms and sectoral changes can distort traditional estimates of structural fiscal revenue, and could lead to serious fiscal policy errors. This paper extends the estimation of structural revenues to take account of asset prices and sectoral changes, and applies this to the case of Ireland, where a property bust has revealed a large hole in the public finances. It is shown that excluding these factors led to a substantial bias in the estimation of structural revenues, and the structural balance prior to the crisis was much larger than earlier estimated.

JEL Classification Numbers: C01, C13, C51, H62, H68, E62

Keywords: Structural Fiscal Balance, Asset Price Cycle, Property Bubble, Ireland

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I. BACKGROUND

The calculation and use of structural fiscal balances has gained in importance in recent years for several reasons. By providing an estimate of the underlying fiscal position it provides guidance as to the health and direction of fiscal policy. It is an important component in determining the size and direction of automatic stabilizers. In addition, it is a key component in the assessment of long-run fiscal sustainability, as it provides a view of what the fiscal balance is likely to tend towards as temporary factors dissipate. Reflecting these considerations, the calculation of structural fiscal balances has taken a central position in the assessment of fiscal policy in the member countries of the European Union, under the Stability and Growth Pact (SGP).

Under the SGP all member states are required to maintain a medium-term fiscal objective defined in terms of the structural fiscal balance. However, there are well known measurement problems in calculating the structural balance, including the estimation of potential output and output gaps, the adjustment of fiscal revenues for the effect of the business cycle using estimated revenue elasticities, and the question of whether adjustments for asset price cycles, changes in the shares of various components of national income, or other factors are also needed.

Several approaches have been proposed for dealing with these challenges. However, the most prominent is the approach developed by the OECD (see Girouard and Andre, 2005), which adjusts for the business cycle but not for asset price cycles or changes in the composition of national income. A variant of the OECD approach was developed by the European Commission (see Larch and Turrini, 2009) to form the basis for calculating the structural balance under the SGP. In contrast, the European Central Bank (ECB) has developed a disaggregated approach which takes changes in the composition of national income into account (Bouthevillain and others, 2001).

The IMF's calculations of the structural balance for Ireland have traditionally broadly followed the OECD approach as follows:[2]

- Potential output is estimated using a Cobb Douglas production function, and output gaps are then calculated.

- Structural revenues are then calculated by using an aggregate elasticity of revenue with respect to the output gap (estimated to be 1.08), and the estimated output gap, to extract the cyclical component of revenue.

[2] This approach is similar to that used by the IMF's Fiscal Affairs Department—described in Fedelino, Ivanova, and Horton (2009)—in recent publications such as Horton, Kumar, and Mauro (2009) and IMF (2009).

- On the expenditure side it is assumed that the only type of expenditure with a cyclical component is unemployment-related benefits. Using data on the unemployment rate and estimates of the NAIRU (obtained using a HP filter on unemployment rate data), we are able to estimate the impact of the cycle on unemployment benefits and thus obtain the estimates of structural expenditure.

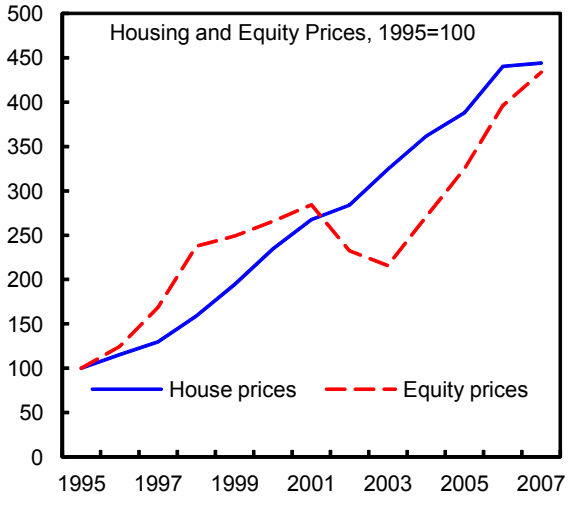
- The structural balance is then the difference between structural revenues and structural expenditures.

While this approach works well in many cases, recent events have highlighted its limitations under certain circumstances, such as property or other asset price booms. Also, in the case of Ireland—which has undergone substantial structural changes in recent decades—not accounting for sectoral changes could create serious biases in the estimation of the structural balance, as changes to different components of national income have different impacts on fiscal revenues. Biases in the calculation of the structural balance may not matter much—in terms of the cost of policy errors—if the trends generating these biases go on indefinitely, or adjust slowly. However, they are particularly dangerous in the case of asset price booms, because they can come to an abrupt end, revealing large fiscal holes that require painful adjustments—as is being experienced by Ireland (see below).

This paper expands the calculation of the structural balance for Ireland to take explicit account of asset price cycles and sectoral shifts, and finds that they make a substantial difference to the calculation of the structural balance. Moreover, whereas previous estimates of the structural balance had pointed to a sound structural position prior to the global crisis, the estimates incorporating asset cycles and sectoral shifts indicate that a large hole had already emerged in the Irish public finances by 2007, even before the crisis struck.

II. Irish Experience

Ireland entered a deep recession in 2008, following years of stellar growth, as a result of a perfect storm of three shocks—to foreign trade, the financial sector, and the housing market. The shocks to foreign trade and the financial sector were largely the result of the global crisis, but the housing market bust was primarily homegrown. As a result, the economy contracted 3 percent in 2008, with the contraction intensifying in 2009—GDP contracted 8.1 percent in Q1-Q3 2009.



Sources: ESRI; Haver; and author's calculations.

The boom years prior to the recession were marked by soaring asset prices, particularly housing and equity. Between 1995 and 2007,

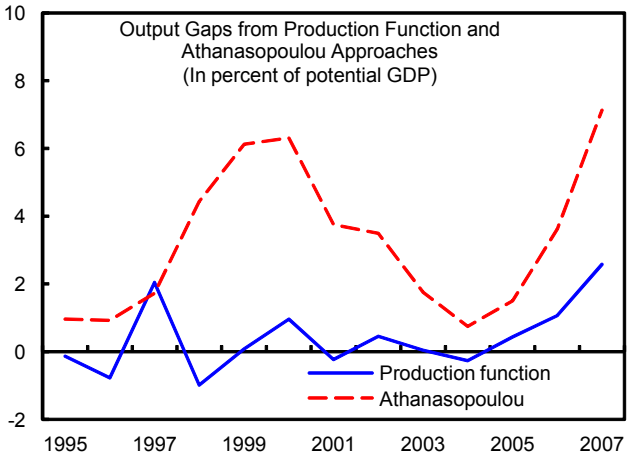
both house and equity prices more than quadrupled. As a result, asset-based tax revenues increased substantially in importance. Especially important for the fiscal position was the influence of the housing sector. With residential investment and house prices soaring, property-based taxes—particularly stamp duty and capital taxes, but also VAT on property—grew at a pace well above GDP growth (Figure 1, see also Addison-Smyth and McQuinn, 2009). This enabled the authorities to reduce their reliance on personal income taxation, while keeping overall revenues buoyant. However, the change in the structure of taxation was not without cost, as it significantly increased the exposure of fiscal revenues to asset market corrections. When Ireland entered the crisis, asset-based taxes collapsed as the housing and equity price bubbles burst, revealing a large hole in the public finances.

A. Issues in Estimating the Irish Structural Balance

Pre-crisis estimates of the Irish structural fiscal balance, based on the traditional OECD-based approach, failed to warn of the scale of deterioration in the structural position. With Ireland having a closely integrated labor market with the UK, and the increasing ease of inflow and outflow of labor from new member states of the EU, a common assessment was that swift changes to migration flows would keep the unemployment rate very close to the NAIRU—and thus keep actual and potential output also very close to each other. Thus, estimated output gaps were typically very small, with the implication that buoyant property-based revenues were largely treated as structural in nature, even though they reflected an expanding asset price bubble. Since asset prices and asset price cycles are not included in the standard production function approach, there was no mechanism to correct this error in the standard analysis. Thus, estimates of the structural fiscal balance remained comfortable, even as the danger to the public finances increased.

The scale of the collapse in revenues in 2008 was well beyond what could be explained by the standard methodology—and especially pronounced for asset-based taxes (Figure 2). This has focused attention on two issues, namely a re-evaluation of the calculation of potential output and the output gap, and explicit consideration of the impact of asset markets and sectoral changes on fiscal revenues.

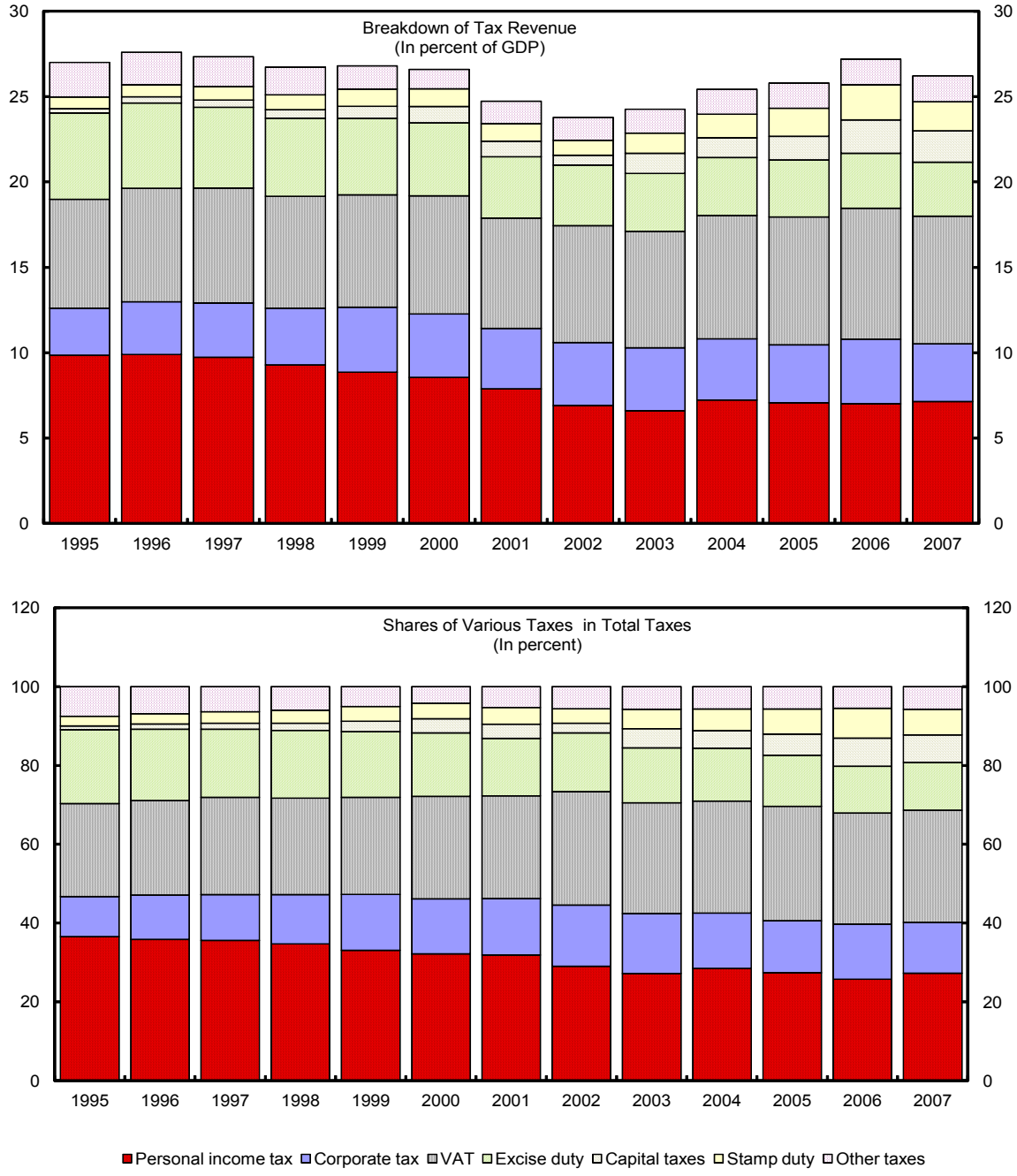
Athanasopoulou (2009) provides revised estimates of potential output and the output gap, using a multivariate Kalman filtering approach on a model where the output gap is identified using a set of plausible explanatory variables and potential output is assumed to follow a stochastic trend with mean-reverting growth rate. The revised estimates are significantly different



Sources: Athanasopoulou (2009), and author's calculations.

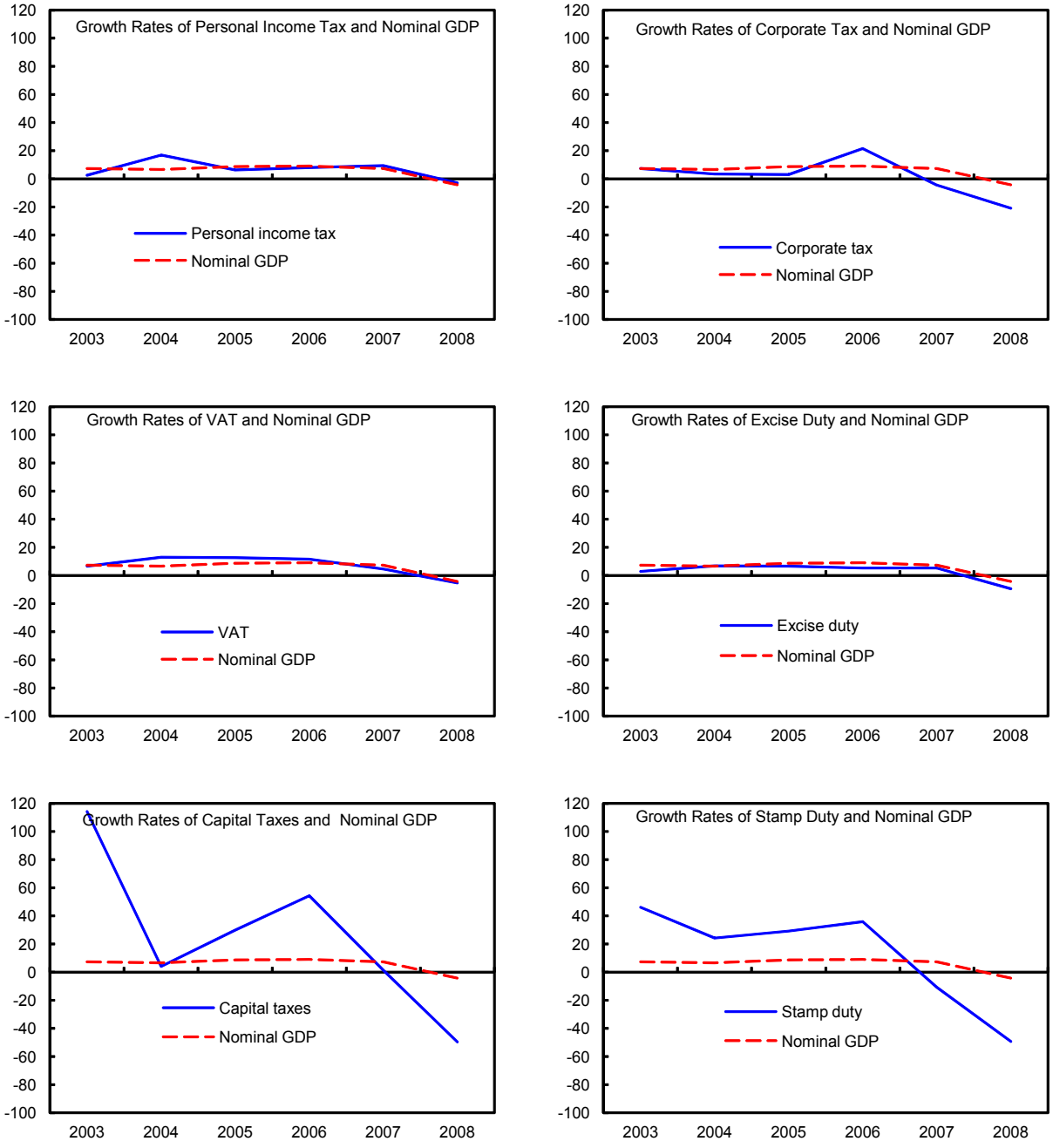
than the standard estimates using the production function approach, and intuitively—albeit with hindsight—tell a more plausible story on the evolution of Irish GDP and output gap. The revised output gap in 2007 was significantly higher than prior estimates, implying that (adjusting for only the output gap) structural fiscal revenues were much weaker than previously estimated.

Figure 1. Ireland: Tax Revenue Breakdown, 1995-2007

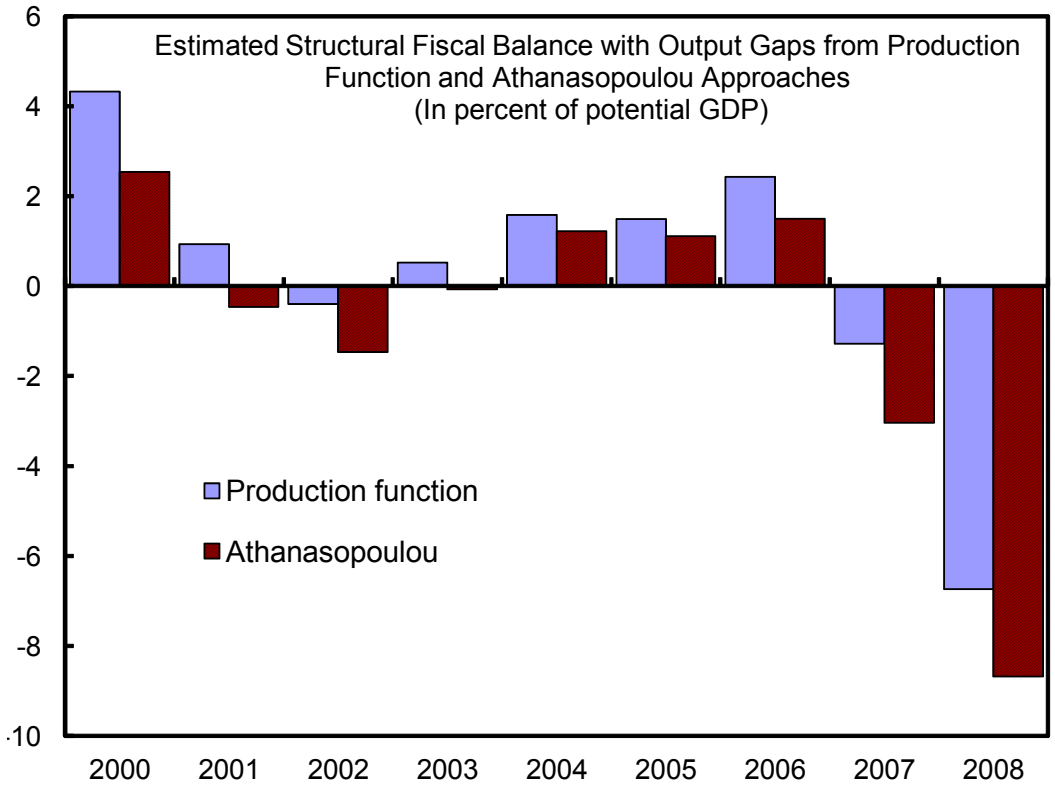


Sources: Irish authorities; and author's calculations.

Figure 2. Ireland: Comparison of Tax and Nominal GDP Growth Rates, 2003-08
(In percent, year-on-year)



Sources: Irish authorities; and author's calculations.



Sources: Athanasopoulou (2009); and author's calculations.

Indeed, correcting the estimated output gap alone causes the estimated structural fiscal balance in 2007—just before the crisis—to worsen by 1¾ percentage points of GDP.

Even so, an approach where nominal GDP—and its structural and cyclical components—is essentially the sole determinant of revenues is not enough to fully explain the scale of the revenue collapse. Given an elasticity for overall tax revenues with respect to nominal GDP estimated at slightly above unity, the collapse in tax revenues should have been only slightly higher than the collapse in nominal GDP. However, in reality the revenue collapse in 2008 was 8½ percent—double the 4¼ percent contraction in nominal GDP. Moreover, the discrepancy in revenue and GDP growth rates was particularly striking for those categories of taxes with a significant sensitivity to asset markets. It is also noteworthy that Eschenbach and Schuknecht (2002), Girouard and Price (2004), and Morris and Schuknecht (2007), among others, all find that excluding asset prices from the analysis can lead to serious biases in the estimation of the structural balance.

Thus, a more disaggregated approach and explicit consideration of asset market changes and sectoral shifts within the economy is needed to ensure a complete assessment of what portion of fiscal revenues could be considered structural. Indeed, European Commission (2008) seeks to explain the apparent large changes in tax elasticities in several member countries,

using such an approach. The next section outlines an estimated model for fiscal revenues that takes into account asset prices and sectoral changes.[3] The estimated equation could be thought of as a reduced form of a structural model that links revenue and its base to a set of explanatory macro variables.

III. THE MODEL

The estimated equation depends on whether the data are stationary or not, and we present below the model in both cases.

A. Model with Stationary Data

With stationary data, the model is given by equation (1) below:

$$\ln R_t = \sum_{i=0}^{m} a_{0i} \ln M_{it} + \sum_{i=0}^{m} a_{1i} \ln M_{it-1} + ... + \sum_{i=0}^{m} a_{li} \ln M_{it-l} + \varepsilon_t \quad (1)$$

where R_t represents revenue in time t; M_{it} represents the value of the ith explanatory variable in time t; a_{li} represents the elasticity of revenue to the l^{th} lag of the i^{th} explanatory variable; and ε_t is the error term.

Taking exponents of both sides of equation (1) to eliminate the natural logs, and using a star and hat to represent the structural level of the variable and the estimated value of the coefficient, respectively, then the estimated structural revenue is given by equation (2) as:

$$R_t^* = R_t \prod_{i=0}^{m} \left(\frac{M_{it}^*}{M_{it}} \right)^{\hat{a}_{0i}} \prod_{i=0}^{m} \left(\frac{M_{it-1}^*}{M_{it-1}} \right)^{\hat{a}_{1i}} ... \prod_{i=0}^{m} \left(\frac{M_{it-l}^*}{M_{it-l}} \right)^{\hat{a}_{lt}} \quad (2)$$

B. Model with Nonstationary Data

Where the data are nonstationary, it is often fruitful to first explore if a stationarity inducing transformation is possible, as it can substantially simplify the estimation process and the calculation of structural revenues. Division by GDP is a good candidate here, because the ratios of all the macro variables used (and underlying tax bases) to GDP are likely to be bounded, and may therefore be more likely to be stationary. Indeed, we find this to be the case for all the variables used in the estimation in this paper.

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[3] This paper abstracts from consideration of the effects of discretionary measures on tax elasticities. European Commission (2009) attempts to adjust revenue data for discretionary measures in a number of countries (excluding Ireland), and finds that overall this has a relatively small impact on the tax elasticity estimates, though in some cases substantial divergences are observed in certain years.

With all variables divided by GDP, the approach is very similar to that used in the case of stationary data, with the main difference that the variables are interpreted as ratios to GDP. On this basis, dividing both numerator and denominator of the ratio (M_{it}^{*}/M_{it}) by nominal GDP (Y_t) and denoting the resulting scaled variable by m_t, the ratio becomes (m_{it}^{*}/m_{it}). Thus we have the structural value of the revenue/GDP ratio given by:

$$r_t^{*} = r_t \prod_{i=0}^{m}\left(\frac{m_{it}^{*}}{m_{it}}\right)^{\hat{a}_{0i}} \prod_{i=0}^{m}\left(\frac{m_{it-1}^{*}}{m_{it-1}}\right)^{\hat{a}_{1i}} \ldots \prod_{i=0}^{m}\left(\frac{m_{it-l}^{*}}{m_{it-l}}\right)^{\hat{a}_{li}} \tag{3}$$

where r_t represents the ratio of revenue to GDP.

If scaling by GDP or other such transformation does not work, the model can be estimated in first differences, or an error correction model such as equation (4) below, which allows for cointegration, could be used.

$$\Delta \ln R_t = \sum_{i=0}^{m} a_i \Delta \ln M_{it} - \lambda\left(\ln R_{t-1} - \sum_{i=0}^{m} \mu_i \ln M_{it-1}\right) + \varepsilon_t \tag{4}$$

In this case, the estimation results are in relation to growth rates rather than levels of the variables, and the structural revenue is determined by the formula:

$$R_t^{*} = R_t\left(\frac{R_{t-1}^{*}}{R_{t-1}}\right)^{(1-\hat{\lambda})} \prod_{i=0}^{m}\left(\frac{M_{it}^{*}}{M_{it}}\right)^{\hat{a}_i} \prod_{i=0}^{m}\left(\frac{M_{it-1}^{*}}{M_{it-1}}\right)^{(\hat{\lambda}\hat{\mu}_i - \hat{a}_i)} \tag{5}$$

Since the right-hand side includes the lagged value of structural revenue, pinning down actual values for the level of structural revenue will require additional assumptions to identify the level of structural revenue in at least one year.

IV. Estimation Results

Log-linear regressions were estimated for all the revenue categories on annual data for 1987-2008. Data used were all divided by GDP. For all variables (in percent of GDP), the unit root hypothesis is rejected using the Ng-Perron test (Table 1). Ng and Perron (2001) show that this test generally has superior power and size properties compared to the traditional Dickey Fuller and Phillips Perron tests. Division by GDP has the implication that the regression equations seek to explain movements in the ratios of various revenue types to GDP, rather than their levels. In addition, GDP itself does not enter any equation as a stand-alone explanatory variable.

Table 1. Ng Perron Unit Root Tests 1/

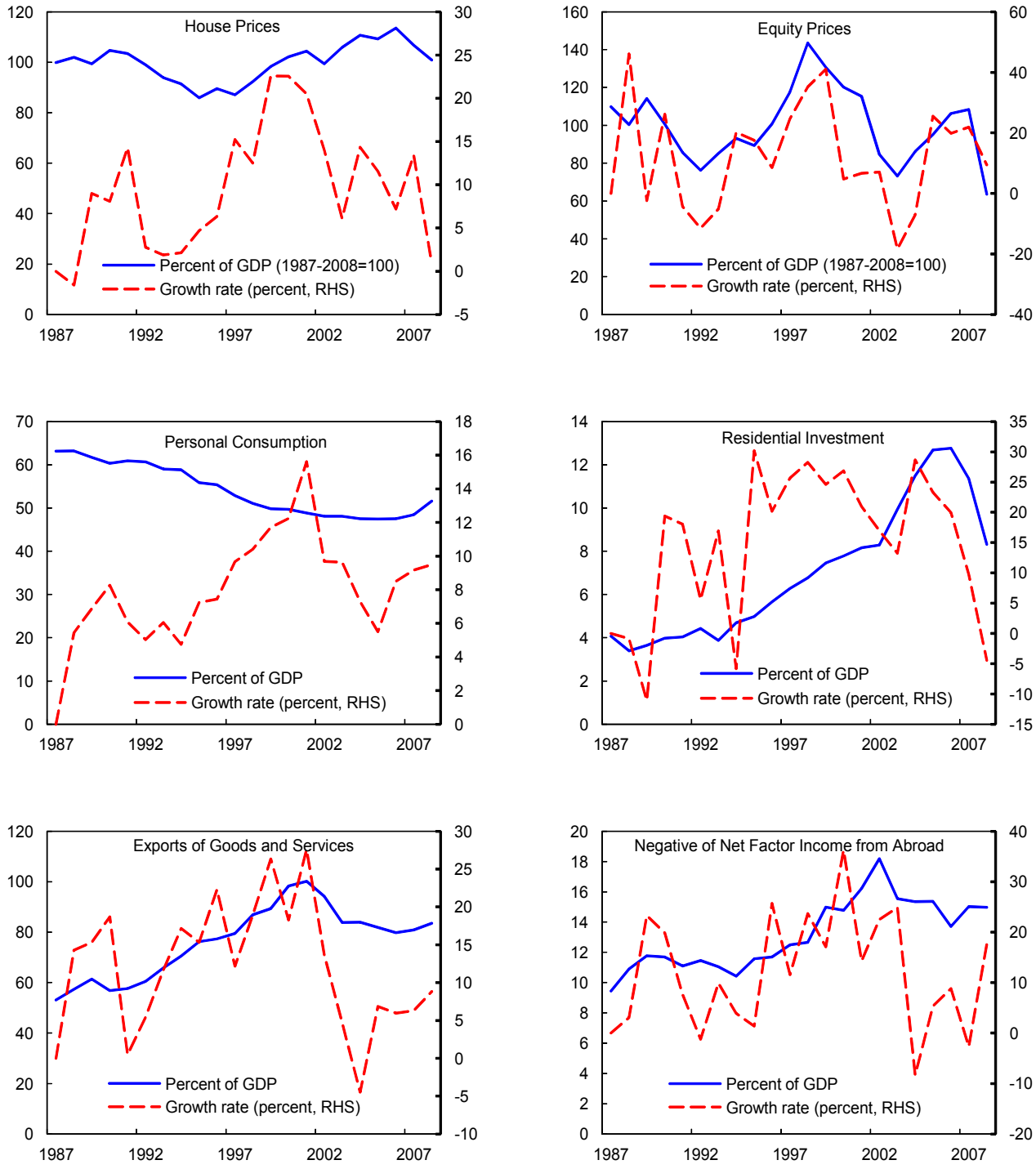
	Test Statistics 2/
Personal income tax	-42.19 ***
Corporate tax	-39.14 ***
VAT	-17.84 **
Excise duty	-21.19 **
Capital taxes	-28.12 ***
Stamp duty	-73.38 ***
Other taxes	-22.04 **
Social insurance contributions	-30.63 ***
Miscellaneous current revenue	-18.58 **
Capital revenue	-22.06 **
Personal consumption	-68.37 ***
Residential investment	-99.30 ***
Negative of net factor income from abroad	-65.15 ***
Exports of goods and services	-39.50 ***
House price index	-27.50 ***
Equity price index	-33.06 ***

Source: Author's calculations.
1/ All variables are in logs and in percent of GDP.
2/ MZa statistic, as in Eviews; *** and ** represent rejection of the unit root hypothesis at the 1 and 5 percent levels, respectively. Critical values: 1 percent level, -23.8; 5 percent level, -17.3.

A variety of macroeconomic variables were examined for explanatory power in the regression exercise. In each equation, variables and lags were added or dropped on the basis of significance, goodness of fit, and implications for serial correlation of the residuals. At the end, the variables that showed significant explanatory power in the equations were nominal consumption, nominal residential investment, house price index, equity price, exports, and net factor income from abroad. It does not appear plausible that any of these explanatory variables is significantly influenced by movements in any single revenue type, so OLS—which is what is used—should yield consistent estimates. Figure 3 presents these variables and their movement over the estimation period.

Most equations were estimated with high precision, with coefficients generally plausible (Table 2). For Ireland, net factor income from abroad is negative throughout the estimation period, so we use the negative of this variable—equivalently its magnitude—in order to be able to transform it into logs for the regressions. As all variables are in percent of GDP a positive or negative sign on a coefficient for a regressor does not translate to a similarly signed relationship between the respective variables in levels. In particular, a positive coefficient simply means that faster-than-GDP increases in the explanatory variable are associated with faster-than-GDP increases the revenue type under consideration, while a negative coefficient means that faster-than-GDP increases in the explanatory variable are associated with slower-than-GDP increases the revenue type under consideration.

Figure 3. Ireland: Revenue Determinants, 1987-2008



Sources: Author's calculations; CSO; and ESRI.

Looking across the various revenue types and explanatory variables, we can summarize as follows:

- Changes to the personal consumption/GDP ratio are found to have a significant positive impact on the ratios of personal income tax (PIT), value added tax (VAT), excise tax, other taxes, and social contributions to GDP.

- Changes to the residential investment/GDP ratio are found to have a significant positive impact on the ratios of value added tax (VAT), capital tax, stamp duty, and social contributions to GDP. The impact on the ratio of other tax to GDP is also positive, but just insignificant at the 10 percent level. On the other hand, changes to the residential investment/GDP ratio are found to have a significant negative impact on the ratio of miscellaneous current revenue to GDP. A possible explanation for this negative relationship is that increases in the residential investment cause increases in GDP, but do not stimulate increases in the base for miscellaneous current revenues. As a result, the ratio of miscellaneous current revenues to GDP declines.

- Changes to the ratio of the magnitude of net factor income from abroad to GDP have a significant negative impact on the ratios of PIT, corporate income tax (CIT), and miscellaneous current revenue to GDP. For Ireland, net factor income from abroad has been heavily influenced by the activities of the multinationals. Thus the negative relationship estimated for these three revenue types suggests that the strong growth in the activities of the multinationals has caused GDP to rise faster than the bases for these revenues.

- Changes to the exports/GDP ratio have a significant positive impact on the ratio of CIT to GDP.

- Changes to the ratio of house prices to GDP have a significant positive impact on the ratio of stamp duty to GDP, but a significantly negative impact on the ratio of capital revenues to GDP. Since the stamp duty equation also includes residential investment—which is the product of a house price index (for new construction) and the quantity of residential construction—the significant coefficient for the stand-alone house price index suggests that house prices have a larger impact on stamp duty than residential construction. With capital revenues, the negative relationship suggests that increases in house prices stimulate GDP to a greater degree than it does the base for this revenue type.

- Finally, changes the ratio of equity prices to GDP have a significant positive impact on the ratios of PIT and excise tax to GDP, but a significantly negative impact on the ratios of other taxes, social contributions, and miscellaneous current revenues to GDP. As above, negative coefficients suggests that increases in equity prices stimulate GDP to a greater degree than it does the base for that revenue type.

Table 2. Regresssion Estimates 1/

	Dependent Variable Estimated Coefficient									
Regressors	PIT	CIT	VAT	Excise	Capital tax	Stamp duty	Other taxes	Soc. contrib	Misc. rev.	Capital rev.
Constant	0.06	-6.10 ***		-7.33 ***	-3.71 ***	-9.54 ***	-12.28 ***	-4.52 ***	4.21 ***	8.60 ***
Personal consumption			0.38 ***				1.18 *	1.46 ***		
Lagged personal consumption	0.89 ***			2.13 ***			2.01 **			
Residential investment					0.85 **	0.52 ***	0.30		-0.15 **	
Lagged residential investment			0.21 ***		0.82 **			0.23 ***		
Negative of net factor income from abroad	-0.33 *	-1.60 **							-0.80 ***	
Lagged negative of net factor income from abroad	-0.30 *	0.46								
Exports of goods and services										
Lagged exports of goods and services		2.34 ***								
House price index						1.70 ***				-1.68 ***
Lagged house price index										
Equity price index				0.24 ***				-0.13 **	-0.32 ***	
Lagged equity price index	0.16 **						-0.31 ***			
R-square	0.96	0.79	0.71	0.96	0.95	0.87	0.94	0.86	0.93	0.33

Source: Author's calculations.
1/ All variables are in logs and in percent of GDP.
2/ ***, **, and * represent significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

V. CALCULATING STRUCTURAL REVENUES

Calculating the structural revenue/GDP ratio for each revenue type requires us to obtain estimates for the ratios (m_{it}^{*} / m_{it}), which measure how far each explanatory variable is from its structural or fundamental value. To do so, we need to generate estimates for the structural values m_{it}^{*} of the explanatory variables. One way is to use a smoothing technique, such as the HP filter, to extract the trend value of the variable, which is then treated as the structural value. This is the approach taken by Morris and Schuknecht (2007) among others.

Figure 4 presents the results of using the HP filter on all the explanatory variables. To minimize end-point problems, projections up to 2014 are added. The extraction of trend appears satisfactory in all cases but that of residential investment, where a significant portion of the large housing bubble seems to have been incorrectly ascribed to the trend.

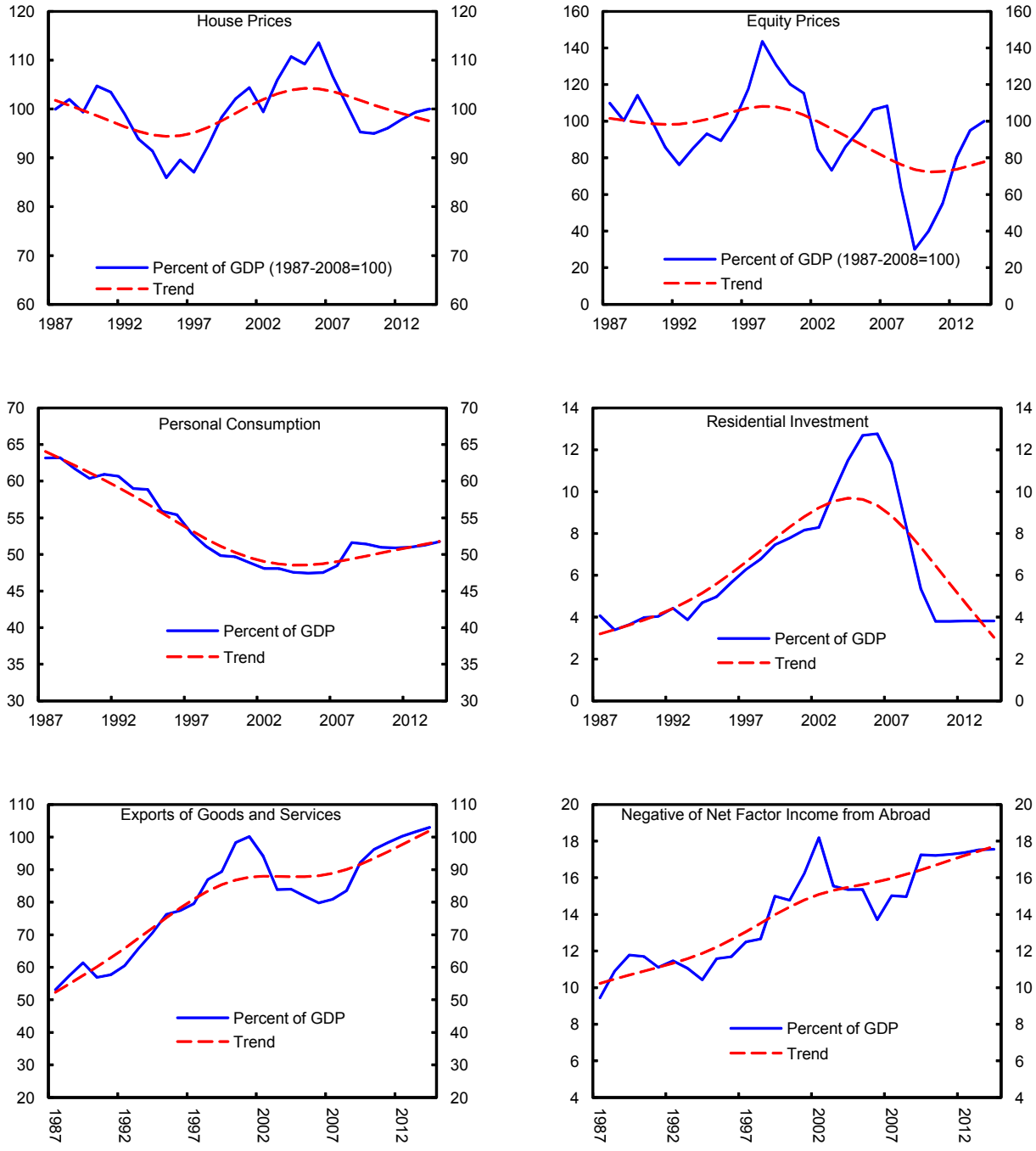
To correct for the housing bubble, an alternative approach is proposed for extracting the underlying trend for the residential investment/GDP ratio, which can be decomposed as follows:

$$\left(\frac{RI_t}{Y_t}\right) = \left(\frac{P_t^H}{Y_t^{PC}}\right)\left(\frac{H_t}{Pop_t}\right) \tag{6}$$

Where RI_t represents residential investment in time t; P_t^H represents the price index for residential construction (largely new houses) in time t; H_t represents real residential construction in time t; Y_t^{PC} represents GDP per capita in time t; and Pop_t is the population in time t.

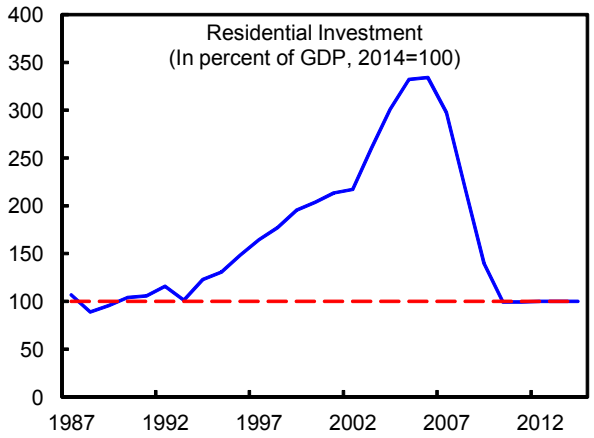
Thus, the residential investment/GDP ratio can be expressed as the product of a price/income ratio, and the ratio of new house building to the population. Price-income ratios are commonly used in the literature on housing bubbles to gauge whether house prices are diverging from fundamentals, with substantial and prolonged increases compared to some long-run average level taken to be evidence that house prices are becoming increasingly unaffordable, and thus diverging from fundamentals (see, for example, OECD, 2005). Also, house building would be expected to bear a relatively stable long-run relationship with the population of a country—which drives household formation (see, for example, Kelleher, 2005). On this basis, we make the assumption that residential investment has a stable long-run relationship with nominal GDP, such that in the short or medium run the ratio of residential investment to GDP can deviate from a fundamental value due to cyclical or other temporary factors such as bubbles, but will return toward that fundamental value over the long run.

Figure 4. Ireland: Revenue Determinants and HP Filtered Trends, 1987-2014



Sources: Author's calculations; CSO; and ESRI.

We will proceed under the assumption that the fundamental value of the residential investment/GDP ratio is that value that is projected at the end of the medium term (taken to be 2014), after the property bubble has fully deflated and output gaps are assumed closed. We project that in 2009 nominal residential investment declined by about 42 percent (which, in fact, is slightly optimistic given data indicating that in the first three quarters of 2009 it declined 48 percent). Also, in 2010 we project a further contraction of about 30 percent, and in subsequent years it is assumed that positive growth resumes at a rate similar to the growth in overall nominal GDP. The text chart presents the implied evolution of the residential investment/GDP ratio, given these projections. It turns out that the estimated fundamental value is very similar to what prevailed through the early 1990s. It is evident that the "non-structural" components of the residential investment/GDP ratio have been large in Ireland, and consequently the rapid decline in this variable will have a substantial impact on revenues, as indeed is being observed.



Sources: CSO; and author's calculations.

Thus, for all other explanatory variables we use the HP filtered values as our estimates of the structural values while for residential investment we take the projected value for 2014 as the structural value. Overall structural revenue is then the sum of the structural levels of the different revenue types.

Figure 5 presents the actual and structural values (from the estimated equations in Section III) of the various revenue types. This indicates that the revenue types for which there has been significant divergence between actual and structural levels in percent of GDP are the VAT, capital taxes, stamp duty, and social contributions. These revenue types also happen to be ones where residential investment has had significant explanatory power, and so the divergences appear to reflect the impact of the property bubble.

Figure 5. Ireland: Actual and Structural Revenues, 1988-2008
(In percent of GDP)

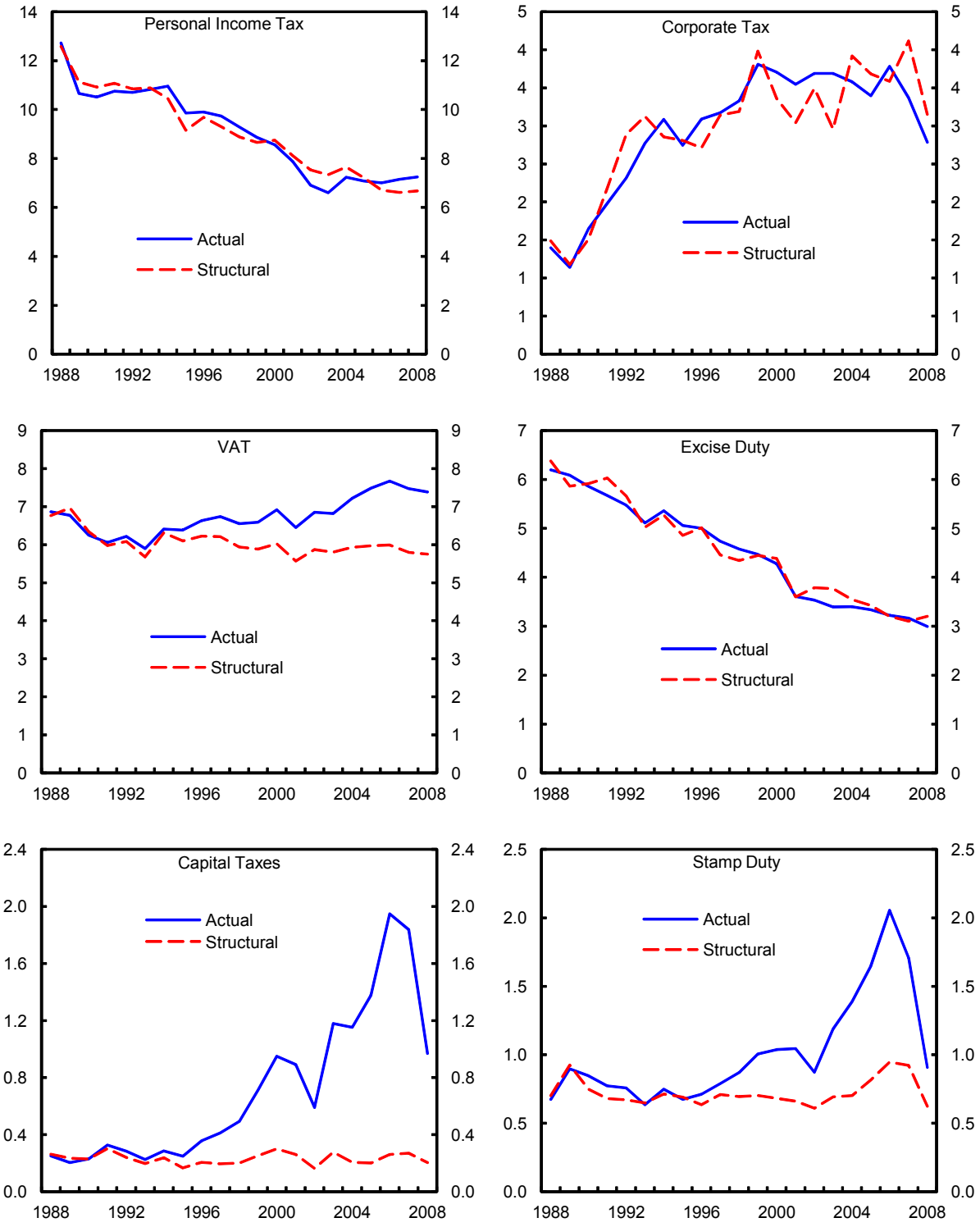
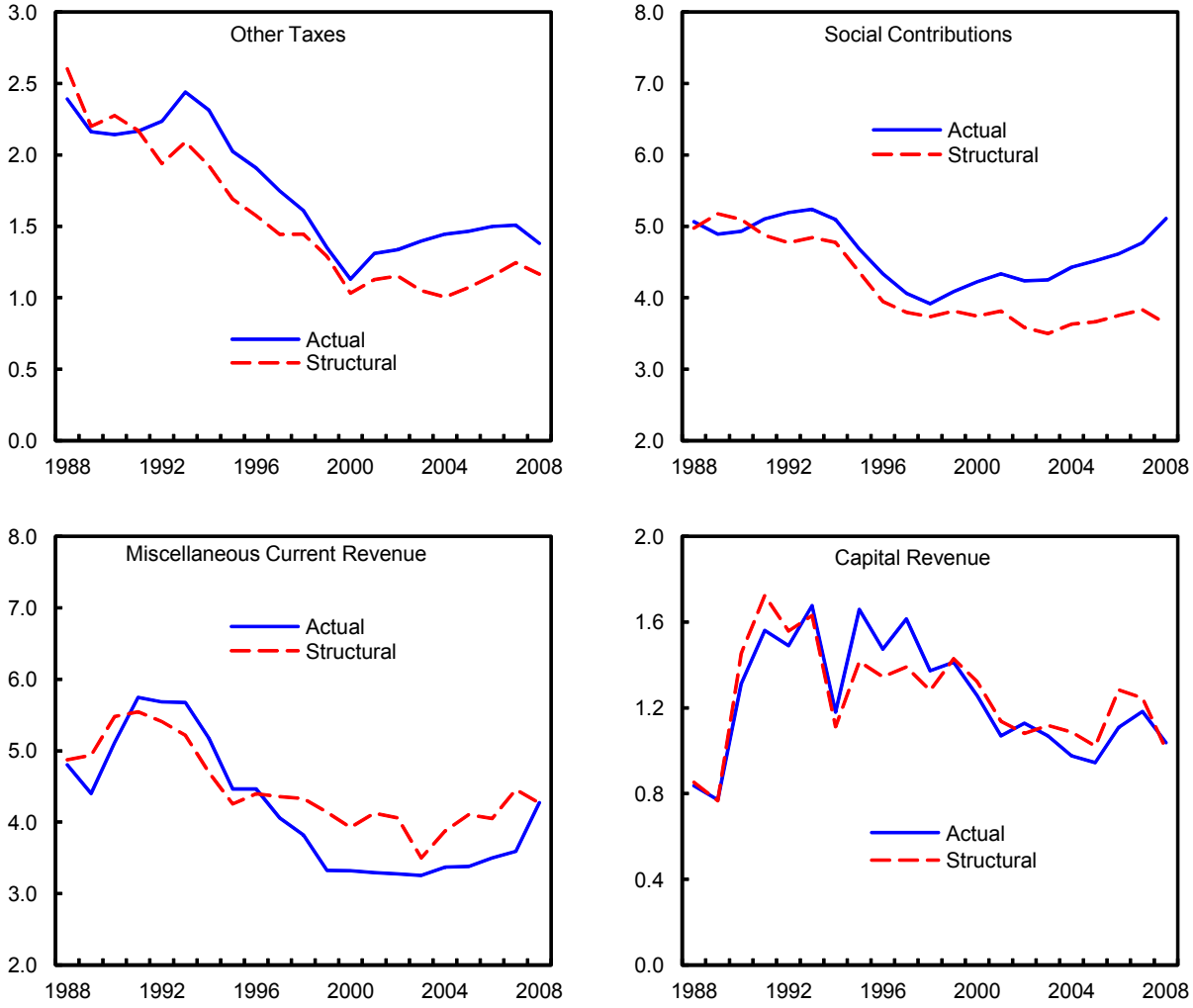


Figure 5. Ireland: Actual and Structural Revenues, 1988-2008 (concluded)
(In percent of GDP)



Sources: Author's calculations; CSO; and Department of Finance.

VI. Structural Expenditures and Structural Balance

As indicated above, unemployment benefits are assumed to be the only component of fiscal expenditure with a significant cyclical component. Thus, fiscal expenditure can be expressed as follows:

$$E = E_s + U \tag{7}$$

where E, E_s and U represent total expenditure, expenditure excluding unemployment benefits, and unemployment benefits, respectively.

Now unemployment benefits can be expressed as follows:

$$U = UR \times L \times B \tag{8}$$

where UR, L and B represent the unemployment rate, labor force, and average benefits, respectively.

The structural level of unemployment benefits is the amount of benefits that would be paid out if the unemployment rate were at its structural level (or NAIRU). This can be expressed as follows:

$$U^* = NAIRU \times L \times B \tag{9}$$

Putting equations (7)-(9) together, we obtain structural expenditure, $E,^*$ as follows:

$$E^* = E_s + \left(\frac{NAIRU}{UR}\right)U \tag{10}$$

Structural expenditure is then divided by potential GDP (obtained using the Athanasopoulou approach) and this ratio is then subtracted from the structural (revenue/GDP) ratio to obtain the estimated structural balance in percent of potential GDP.

Table 3 presents the estimates of structural revenues, structural expenditure, and the structural balance. This indicates that the structural fiscal deficit in Ireland has been significantly higher than earlier estimated, had increased to 7 percent of potential GDP in 2007 (prior to the crisis), and increased further to 13 percent of potential GDP in 2008. Interestingly, however, most of the structural deterioration has been on the expenditure side rather than the revenue side. Between 2000 and 2008 structural expenditures increased by 10 percentage points of potential GDP, far above the 3.8 percentage point decline in structural revenues. The deterioration was particularly acute between 2006 and 2008, where structural expenditures rose by almost 8 percentage points of potential GDP. Arguably, an expenditure relaxation on this scale would not have occurred if policymakers had been guided by the estimates of structural revenues in this paper, which would have warned of a substantial and rising difference between the headline and structural revenue/GDP ratios.

Table 3. Structural Fiscal Position 1/

	Estimates								
	2000	2001	2002	2003	2004	2005	2006	2007	2008
Structural revenue	33.5	31.5	31.3	30.0	31.6	31.2	30.9	31.6	29.7
Structural expenditure	32.7	33.8	33.8	32.9	33.0	33.5	34.8	38.6	42.7
Structural balance	0.8	-2.3	-2.5	-2.9	-1.4	-2.3	-3.9	-7.0	-13.0
Memo items									
Structural balance under alternative approaches									
Production function approach	4.3	0.9	-0.4	0.5	1.6	1.5	2.4	-1.3	-6.7
Using Athanasopoulou output gap 2/	2.5	-0.5	-1.5	-0.1	1.2	1.1	1.5	-3.0	-8.7
Headline revenue (%GDP)	35.4	33.4	32.4	32.8	34.2	34.6	36.4	35.8	34.1
Headline expenditure (%GDP)	30.6	32.5	32.7	32.4	32.8	33.0	33.5	35.7	41.2
Headline balance (%GDP)	4.8	0.9	-0.3	0.4	1.4	1.6	2.9	0.1	-7.2

Sources: Athanasopoulou (2009); Department of Finance; and author's calculations.
1/ In percent of potential GDP unless otherwise stated.
2/ Same structural expenditure estimates as above, but structural revenue obtained by applying aggregate tax elasticity to Athanasopoulou output gap.

VII. CONCLUDING REMARKS

This paper extends the standard estimation of structural balances for Ireland in a number of important ways, explicitly accounting for asset price cycles, the housing bubble, and changes to the composition of national income. It is found that these factors have had a significant and ongoing impact on Irish fiscal revenues. The effect of the housing bubble is particularly pronounced in the case of indirect taxes like VAT, capital gains, and stamp duty. It also turns out that equity prices have a significant impact on personal income taxes. The analysis also highlights that there have been substantial changes in the sectoral composition of GDP, which have had an impact on the evolution of structural revenues.

The paper also demonstrates that not accounting for asset price cycles, bubbles, or sectoral changes can generate a large bias in the calculation of the structural balance—one moreover that generally cannot be corrected for by changing the estimated output gap. In Ireland's case, this bias, which made the revenue prospects seem much rosier than they actually were, helped stimulate an expenditure relaxation that created a large hole in the public finances that will take several painful years to close.

Thus, there is a strong case for expanding the standard OECD-based methodology to include the missing elements outlined above, as done in this paper. Indeed, the ECB is already moving in this direction to refine the treatment of asset-based taxes in its disaggregated approach.

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