

Revenue Potential, Tax Space, and Tax Gap

A Comparative Analysis

Munawer Sultan Khwaja

Indira Iyer

The World Bank
Europe and Central Asia Region
Poverty Reduction and Economic Management Department
May 2014



Abstract

This paper contributes to the empirical literature on the key determinants of the revenue generating potential in 61 countries. The paper uses a broad set of data and econometric methods to conduct analyses that are of relevance to revenue potential. Earlier studies have not distinguished between the revenue potential based on economic fundamentals of countries and that based on what the legal framework prescribes. This study uses a dual approach to revenue potential to examine the issue. Two sets of variables are used, one related to the intrinsic economic structure and strength of countries that affect revenue potential and the other related to tax policy variables. Accordingly the analysis finds two sets of revenue potentials: one can be termed “revenue potential (economic),” and the other “revenue potential (legal).” The difference between the revenue potential (legal) and the actual revenue collected is commonly

understood as the “tax gap.” The difference between the revenue potential (economic) and the actual revenue collected can be termed the “tax space,” the amount of revenue that a country can afford to collect, given its economic strength, not based on what the parliament has mandated. The results show that legally mandated revenue potentials in countries in Eastern Europe and Central Asia are often higher than the revenue potential based on what the country’s economic fundamentals can afford. The paper also makes use of a tax effort index and finds that although many countries are performing close to the revenue potential (economic), it is more difficult to match up to the revenue potential (legal). The relationship between the revenue potential and the shadow economy, value added tax productivity, and some other determinants are examined to test whether some countries are taxing beyond their means.

This paper is a product of the Poverty Reduction and Economic Management Department, Europe and Central Asia Region. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The authors may be contacted at mkhwaja@worldbank.org and iyer_indira@yahoo.com.

The Policy Research Working Paper Series disseminates the findings of work in progress to encourage the exchange of ideas about development issues. An objective of the series is to get the findings out quickly, even if the presentations are less than fully polished. The papers carry the names of the authors and should be cited accordingly. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.

Revenue Potential, Tax Space, and Tax Gap: A Comparative Analysis^{*}

Munawer Sultan Khwaja[†] and Indira Iyer[‡]

JEL classification: H2. Taxation, Subsidies, and Revenue; H21. Efficiency, Optimal Taxation; H27. Tax Evasion; H87. International Fiscal Issues

Keywords: Comparative Taxation; Tax Gap Analysis; Revenue Potential; Tax Space;

^{*} We thank Prof. Richard Bird (University of Toronto), David Grigorian (IMF), Annette Alstadsater (University of Oslo), and the following World Bank colleagues for their useful comments: Indermit Gill, Adrian Fozzard, Aristomene Varoudakis, Abebe Adugna, Tuan Minh Le, Sebastian Eckardt, Juan Zalduendo, Daniel Alvarez, David Nummy, Stella Ilieva, Agim Demukaj and Borko Handjiski. We have also benefited from comments received from the participants of Tax Policy Seminar at the World Bank in Washington, DC (February 2014). We are thankful to the Russian Federation PFM Trust Fund for funding this study

[†] Lead Tax Policy and Revenue Administration Specialist, World Bank (Washington, DC). Email: mkhwaja@worldbank.org

[‡] Consultant, World Bank, formerly George Washington University (Washington, DC). Email: mkhwaja@worldbank.org

Revenue Potential, Tax Space, and Tax Gap: A Comparative Analysis

1. Introduction

The decade 2000-2010 has witnessed major changes in tax systems globally. The aim of meeting the Millennium Development Goals has put greater realization in developing countries to improve their domestic resource mobilization in a concerted manner. Although the study looks at tax space and tax gap in 61 countries, the main focus of the study is post-socialist countries of Eastern Europe, Russia and Central Asia

During the last two decades the countries of Eastern Europe and Central Asia (ECA) have experienced significant changes in their political and economic systems while moving towards more democratic institutions and free market systems. Simultaneously, issues regarding fiscal sustainability have become important due to the size and composition of public expenditure and the speed and scope of tax reforms.

The high and growing levels of public spending have imposed high tax burdens on the economy. The early transition years involved “multiple shocks”¹ with the removal of employment guarantees in state-owned enterprise, a rise in open and hidden unemployment and a rise in cash transfers and social security payments. In addition, public spending on other categories as well like wages and salaries, capital expenditures, and on public health and education has also continued to rise.

The legacy of planned socialism has also had an impact on the present tax systems. Primary among these are a lack of a tradition of voluntary compliance, ‘negotiated taxes’ for firms, a weak and underdeveloped tax administration, and public distrust of government institutions (Martinez-Vazquez and McNab, 2000). All these factors along with a tradition of corrupt government practices and a large and growing “shadow” economy which escapes the tax net have contributed to lower levels of tax compliance and tax evasion.

The countries chosen for this study have embarked on their growth paths with uneven economic growth and uneven tax effort among these countries. ‘Tax effort’ is defined as the ratio between the actual revenue collected and the revenue potential of an economy. Low tax effort hinders sound fiscal policy. However, tax revenues can be increased through a better mix of tax reform policies and strengthening of the tax administration. The question is: should revenues be increased beyond the economic capacity of a country. This regional study ranks countries by their tax collection efforts and tax potential, and tries to understand whether taxing beyond what the economic potential would allow it to results in lower tax productivity and lower tax effort.

2. Definitions: Tax effort, revenue potential, tax space, and tax gap

The absolute tax effort, or the ratio of actual tax collected to GDP, is a good indicator of the tax collection trends of a single country over a period of time. However, this ratio does not capture the tax potential or tax capacity of a country, or whether a country is putting in enough effort to mobilize its resources in comparison with other countries. To facilitate more effective cross-country comparisons, several studies have used a regression approach to estimate the tax potential. Using this approach, the “revenue potential”, or “tax capacity” for a country is first estimated as its predicted value from a regression that controls for the individual characteristics of a country. Based on this, an index of the “relative tax effort”, or the actual tax collected to the potential tax (both as a share of GDP), is computed to facilitate easier cross country comparisons.

¹World Bank. 2007. p25

As the relative tax effort index is the ratio between actual tax collections to the potential tax revenue, this ratio may be greater than 1 for countries with a high tax effort, equal to 1 for countries fully using their potential tax capacity, or less than 1 for countries with a low tax effort. The “relative tax effort” is indicative of how well a country is exploiting its potential tax base. Throughout this paper, “tax effort” refers to the relative tax effort of countries and the countries are grouped on the basis of high, medium and low tax effort. The details of this classification are in Section 7(f).

There have been several empirical cross country analyses using the regression approach to measure a country’s revenue potential and its tax effort. One of the earliest papers on this was by Bahl (1971) who computed the relative tax effort of the i th country using the “tax base proxies” (GDP per capita, agriculture and size of the foreign trade sector) of the i th country and the average practice across the sample of 51 countries. Piancastelli (2001) estimates the tax effort index for a panel of 75 countries for the period 1985-1995 using just GDP per capita to measure the stage of development, the share of agriculture / industry/ services (separately in each regression) as a percent of GDP and trade as a percent of GDP. Using a larger data set of 141 countries over the period 1990-2004, Davoodi and Grigorian (2007) extend this regression based analysis by looking at institutional quality and the shadow economy as predictors of tax collection and tax potential. Using a similar approach for 105 developing countries over 25 years, Gupta (2007) also includes tax policy variables (highest marginal tax rates for PIT, CIT and average import tariff rate) that impact revenue efforts. Le, Moreno-Dodson and Rojchaichaninthon (2008) estimate the tax potential and relative tax effort using structural and institutional quality variables for a panel of 104 countries covering the period 1994-2003.

This study also distinguishes between the revenue potential based on the inherent economic capacity of a country -the “economic revenue potential” - and that based on what the legal and regulatory framework of the country prescribes - “legal revenue potential”. Taking this dual approach, two regressions are run to determine ‘revenue potential (economic)’ and ‘revenue potential (legal)’ using two sets of variables, one corresponding to the intrinsic economic structure and strength of countries, and the other incorporating tax policy, which is an expression of political choice. The “revenue potential (legal)” is the full model specification and the “revenue potential “economic” is a reduced model nested in the full model. Details of the estimation methodology are in Annex B.

The difference between the revenue potential (legal) and the actual revenue collected is commonly understood as the “tax gap”. The difference between the revenue potential (economic) and the actual revenue collected can be termed the “tax space”, i.e., the amount of revenue that a country can afford to collect, given its inherent economic strength, not based on what the parliament has mandated. The difference between the tax gap and the tax space – called “difference”- is discussed in Section 7(a) and 7(c).

3. Components of the study

This study empirically investigates the tax effort and tax potential of a group of countries that include countries in the ECA region and the EU, as well as countries in other regions that bear similar characteristics in terms of tax structure. For instance, the countries in this sample have both VAT and social security taxes. In addition, some qualifying countries have been excluded due to lack of relevant tax data which is primarily sourced from WDI, OECD and Eurostat for this study. Accordingly, the sample of countries in this study has been limited to 61 countries. A smaller sample also tends to dampen the effect of the “world-wide average bias” in panel data analysis that may make results not too representative. Interestingly, in robustness checks, when the sample was increased to 88 countries where complete data was available, the results do not change much.

Within the ECA region itself, there is considerable diversity. In addition to Turkey, the other ECA countries can be broadly grouped into the “EU-10+1” (Bulgaria, Croatia, Romania, Czech Republic, Hungary, Poland, Slovak Republic, Slovenia; Estonia, Latvia, and Lithuania); the Balkans comprising Albania, Bosnia and Herzegovina, Kosovo, the former Yugoslav Republic of Macedonia, Serbia, and Montenegro; the Commonwealth of

Independent States (CIS) and South Caucasus countries comprising Armenia, Belarus, Georgia, Kyrgyz Republic, Moldova, Tajikistan and Ukraine; and the oil producing countries of comprising Azerbaijan, Kazakhstan, and the Russian Federation. Broad trends in tax ratios across these groups are discussed in Section 4.

This study analyzes the relationship between actual revenue collection, the economic and legal revenue potentials, and the tax space, tax gap and tax effort of countries. In addition, countries in the dataset are grouped with respect to their actual tax collections (low, medium, high) and their tax effort (low, medium, high) and comparisons are drawn across them. The size of the shadow economy also affects tax revenue collections, and hence, the effect of the on the tax gap, tax space and tax effort is also analyzed.

4. Tax structure in different regions

Tax revenues in the formally centrally planned economies were mainly from enterprise profits, turnover and payroll taxes levied on state-owned enterprises. Individual income tax was relatively unimportant. The current tax system in the transition countries has a greater reliance on direct taxes including the personal income tax (PIT), corporate income tax (CIT), and the payroll and social security taxes; and indirect taxes including VAT, excises and customs tariff.

Personal income tax is still not well developed in the Commonwealth of Independent States (CIS). Many CIS countries still do not have global aggregation of incomes from all sources into ‘total income’ and universal filing of tax declarations by individuals is not widely practiced. Typically, the employer files the detailed list of withholding tax for all its employees in one consolidated return. Most countries in ECA have personal income tax structure with a flat rate. Although this increases the regressiveness of the tax system, the main argument used for introducing flat rates in PIT is to introduce simplicity, broaden the tax base, reduce administrative costs, and improve tax compliance. The flat rate applied to PIT and CIT vary significantly across countries. In 2010, the lowest rate for PIT was 4 percent for Kosovo and the highest for Slovenia at 41 percent and Croatia at 40 percent. For the same year, Ukraine and Tajikistan had the highest CIT rate at 25 percent, while Montenegro had the lowest at 9 percent. However, flat taxes have often been criticized on equity grounds and its effect on tax compliance has been mixed².

The burden of labor taxes (includes PIT, social security contributions by employees, and payroll taxes or social security contributions by employers) are disproportionately high in ECA countries. Labor taxes accounts for about 40 percent of total labor cost on average³. In 2010, the tax wedge was highest in Hungary and Latvia at 33 percent and lowest in Belarus at 6 percent. On average, social security contributions contribute to about 77 percent of the tax wedge. Reflecting the historical legacy of the tax structure, the social security contributions are largely paid by the employers. The very high rates of labor taxes contribute to lower employment levels in the formal sector and larger shadow employment in the ECA region.

For most ECA countries, the VAT replaced the complex turnover taxes, and is the single most important source of revenue. Currently all CIS countries have a VAT single rate structure of 20 percent, except for a reduced rate in Russia, Belarus and Uzbekistan for food and medicines. The non-CIS Eastern European countries adopted a European credit-invoice VAT structure with multiple rates.

² World Bank. 2007. In the Slovak Republic, self-employed tax returns increased by 14.6 percent in the first year of the flat tax reform in 2004(p265). In Ukraine, however, the high consolidated rates of payroll taxes discourage PIT reporting, and consequently PIT too, as both share the same base. Employers and employees enter into a collusion to set the “take-home pay” for the employee, which is partly what is recorded in the books and partly in unrecorded cash (p269).

³ World Bank. 2007. In the middle-income ECA countries (Poland, Romania, and the Slovak Republic), social security contributions make up for 45 to 49 percent of gross wage, compared to Chile and the Republic of Korea where it is 13 and 16 percent respectively (p282-283).

5. Estimation methodology

This study uses the empirical methodology used in previous studies by Piancastelli (2001), Davoodi and Grigorian (2007), Gupta (2007), and Le et al (2008). As in previous studies, in this paper too, revenue potential is based on a regression analysis and the revenue potential of a given country is estimated from a comparison with the average performance of a sample of countries. Naturally, the larger the sample, the larger is the difference in the economic, institutional, tax policy and tax administration frameworks across the group, making it difficult to draw policy implications from such an exercise. Hence, in the context of studying the tax revenue potentials in the ECA region, as we do in this paper, we handle the "worldwide average" bias by cutting down the sample of countries to only those countries that share similar characteristics in terms of their tax structure to the ECA countries. This limits the countries to those that have both social security taxes and value added taxes. Hence, the sample set in this paper is smaller than most cross-country panel data studies that use over 110 countries in their analysis.

In this paper, the sample size is 61 countries, that covers 23 ECA countries (including 2 that have graduated from the World Bank recently, but for the purpose of this paper are grouped with ECA), 5 ECA countries that have graduated from the World Bank earlier and are (for the purposes of this paper) classified together with OECD countries, and 33 other countries in the OECD, LAC, EAP and AFR regions.

Fixed effects and random effects

The fixed effect model specification is: $y_{it} = \alpha_i + \beta X_{it} + \gamma Y_{it} + \delta Z_{it} + \varepsilon_{it}$ where, y_{it} is the total tax revenue as a percent of GDP in country i at time t , α_i is the country fixed effect, X_{it} is the set of structural variables, Y_{it} is the set of institutional variables, and Z_{it} is the set of policy variables. The random effects specification is: $y_{it} = \alpha + \beta X_{it} + \gamma Y_{it} + \delta Z_{it} + u_i + \varepsilon_{it}$; where u_i is the country-specific error term. The Hausman specification test is generally used to decide between the fixed effects and random effects model.

The crucial distinction between fixed and random effects is whether the unobserved country effects are correlated with the regressors in the model. A major motivation for using the fixed effects models is to control for this unobserved heterogeneity. Clark and Linzer (2013), note that while the main objection to using random effects is that the covariates may be correlated with the unit effects, it does not imply that any correlation between the covariates and the unit effects implies that the fixed effects should be favored since, except in exceptional circumstances, there would always be some level of correlation between the covariates and the unit effects.

The choice should, hence, depend on how much bias is created by this correlation, and how much variance is introduced by using the fixed effects instead of the random effects. Running Monte Carlo simulation exercises, Clark and Linzer (2013) find that when the variation of the covariates is primarily within the units, "there is rarely any divergence between the random effects estimator and the fixed effects estimator...and the conventional understanding that correlation between regressors and unit effects results in unwarranted bias in the estimate of the model parameters is unfounded". The authors also find any bias in the slope parameter estimate is more than compensated for by the increase in estimate efficiency.

Clark and Linzer (2013) further suggest that when units are relatively similar to one another on average, and with larger amounts of data (typically more than five observations per unit), there is no discernible difference in estimates of β between the two estimators, even when the regressor and the unit effects are very highly correlated. Thus, the authors suggest, the appropriate model should be guided by the researcher's goals. For example, if one seeks to make predictions, then the random effects estimator should be preferred.

The considerations for choosing between a fixed effects or random effects model is also discussed by Clarke et al (2010). The authors argue that the fixed effects model is used in many studies “almost by default”, whereas the appropriate model choice would depend on the type of research question being addressed. The authors argue that while both these methods are appropriate in different contexts, but when the selection of the group is well understood and rich data is available, than the “random effects models have qualities very close to those of fixed effects models”. In such a case, the random effects model should be preferred both for its efficiency over the fixed effects approach and that it allows the researcher to make a wider range of policy relevant inferences.

There are other reasons why the random effects model may be preferred, particularly in tax analysis where tax rates change very gradually over time or do not display any change at all. In time series, cross-sectional data where the independent variable is slow-moving or time-invariant, if the model is using fixed effects, there is the danger of collinearity and biased estimates leading to highly unreliable inferences. Random effects models are not subject to this limitation and in tax models where sluggish tax policy variables (e.g., tax rates) play an important explanatory role in determining tax revenue collections, the random effects model may be the preferable specification of choice.

In this paper, the selection of the sample of 61 countries is well understood by including countries that have relatively similar characteristics in terms of their tax structure. We also include tax policy variables as relevant explanatory variables to predict tax revenue collections. We use a random effects specification of the model. As discussed above, any potential bias in the β estimator is compensated by more efficient estimators as well as the ability to include sluggish tax policy variables. The baseline panel regressions were run using both fixed effects and random effects for both the economic and legal model specifications (discussed below). The Hausman test favored the specification of the model with random effects.

Nested models

This study examines the revenue generating potential of the 61 countries in this sample using a dual approach. Two separate sets of revenue potentials are estimated. “Revenue potential economic” uses variables that are related to the intrinsic economic structure and strength of countries that affect revenue potential. The second regression uses all the variables in the “economic” regression and adds tax policy variables. This is called the “revenue potential legal”. In effect, in this paper, the economic model is nested within the legal model.

Clogg et al. (1995) discuss this issue of comparing regression coefficients between models where one of the models is nested in the other, and suggest a methodology to compare the two explanations of some specified dependent variable from the same data set. The first model uses a set of predictors $X = X_1 + X_2 + \dots + X_p$. The second model uses the same set of predictors X but also adds a new set $Z = Z_1 + Z_2 + \dots + Z_q$. The authors discuss the main logic of making such comparisons. The first reason why such a comparison would be made is to answer the question of whether the increment in prediction obtained by adding Z is significant or important. Tests on such incremental contributions rest on the premise that the more comprehensive or “full” model has generated the data and statistical inferences in the reduced model are conditional on the truth of the full model. Such comparisons are made to ascertain whether the original explanation, the alternative explanation, or some combination of the two is most consistent with the data.

The second reason is to examine “causal structures”. If the causal structure is represented by the reduced model (here, the economic model) with specified predictors X , then it is important to examine the change when various modifications have been made to the causal structure. Clogg et al (1995) are of the view that, while “this framework is not an automatic recipe for causal inference (it) is the most common way to modify a given explanation. This logic is clearly related to the discovery and validation of “laws” (Pratt and Schlaifer 1998) and is, or ought to be, a vital part of theoretical analysis where alternative examples are truly pitted against each other”.

If the “Z” variables in the “full” model are the tax variables τ , the nested reduced economic model can be derived from the full legal model in the following way:

Nested economic model:

$$y_{it} = \alpha + \beta \cdot X_{it} + u_i + \varepsilon_{it}$$

Full legal model:

$$y_{it} = \alpha + \beta \cdot X_{it} + \gamma \cdot \tau_{it} + u_i + \varepsilon_{it}$$

The revenue potential legal (RPL) is first estimated using the full model:

$$RPL = \hat{y}_{it} = \hat{\alpha} + \hat{\beta} \cdot X_{it} + \hat{\gamma} \cdot \tau_{it}$$

The revenue potential economic (RPE) is then backed out of the full model above by the following:

$$RPE = \hat{y}_{it} - \hat{\gamma} \cdot \tau_{it} = \hat{\alpha} + \hat{\beta} \cdot X_{it} = RPL - \hat{\gamma} \cdot \tau_{it}$$

An alternative method to the above is to run a counterfactual after estimating the revenue potential legal (RPL) and setting the tax variables, τ , to zero. Both these methods of either backing out the RPE from the RPL as discussed above, or by running a counterfactual on the RPL, give the same estimates of the revenue potential economic (RPE). In this paper, $X = 6$ in the reduced “economic” model and we add $Z = 4$ to specify the full “legal” model.

Model estimation

The panel was found to be heteroskedastic using the modified Wald test and the Poi and Wiggins Likelihood test. Since the panel could have heteroskedasticity with no autocorrelation, heteroskedasticity with panel level AR1, or heteroskedasticity with cross sectional correlation with a common AR1 across all panels, the model was tested for autocorrelation using the Woolridge test and cross-sectional dependence or contemporaneous correlation using Breusch-Pagan LM test of independence and the Pasaran CD tests. The panel had evidence of contemporaneous correlation across the panels.

The model was, hence, estimated using (a) Fixed effects (FE) with robust clustered standard errors; (b) Random effects (RE) with robust clustered standard errors; (c) GLS with panel level heteroskedasticity and an AR1 process and (d) Panel Corrected Standard Errors (PCSE) with panel level heteroskedasticity and contemporaneous correlation across panels (Annex A, Tables A1 and A2).

For feasibility and consistency, the GLS model requires $T > N$. In our panel, we have 11 time periods and 61 panels, so the GLS specification was not opted for. The PCSE model allowing for panel level heteroskedasticity and contemporaneous correlation across panels also gives consistent estimates. The PCSE model works well where $N > T$, and is the specification that is used for computing tax revenue potentials in our sample of 61 countries.

The model was also estimated using the Arellano-Bond (A-B) dynamic GMM estimator with a lagged dependent variable. The A-B model would be a suitable model for the panel data as we have a small T and a large N . The model was estimated using the system GMM. However, the results from the system GMM estimator were weaker than that from the PCSE estimator, and hence, the latter has been used to predict the tax potentials.

To account for a possible structural break after the global recession of 2008, the model was tested for time effects. The time effects were not found to be significant for the period 2000-2007, though they become significant during the recession of 2008 and the post-recession phase. Hence, a post-2008 dummy to account for the global recession

has been added to the model. Separate regressions for the full sample period (2000-2010) incorporating a structural break in 2008 is in Table 1 below. The regression results for the sub-periods 2000-2007 and 2008-2010 are in Annex A, Tables A3 to A4.

The full model using PCSE (equation 13, Table 1) has been used for calculating the revenue potential legal (RPL) with the following specification.

$RPL = f(\text{GDP per capita, share of services in GDP, share of trade in GDP, age dependency ratio, control of corruption, CIT, CIT square, VAT, VAT square, post 2008 dummy})$

The revenue potential economic (RPE) has been backed out from the full model by the methodology described above.

$RPE = RPL - (-0.579 \cdot CIT) - (0.017 \cdot CIT \text{ square}) - (-0.512 \cdot VAT) - (0.050 \cdot VAT \text{ square})$

Explanatory variables

The variables included in this analysis are a mix of structural variables, institutional variables and policy variables that impact tax collection effects of a national government. Summary statistics of the main variables are in Annex A, Table A(5).

The “PPP adjusted GDP per capita” indicates country’s level of development and the capacity to tax. The higher the GDP per capita the higher is both the potential tax base as well, and this variable is expected to have a positive coefficient.

The economic structure of the economy and the relative difficulty to tax is typically proxied by the share of agriculture value added in GDP in past studies. For instance, Le, Morena-Dodson and Rojchaichaninthorn (2008), and Davoodi and Grigorian (2007) have accounted for this by regressing the tax ratio on the share of agriculture in GDP. Piancastelli(2001) has separately tested for the significance of value added in the agriculture, industry and service sectors as percent of GDP and found none of these being significant predictors of tax/GDP ratios. In our regressions, the share of agriculture value added to GDP was not a significant predictor of tax collections, while the share of industry and service value added as a percent of GDP were significant predictors. Since tertiarisation has been the dominant feature of structural change in the global economy in the last two decades⁴, and has contributed to greater job creation (as a percent of total employment) as well as a greater share of GDP, the regressions in this study use the share of service sector in GDP⁵ as it is expected to positively impact tax revenue collections.

Taxes from trade are an important source of revenue that is relatively easier to tax even with a weak tax administration. Hence, trade openness (imports plus exports over GDP) is a variable in our regressions and is expected to have a positive coefficient.

The share of urban population reflects demand for urban services, and tax levels. In our sample, the share of urban population was not significant. The age dependency ratio was significant with a negative coefficient. The age dependency ratio is the percent of people below 15 and above 64 to total population. The age dependency ratio is used as a predictor in this analysis and reflects the percent of productive population and hence the size of the tax base.

⁴ The share of services in GDP for the period 2000-2010 was 61% for the sample as a whole, 56% for the ECA region, and 69% for the OECD countries.

⁵ It is also true that the part of the service sector that is based on small business, and not on wage income, is usually harder to tax.

Governance and institutional quality also affect tax revenue collection. In many formerly centrally planned economies, the government and the administration still maintain strong discretionary power over the allocation of resources, implicitly enhancing corruption. Corruption reduces citizens' trust in government authority. Tanzi and Davoodi (1997) empirically show that high corruption lowers revenues. Bird et al (2004) also find that institutional qualities, such as corruption or political stability, as measured by the governance quality index significantly reduce tax effort. According to the corruption perception index of Transparency International, among the ECA countries, Slovenia and Estonia have the lowest corruption while corruption is most pervasive in Bulgaria and Romania⁶. Torgler and Schneider (2007) show that improving governance and institutional quality increases tax morale and tax compliance. In fact, in many instances, the perception of good governance has a greater impact on tax compliance than reforming tax systems. Several indices of institutional quality (control of corruption, regulatory quality, government effectiveness and political stability) were tested separately for significance. Control of corruption was found to be a significant predictor of tax ratios.

The incentive to evade taxes is greater when the tax burden is higher. Effective tax rates are typically a better measure to reflect a country's tax policy. However, effective tax rates are not available for most countries in this study, and hence, as done in several other empirical studies, the maximum marginal tax rates have been used to proxy for tax burdens. The maximum marginal PIT used separately as a regressor was not significant, while the maximum marginal CIT and the VAT rate were found to be significant and negative. This implied that there was a greater incentive to evade taxes as the tax rates increased. In addition, the square of the tax rates was also used to capture any potential non-linearity as well as to smooth out the effect of increasing taxes. The square of the tax rates was found to be positive and significant.

Most panel data analysis on tax effort and tax potential done so far have either not used tax policy variables (PIT, CIT and VAT) as a predictor of tax revenue collections, or if they have used it, have found it to be insignificant⁷. This certainly appears counter-intuitive. The Laffer curve effect in tax literature is well known⁸. Tax revenue collections as a proportion of GDP are correlated with tax rates up to a tipping point in the tax rates, after which tax revenue collections show a downward trend as tax rates increase. So, certainly tax rates and the tax structure do have an impact on tax revenue collections.

Hence, it seems surprising that studies so far on tax revenue collections and tax potential have either omitted tax policy variables in their analysis, or if they have included them, found these variables to be insignificant. One possible reason could be the large sample size in these studies and the consequent heterogeneity in the sample that is unable to capture the influence of tax rates⁹.

⁶ Transparency International, Global Corruption Report 2009.

⁷ Tuan Minh Le et al (2008, 2012) use 5 variables (GDP per capita, population growth rate, trade openness, agriculture and corruption) to predict tax revenue potential. The authors do not include tax policy variables. Gupta (2007) does use tax policy variables (taxes on goods and services, corporate tax and tax on trade) but finds none of these variables significant. Of note is that the sample size falls dramatically to a one-fourth of the original sample when he adds the tax policy variables. Gupta (2007) finally uses just four variables to predict tax potentials in his study-GDP per capita, import share, share of aid and share of debt. Piancastelli (2001) uses three variables –GDP per capita, agriculture and trade- to predict tax revenue potentials. Piancastelli does not explore the impact of tax policy variables on tax revenue collections. A notable exception is Davoodi and Grigorian (2007), where using the instrumental variable approach, the authors find the corporate tax rate significant in explaining the shadow economy. The predicted value of the “shadow” is used as a regressor in the tax potential calculations.

⁸ Some empirical studies (Trabant and Uhlig 2012), however, find little evidence of the Laffer curve effect.

⁹ For example, the sample size in Tuan Minh Le et al(2012) is 110 countries covering the period 1994-2009, Gupta (2007) has 105 countries over a 25 year period (with no corrections for possible structural breaks), and the sample in Davoodi and Grigorian (2007) is 141countries over the time period 1990-2007

Another possible reason could be the different specification of the model. All the prior studies reviewed in this paper have used a fixed effects model. Under this specification, it is difficult to gauge the impact of time-invariant variables as these will be found to be collinear with the fixed country effects. As tax policy rates in most countries are sticky and do not typically change year to year, these variables will likely drop out or be insignificant in any regression using fixed effects. This study, using a PCSE model has found that tax policy variables (CIT and VAT) have a significant effect on tax revenue collections.

To check the robustness of these results, the regressions were run with alternate specifications. First, the regressions were run using "industry" instead of "services" as a structural variable. Interestingly, the industry coefficient was negative and the services coefficient was positive. The tax potentials, however, did not vary much (Annex C). This means that as the level of industrialization increases, the tax collections actually decrease. This result was robust both to increased sample size (tested with a full sample of 88 countries where complete data was available), as well as breaking up the time period from 2000-2010 into further sub-periods. A possible explanation for a negative coefficient for industry is that as the level of economic development increases, some part of the industrial sector escapes taxation perhaps due to a combination of factors that include the possibility of small scale industries being set up as well as part of the output being manufactured in the shadow economy. The results are also robust to using the lagged values of the explanatory variables.

Table 1
PCSE: 2000 -2010

	(1) taxgdpin	(2) taxgdpi n	(3) taxgdpin	(4) taxgdpin	(5) taxgdpin	(6) taxgdpin	(7) taxgdpin	(8) taxgdpin	(9) taxgdpin	(10) taxgdpin	(11) taxgdpin	(12) taxgdpin	(13) taxgdpin
lgdppc	7.16*** (15.12)	6.79*** (10.42)	6.27*** (13.15)	5.99*** (12.22)	6.39*** (10.87)	5.43*** (10.21)	3.41*** (4.76)	6.00*** (8.83)	4.78*** (6.63)	3.41*** (4.29)	3.86*** (4.59)	3.00*** (4.02)	3.04*** (4.10)
agr		-0.06 (-0.93)											
ser			0.14*** (4.12)	0.16*** (4.85)	0.17*** (5.21)	0.15*** (4.57)	0.15*** (4.46)	0.18*** (5.23)	0.16*** (4.54)	0.15*** (4.56)	0.14*** (4.05)	0.10*** (3.30)	0.11*** (3.64)
trade				0.03*** (4.99)	0.03*** (4.56)	0.03*** (4.59)	0.04*** (5.14)	0.04*** (5.41)	0.04*** (5.03)	0.03*** (5.11)	0.03*** (4.60)	0.04*** (5.76)	0.04*** (5.98)
urban					-0.05* (-1.70)								
age						-0.17*** (-3.26)	-0.27*** (-5.76)	-0.21*** (-4.33)	-0.23*** (-4.68)	-0.27*** (-5.80)	-0.25*** (-4.77)	-0.35*** (-8.01)	-0.36*** (-8.34)
control-corr							1.98*** (4.00)			2.00*** (4.05)	1.91*** (3.90)	1.05** (2.46)	0.95** (2.23)
reg qly								-0.67 (-0.98)					
gov eff									0.79 (1.41)				
pit										-0.01 (-0.25)			
cit											-0.33* (-1.77)	-0.58*** (-3.54)	-0.58*** (-3.63)
cit square											0.01* (1.67)	0.02*** (5.43)	0.02*** (5.61)
vat												-0.49* (-1.68)	-0.51* (-1.79)
vat square												0.05*** (4.98)	0.05*** (5.17)
post2008													-0.58*** (-2.59)
_cons	-37.8*** (-8.29)	-33*** (-5.15)	-37.91*** (-9.84)	-39.65*** (-9.95)	-40.31*** (-9.85)	-24.94*** (-3.99)	-1.66 (-0.21)	-30.63*** (-4.33)	-16.96** (-2.26)	-1.59 (-0.20)	-2.11 (-0.26)	4.38 (0.61)	4.18 (0.59)
N	642	642	642	642	636	642	588	586	582	582	588	588	588

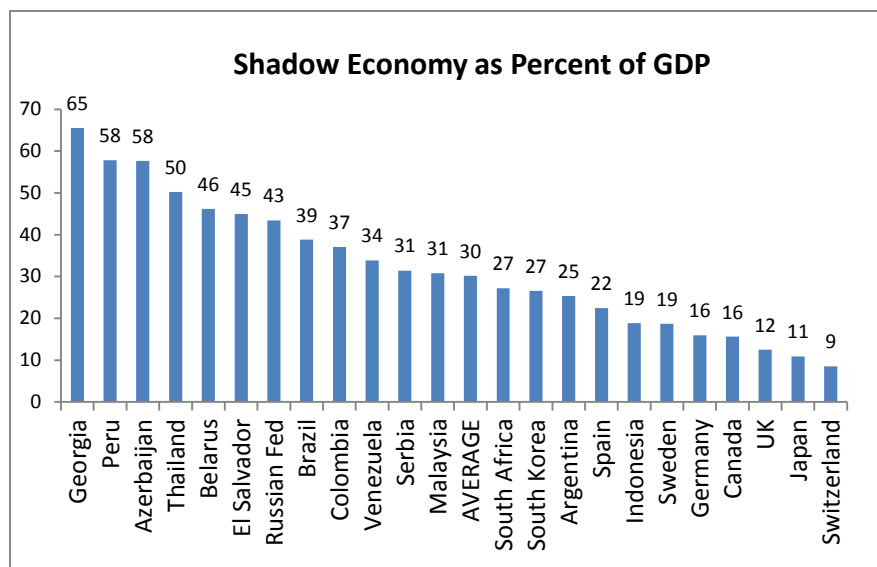
Data Sources

Data on tax revenue to GDP and the composition of tax revenue (direct and indirect taxes) are from OECD Stat, EuroStat, The World Bank ECA FACE Database, and the World Development Indicators.. Data on PPP adjusted GDP per capita, share of industry in GDP, share of services in GDP, share of trade in GDP, , and age dependency are from the *World Development Indicators* (WDI). Data for the shadow economy is from Schneider et al (2010). Data for the policy variable measuring tax burdens (VAT and corporate tax) are from the *World Development Indicators* (WDI: 2010). Data on governance indicators are from *World Bank Governance Indicators*.

6. Tax burdens and the shadow economy

The shadow economy includes all market-based legal production of goods and services that are concealed from the government primarily to avoid payment of income, value added or other taxes; to avoid payment of social security contributions; and to avoid having to meet certain legal labor market standards, such as minimum wages, maximum working hours and safety standards (Schneider 2010).

Despite tax reform measures, the size of the shadow economy has stubbornly remained at an average of about a third of the GDP in ECA countries. According to recent estimates by Schneider, Buehn and Montenegro (2010), the three countries with the smallest shadow economies among the 23 ECA countries analyzed in this study were the Slovak Republic, the Czech Republic and Hungary¹³ with an average size of 18 percent over the period 1999-2007. During this same period, the shadow economy in Russia and Moldova was around 44 percent and Georgia topped the list as the country with the highest “shadow” of a size close to two thirds of its GDP. In this sample, UK, Japan and Switzerland had the smallest percentage in the shadow at 12%, 11%, and 9% respectively.



The incentive to evade taxes due to the heavy burden imposed by the overall tax structure and social security contributions is one of the main causes for the existence of the shadow economy. It follows that the larger the shadow, the greater is the underreporting and the consequent loss in tax revenues.

The official GDP of a country tends to be underreported due to the existence of a shadow economy. Hence, the “official” or actual tax /GDP ratio figures may actually be much lower if we take into account the shadow economy which completely escapes taxation (by definition). However, it cannot be assumed that the official GDP of a country is fully increased by the size of the shadow as this would imply that that there is no overlapping between the estimates of the shadow and the estimates of the GDP. In addition, a fair amount of the shadow activity in every country occurs in activities that are below taxable thresholds. To account for the fact there is the issue of double counting and that all shadow activities are not taxable, in this paper we have assumed that just 1/3 of the shadow escapes taxation. The methodology to compute the tax gap and tax space with and without the shadow is in Annex B.

¹³ These three countries have since graduated from the ECA region, but where in it for the period involved in our analysis.

Incorporating the size of the shadow directly as an exogenous variable in predicting tax potentials suffers from the problem of endogeneity. The method of two stage least squares was also not found to be suitable due to the difficulty of finding suitable instruments¹⁴. In the presence of the shadow economy, as the actual tax collections compared to official GDP ratio would be somewhat higher than if actual tax collections were to be compared to a revised GDP which includes some measure of underreporting due to the shadow economy, it implies that there is more room for the government to increase revenue collections by suitable policies to bring more of the shadow economy into the tax net. Hence, in this paper we have two numbers for actual tax collections: actual tax collections as a percent of official GDP and actual tax collections as a percent of “revised” GDP which includes the shadow economy. It is to be noted that this type of analysis to examine the tax gap and tax space both with and without the shadow economy keeps the tax potentials in the economy (both the economic and legal potentials) computed by the regression analysis unchanged.

7. Assessment of revenue performance

a. Revenue potential, tax gap and tax space

As discussed in section 2, two sets of revenue potentials are determined: the ‘revenue potential (economic)’, and the other ‘revenue potential (legal)’. The difference between the revenue potential (legal) and the actual revenue collected is commonly understood as the ‘*tax gap*’. The difference between the revenue potential (economic) and the actual revenue collected can be termed the ‘*tax space*’, i.e., the amount of revenue that a country can afford to collect, given its economic strength, not based on what the parliament has mandated. A positive “*difference*” between the tax gap and the tax space indicates that in these countries, the legally mandated tax regimes were significantly higher than what the country’s economic fundamentals could afford. The magnitude of the “*difference*” does not in any way indicate that either tax rates or tax revenues should be decreased by this amount. The “*difference*” merely suggests that in these countries there is a greater incentive to evade taxes as well as a greater load on tax administration as the country is taxing its people more than what they can afford, given their economic situation.

The results show that revenue potentials (legal) are usually higher than the revenue potential (economic) in almost all countries (Annex A, Table A(1)). In the ECA region, the largest positive “*difference*” between revenue potential (legal) and revenue potential (economic) was in Moldova followed by Poland and Croatia. Bosnia, Kazakhstan and Kosovo showed the lowest difference between the revenue potential legal and the revenue potential economic.

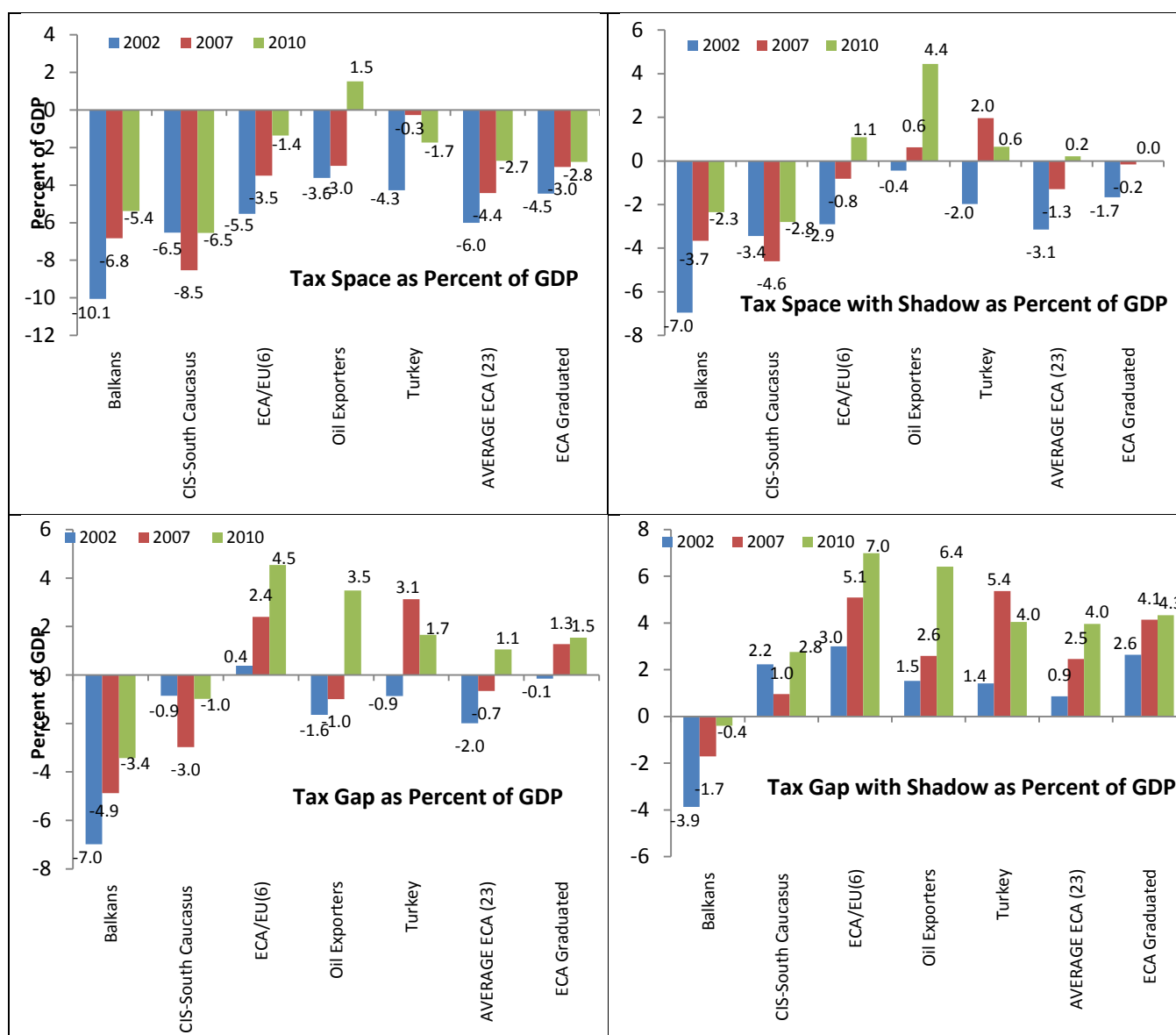
Annex A, Table A(1) also lists the tax space and tax gaps for ECA, LAC, EAP, MNA and OECD (the OECD list includes non-OECD members that have graduated from the World Bank). If the shadow economy is taken into account, the actual GDP of a country is much greater than reported. As discussed in Section 6, one third of the shadow economy is assumed to escape taxation, and the GDP of the economy is recomputed taking this into account. This would mean that the actual tax collections as a percentage of GDP if we include the shadow economy that escapes taxation would be lower than reported. As seen in Annex A, Table A(1), the tax space was generally lower than the tax gap, and if the shadow economy is taken into account, the tax gap is seen to be much higher.

A positive tax space indicates that the country is not fully utilizing its revenue potential up to its economic capacity. In the ECA region, only Azerbaijan, Georgia, Slovak Republic and Kosovo had a positive tax space. A large negative tax space (as in Montenegro, Serbia and Belarus) shows that the country is actually collecting way above its economic capacity. Among OECD members, the Nordic countries show very high negative tax space.

¹⁴ Finding suitable instruments for the shadow is difficult. As is well known, a bad or a poor instrument is worse than doing OLS.

The following chart indicates the tax space and the tax gap in the ECA region, and if we take into account the shadow economy that escapes taxation, the tax gap and tax space are larger. Interestingly, the tax gap and tax space displayed an uneven pattern across three time periods (2002, 2007, 2010). However, if the shadow economy is taken into account, there is a clear trend - the tax gap and tax space increased across all groups following the global recession in 2008 (except for Turkey). While there is a negative tax space and tax gap in several groups, if we take into account the shadow economies in these countries, the negative tax space and tax gap considerably decreases, and in some years actually shows a positive space, indicating that there could still be room to increase tax revenues if the shadow economy is brought into the tax net. The ECA/EU(6), the oil exporting countries and Turkey had the highest tax gap and tax space (with shadow) indicating that there is greater scope to increase revenues in these countries. Annex D gives a graphic presentation of the tax space, tax gap and tax effort for all ECA countries over the period 2002-2010.

Chart 1. Tax Space and Tax Gap in the ECA Region



b. Actual and potential tax revenues

Chart 2(a) shows that there is a positive relationship between actual revenue collected and the revenue potential, both economic and legal. These are shown to be true in separate sub-charts below for ECA countries and the entire sample. Countries that have high revenue potential typically collect more revenue. Chart 2(b) shows that the tax potentials – both economic and legal – decreased after 2007. Among the ECA countries, the ECA/EU(6) group show the most tax potentials, while the CIS and South Caucasus group show the least tax potentials.

Chart 2(a). Actual and Potential Tax Revenues

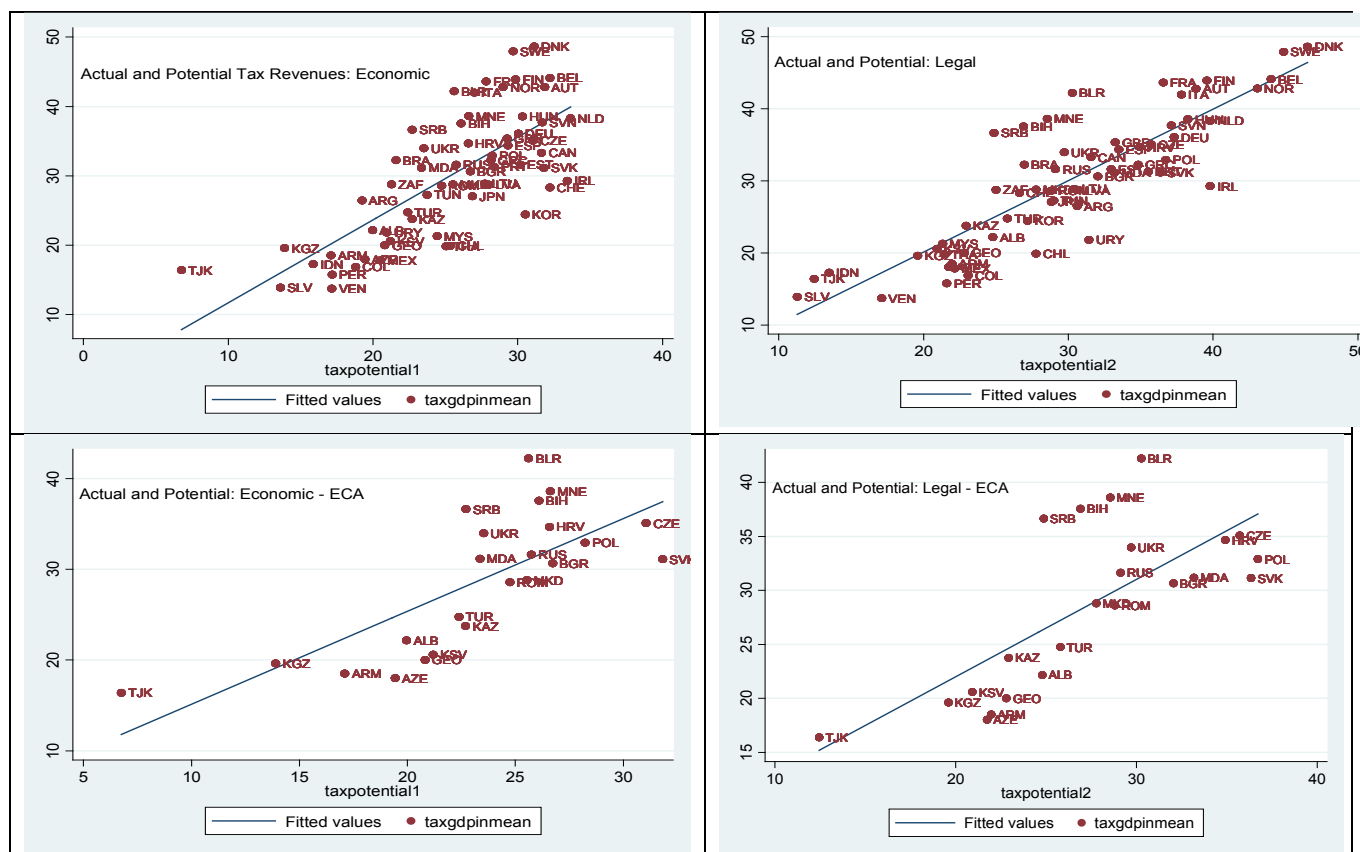
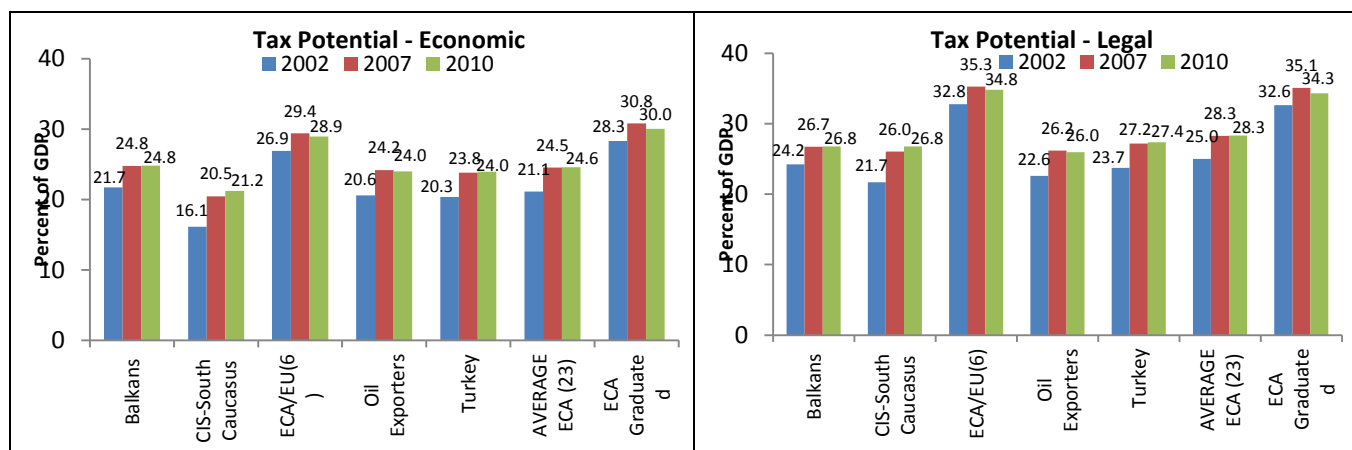


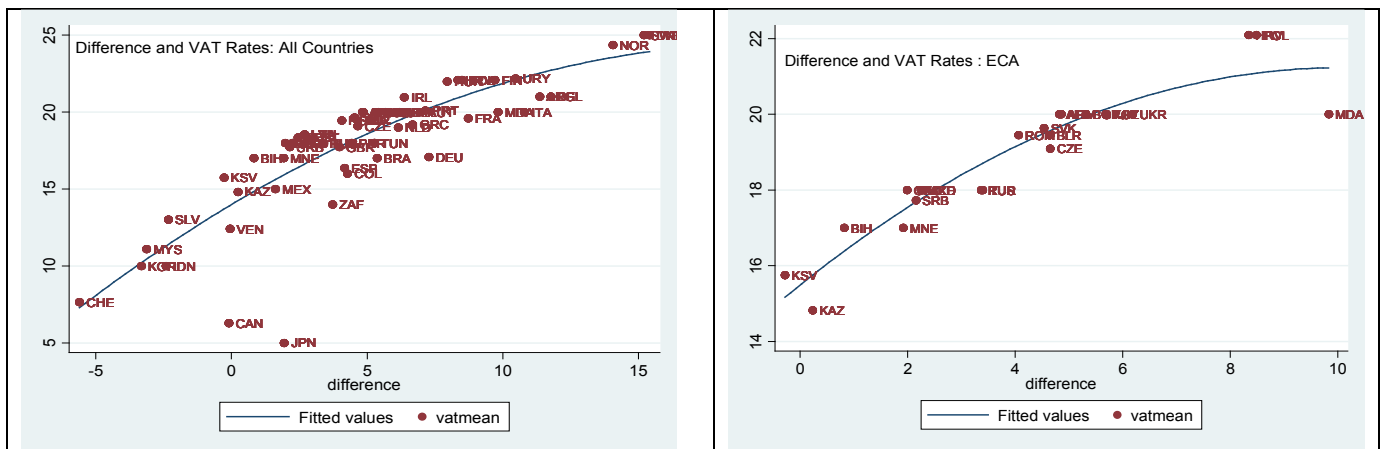
Chart 2(b). Actual and Potential Tax Revenues in the ECA Region



c. Difference in revenue potentials and VAT productivity

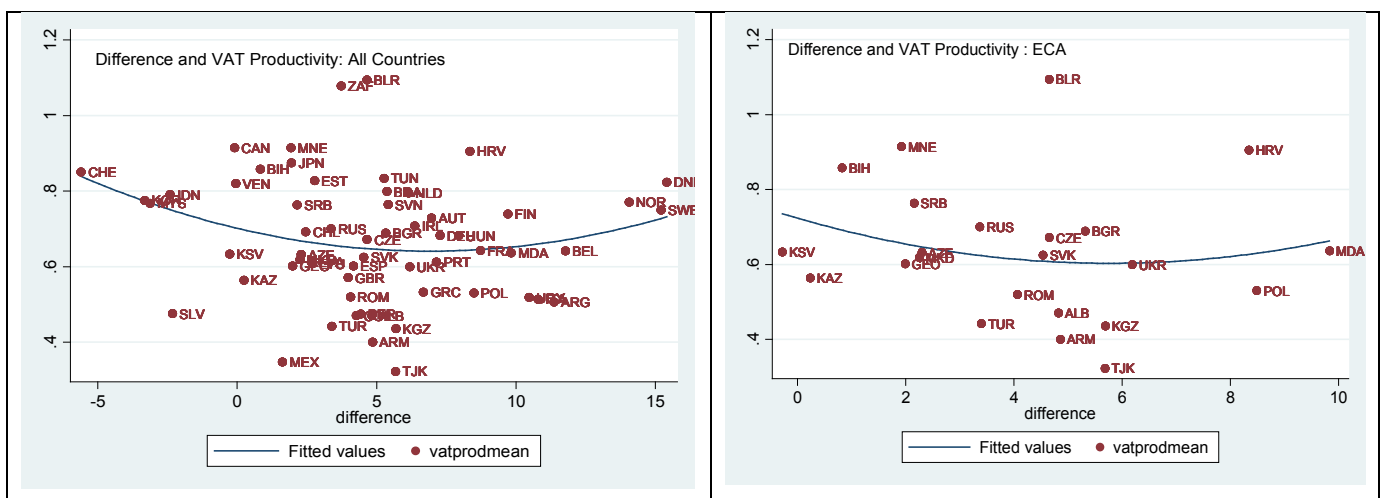
The difference in revenue potentials (legal – economic) gives an indication of how much more the country’s tax regime mandates over and above the country’s intrinsic capacity. The results of the study show that as VAT rates increases, the “difference” increases (*Chart 3*). This result holds even for CIT rates. This indicates that the legally mandated tax rates directly raise revenue potentials.

Chart 3. Difference in Potentials and VAT Rates (Difference = Legal – Economic)



The relationship between the difference in revenue potentials (legal-economic) and VAT productivity is negative (*Chart 4*). The larger is this difference the lower is the VAT productivity. Tax revenue productivity shows what percentage of the tax base is being covered by actual tax collection for every percent of the tax rate. The productivity depends both on: (i) the tax policy choices that a country makes and (ii) the quality and effectiveness of its tax administration. If the tax legislation provides for too many exemptions, special treatments and loophole, this erodes the tax base. Also, a weak tax administration that is not able to unearth tax evasion also leads to reduced productivity. The chart below points out that if a country is taxing its economy well above its intrinsic capacity, this stretches the capacity of the tax administration and also provides greater incentive for cheating and evasion since, in effect, the economy is taxing its people much more than what they can afford, given their economic situation.

Chart 4. Difference in Potentials and VAT Productivity (Difference = Legal – Economic)



d. Legal revenue potentials, tax effort and the shadow economy

The relationship between legal revenue potential and the size of the shadow economy is also negative (*Chart 5*), both for the entire sample of countries and for ECA. *Chart 6* shows a Laffer curve effect for tax effort and the shadow economy both for the entire sample of countries and for ECA.

Chart 5. Tax Potential (Legal) and Shadow

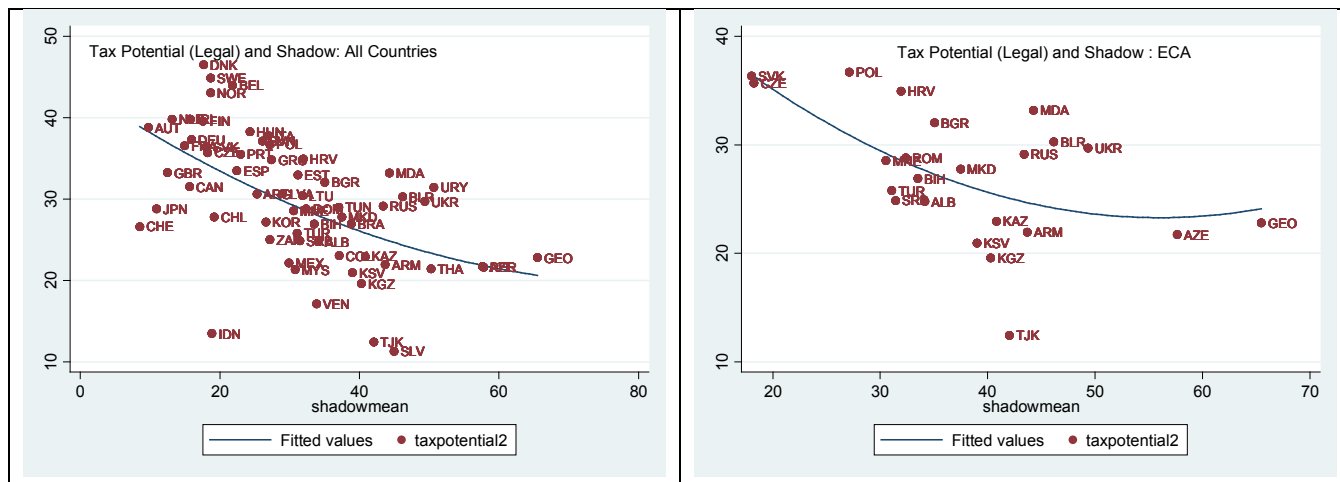
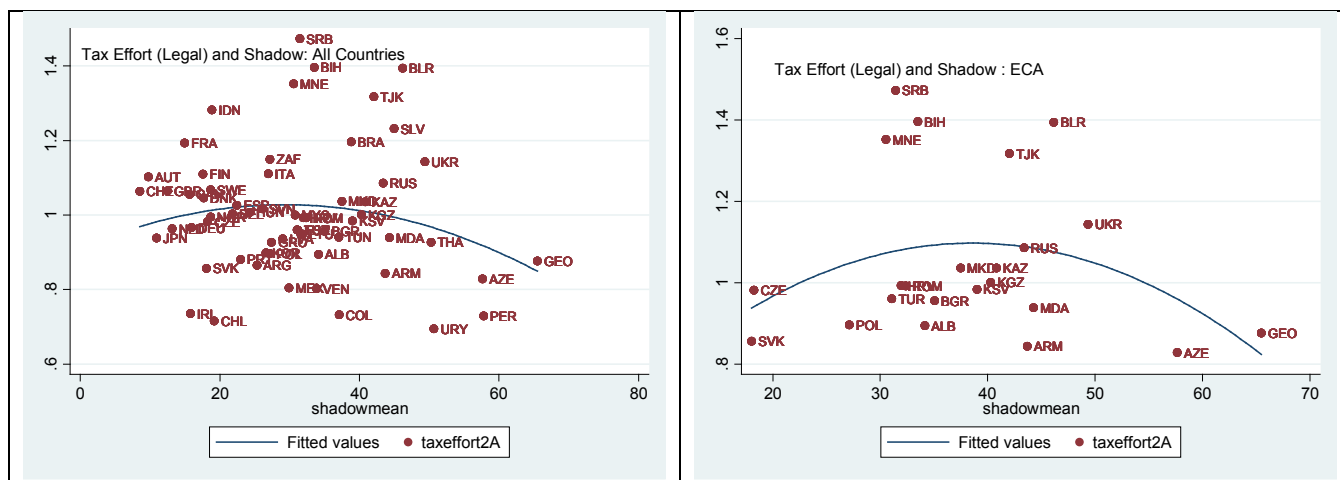


Chart 6. Tax Effort and Shadow



e. Tax effort

This study also makes use of the tax effort index, the ratio between actual tax collection and the tax potential and finds that most countries are performing above their revenue potential (economic). Table 2 below shows the tax effort and the economic and legal revenue potential by region. While 4 out of 23 countries in ECA had tax effort (economic) index lower than one (i.e., they were performing below their intrinsic economic strength), 13 countries had tax effort (legal) index lower than one (i.e., they were performing below what they could have collected based on their legal framework). If we take into account the shadow economy, most of the ECA countries had tax effort (legal) less than one, with a range from 0.70 for Azerbaijan to 1.33 for Serbia.

Table A(2) in Annexure A ranks countries by their tax effort (legal). Serbia, Bosnia Herzegovina, and Montenegro have the highest tax effort (legal) while Colombia, Peru, and Uruguay have the lowest tax effort over the period 2000-2010.

Table 2. Tax Effort Indices: Region-wise

Country	Shadow as % of GDP	Actual Tax/GDP ratio	Tax Revenue/GDP with Shadow	Potential		Tax Effort		Tax Effort (Legal) with Shadow
				<i>Econ</i>	<i>Legal</i>	<i>Econ</i>	<i>Legal</i>	
ECA								
Albania	34.14	22.17	19.92	19.97	24.79	1.11	0.89	0.80
Armenia	43.70	18.52	16.18	17.10	21.96	1.08	0.84	0.74
Azerbaijan	57.66	18.00	15.12	19.43	21.73	0.93	0.83	0.70
Belarus	46.18	42.21	36.63	25.62	30.27	1.65	1.39	1.21
Bosnia&Herz	33.50	37.57	33.83	26.09	26.91	1.44	1.40	1.26
Bulgaria	35.05	30.64	27.46	26.73	32.05	1.15	0.96	0.86
Croatia	31.94	34.67	31.37	26.58	34.93	1.30	0.99	0.90
Czech Rep	18.25	35.07	33.08	31.06	35.72	1.13	0.98	0.93
Georgia	65.49	19.99	16.44	20.82	22.81	0.96	0.88	0.72
Kazakhstan	40.81	23.76	20.94	22.69	22.93	1.05	1.04	0.91
Kosovo	39.00	20.59	18.24	21.20	20.93	0.97	0.98	0.87
Kyrgyz Rep	40.30	19.61	17.31	13.90	19.59	1.41	1.00	0.88
Macedonia	37.48	28.78	25.61	25.53	27.78	1.13	1.04	0.92
Moldova	44.29	31.16	27.19	23.36	33.19	1.33	0.94	0.82
Montenegro	30.54	38.60	35.06	26.63	28.55	1.45	1.35	1.23
Poland	27.14	32.91	30.21	28.23	36.73	1.17	0.90	0.82
Romania	32.38	28.59	25.83	24.74	28.81	1.16	0.99	0.90
Russian Fed	43.40	31.62	27.66	25.75	29.12	1.23	1.09	0.95
Serbia	31.43	36.64	33.20	22.72	24.87	1.61	1.47	1.33
Slovak Rep	18.04	31.13	29.38	31.81	36.35	0.98	0.86	0.81
Tajikistan	42.04	16.40	14.40	6.76	12.44	2.43	1.32	1.16
Turkey	31.09	24.76	22.45	22.39	25.79	1.11	0.96	0.87
Ukraine	49.35	33.97	29.22	23.53	29.72	1.44	1.14	0.98
OECD								
Austria	9.73	42.79	41.46	31.86	38.83	1.34	1.10	1.07
Belgium	21.83	44.12	41.16	32.23	44.00	1.37	1.00	0.94
Canada	15.64	33.29	31.66	31.65	31.55	1.05	1.06	1.00
Denmark	17.66	48.65	45.97	31.13	46.53	1.56	1.05	0.99
Estonia	31.18	31.63	28.68	30.18	32.96	1.05	0.96	0.87
Finland	17.58	43.92	41.51	29.85	39.56	1.47	1.11	1.05
France	14.94	43.63	41.58	27.82	36.55	1.57	1.19	1.14
Germany	15.91	36.08	34.28	30.04	37.31	1.20	0.97	0.92
Greece	27.40	32.26	29.59	28.15	34.83	1.15	0.93	0.85
Hungary	24.29	38.55	35.69	30.32	38.27	1.27	1.01	0.93
Ireland	15.75	29.27	27.82	33.43	39.81	0.88	0.74	0.70
Italy	26.93	41.99	38.57	27.00	37.80	1.56	1.11	1.02
Japan	10.90	27.06	26.12	26.87	28.82	1.01	0.94	0.91
Latvia	29.01	28.72	26.21	28.00	30.69	1.03	0.94	0.85
Lithuania	31.83	28.87	26.13	27.73	30.43	1.04	0.95	0.86
Netherlands	13.16	38.34	36.74	33.66	39.80	1.14	0.96	0.92
Norway	18.66	42.82	40.34	29.00	43.06	1.48	0.99	0.94
Portugal	22.95	31.28	29.08	28.37	35.52	1.10	0.88	0.82

Table 3 groups countries on the basis of tax effort versus the level of actual tax collection (high, medium and low).¹⁵ Countries which have high tax collections and high tax effort include Belarus, Bosnia & Herzegovina and Montenegro and Serbia in the ECA region and high income countries in the OECD region. These countries already are taxing their economies at high levels and the tax authorities are already performing close to or above their potentials. Hence, these countries should aim for improving tax efficiency to enhance tax revenues. Countries with low tax collections and low tax effort include Albania, Armenia, Azerbaijan and Georgia in the ECA region and middle income countries in the LAC region. In these countries, there is considerable room to increase tax revenues both through suitable tax policy measures as well as tax administration reforms. The two low income countries in the sample, Kyrgyz Republic and Tajikistan, have low tax collections and medium to high tax efforts. In both these countries, the shadow economy is estimated to be close to 40% of the GDP and the tax administration is also weak (as seen in Annex A, Table A(6)). Hence, considerable gains in tax revenues can be achieved through policies that encourage the growth of the formal sector and more efficient tax administration.

Table 3: Tax Effort Indices and Tax Collection

		LOW		MEDIUM		HIGH	
TAX COLLECTIONS	LOW	ECA	Others	ECA	Others	ECA	Others
		Albania Armenia Azerbaijan Georgia	Argentina Chile Colombia Korea, Rep Mexico Peru Thailand Uruguay Venezuela	Kazakhstan Kosovo Kyrgyz Rep Turkey	Malaysia	Tajikistan	El Salvador Indonesia
	MEDIUM	ECA	Others	ECA	Others	ECA	Others
		Moldova Poland Slovak Rep	Ireland Portugal	Bulgaria Macedonia Romania Russian Fed	Estonia Greece Japan Latvia Lithuania Tunisia	Ukraine	Brazil Canada Switzerland South Africa
	HIGH	ECA	Others	ECA	Others	ECA	Others
				Croatia Czech Rep	Belgium Germany Hungary Netherlands	Belarus Bosnia&Herz. Montenegro Serbia	Austria Denmark Finland France

¹⁵ This classification is a modified version of the classification made in Tuan Minh Le (2008) et al, “Expanding Taxable Capacity and Reaching Revenue Potential”, World Bank Policy Research Paper.

“**Tax Collection with Shadow**” is the actual tax collections as a percent of an “estimated GDP”. The “estimated” GDP includes the reported GDP plus the additional GDP generated by the shadow economy, ie, GDP (estimated) = GDP+ 0.33*(shadow*GDP). **Tax Effort (with shadow)** = “Tax Collection with Shadow” / Potential Tax Revenue (Legal). A country is classified as having “Low” tax effort (E) if $E < 0.85$; “medium” tax effort if $0.85 \leq E \leq 0.95$; “high” tax effort if $E > 0.95$.

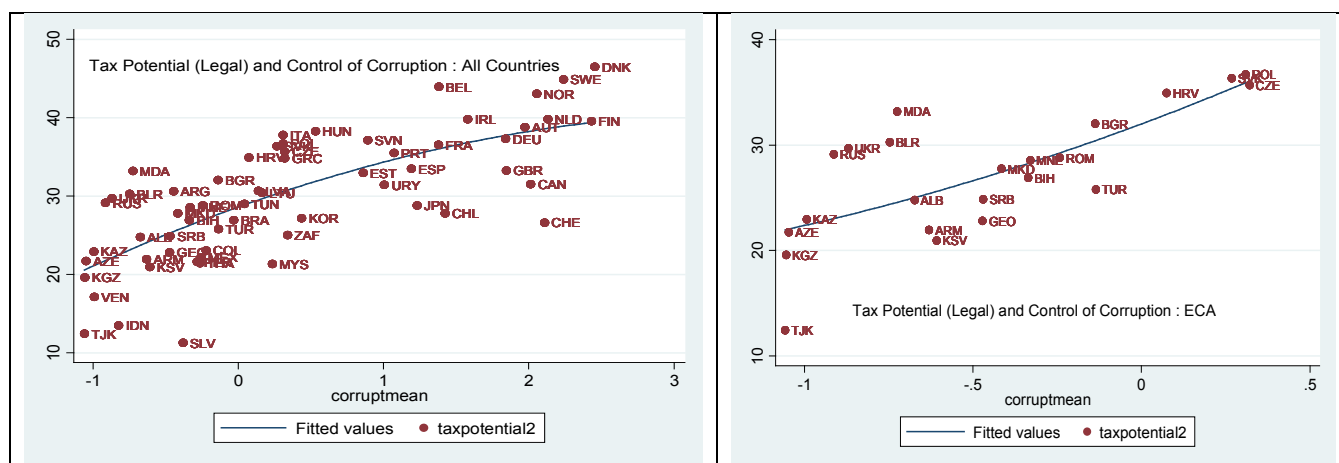
The mean Tax-GDP ratio in sample of 61 countries is 29.87 percent. The standard deviation is 9.08. A country is classified as “medium tax collection” (C) country if it is $\frac{1}{2}$ a standard deviation below or above the mean tax to GDP collection ratio. Accordingly, a country is classified as “low collection” country $C < 25.5$; a “medium tax collection” country if $25.5 \leq C \leq 34.0$; and “high tax collection” country if $C > 34.0$.

	LOW		MEDIUM		HIGH	
				Slovenia Norway		Italy Spain Sweden U K

g. Tax potential, tax effort and the control of corruption

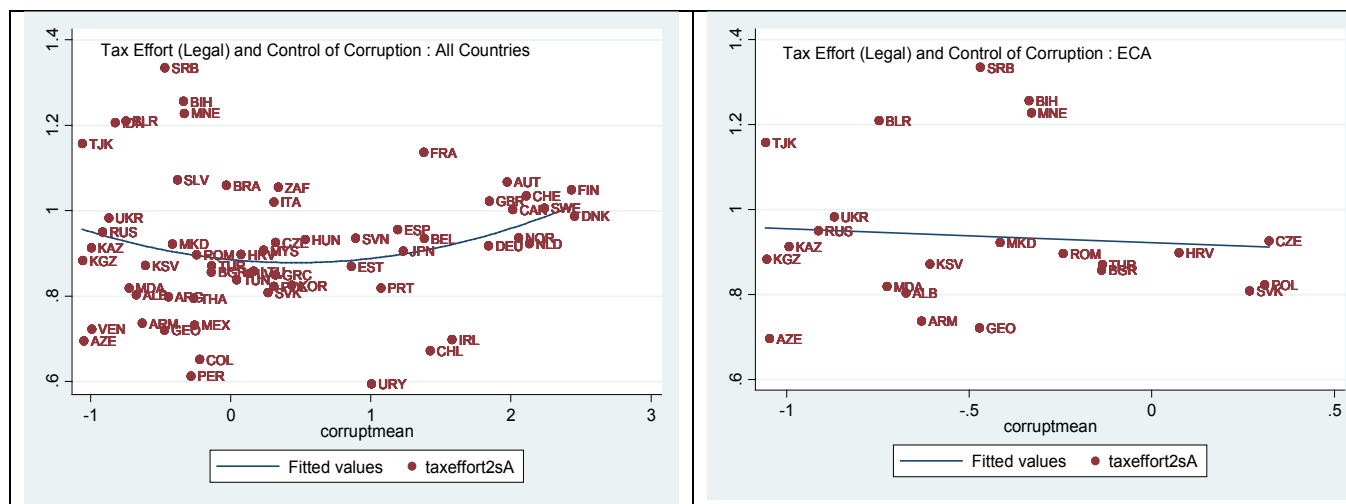
Chart 8 shows that there is a positive relationship between tax potential (legal) and the control of corruption. Greater control over corruption raises the potential for countries to collect larger revenues. This is true both in the entire sample and for ECA countries.

Chart 8. Tax Potential (Legal) with shadow and Control of Corruption



The story is not so clear in so far as it related to the effect of control over corruption on actual collection. *Chart 9* shows that a greater control over corruption encourages greater tax collections generally for the entire sample and more so for the OECD countries, though this relationship is fairly flat for ECA countries. A possible explanation could be that in transition economies, the breakdown of the controlled economy and the weak and inexperienced institutions that replaced it, created incentives to evade tax that were so strong that control of corruption alone, though necessary, was not sufficient to improve collection.

Chart 9. Tax effort (Legal) with shadow, and Control of Corruption



8. Conclusions

The tax collection in any country is influenced by a number of factors. In general, high income countries have higher tax shares as a proportion of GDP, though this is very much a policy choice and some high-income countries choose to levy lower taxes. Economies with a greater share of the shadow economy generally collect lower taxes than their potential. In addition, the nature of tax policies, inefficient tax administrations, weak institutions and poor quality of governance impact tax collections.

This paper adds to the existing literature on the key determinants of revenue potential in using a broad set of data and econometric methods. Earlier studies had not distinguished between the revenue potential based on economic fundamentals of countries and those based on their legal framework. This study examines the issue using this dual approach to revenue potential. Accordingly we get two sets of revenue potentials 'revenue potential economic' and 'revenue potential legal'. The study also distinguishes between 'tax gap' and 'tax space'. The difference between the revenue potential (legal) and the actual revenue collected is commonly understood as the 'tax gap'. The difference between the revenue potential (economic) and the actual revenue collected we term the 'tax space'. The tax space is the amount of revenue that a country can afford to collect, given its economic strength, not based on the country's legislation.

The results show that revenue potentials (legal) are typically higher than the revenue potential (economic) in almost all countries indicating that in these countries legally mandated tax regimes were significantly higher than what the country's economic fundamentals could afford. The study also shows that tax space was generally lower than the tax gap. A positive tax space indicates that the country is not fully utilizing its revenue potential up to its economic capacity. This study finds that most countries were fully utilizing their revenue potential up to their economic capacity. A large negative tax space (as in Belarus, Bosnia Herzegovina, Montenegro, Serbia and Ukraine) shows that the country is actually collecting way above its economic capacity. Among OECD members, the Nordic countries as well as Denmark, France and Italy show very high negative tax space.

The tax gap in countries is seen to be significantly higher the shadow economy is taken into account. For instance, the tax gap as a percentage of GDP in Azerbaijan increased from 3.73 percent to 6.60 percent, and in Ukraine's from -4.25 percent to 0.50 percent. In Georgia too, the presence of a large shadow economy (65 percent of GDP) greatly amplified the tax gap from 2.81 percent to 6.37 percent of GDP.

The results of the study also show that the larger the difference in legal and economic revenue potentials, the smaller is the VAT productivity. This indicates that if a country is taxing its economy well above its intrinsic economic strength, this stretches the capacity of the tax administration and also provides greater incentive for cheating and evasion since the country is taxing its people more than what they can afford, given their economic situation. The chart is downward sloping for all countries in the sample. Similar effects are seen when we compare the tax efforts of countries to tax productivity and the shadow economy.

Further research should look at how the tax effort is affected by the structure and content of public expenditure, the assumption being that the perception of the fairness of government spending can affect compliance behavior. Likewise work needs to be done on how tax effort is affected by the tax structure (the composition of different taxes in the revenue basket) in a given country.

References

- Bird, Richard M., Jorge Martinez-Vazquez, and Benno Torgler. 2004. "Societal Institutions and Tax Efforts in Developing Countries". Working Paper 04-06, Andrew Young School of Policy Studies, Georgia State University, Atlanta.
- Clark, Tom S and Drew A Linzer. 2013. "Should I use Fixed or Random Effects?"
- Clarke, Paul, Claire Crawford, Fiona Steele and Anna Vignoles. 2010. "The Choice Between Fixed and Random Effects Models: Some Considerations for Educational Research". IZA Discussion Paper Series No. 5287.
- Clogg, Clifford C, Eva Petkova and Adamantios Haritou. 1995. "Statistical Methods for Comparing Regression Coefficients Between Models", *The American Journal of Sociology*, Vol. 100, No. 5 (Mar., 1995), pp. 1261-1293, The University of Chicago Press
- Davoodi, Hamid and David Grigorian. 2007. "Tax Potential vs Tax Effort: A Cross-Country Analysis of Armenia's Stubbornly Low Tax Collection". WP/07/106, International Monetary Fund, Washington, DC.
- Gupta, Abhijit. 2007. "Determinants of Tax Revenue Efforts in Developing Countries", WP/07/184, International Monetary Fund, Washington DC.
- Le, Tuan Minh, Blanca Moreno-Dodson and Jeep Rojchaichaninthon. 2008. "Expanding Taxable Capacity and Reaching Revenue Potential: Cross Country Analysis", Policy Research Working paper 4559, The World Bank, Washington DC.
- Le, Tuan Minh, Blanca Moreno-Dodson and Nihal Bayraktar. 2012. "Tax Capacity and Tax Effort: Extended Cross Country Analysis from 1994 to 2009".
- Piancastelli, Marcelo. 2001. "Measuring the Tax Effort of Developed and Developing Countries: Cross Country Panel Data Analysis, 1985/95." IPEA Working Paper No. 818.
- Martinez-Vazquez J, and R M McNab. 2000. "The Tax Reform Experiment in Transition Countries". Working Paper 00-1, Andrew Young School of Policy Studies, Georgia State University, Atlanta.
- Schneider, Friedrich, Andreas Buehn and Claudio E Montenegro. 2010. "Shadow Economies all over the World: New Estimates for 162 Countries from 1999 to 2007". Policy Research Working Paper 5356, World Bank, Washington DC.
- Tanzi, Vito, and Hamid Davoodi. 1997. "Corruption, Public Investment, and Growth." Working Paper/97/139, International Monetary Fund, Washington, DC.
- Teera, Joweria and John Hudson. 2004. "Tax Performance: A Comparative Study". *Journal of International Development*. 16: 785-802
- Torgler, B. 2011. "Tax Morale, Eastern Europe and European Enlargement". Policy Research Working Paper 5911, World Bank, Washington DC.
- Torgler, B. and F. Schneider. 2007. "Shadow Economy, Tax Morale, Governance and Institutional Quality: A Panel Analysis." IZA Discussion Papers 2563, Institute for the Study of Labor (IZA).
- Trabant, M. and H. Uhlig (2012) How do Laffer Curves Differ across Countries? International Finance Discussion Papers, Board of Governors of the Federal Reserve System
- World Bank. 2007. "Fiscal Policy and Economic Growth: Lessons for Eastern Europe and Central Asia", ed by Cheryl Gray, Tracey Lane and Aristomene Varoudakis. The World Bank, Washington DC.

ANNEX A

Table A(1)
Revenue Potentials, Difference in Potentials, Tax Gap and Tax Space

Country	Shadow as % of GDP	Actual Tax / GDP Ratio	Tax Revenue /GDP with Shadow	Potential		Difference (Legal- Econ)	Tax Space (% of GDP)	Tax Gap (% of GDP)	Tax Gap with Shadow (% of GDP)
				Econ	Legal				
ECA									
Albania	34.14	22.17	19.92	19.97	24.79	4.82	-2.20	2.62	4.87
Armenia	43.70	18.52	16.18	17.10	21.96	4.86	-1.42	3.44	5.77
Azerbaijan	57.66	18.00	15.12	19.43	21.73	2.30	1.43	3.73	6.60
Belarus	46.18	42.21	36.63	25.62	30.27	4.65	-16.59	-11.94	-6.36
Bosnia&Herz	33.50	37.57	33.83	26.09	26.91	0.83	-11.48	-10.65	-6.91
Bulgaria	35.05	30.64	27.46	26.73	32.05	5.32	-3.91	1.41	4.58
Croatia	31.94	34.67	31.37	26.58	34.93	8.35	-8.09	0.26	3.56
Czech Rep	18.25	35.07	33.08	31.06	35.72	4.66	-4.01	0.65	2.64
Georgia	65.49	19.99	16.44	20.82	22.81	1.99	0.82	2.81	6.37
Kazakhstan	40.81	23.76	20.94	22.69	22.93	0.24	-1.06	-0.82	2.00
Kosovo	39.00	20.59	18.24	21.20	20.93	-0.28	0.62	0.34	2.69
Kyrgyz Rep	40.30	19.61	17.31	13.90	19.59	5.69	-5.71	-0.02	2.28
Macedonia	37.48	28.78	25.61	25.53	27.78	2.25	-3.26	-1.01	2.16
Moldova	44.29	31.16	27.19	23.36	33.19	9.83	-7.80	2.03	6.00
Montenegro	30.54	38.60	35.06	26.63	28.55	1.92	-11.97	-10.05	-6.51
Poland	27.14	32.91	30.21	28.23	36.73	8.49	-4.68	3.81	6.52
Romania	32.38	28.59	25.83	24.74	28.81	4.07	-3.85	0.22	2.98
Russian Fed	43.40	31.62	27.66	25.75	29.12	3.37	-5.87	-2.50	1.46
Serbia	31.43	36.64	33.20	22.72	24.87	2.15	-13.93	-11.77	-8.33
Slovak Rep	18.04	31.13	29.38	31.81	36.35	4.54	0.68	5.22	6.97
Tajikistan	42.04	16.40	14.40	6.76	12.44	5.68	-9.64	-3.96	-1.96
Turkey	31.09	24.76	22.45	22.39	25.79	3.40	-2.37	1.03	3.33
Ukraine	49.35	33.97	29.22	23.53	29.72	6.19	-10.44	-4.25	0.50
OECD									
Austria	9.73	42.79	41.46	31.86	38.83	6.98	-10.94	-3.96	-2.63
Belgium	21.83	44.12	41.16	32.23	44.00	11.77	-11.90	-0.12	2.84
Canada	15.64	33.29	31.66	31.65	31.55	-0.10	-1.65	-1.74	-0.11
Denmark	17.66	48.65	45.97	31.13	46.53	15.40	-17.52	-2.11	0.56
Estonia	31.18	31.63	28.68	30.18	32.96	2.78	-1.45	1.33	4.28
Finland	17.58	43.92	41.51	29.85	39.56	9.71	-14.07	-4.36	-1.95
France	14.94	43.63	41.58	27.82	36.55	8.73	-15.80	-7.08	-5.03
Germany	15.91	36.08	34.28	30.04	37.31	7.27	-6.04	1.23	3.03
Greece	27.40	32.26	29.59	28.15	34.83	6.68	-4.12	2.56	5.24
Hungary	24.29	38.55	35.69	30.32	38.27	7.96	-8.23	-0.28	2.58
Ireland	15.75	29.27	27.82	33.43	39.81	6.38	4.16	10.54	11.99
Italy	26.93	41.99	38.57	27.00	37.80	10.80	-14.99	-4.19	-0.77
Japan	10.90	27.06	26.12	26.87	28.82	1.95	-0.18	1.76	2.70
Latvia	29.01	28.72	26.21	28.00	30.69	2.69	-0.72	1.97	4.48
Lithuania	31.83	28.87	26.13	27.73	30.43	2.70	-1.14	1.55	4.30
Netherlands	13.16	38.34	36.74	33.66	39.80	6.15	-4.68	1.47	3.06
Norway	18.66	42.82	40.34	29.00	43.06	14.06	-13.82	0.24	2.72
Portugal	22.95	31.28	29.08	28.37	35.52	7.15	-2.92	4.23	6.43
Slovenia	26.10	37.73	34.74	31.70	37.12	5.41	-6.02	-0.61	2.38
Korea, Rep.	26.60	24.43	22.46	30.51	27.19	-3.32	6.08	2.76	4.73

Country	Shadow as % of GDP	Actual Tax / GDP Ratio	Tax Revenue /GDP with Shadow	Potential		Difference (Legal-Econ)	Tax Space (% of GDP)	Tax Gap (% of GDP)	Tax Gap with Shadow (% of GDP)
				Econ	Legal				
Spain	22.43	34.37	32.00	29.32	33.49	4.17	-5.05	-0.89	1.48
Sweden	18.65	47.92	45.15	29.67	44.88	15.20	-18.25	-3.05	-0.27
Switzerland	8.51	28.32	27.55	32.22	26.62	-5.60	3.90	-1.70	-0.93
UK	12.46	35.38	33.98	29.26	33.24	3.98	-6.12	-2.14	-0.74
LAC									
Argentina	25.31	26.48	24.44	19.23	30.60	11.37	-7.25	4.12	6.16
Brazil	38.83	32.24	28.58	21.58	26.95	5.37	-10.66	-5.29	-1.63
Chile	19.20	19.87	18.69	25.32	27.78	2.46	5.44	7.91	9.09
Colombia	37.08	16.89	15.05	18.79	23.07	4.28	1.90	6.18	8.02
El Salvador	44.94	13.89	12.10	13.60	11.28	-2.32	-0.29	-2.61	-0.82
Mexico	29.91	17.83	16.23	20.53	22.16	1.63	2.70	4.33	5.93
Peru	57.79	15.76	13.24	17.17	21.61	4.44	1.41	5.85	8.37
Uruguay	50.66	21.82	18.70	20.96	31.43	10.48	-0.87	9.61	12.74
Venezuela	33.85	13.73	12.35	17.16	17.10	-0.05	3.43	3.37	4.75
Others									
Indonesia	18.85	17.27	16.26	15.88	13.47	-2.41	-1.39	-3.80	-2.79
Malaysia	30.76	21.31	19.34	24.44	21.31	-3.12	3.13	0.01	1.97
Thailand	50.25	19.86	17.03	25.04	21.42	-3.62	5.18	1.56	4.39
Tunisia	37.04	27.27	24.30	23.73	28.99	5.26	-3.54	1.72	4.69
South Africa	27.18	28.76	26.39	21.28	25.01	3.73	-7.48	-3.75	-1.38

Table A(2)
Tax Effort Indices: Ranking by Tax Effort (Legal) with Shadow

Country	Shadow as % of GDP	Actual Tax/GDP ratio	Tax Revenue/ GDP with Shadow	Potential		Tax Effort		Tax Effort (Legal) with Shadow
				Econ	Legal	Econ	Legal	
Serbia	31.43	36.64	33.20	22.72	24.87	1.61	1.47	1.33
Bosnia&Herz	33.50	37.57	33.83	26.09	26.91	1.44	1.40	1.26
Montenegro	30.54	38.60	35.06	26.63	28.55	1.45	1.35	1.23
Belarus	46.18	42.21	36.63	25.62	30.27	1.65	1.39	1.21
Indonesia	18.85	17.27	16.26	15.88	13.47	1.09	1.28	1.21
Tajikistan	42.04	16.40	14.40	6.76	12.44	2.43	1.32	1.16
France	14.94	43.63	41.58	27.82	36.55	1.57	1.19	1.14
El Salvador	44.94	13.89	12.10	13.60	11.28	1.02	1.23	1.07
Austria	9.73	42.79	41.46	31.86	38.83	1.34	1.10	1.07
Brazil	38.83	32.24	28.58	21.58	26.95	1.49	1.20	1.06
South Africa	27.18	28.76	26.39	21.28	25.01	1.35	1.15	1.06
Finland	17.58	43.92	41.51	29.85	39.56	1.47	1.11	1.05
Switzerland	8.51	28.32	27.55	32.22	26.62	0.88	1.06	1.03
UK	12.46	35.38	33.98	29.26	33.24	1.21	1.06	1.02
Italy	26.93	41.99	38.57	27.00	37.80	1.56	1.11	1.02
Sweden	18.65	47.92	45.15	29.67	44.88	1.62	1.07	1.01
Canada	15.64	33.29	31.66	31.65	31.55	1.05	1.06	1.00
Denmark	17.66	48.65	45.97	31.13	46.53	1.56	1.05	0.99

Country	Shadow	Actual	Tax	Potential		Tax Effort		Tax
Ukraine	49.35	33.97	29.22	23.53	29.72	1.44	1.14	0.98
Spain	22.43	34.37	32.00	29.32	33.49	1.17	1.03	0.96
Russian Fed	43.40	31.62	27.66	25.75	29.12	1.23	1.09	0.95
Norway	18.66	42.82	40.34	29.00	43.06	1.48	0.99	0.94
Slovenia	26.10	37.73	34.74	31.70	37.12	1.19	1.02	0.94
Belgium	21.83	44.12	41.16	32.23	44.00	1.37	1.00	0.94
Hungary	24.29	38.55	35.69	30.32	38.27	1.27	1.01	0.93
Czech Rep	18.25	35.07	33.08	31.06	35.72	1.13	0.98	0.93
Netherlands	13.16	38.34	36.74	33.66	39.80	1.14	0.96	0.92
Macedonia	37.48	28.78	25.61	25.53	27.78	1.13	1.04	0.92
Germany	15.91	36.08	34.28	30.04	37.31	1.20	0.97	0.92
Kazakhstan	40.81	23.76	20.94	22.69	22.93	1.05	1.04	0.91
Malaysia	30.76	21.31	19.34	24.44	21.31	0.87	1.00	0.91
Japan	10.90	27.06	26.12	26.87	28.82	1.01	0.94	0.91
Croatia	31.94	34.67	31.37	26.58	34.93	1.30	0.99	0.90
Romania	32.38	28.59	25.83	24.74	28.81	1.16	0.99	0.90
Kyrgyz Rep	40.30	19.61	17.31	13.90	19.59	1.41	1.00	0.88
Kosovo	39.00	20.59	18.24	21.20	20.93	0.97	0.98	0.87
Turkey	31.09	24.76	22.45	22.39	25.79	1.11	0.96	0.87
Estonia	31.18	31.63	28.68	30.18	32.96	1.05	0.96	0.87
Lithuania	31.83	28.87	26.13	27.73	30.43	1.04	0.95	0.86
Bulgaria	35.05	30.64	27.46	26.73	32.05	1.15	0.96	0.86
Latvia	29.01	28.72	26.21	28.00	30.69	1.03	0.94	0.85
Greece	27.40	32.26	29.59	28.15	34.83	1.15	0.93	0.85
Tunisia	37.04	27.27	24.30	23.73	28.99	1.15	0.94	0.84
Korea, Rep.	26.60	24.43	22.46	30.51	27.19	0.80	0.90	0.83
Poland	27.14	32.91	30.21	28.23	36.73	1.17	0.90	0.82
Moldova	44.29	31.16	27.19	23.36	33.19	1.33	0.94	0.82
Portugal	22.95	31.28	29.08	28.37	35.52	1.10	0.88	0.82
Slovak Rep	18.04	31.13	29.38	31.81	36.35	0.98	0.86	0.81
Albania	34.14	22.17	19.92	19.97	24.79	1.11	0.89	0.80
Argentina	25.31	26.48	24.44	19.23	30.60	1.38	0.87	0.80
Thailand	50.25	19.86	17.03	25.04	21.42	0.79	0.93	0.80
Armenia	43.70	18.52	16.18	17.10	21.96	1.08	0.84	0.74
Mexico	29.91	17.83	16.23	20.53	22.16	0.87	0.80	0.73
Venezuela	33.85	13.73	12.35	17.16	17.10	0.80	0.80	0.72
Georgia	65.49	19.99	16.44	20.82	22.81	0.96	0.88	0.72
Ireland	15.75	29.27	27.82	33.43	39.81	0.88	0.74	0.70
Azerbaijan	57.66	18.00	15.12	19.43	21.73	0.93	0.83	0.70
Chile	19.20	19.87	18.69	25.32	27.78	0.78	0.72	0.67
Colombia	37.08	16.89	15.05	18.79	23.07	0.90	0.73	0.65
Peru	57.79	15.76	13.24	17.17	21.61	0.92	0.73	0.61
Uruguay	50.66	21.82	18.70	20.96	31.43	1.04	0.69	0.59

Table A(3)
PCSE: 2000-2007

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	taxgdpin	taxgdpin	taxgdpin	taxgdpin	taxgdpin	taxgdpin	taxgdpin	taxgdpin	taxgdpin	taxgdpin	taxgdpin	taxgdpin
lgdppc	7.30*** (14.85)	6.96*** (9.44)	6.07*** (10.94)	5.91*** (10.63)	6.32*** (9.80)	4.71*** (8.09)	2.44*** (3.04)	5.73*** (7.08)	3.95*** (4.69)	2.39*** (2.80)	2.91*** (3.04)	2.61*** (3.08)
agr		-0.06 (-0.73)										
ser			0.17*** (4.27)	0.19*** (4.91)	0.20*** (5.26)	0.21*** (5.71)	0.20*** (5.26)	0.24*** (5.99)	0.22*** (5.51)	0.21*** (5.49)	0.19*** (4.82)	0.13*** (3.97)
trade				0.03*** (3.64)	0.03*** (3.21)	0.03*** (3.60)	0.03*** (4.20)	0.04*** (4.77)	0.04*** (4.06)	0.03*** (4.13)	0.03*** (3.59)	0.03*** (4.95)
urban					-0.06 (-1.63)							
age						-0.28*** (-5.10)	-0.36*** (-6.98)	-0.27*** (-5.11)	-0.31*** (-5.78)	-0.36*** (-7.13)	-0.33*** (-5.84)	-0.41*** (-8.69)
control-corrupt							2.18*** (3.81)			2.24*** (3.87)	2.13*** (3.69)	1.00*** (2.15)
reg qly								-1.17 (-1.48)				
gov eff									0.82 (1.23)			
pit										-0.02 (-0.39)		
cit											-0.26 (-1.37)	-0.54*** (-2.93)
cit square											0.00 (1.20)	0.02*** (4.58)
vat												-0.49 (-1.59)
vat square												0.05*** (4.66)
_cons	-38.60*** (-8.14)	-35.01*** (-4.67)	-37.35*** (-8.73)	-39.81*** (-9.09)	-40.11*** (-9.00)	-15.23** (-2.28)	9.14 (1.05)	-27.67*** (-3.30)	-7.96 (-0.92)	9.59 (1.10)	7.77 (0.87)	9.97 (1.25)
N	459	459	459	459	456	459	405	403	402	402	405	405

t statistics in parentheses

* p<.10, ** p<.05, *** p<.01

Table A(4)
PCSE: 2008-2010

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	taxgdpin	taxgdpin	taxgdpin	taxgdpin	taxgdpin	taxgdpin	taxgdpin	taxgdpin	taxgdpin	taxgdpin	taxgdpin	taxgdpin
lgdppc	6.60*** (8.88)	6.72*** (5.00)	4.84*** (6.51)	4.49*** (6.45)	4.36*** (4.74)	4.34*** (6.14)	3.64*** (3.22)	6.29*** (5.40)	5.64*** (4.21)	3.77*** (2.96)	3.27** (2.33)	2.68** (2.35)
agr		0.02 (0.12)										
ser			0.27*** (4.61)	0.28*** (5.11)	0.30*** (5.43)	0.29*** (5.30)	0.28*** (5.11)	0.36*** (6.55)	0.32*** (5.99)	0.29*** (5.25)	0.27*** (4.41)	0.21*** (3.89)
trade				0.05*** (4.41)	0.05*** (4.14)	0.05*** (4.10)	0.04*** (3.92)	0.05*** (4.72)	0.05*** (4.30)	0.04*** (3.90)	0.05*** (3.93)	0.05*** (4.46)
urban					-0.01 (-0.19)							
age						-0.13 (-1.57)	-0.15* (-1.77)	-0.12 (-1.50)	-0.09 (-1.06)	-0.14 (-1.62)	-0.19** (-1.97)	-0.28*** (-3.79)
control-corrupt							0.71 (0.72)			0.69 (0.71)	0.78 (0.81)	-0.01 (-0.02)
reg qly								-2.97** (-2.16)				
gov eff									-1.69 (-1.26)			
pit										-0.03 (-0.49)		
cit											-0.27 (-1.05)	-0.57** (-2.47)
cit square											0.01 (1.56)	0.02*** (4.45)
vat												-0.72* (-1.74)
vat square												0.05*** (3.93)
_cons	-32.72*** (-4.53)	-33.95** (-2.45)	-32.74*** (-5.46)	-34.89*** (-6.11)	-33.78*** (-5.28)	-27.17*** (-3.42)	-18.70 (-1.46)	-49.56*** (-4.39)	-43.07*** (-3.22)	-20.48 (-1.55)	-12.12 (-0.95)	-2.64 (-0.24)
N	183	183	183	183	180	183	183	183	180	180	183	183

t statistics in parentheses

* p<.10, ** p<.05, *** p<.01

Table A(5)
Summary statistics (Average 2000 – 2010)

	Country	Actual Tax/ GDP Ratio	GDP per capita PPP	Ind as % of GDP	Ser as % of GDP	Trade as % of GDP	% Urban	Age Depen dency	Control of Corrupt ion	Reg Quality	CIT Rate	VAT Rate
1	Albania	22	6184	20	57	72	47	53	-0.67	-0.09	16	20
2	Argentina	26	11256	32	59	38	91	58	-0.44	-0.61	35	21
3	Armenia	19	3987	41	37	68	64	51	-0.63	0.17	20	20
4	Austria	43	33808	30	69	100	67	48	1.97	1.59	29	20
5	Azerbaijan	18	5315	59	31	94	52	47	-1.05	-0.55	22	18
6	Belarus	42	8806	41	49	129	72	43	-0.75	-1.4	24	19
7	Belgium	44	31996	24	75	153	97	52	1.38	1.31	36	21
8	Bosnia&Herz	38	6388	25	65	105	45	43	-0.34	-0.33	15	17
9	Brazil	32	8705	28	66	25	83	51	-0.03	0.15	34	17
10	Bulgaria	31	9718	29	62	116	70	46	-0.14	0.58	12	20
11	Canada	33	34460	32	66	72	80	45	2.01	1.6	37	6
12	Chile	20	12712	39	56	70	88	49	1.42	1.46	17	18
13	Colombia	17	7445	33	59	36	74	56	-0.22	0.12	34	16
14	Croatia	35	15042	28	66	88	56	48	0.07	0.42	21	22
15	Czech Rep	35	21050	38	59	125	74	41	0.32	1.11	26	19
16	Denmark	49	32715	25	73	93	86	51	2.46	1.8	28	25
17	El Salvador	14	5680	30	59	70	62	72	-0.38	0.12	25	13
18	Estonia	32	15688	29	68	151	69	48	0.86	1.38	22	18
19	Finland	44	30357	32	65	78	83	50	2.43	1.76	27	22
20	France	44	29262	21	77	54	81	54	1.38	1.21	34	20
21	Georgia	20	3612	24	61	79	53	49	-0.47	-0.12	16	18
22	Germany	36	31755	29	70	77	73	49	1.84	1.55	37	17
23	Greece	32	23794	19	76	58	60	48	0.32	0.86	31	19
24	Hungary	39	16228	30	65	147	67	46	0.53	1.14	17	22
25	Indonesia	17	3164	46	39	58	46	51	-0.82	-0.45	30	10
26	Ireland	29	37263	36	62	163	60	48	1.58	1.73	15	21
27	Italy	42	28066	27	71	53	68	51	0.31	0.93	37	20
28	Japan	27	30103	28	70	26	85	51	1.23	1.02	40	5
29	Kazakhstan	24	8531	40	53	91	55	48	-0.99	-0.43	28	15
30	Korea, Rep.	24	22789	37	59	81	81	39	0.44	0.77	28	10
31	Kosovo	21	5962	20	68	69	.	52	-0.61	0.04	13	16
32	Kyrgyz Rep	20	1772	25	44	109	35	59	-1.05	-0.39	10	20
33	Latvia	29	12341	22	74	100	68	47	0.14	0.95	18	19
34	Lithuania	29	13703	31	65	117	67	47	0.17	1.01	17	19
35	Macedonia	29	8048	30	58	107	59	45	-0.42	0.01	13	18
36	Malaysia	21	11564	47	44	198	67	57	0.24	0.5	27	11
37	Mexico	18	12161	33	64	57	76	59	-0.26	0.35	31	15
38	Moldova	31	2284	18	63	131	45	44	-0.72	-0.31	0	20
39	Montenegro	39	9891	20	70	116	63	47	-0.33	-0.18	9	17
40	Netherlands	38	35507	24	73	133	80	48	2.13	1.79	31	19
41	Norway	43	46680	41	58	72	78	52	2.06	1.35	28	24
42	Peru	16	6689	34	59	42	75	60	-0.28	0.25	30	18
43	Poland	33	14215	31	65	74	61	42	0.31	0.79	22	22
44	Portugal	31	21504	25	72	67	58	49	1.07	1.11	29	20
45	Romania	29	9358	33	56	73	53	44	-0.24	0.3	20	19
46	Russian Fed	32	11813	36	59	56	73	41	-0.91	-0.33	27	18
47	Serbia	37	8318	29	58	74	54	49	-0.47	-0.41	12	18

	Country	Actual Tax/ GDP Ratio	GDP per capita PPP	Ind as % of GDP	Ser as % of GDP	Trade as % of GDP	% Urban	Age Depen dency	Control of Corrupt ion	Reg Quality	CIT Rate	VAT Rate
48	Slovak Rep	31	16567	36	60	158	56	41	0.27	1.01	22	20
49	Slovenia	38	23372	34	63	122	50	43	0.89	0.81	24	20
50	South Africa	29	8623	32	65	59	59	56	0.34	0.57	37	14
51	Spain	34	26975	29	68	57	77	46	1.19	1.26	33	16
52	Sweden	48	32103	28	71	89	84	54	2.24	1.62	28	25
53	Switzerland	28	36104	27	71	91	73	47	2.11	1.64	23	8
54	Tajikistan	16	1421	31	44	112	26	77	-1.06	-1.12	25	20
55	Thailand	20	6589	44	46	134	32	43	-0.26	0.27	30	7
56	Tunisia	27	7270	30	60	93	65	49	0.04	-0.01	32	18
57	Turkey	25	11077	28	61	49	67	52	-0.14	0.24	27	18
58	Ukraine	34	5360	34	55	105	68	44	-0.87	-0.52	27	20
59	UK	35	31989	24	75	57	79	52	1.85	1.73	29	18
60	Uruguay	22	10096	26	65	53	92	59	1.01	0.36	29	22
61	Venezuela	14	10115	53	43	50	92	57	-0.99	-1.12	32	12
	AVERAGE	30	16454	31	61	88	67	50	0.36	0.54	26	18

Table A(6)
Tax effort (with shadow) and tax productivity

The following table groups ECA countries according to their tax effort and tax productivity which is taken as a proxy for tax administration.

“Tax Collection with Shadow” is the actual tax collections as a percent of an “estimated GDP”. The “estimated” GDP includes the reported GDP plus the additional GDP generated by the shadow economy, ie, $GDP (estimated) = GDP + 0.33 * (shadow * GDP)$

Tax Effort (with shadow) = “Tax Collection with Shadow” / Potential Tax Revenue (Legal). A country is classified as having “Low” tax effort (E) if $E < 0.80$; “medium” tax effort if $0.80 \leq E \leq 0.95$; “high” tax effort if $E > 0.95$.

Tax productivity is classified as being “low” if VAT productivity (P) is < 0.65 ; “medium” if VAT productivity is $0.65 \leq P \leq 0.85$; and “high” if VAT productivity is > 0.85

		LOW	MEDIUM	HIGH
TAX PRODUCTIVITY	WEAK	Albania Armenia Azerbaijan Georgia Moldova Poland Slovak Republic	Kazakhstan Kosovo Kyrgyz Republic Macedonia Romania Turkey	Tajikistan Ukraine
	AVERAGE		Bulgaria Czech Republic Russian Fed	Serbia
	STRONG		Croatia	Belarus Bosnia & Herz. Montenegro

ANNEX B

METHODOLOGY TO CALCULATE THE TAX RATIOS WITH THE SHADOW ECONOMY

Let

A = Actual tax collections (in 2005 US\$)

E = Potential tax collections (“economic”) (in 2005 US\$)

L = Potential tax collections (“legal”) (in 2005 US\$)

S = Shadow economy (in 2005 US\$)

G₁ = Reported GDP (in 2005 US\$)

G₂ = GDP with shadow (in 2005 US\$)

and,

a = (A/GDP₁) = Actual tax collections as % of reported GDP

e = (E/GDP₁) = Potential tax collections (“economic”) as % of reported GDP

l = (L/GDP₁) = Potential tax collections (“legal”) as % of reported GDP

s = (S/GDP₁) = Shadow as % of reported GDP

I Calculating “effective” tax ratio with the shadow

$$\text{“Effective” tax ratio with shadow} = \frac{A}{G_2} = \frac{A}{G_1 + (0.33)sG_1} = \frac{A}{G_1(1+0.33s)} = \frac{a}{(1+0.33s)}$$

II Calculating the “tax effort” with and without the shadow

$$\text{Tax effort (legal)} = \text{Actual tax ratio} / \text{Potential tax ratio (legal)} = \frac{a}{l}$$

$$\begin{aligned} \text{Tax effort (legal) with shadow} &= \text{“Effective” tax ratio} / \text{Potential tax ratio (legal)} = \frac{a/(1+0.33s)}{l} \\ &= \frac{a}{l(1+0.33s)} \end{aligned}$$

Similarly,

Tax effort (economic) without and with the shadow are $(\frac{a}{e})$ and $(\frac{a}{e(1+0.33s)})$ respectively.

III Calculating the “tax gap” and “tax space”

(a) Without shadow

$$\text{Tax gap} = \text{Tax revenue potential (legal)} - \text{Actual tax collections} = lG_1 - aG_1 = (l - a)G_1$$

$$\text{Tax gap as \% of reported GDP} = (l - a)$$

$$\text{Tax space} = \text{Tax revenue potential (economic)} - \text{Actual tax collections} = eG_1 - aG_1 = (e - a)G_1$$

$$\text{Tax space as \% of reported GDP} = (e - a)$$

(b) With shadow

$$\begin{aligned} \text{Tax gap as \% of GDP} &= \text{Tax potential (legal)} - \text{“Effective” tax ratio} \\ &= l - \frac{a}{(1+0.33s)} \end{aligned}$$

or,

$$\text{Tax gap as \% of GDP} = \frac{l+0.33ls-a}{(1+0.33s)}$$

Similarly,

$$\text{Tax space as \% of GDP is } = \frac{e+0.33es-a}{(1+0.33s)}$$

ANNEX C

TAX POTENTIALS USING “INDUSTRY” AND “SERVICES” AS ALTERNATE SPECIFICATIONS: 2000-2010

Country	Region	Actual Tax/ GDP	Tax potential		Country	Region	Actual Tax/ GDP	Tax potential	
			With services	With industry				With services	With industry
Albania	ECA	22.17	24.79	26.01	Kyrgyz Rep	ECA	19.61	19.59	20.50
Argentina	LAC	26.48	30.60	30.65	Latvia	OECD	28.72	30.69	30.47
Armenia	ECA	18.52	21.96	22.51	Lithuania	OECD	28.87	30.43	30.11
Austria	OECD	42.79	38.83	39.02	Macedonia	ECA	28.78	27.78	27.90
Azerbaijan	ECA	18.00	21.73	20.97	Malaysia	EAP	21.31	21.31	21.41
Belarus	ECA	42.21	30.27	30.39	Mexico	LAC	17.83	22.16	21.85
Belgium	OECD	44.12	44.00	44.18	Moldova	ECA	31.16	33.19	32.58
Bosnia&Herz	ECA	37.57	26.91	26.81	Montenegro	ECA	38.60	28.55	28.49
Brazil	LAC	32.24	26.95	26.85	Netherlands	OECD	38.34	39.80	40.27
Bulgaria	ECA	30.64	32.05	31.75	Norway	OECD	42.82	43.06	42.79
Canada	OECD	33.29	31.55	31.83	Peru	LAC	15.76	21.61	21.19
Chile	LAC	19.87	27.78	27.12	Poland	ECA	32.91	36.73	36.46
Colombia	LAC	16.89	23.07	22.96	Portugal	OECD	31.28	35.52	35.60
Croatia	ECA	34.67	34.93	34.78	Romania	ECA	28.59	28.81	28.95
Czech Rep	ECA	35.07	35.72	35.73	Russian Fed	ECA	31.62	29.12	29.06
Denmark	OECD	48.65	46.53	46.38	Serbia	ECA	36.64	24.87	24.92
El Salvador	LAC	13.89	11.28	11.07	Slovak Rep	ECA	31.13	36.35	36.29
Estonia	OECD	31.63	32.96	32.89	Slovenia	OECD	37.73	37.12	37.11
Finland	OECD	43.92	39.56	39.54	South Africa	AFR	28.76	25.01	24.51
France	OECD	43.63	36.55	36.82	Spain	OECD	34.37	33.49	33.89
Georgia	ECA	19.99	22.81	22.89	Sweden	OECD	47.92	44.88	44.63
Germany	OECD	36.08	37.31	37.48	Switzerland	OECD	28.32	26.62	26.82
Greece	OECD	32.26	34.83	35.36	Tajikistan	ECA	16.40	12.44	12.58
Hungary	OECD	38.55	38.27	37.93	Thailand	EAP	19.86	21.42	21.49
Indonesia	EAP	17.27	13.47	13.33	Tunisia	MENA	27.27	28.99	29.20
Ireland	OECD	29.27	39.81	39.54	Turkey	ECA	24.76	25.79	26.20
Italy	OECD	41.99	37.80	37.96	Ukraine	ECA	33.97	29.72	29.71
Japan	OECD	27.06	28.82	28.80	UK	OECD	35.38	33.24	33.41
Kazakhstan	ECA	23.76	22.93	22.78	Uruguay	LAC	21.82	31.43	31.52
Korea, Rep.	OECD	24.43	27.19	27.43	Venezuela	LAC	13.73	17.10	16.31
Kosovo	ECA	20.59	20.93	20.91					

ANNEX D

TAX SPACE, TAX GAP AND TAX EFFORT IN SELECTED COUNTRIES

