

**Tax Potential vs. Tax Effort:
A Cross-Country Analysis of Armenia's Stubbornly Low Tax Collection¹**

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Abstract

Despite a record growth since 2000, Armenia's tax-to-GDP ratio has been fairly stable at about 14½ percent. This paper catalogues a range of factors that may account for Armenia's stubbornly low tax collection by benchmarking Armenia's tax-to-GDP against some comparator countries and conducting an extensive econometric study of the main determinants of tax collection using a large panel data set of 141 countries over a 15-year period. We find empirical support for the hypothesis that the persistence of low tax-GDP ratio can be traced to persistence of weak institutions and a large shadow economy. The gap between the potential and actual tax collection in Armenia is found to be as high as 6½ percent of GDP. We conclude with some policy recommendations that, if adopted, can boost revenue buoyancy.

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I. INTRODUCTION

The Armenian economy has been one of the fastest growing economies in the world in recent years and performed strongly by most macroeconomic criteria, particularly since 2000. The central government's budget deficit has fallen from about 4½ percent of GDP in 2000 to about 1 percent in 2006. Inflation has averaged about 3 percent a year. The overall poverty rate has continued the downward trend begun in the late 1990s, falling from 51 percent in 2001 to 35 percent in 2004. Armenia's progress on structural reforms has also been noticeable as it scores rather well on transition indicators, as measured by the European Bank for Reconstruction and Development, ahead of many countries in the Commonwealth of Independent States (CIS).

Yet, despite six consecutive years of double-digit nominal income growth and six consecutive years of real income growth in excess of 9 percent per year, the ratio of tax revenues to GDP has been fairly stable at about 14½ percent. It has been flat at 14 percent in 2003-04, despite record income growth in these years, edging up slightly in 2005-06. Despite the pick up in the last two years, Armenia's tax buoyancy remains low by regional and international standards. Tax collections in 2006 remain 1½ percent of GDP lower than the IMF's and the government's own program targets in 2005 and 2006.

As a result, the expenditure side of the budget remains constrained. The level of spending on social sector and public investment projects is low (by international standards), thereby limiting much-needed progress on the social front. Given the small size of the public sector, and the state of development of the private sector, market failures are frequent, and public-private partnerships (including with the Diaspora participation) are few and far between to overcome those failures. These factors undoubtedly have taken a toll on labor market conditions and the demographic situation: unemployment is still high despite rising real wages and emigration persists.

In this respect, several questions about tax revenue performance come to mind.

- Is the lack of buoyancy a temporary phenomenon that will simply disappear once tax collection agencies catch up with the record income growth? If so, how long will it take to witness a catch up effect? To what extent is the failure to catch up due to the tax collection agencies' limited institutional capacity?
- Is the unevenness of Armenia's high growth—concentrated in the agriculture, construction, and services sectors, which seem to have so far escaped making solid contributions to the tax collection effort—the primary reason for its low tax ratio or does this unevenness reflect a conscious public choice favoring sectors of the economy which contribute the most to overall growth, but not to tax collection?

- Is Armenia’s relatively stable low tax-to-GDP ratio simply a legacy of past tax reforms which are destined to persist over time? Is it due only to poor tax policy, or is it also due to weak tax and customs administrations or both?
- Is the persistence of a low tax-to-GDP ratio the result of a vicious cycle of the low quality of public infrastructure (defined broadly to include the public institutional workings of a market economy), and the public’s willingness to evade taxes and operate in the shadow economy, that depresses tax revenues and in turn limits the government’s ability to provide high quality public infrastructure?
- If the tax revenues collected do represent Armenia’s full tax potential, then is it just a matter of public choice—namely, that Armenia is simply content to live with high economic growth, high remittances that finance private consumption, and low tax collection?² What is the “appropriate” size of government in Armenia as measured by government spending, for example?
- Does the tax effort in Armenia fall short of its potential as many seem to believe?

The primary aim of this paper is to identify a proximate set of factors that contribute to Armenia’s stubbornly low tax-to-GDP ratio. We rely on several benchmark analyses of Armenia’s tax-to-GDP ratio to analyze the impact of past tax reforms and tax revenue performance under IMF-supported programs, including the current program that covers 2005–08. We then look extensively into the econometric determinants of Armenia’s tax revenues using a large panel data set of up to 141 countries over the 1990–2004 period. Econometric analysis and data limitations cannot possibly account for all the factors mentioned above. Our intention instead is to explain the determinants of tax revenues as much as possible using a conventional tax revenue model while taking into account particular features of the Armenian fiscal system and economic environment.

In particular, an important hypothesis of the paper is that the persistence of Armenia’s low tax-to-GDP ratio is positively linked to the persistence of weak institutions and a large informal/shadow economy.³ What ultimately matters in this process is whether there is the political will to reform institutions—defined broadly to include fiscal institutions, in particular the quality of tax and customs administration—and demonstrate to the public that higher tax revenues are being used to provide high quality public infrastructure, thus gaining the trust of the tax-paying public and boosting tax morale and trust in the fiscal system, all of which will eventually entail reducing the size of the shadow economy and widening the tax base.

² In 2005 remittances amounted to roughly 20 percent of GDP, far exceeding the tax-to-GDP ratio.

³ The relevance of these factors in the Armenian context is supported by anecdotal evidence. As reported by Radio Free Europe/Radio Liberty Armenian Service, for instance, the head of the State Taxation Service division tasked with combating tax fraud was assassinated on September 7, 2006. In addition to being a high-level tax official, he was also a wealthy businessman, reportedly owning one of Armenia’s two main liquefied gas companies, Goshgaz. Armenia to date has no legislation regulating conflicts of interest and no centralized public registry of corporate ownership.

The paper is structured as follows. Section II summarizes Armenia's track record on tax revenues and a selective review of tax reforms and tax and customs administration. Section III looks at the determinants of tax revenues using an econometric analysis of a large panel of countries. This allows us to construct a measure of Armenia's tax effort, and analyze it over time as well as in comparison with other countries and with Armenia's tax potential. Finally, Section IV summarizes the findings of the paper and draws some policy recommendations for improving tax collection in Armenia.

II. ARMENIA'S TAX PERFORMANCE

A. Overall Tax Performance

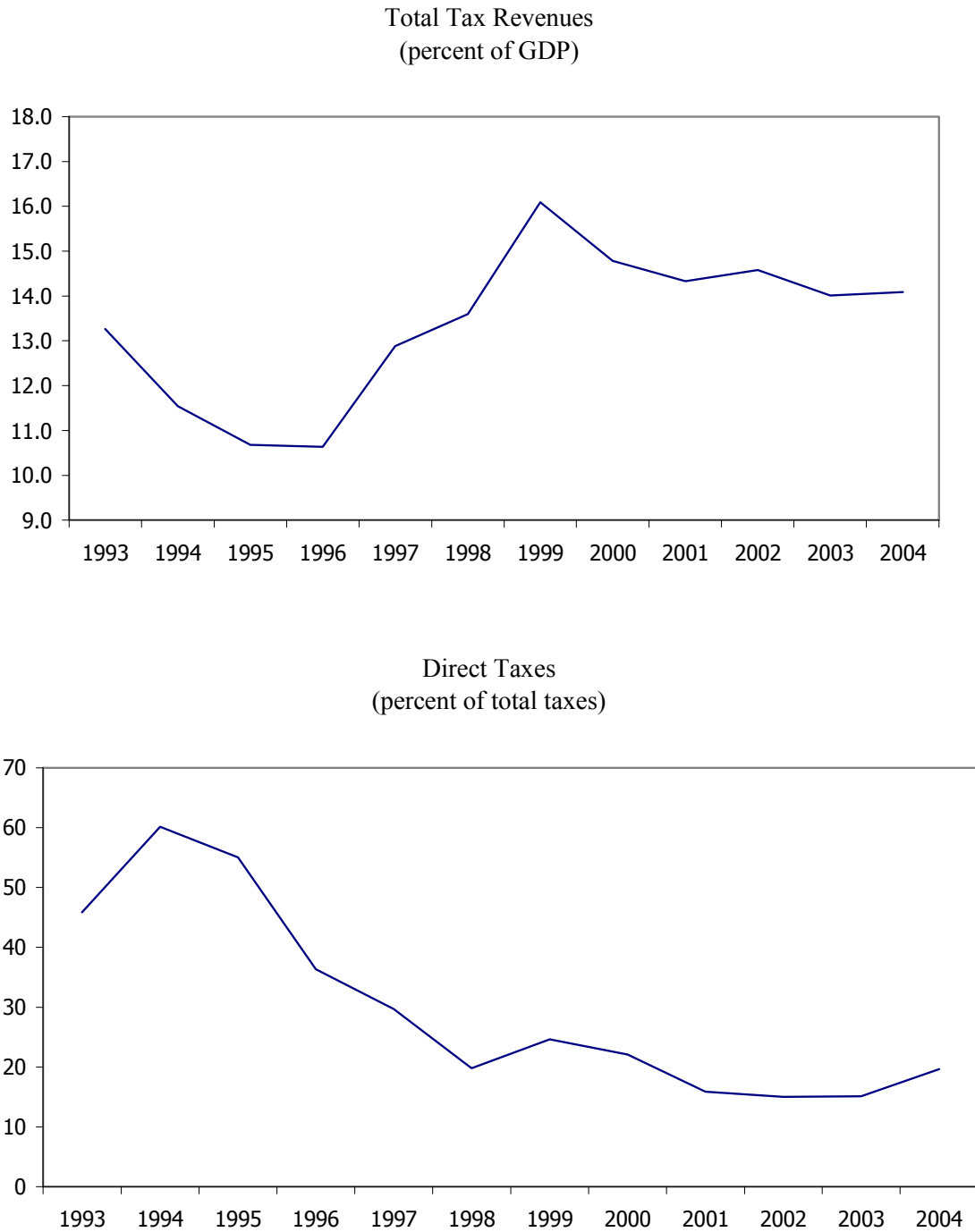
Armenia's tax revenue performance has varied considerably over the past decade, with stable tax-to-GDP ratio, averaging in recent years about 14½ percent of GDP (Figure 1, Table 1). The highest ratio of tax revenue to GDP over the past decade was recorded in 1999 when it reached about 16 percent of GDP due to some unusual temporary factors.⁴ The decline in tax-to-GDP ratios since 2000 was mirrored in all major tax categories. Collection of income taxes (personal and corporate income) showed the largest decline (0.5 percent of GDP), followed by excises (0.4 percent of GDP), and value-added tax (VAT) and custom duties (0.2 percent of GDP each). Presumptive income taxes and the so-called simplified tax (a turn-over based tax for small businesses) were the only two categories that showed increases during 2000–04. Of particular concern is the pronounced decline in the VAT and excise categories, which account for the bulk of tax revenue.

Armenia's tax-to-GDP ratio is low in comparison with CIS countries, a useful benchmark to consider.⁵ Over the 1998–2004 period, the period common to all CIS countries for which comparable data could be assembled, Armenia recorded a tax-to-GDP ratio of 14½ percent. This is below the unweighted (arithmetic) average for the CIS 12 and the CIS 7 of 18.3 percent and 15.8 percent, respectively (Table 2). These discrepancies get larger if comparisons are made with CIS averages that exclude Armenia. Armenia's low tax-to-GDP ratio is also evident if the median is used instead of the unweighted average, particularly for the CIS 12. Armenia's relative position among the CIS countries does not change much using the more recent data over the 2000–04 period. Changes in corporate income tax and VAT rates may account for some of the cross-country differences and time variation in tax-GDP ratios among CIS countries. However, finding a consistent pattern in a regression framework that controls for tax rates among other determinants of taxes has proven difficult.

⁴ Chief among these were a series of netting out operations and the extension of the 1999 tax year into 2000, which also affected tax revenues as recorded in that year. These factors may have added up to 2 percent of GDP in higher tax collection; see Gelbard *et al.* (2005).

⁵ The following country groupings will be used: CIS 12 (or CIS 11, which excludes Armenia); and CIS 7, which includes seven of the CIS 12 countries with low per capita income (or CIS 6, which excludes Armenia). See Table 2 for the list of countries in each grouping. Other benchmarks are considered in the next section.

Figure 1. Armenia: Central Government Tax Revenues, 1993-2004



Source: Armenian authorities.

Among the CIS 7 countries, Armenia's tax-to-GDP ratio is higher than four, but well below the remaining two countries that are poorer than Armenia. These four countries are Azerbaijan, Georgia, the Kyrgyz Republic, and Tajikistan while Moldova and Uzbekistan are the two countries with tax-to-GDP ratios of 19.8 percent and 25.2 percent, respectively. Ironically, these two countries have per capita incomes that are half as large as Armenia's. Therefore, differences in income alone cannot account for the difference in tax performance between Armenia and other countries. Section III of the paper will address these issues more closely.

B. Direct vs. Indirect Taxes

Over time, Armenia's tax revenue has shown significantly less reliance on direct taxes, which tend to grow with income and enhance revenue buoyancy, and consequently more reliance on indirect taxes. The latter account for about 80 percent of tax revenues, up from 64 percent in the mid-1990s (Table 3). As a result, the share of direct taxes⁶ in total taxes declined by some 50 percent. This decline would have been much higher (at 60 percent), had it not been for an almost doubling of the collection of enterprise profit taxes in 2004.⁷ The performance of VAT, excise taxes to some extent, and consumption taxes in general have contributed significantly to the rise in the share of indirect taxes since the mid-1990s. Reliance on more regressive indirect taxes in general increases inequity as low income households tend to have a higher marginal propensity to consume.⁸ Also, aggregate income growth, particularly if accrued primarily to higher income individuals, may not lead to significant tax collection if the tax system is not sufficiently progressive.

The decline in the importance of direct taxes is, to a large extent, a direct consequence of several tax policy reforms that were introduced in mid-2000 and may signify a trend towards a less equitable tax system in Armenia. These reforms were instituted by the Armenian authorities with the objective of improving the investment climate and stimulating economic growth. Growth accelerated, but there are many other factors that contributed to this economic growth.⁹ The tax reforms consisted of reducing tax rates on income and profits, accelerating depreciation allowances, generous profit tax holidays, a higher income tax exemption, a tripling of the VAT threshold, and the introduction of a simplified turn-over based tax for small businesses. As a result, the share of direct taxes in total tax revenues fell

⁶ Direct tax is defined as personal income tax plus enterprise profit tax.

⁷ This significant pick up in tax collection could be due to improvements in the operation of the large taxpayer unit at the State Tax Inspectorate.

⁸ However, indirect taxes can be progressive if designed properly (e.g., exemption of food from taxes even though the rich would also benefit from such exemptions. See Sahn and Younger (1999). Similarly, income taxes can be made regressive if certain incomes are exempted (e.g., capital income) or certain tax incentives are terminated (e.g., removal of tax holidays).

⁹ The fall in Armenia's real GDP in the early part of the transition was one of the largest among the transition economies and a rebound was long overdue.

substantially.¹⁰ However, as shown by Joulfaian and Melikyan (2004), the overall marginal effective tax rates in Armenia remained well below statutory rates.

The large decline in the importance of direct taxes should raise concerns about striking the right balance between the three goals of fiscal policy, namely, the balance between efficiency in tax collection, equity, and macroeconomic stability. Although there are other factors at work and the tax reforms of the post-2000 period per se cannot fully account for the overall tax performance, there was nevertheless a large reversal in the share of direct taxes in tax revenues from 37 percent between 1994–2000 to 20 percent in the post-2000 period, equivalent to a drop of 1.7 percent of GDP. The increase in indirect taxes following these reforms more than compensated for the decline in direct taxes, but best practices in tax policy design indicate that with such a large reversal the balance of the tax system in Armenia between efficiency and equity considerations may have shifted more towards inequity.¹¹ Needless to say, the issue of simplicity/transparency and quality of tax administration also weigh in these considerations, and need to be carefully considered.

Armenia's small share of direct taxes in total tax revenues is perhaps one factor behind its low tax-to-GDP ratio vis-à-vis other CIS countries (Tables 4 and 5).¹² The adverse impact of Armenia's 2000 tax reforms on performance of direct taxes, as discussed above, may be more discernable when it is seen in a cross-country perspective even though other countries may have also embarked on tax reforms at about the same time (e.g., Russia). Nevertheless, during 1998–2004, Armenia had the second and third-lowest share of direct taxes in tax revenues and GDP and its relative ranking did not change much during this period. The decline in ratio of direct to total taxes since 1999 is in marked contrast to either an increase in this ratio for other CIS countries (Tables 4 and 5)

Casual cross-country comparisons show that Armenia's actual tax-to-GDP ratio falls below its potential by as much as 1½ percent of GDP, suggesting significant room for broadening the income tax base and strengthening tax administration. Figure 2 plots tax-to-GDP ratios against the share of direct taxes in total tax revenues for CIS 12 countries during 1998–2004. It shows the presence of a positive relationship between these two variables. Over the period, Armenia recorded a tax-to-GDP ratio of 14½ percent whereas the fitted relationship shows that it should have had a tax-to-GDP ratio of 16 percent. This shortfall of 1½ percent of GDP is crude as there are many other factors that influence tax revenues, an issue that is systematically analyzed in Section IV of the paper. Nevertheless, the relationship suggests

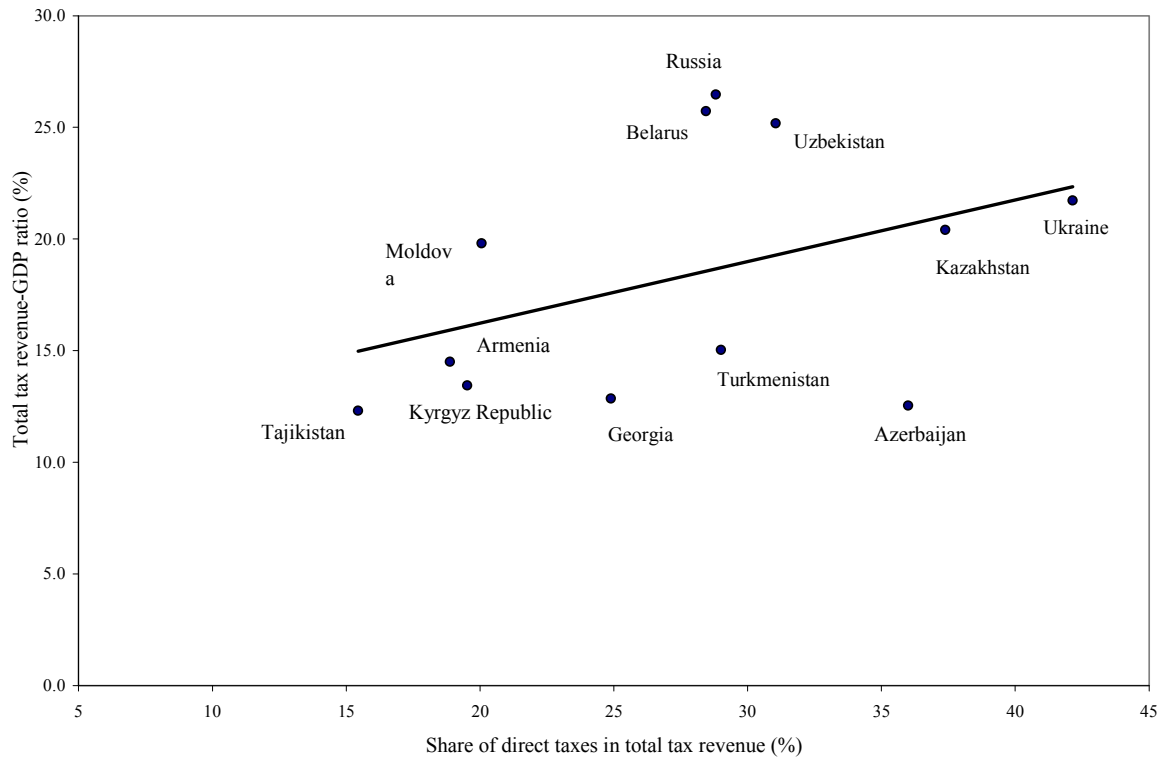
¹⁰ Broadening the coverage of direct taxes to include presumptive income and simplified taxes would increase the share of direct taxes, but its importance would remain well below mid-1990s.

¹¹ Available measures of income inequality show a significant decline in inequality in Armenia over the past decade as observed by Gelbard *et al.* (2005, Table 2.7). However, these do not measure inequality before and after tax.

¹² The share of direct taxes in total taxes in OECD countries rose slightly from the late 1990s to early 2000s.

that there is significant room for increasing income taxes either through broadening the base, strengthening administration or both.

Figure 2. CIS: Total Tax Revenues vs. Direct Taxes



C. VAT Performance

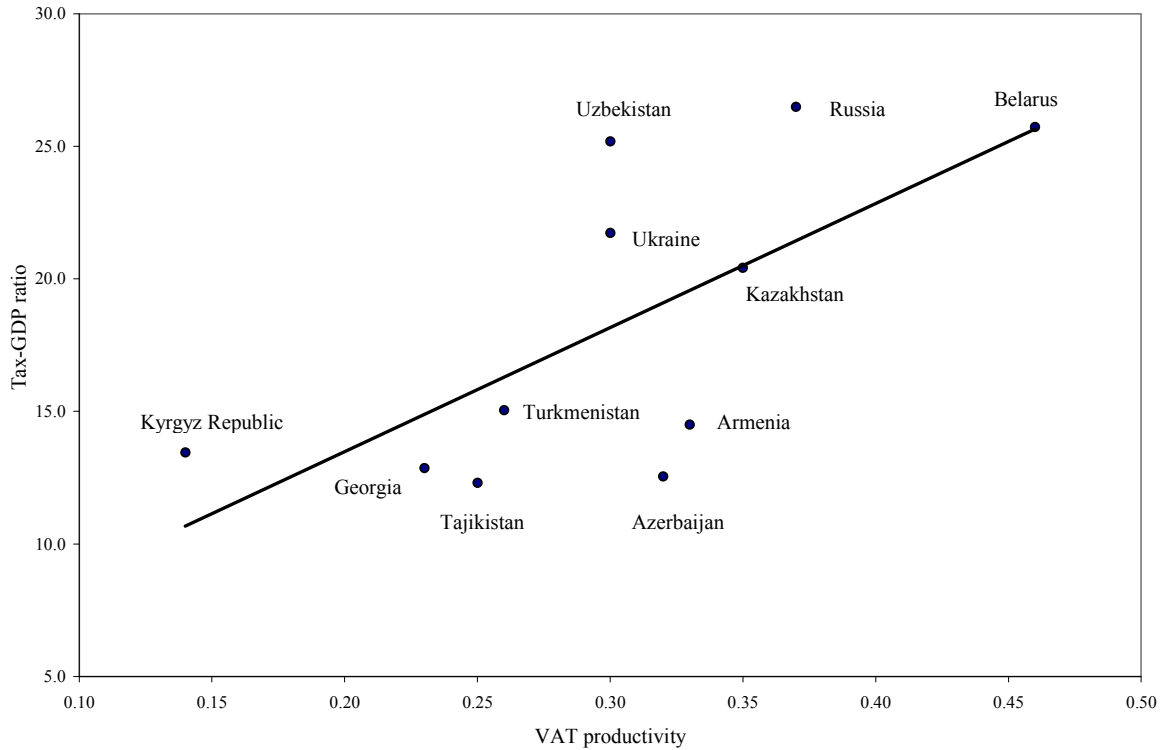
Although declining since 2001 (except for a brief spike in 2002, see Table 6), Armenia's VAT collection is much better than its income tax collection when compared with other CIS countries: it accounts for some 45 percent of tax revenues and 6½ percent of GDP. Among the CIS 12 countries and with the exception of Moldova and the Kyrgyz Republic, Armenia has the highest share of its tax revenues originating from VAT. Its VAT collection in terms of GDP exceeds that of eight CIS countries and is only below Moldova, Belarus, and Uzbekistan.

Nevertheless, as in the case of income taxes, Armenia's VAT collection is below its full potential, suggesting significant room for further tax policy and tax administration reforms. Figure 3 plots the tax-to-GDP ratio against VAT productivity for CIS countries.¹³ The fitted relationship is positive and statistically significant, suggesting that as the efficiency of VAT

¹³ VAT productivity is defined as the ratio of VAT revenues to GDP or consumption divided by the standard VAT rate. A higher number signifies a more efficient VAT system with fewer exemptions.

collection increases so does the tax-to-GDP ratio.¹⁴ The relationship shows that Armenia's potential for higher tax revenues, given its VAT productivity, exceeds actual tax collection by as much as 5 percent of GDP.¹⁵ This casual empiricism suggests that by improving its VAT productivity, say through lower exemptions, Armenia can ride up the fitted relationship and boost its revenues.

Figure 3. CIS: Tax Revenues vs. VAT Productivity



D. Tax Buoyancy

Armenia's tax revenue buoyancy is low compared with other CIS countries, despite double-digit economic growth registered since 2000, suggesting another factor for its low tax-to-GDP ratio (Table 7).¹⁶ Since 2000, GDP has grown strongly each year and yet revenues have

¹⁴ The estimated regression is tax-to-GDP ratio = 4.11 + 46.84*VAT productivity, $R^2 = 0.45$ with a t-ratio of 2.74 on the estimated coefficient of VAT productivity.

¹⁵ A similar caveat to income tax calculation applies here as well.

¹⁶ Tax revenue buoyancy is defined as the elasticity of tax revenues with respect to nominal GDP. The elasticity summarizes the impact of both tax policy (base effect with an unchanged tax administration) as well as tax administration (efficiency in raising one additional dram from the same base with an unchanged tax policy).

not kept up pace with economic growth. Table 7 reports revenue buoyancy for three types of taxes (total, direct, and VAT) for Armenia and other CIS countries over the 1998–2004 period. Armenia’s record on tax buoyancy is poor as reflected in the following observations:

- Armenia has revenue buoyancies that are below unity and below all four CIS averages for all three categories of taxes.
- In Armenia, VAT has the highest buoyancy, followed by total taxes and direct taxes.
- At 0.55, Armenia’s direct taxes have the lowest buoyancy among all CIS countries and the three categories of taxes.¹⁷ This buoyancy increases to 0.69 if presumptive income tax is also counted as part of direct taxes.

III. CROSS-COUNTRY REGRESSION ANALYSIS

A. Methodology and Data

There is a large body of literature on tax revenue potential in developing countries (e.g., Bahl, 1971; Tanzi, 1987; Leuthold, 1991; and Stotsky and WoldeMariam, 1997; among others). However, there is little research that looks at institutional quality as a determinant of tax collection and potential.¹⁸ In addition to conventional determinants of tax revenues, this small, but growing literature regards quality of institutions and governance as important factors behind the poor tax collection in many countries. These factors are thought to influence tax revenue through their contribution to tax evasion, improper tax exemptions, and weak tax administration (Tanzi and Davoodi, 1997). More and more studies find that any successful tax reform should be rooted in a strong political will to reform (Bird, 2004), and that a country’s tax record reflects its political or ‘societal’ institutions (Alm and Martinez-Vazquez, 2003). Indeed, as Bird, Martinez-Vazquez, and Torgler (2004) conclude, a legitimate and responsive state—one that secures the rule of law and keeps corruption under control—appears to be an essential precondition for a more adequate tax collection effort.

In addition to the role of institutions, this paper also focuses on the size of the informal (or shadow) economy as a determinant of tax revenue. The agents’ incentives to “go formal” and pay taxes are among other things also influenced by the quality and quantity of public services. A vicious circle is likely to exist, therefore, whereby agents’ unwillingness to pay taxes results in the government’s inability to provide adequate quality/quantity of public services, thus further reducing the incentives to pay taxes.

¹⁷ A buoyancy of 0.55 means, for example, that if GDP increases by 1 percent, direct taxes increase by 0.55 percent, which results in a declining tax-to-GDP ratio.

¹⁸ Exceptions perhaps are Tanzi and Davoodi (2000) and Bird, Martinez-Vazquez, and Torgler (2004), which, however, employ a cross-sectional approach as opposed to a panel set-up, which is the approach used in this study.

Following the tax effort literature,¹⁹ we define the reduced form equation for a cross-country panel regression in the following format:²⁰

$$y_{it} = \alpha + \beta \cdot X_{it} + u_i + \varepsilon_{it} \quad (1)$$

where y_{it} is the total tax revenue as a percent of GDP in a country i at time t , α is the “global” constant, u_i is the country-specific error term, ε_{it} is the mean-zero sample-wide error term, and β is the vector of coefficients on the vector of parameters that influence the tax-to-GDP ratio, X_{it} , which itself is comprised as follows:

$$X_{it} = (GDPPC_{it}, INS_{it}, INF_{it}, AGRIC_{it}, TRADE_{it}, OIL_{it}, URBAN_{it}, SHADOW_{it})$$

where *GDPPC* is the PPP-adjusted GDP per capita;

INS is a measure of institutional quality;

INF is the rate of consumer price inflation;

AGRIC is the share of agriculture in GDP;

TRADE is the ratio of exports plus imports to GDP;

OIL is a dummy variable for fuel exporters;²¹

URBAN is the share of the urban population in a country’s total population; and

SHADOW is a measure of shadow economic activity, taken in percent of GDP.

Income level, *GDPPC*, is used as a proxy for the level of a country’s development, and it is expected to be positively correlated with the government’s ability to collect taxes and the citizens’ ability to pay them. Quality of institutions, *INS*, which captures various aspects of the governance of the public sector, such as corruption, rule of law, the extent of rent seeking and regulatory burden, is expected to be positively associated with tax revenue. A higher value of *INS* indicates a higher quality of institutions. To proxy for the quality of a country’s macroeconomic policies and to also capture any direct impact of inflation on tax collection—through the effect on consumption and investment, and subsequently on their related tax categories—we also included *INF* as a regressor. A negative coefficient is expected for this

¹⁹ See, for example, Bahl (1971), Tanzi (1987), Stotsky and WoldeMariam (1997), Bird, Martinez-Vazquez, and Torgler (2004) and Hudson and Teere (2004).

²⁰ Leuthold (1991), for instance, arrives at a similar specification using an aggregate welfare maximization framework.

²¹ This variable takes a value of 1 if the country is a fuel exporter (i.e., share of oil and gas in total exports exceeds 40 percent), and 0 otherwise. While arguably inferior by nature to the corresponding continuous variable, this dummy variable is likely to paint a more realistic picture of the country’s genuine fuel taxable base. This is because for some countries the reported values for fuel-to-total exports contain only re-export and/or transit of fuels, instead of production and genuine export of fuel products, with different implications for the government’s ability to tax them. In addition, for some countries, where the data on fuel exports were not available, we were nevertheless able to deduce the value for *OIL* based on publicly available production data.

variable. The presence of *AGRIC* in equation 1 is dictated by general (administrative and political economy) difficulties of taxing agriculture and the intentions of many governments to either provide tax exemptions or subsidies (or both). The presence of a large rural sector also reduces the demand for government services, since many public sector activities are city-based (Tanzi, 1992). Therefore, to proxy for the demand for public services, we included the share of the urban population, *URBAN*, in our regressions. Given different levels of agricultural productivity across countries, a large agricultural sector share does not necessarily indicate a smaller urban population. Hence the need to control for urban population separately, as an indicator of the demand for government services. A positive coefficient is expected for *URBAN* to the extent that higher demand for public services *ceteris paribus* requires higher tax revenue.

Given the relative ease in taxing foreign trade compared to domestic activities, we follow the literature to include *TRADE* in the regressions and expect it to have a positive impact on tax collection. The inclusion of *OIL* in the regressions is justified on the same grounds as the ease in taxing fuel- (and generally, natural resource extraction-) related activities, which is likely to generate more tax revenue (per unit of output or value added) than non-fuel activities. A negative coefficient is expected for the *OIL* variable to the extent that direct or indirect taxes raise little revenues in countries with abundant oil reserves. In summary, it is useful to think of *GDPPC*, *AGRIC*, *TRADE*, and *OIL* as proxies for various structural components of the economy's tax base.

While lacking solid theoretical foundations, the approach outlined above is rather attractive because of its ability to provide a simple empirical framework to measure a country's tax effort vis-à-vis that of its peers (Tanzi and Zee, 2000). The predicted/fitted values of the dependent variable obtained through equation 1 will thus measure the country's tax potential, while the ratio of the actual to predicted tax revenue will be a proxy for the level of tax effort.

The analysis will be based on publicly available data on up to 141 countries for the period 1990–2004 downloaded from the IMF's Government Financial Statistics database. Where necessary, these data were complemented by those contained in various IMF staff reports and other publications, as well as countries' official websites. Indicators of institutional quality used in the paper are from the International Country Risk Guide (ICRG). A more complete list of data sources and their statistical properties is provided in Table 8.

B. Regression Analysis

Before we proceed with the discussion of the main regression results, we would like to discuss our treatment of our proxy for the tax morale variable. The link between tax morale and tax collection has been documented in the literature (e.g., Cummings et. al., 2005).²² However, given measurement issues in the context of large group of countries, we used the ratio of shadow economic activity (*SHADOW*) as a proxy for low tax morale and willingness to pay. The latter is shown to be correlated with low tax morale (see, for example, Alm and

²² For studies discussing this link in the Armenian context, see McGree (1999) and McGee and Maranjyan (2006).

Torgler, 2004) partly through lower moral cost of tax evasion and otherwise weaker motivation to pay taxes. It is not unreasonable to expect countries with a large shadow economy to have smaller levels of tax-to-GDP.

Although it appears that *SHADOW* has somewhat larger but still limited coverage across countries and periods, cutting our sample size more than in half. Its use may also introduce some potential econometric problems, since *SHADOW* could be endogenous to, or simultaneously determined with, the fiscal policy outcomes (e.g., tax collection).²³ As demonstrated by Torgler (2003), Alm, Martinez-Vazque, and Torgler (2006), and Schneider and Torgler (2007), institutional factors—such as trust in the legal system and government—have a significant impact on tax morale.

To increase the number of observations on the *SHADOW* (and also minimize any simultaneity between the tax effort and the shadow economy), we conduct an imputation procedure using *SHADOW* as a dependent variable. We follow Schneider (2005) and others in assuming that differences in the shadow economy across countries could be explained by the differences in tax (and social security contribution) burden; quality of institutions (or more precisely, intensity/enforcement of regulations); quality and quantity of public sector services; and income level. To proxy for the tax burden, we used the highest marginal corporate tax rate, *CORPTAX*, across countries as reported by the World Bank. ICRG's composite measure of the quality of institutions, *COMPOSITE*, was used as a proxy for institutional development as well as of social services provision. To capture any potential non-linearity between quality of institutions and shadow economy, we added the squared value of this indicator, *COMPOSITE-SQ*, as a regressor. To account for the impact of political/social violence on the incentives of the private sector to go underground, we included a dummy variable *VIOLENCE*, compiled using the dataset provided by the Center for Systemic Peace.²⁴ A positive sign is expected for the estimated coefficient on *VIOLENCE*.

The results of this regression are presented in Table 9. The random effects specification (column 2) was rejected in favor of fixed effects specification (column 3).²⁵ The OLS specification contained in column 1 is reported for comparison purposes only. As expected, countries with a higher level of GDP per capita have lower levels of shadow activity. Similarly, while the coefficient on *VIOLENCE* is not significant (with the exception of one specification, see below), it is positive, suggesting that countries with a lower level of political and social conflict are likely to have lower levels of shadow activity. The coefficients on *COMPOSITE* and *COMPOSITE-SQ* suggest that, while improvements in

²³ See Auriol and Wartlers (2005) for a theoretical model and empirical results showing that both revenue collection and shadow economic activity are simultaneously determined by market entry fees. In addition, many of the existing measures of shadow economy are derived from the tax data.

²⁴ *VIOLENCE* takes a value of 1 if the country is reported to have had a conflict in a given year and 0 otherwise.

²⁵ The Hausman test had a p-value of 0.000.

bureaucratic quality reduce the incentives to go underground, this impact is likely to be lower, the higher the level of institutional quality. Oddly enough, the coefficient on *CORPTAX* is negative suggesting that excessively high tax rates may reduce incentives to join the shadow economy, a finding that has also been reported in other studies of the shadow economy (e.g., Friedman et. al., 2000). This finding may imply that the benefits of higher tax rates may actually outweigh the costs of avoiding them (especially if they are accompanied by stricter punishments for non-compliance). Finally, the negative and significant impact of inflation, as a proxy for the quality of macroeconomic management, on the shadow economy is consistent with the observation that the inflation tax is faced by every individual regardless of whether one operates in the shadow economy. As a result, there is every reason to make use of public goods and services by joining the formal sector when inflation is high rather than when it is low.

To test for the robustness of these results, we also replaced *COMPOSITE* with the ICRG measure of quality of bureaucracy (*BUREAUCRATIC*). Results are similar to those obtained using *COMPOSITE* and are reported in column 4. Finally, in column 5 we reported the outcome of the regression without the *CORPTAX*, the variable with the smallest number of observations. While not significantly different from the results reported in columns 1-4, this specification allows for the use of a much larger sample of countries, a feature that makes this specification attractive for use in robustness tests in the second stage regressions below. Specifications 3 and 5 were used to get the imputed values of the dependent variables denoted by *SHADOW-hat* and *SHADOW-hat2*, respectively, to be used for an estimation of equation 1.²⁶ With this in mind, we now turn to the discussion of the main results.

The results of the estimation of equation 1 are reported in Table 10. Again, the fixed-effects model was picked (column 2).²⁷ All key variables of interest have the predicted signs.²⁸ As hypothesized, the effect of per capita income (*GDPPC*) on tax collection is positive and is consistent with the results of most studies cited above.²⁹ As expected, the impact of institutional quality on tax collection is positive and significant. This is consistent with the findings of Tanzi and Davoodi (2000) and Bird, Martinez-Vazquez, and Torgler (2004) and provides evidence of a direct channel for the impact of institutions on tax collection (apart from the indirect impact that institutions have through shadow economic activity). Regarding the impact of the shadow economy, here again the (negative) sign and significance are as expected. Its magnitude implies approximately a 1.5 percent of GDP increase in tax collection for every 10 percentage point drop in the shadow economy ratio.

²⁶ Given the limited number of observations for *SHADOW*, the out-of-sample fit was used to generate *SHADOW-hat* and *SHADOW-hat2*. The results obtained using the in-sample fit are not qualitatively different and are available from the authors upon request.

²⁷ As before, the Hausman test had a p-value of 0.000.

²⁸ While the overall fit of the fixed effect regressions is low, this is due to the de-meaning procedure that STATA uses to run the fixed effects regressions. The equivalent Least Squares Dummy Variable (LSDV) regressions have R-squared exceeding 90 percent.

²⁹ The coefficient is significant when a logarithm of *GDPPC* is used instead.

The negative sign on *INF* confirms our expectations regarding the detrimental impact of inflation on tax collection and is consistent with the results reported by Agbeyegbe, Stotsky, and WoldeMariam (2004). The coefficient on *URBAN* is both positive and significant, confirming our hypothesis on the impact of the demand for public services on tax collection. The coefficient on *AGRIC* is positive in most specifications (also see below) but is not significant. While running contrary to common belief, this result is not uncommon in the literature, with some studies even reporting a significant (positive) impact of agriculture on tax collection (e.g., Bird, Martinez-Vazquez, and Torgler, 2004). Similarly, the coefficient on *TRADE* is positive but not significant. This is consistent with Combes and Saadi-Sedik (2006), who report that (in developing countries) the negative impact of trade openness on budget balances is typically more than offset by trade-induced improvements in institutions and tax administration.³⁰ Finally, the impact of *OIL* on tax collection is not conclusive, presumably because of the oil sector tax regime (and not because of the inability to collect taxes): in some oil-exporting countries oil revenue is collected in the form of royalties (which may not be classified as tax revenue), instead of taxes on oil companies. Hence the low level of the tax-to-GDP ratio despite the presence of oil resources.

To capture the effect of the switch to the destination principle for trade within CIS countries in 1997 and the one-off adjustment to the 1999 year (as discussed above), we included two dummy variables in the regressions (columns 3-5): *Armenia-1997* takes value of 1 for 1997-2004, and 0 otherwise, while *Armenia-1999* takes value of 1 for 1999, and 0 otherwise. The coefficients on both variables suggest that the move toward the destination principle may have permanently increased the tax collection in Armenia by approximately 3.4-3.9 percent of GDP, while the extension of the 1999 tax year into 2000 may have overstated the tax revenue in 1999 by as much as 1.9-2.5 percent of GDP

Perhaps more interestingly, we also tested for the hypothesis that during the episodes of fast growth countries collect less in taxes because tax administrations are usually slow to adjust in adequately covering the tax base.³¹ A dummy variable *REALGR* was added to test this hypothesis, taking a value of 1 if a country's real GDP growth exceeds 10 percent in a given year and 0 otherwise.³² The sign and significance of the coefficient on *REALRG* (taken individually and interacted with the Armenia country dummy variable) suggest that (1) contrary to expectations, high-growth countries collect more revenues during high-growth episodes than otherwise; and (2) during its high-growth years, Armenia collected 0.6 percent of GDP more in taxes than other countries with high growth.³³ Viewed together, these

³⁰ However, as discussed in Keen and Simone (2004), trade taxes—a component of total taxes—are likely to decrease if the liberalization progresses beyond a threshold.

³¹ This hypothesis is often raised by the Armenian authorities in the context of policy discussions with the IMF on tax administration as a possible explanation for low tax collection.

³² The choice of the threshold for the dummy variable was driven by the fact that Armenia's GDP growth in recent years was above 10 percent.

³³ This difference is not statistically significant, however.

findings refute the claims that Armenia's low tax-to-GDP ratio could partly be caused by the fast growth of its economy in recent years.

Finally, we tested for the hypothesis that Armenia's direct tax revenue buoyancy lags behind that of other countries and the CIS 11 (as discussed in Section II). For that, we slightly modified equation 1 to have (log) nominal values of direct taxes as the dependent variable, added (log) nominal GDP as a regressor, and interacted it with CIS11 and Armenia dummies. While the estimated coefficient on the former interaction term turned out to be positive (suggesting that CIS11 countries have an above-average direct tax buoyancy), the coefficient on the latter interacted term was negative. This suggests that even after controlling for other determinants of tax revenue, the results in Table 7 hold.³⁴

Next, we run a number of additional regressions to test for the robustness of the results, (see Table 11). First, we attempted to control for problems in the error term: the regression outcome reported in column 1 controls for heteroskedasticity (i.e., contains estimates of *t*-statistics based on heteroskedasticity-consistent standard errors), while that reported in column 2 controls for autocorrelation (i.e., allows for first order serial correlation in residuals within groups). In regression 3, we replaced *SHADOW-hat* with *SHADOW-hat2*, which is derived as discussed above. Finally, regression 4 contains results based on a truncated sample: only observations with values of the dependent variable falling within the range of plus/minus one standard deviation from its mean are included in the regression. All regressions in Table 11 produce qualitatively similar results across all coefficient estimates with continued significance and expected signs on the measure of institutional quality and shadow economy.

In a second round of robustness checks, and to test whether country/regional differences would account for a low regression fit, we run equation 1 for various regions and income groupings separately. While the values of R-squared reported in Table 12 are indeed higher, the differences in results across these groupings reveal much more. First of all, unlike in the overall sample, the impact of (i) institutions, (ii) shadow economic activity, and (iii) inflation on tax collection within the OECD countries becomes insignificant. This is explained by rather low levels of risks stemming from the above factors for tax collection, as explained above, as well as the limited variation in the values of these indicators among the OECD countries.³⁵ Additionally, agriculture and trade openness have a negative impact on tax collection, both consistent with the hypotheses outlined above. The former result could perhaps be due to the fact that, given the largely subsidized nature of agriculture in OECD countries, a larger share of agriculture implies more tax exemptions and, therefore, less tax revenues. For the latter result, since the marginal improvement in institutional quality and, as a result tax administration, are likely to be lower than in developing countries, countries in the OECD lack the offsetting factor of trade openness on tax collection à la Combes and Saadi-Sedik (2006).

³⁴ These results are available from the authors upon request.

³⁵ However, interestingly enough, the disparity in the income per capita is sufficient to result in a positive and significant relationship between the *GDPPC* and tax collection which may indicate the extent of the progressivity of income taxes and the predominance of direct taxes.

Second, for the other extreme on the income scale, in Low Income Countries as a group, trade openness leads to higher tax-to-GDP ratios, and there seems to be no link between *URBAN* and tax collection. The former result could be attributed to the higher marginal improvement of institutions from trade, and the latter result could perhaps be due to lower levels of urban population in low income countries.

Third, interesting regional patterns emerge (columns 4-8) ranging from the impact of *INF* (where regions with a large number of countries with a high inflation history, LAC and MCD, seem to sustain a strong negative link between inflation and tax collection) to the impact of *URBAN* (where the link is insignificant and even turns negative in MCD and AFR, respectively).

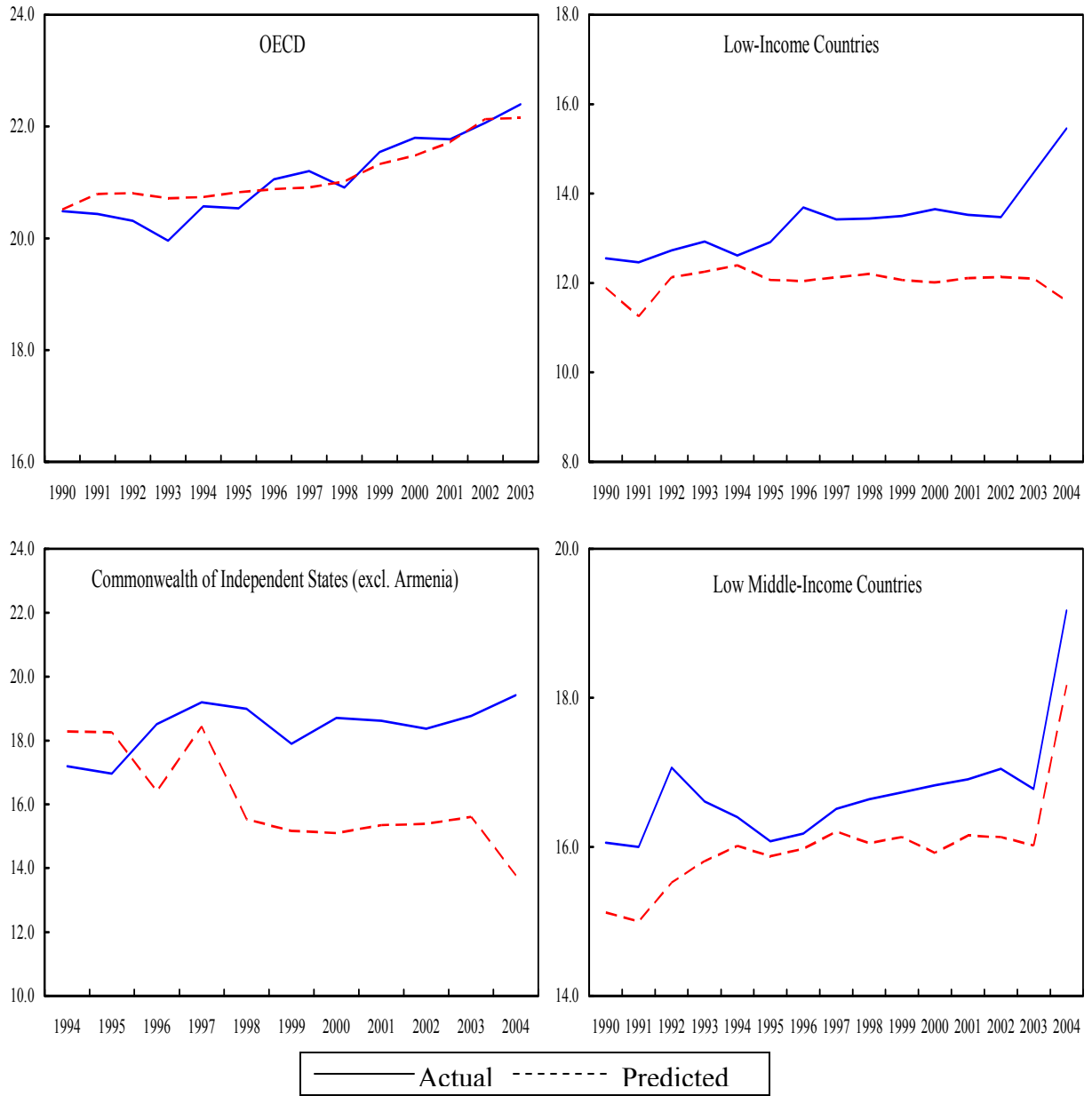
C. Post-estimation Analysis

We use the results obtained above to estimate the potential tax-to-GDP ratio and construct a measure of tax effort across countries. Figure 4 depicts actual and potential (based on regression 3 from Table 10) tax-to-GDP ratios for 4 country groupings for 1990–2004: OECD, CIS11, Low Income Countries, and Low Middle Income Countries. It appears that for the sample period, the tax collection in OECD countries hovers around its potential. In contrast, Low Income and Low Middle Income countries collect more in taxes than what their characteristics would suggest. Interestingly, and consistent with Auriel and Wartlers (2005), the CIS countries (excluding Armenia) also collect more taxes than their potential levels.

The comparative relationship for Armenia for 1996–2006 is depicted on Panel 1, Figure 5 (2005 and 2006 values are out-of-sample predictions using estimated values of regressors where actual values were not available). Using the alternative specification with the larger sample (i.e., regression 3 in Table 11) to predict the same indicator results only in a difference of one-tenth of a percentage point of GDP on average for 1996–2004 (and less for more recent years), suggesting that the estimates are rather robust. The gap between actual and potential levels is equal to 6.4 percent of GDP on average between 1996–2006.³⁶ It is important to note that despite the government's attempts to boost tax collection in recent years, the tax effort—the ratio of actual to potential tax collection, depicted in Panel 2, Figure 5—has been on a declining path since 2000.

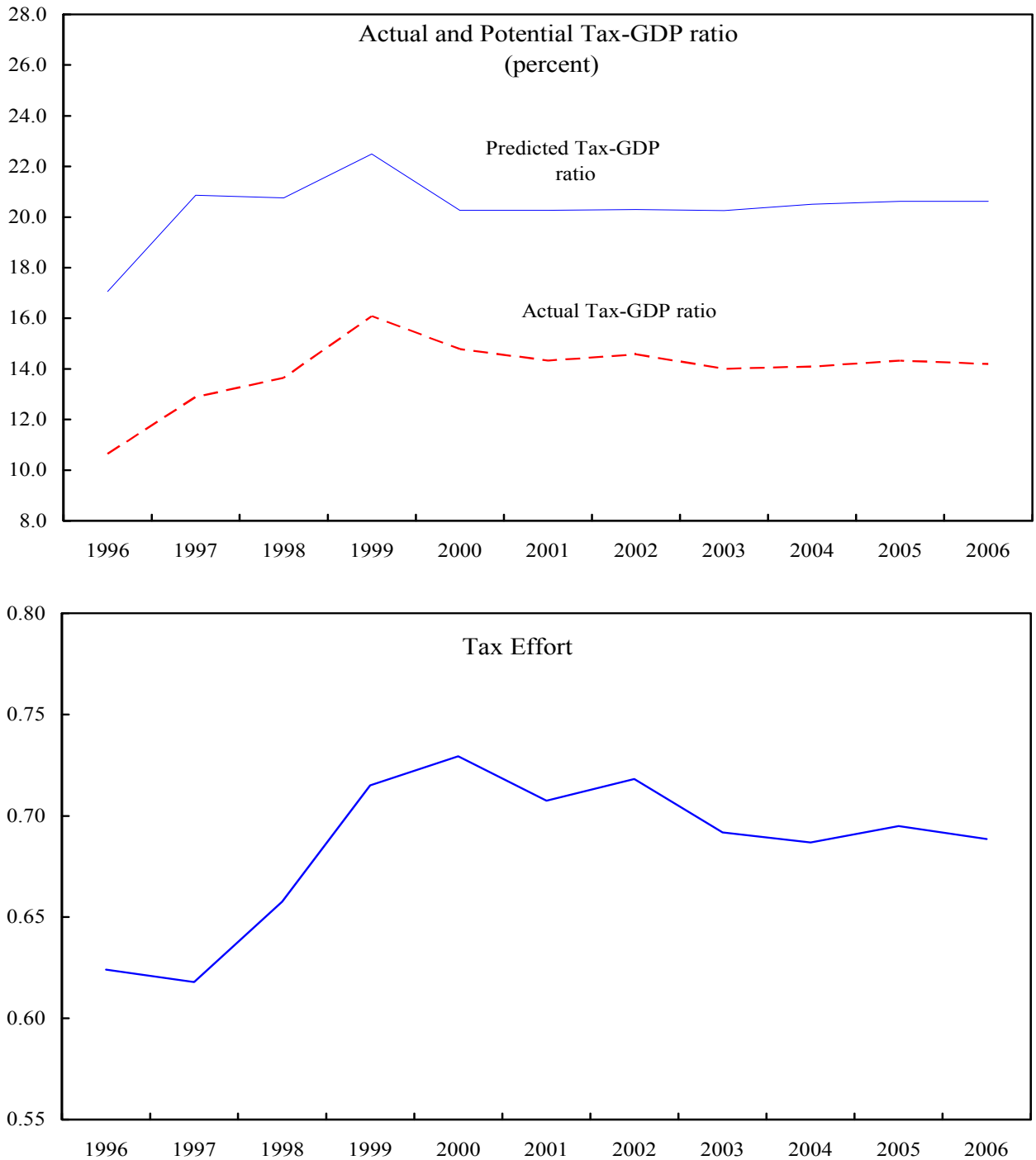
³⁶ In nominal terms, this shortfall was approximately \$300 million and \$400 million in 2005 and 2006, respectively.

Figure 4. Actual and Potential Tax-to-GDP Ratios for Select Country Groupings, 1990-2004



Source: Authors' calculations.

Figure 5. Armenia: Actual and Potential Tax Levels, and Tax Effort, 1996-2006



Source: Armenian authorities and own calculations.

Estimates of the potential tax-GDP ratio for 2005 and 2006 are based on assumptions of some independent variables, where their actual values are not yet available.

The estimated contribution of each variable in the baseline regression shows that of the potential tax revenues of approximately 20 ½ percent of GDP, urbanization contributes the most (about 11 percent of GDP), followed by the shadow economy (5 ½ percent of GDP) and quality of institutions (4 percent of GDP). The strong contribution of urbanization is consistent with a high demand for public services from roughly ⅔ of Armenians who live in urban areas as well as concentration of economic activities in the urban sector in Armenia.³⁷ However, its relatively sizable contribution as compared to actual collection of roughly 14½ percent of GDP also implies that little taxes are actually collected from the urban sector and related activities such as construction sector, which in Armenia is concentrated in and around the capital city.

While it is unlikely that policies will have much immediate impact on Armenia's disparity relative to other countries in terms of per capita income, share of urban population, or oil exports (i.e., some of the drivers behind the potential tax-to-GDP ratio), there are other factors that are very much in the policymaking realm. Specifically, policies aimed at improving governance and tax administration as well as enhancing the willingness to pay taxes will provide a much needed boost to Armenia's tax-to-GDP ratio. While, as suggested by the above regressions, tax collections could go up both directly (as a result of improvements in administration and tax coverage) and indirectly (through improvements in willingness to pay and reduction in shadow economic activity), improvements in governance and institutional quality lie at the heart of both channels.

If viewed through their impact on real activity and poverty reduction, policies and practices targeted at improving governance and the rule of law are likely to be much more powerful and have an impact going beyond that outlined above (see Rodrik, Subramanian, and Trebbi, 2002 and other articles in the burgeoning literature on the impact of institutions on economic activity). And as indicated earlier, while the efforts directed at improving tax policy and tax administration will help strengthen tax collection in Armenia, these are unlikely to result in the much-needed structural change if undertaken outside of a comprehensive package that also—and more importantly—targets improvements in the rule of law and institutional quality, and tax morale. Failure to aggressively reform 'societal' institutions governing the willingness to pay (or avoid) taxes and continued reliance on stand-alone and piecemeal administrative and policy changes (i.e., those without accompanying significant changes in institutions and governance) as in the past will not result in significant gains in tax collection in the future. These, however, are mostly in the domain of political will, which is outside of the scope of this paper.

IV. CONCLUSIONS

In sum, improving institutions—defined broadly to include institutional weaknesses in tax and customs administration as well as other economic aspects of governance—is a viable

³⁷ Armenia ranks the seventh highest country in the world in terms of percent of urban population living in the country's largest metropolitan area, the capital (World Development Indicators, 2006). The top six countries include city-states such as Singapore, Honk Kong, and Puerto Rico.

option available to Armenia's policymakers wishing to permanently enhance the economy's tax-generating capacity to meet the needs of the economy for infrastructure investments and social programs. As Bird, Martinez-Vazquez, and Torgler (2004) note, "while at first glance giving such advice to poor countries seeking to increase their tax ratios may not seem more helpful than telling them to find oil, it is presumably more feasible than to rearrange nature's bounty." We agree with this conclusion.

This paper documents Armenia's low tax-to-GDP ratio relative to a large number of benchmarks and shows that its persistently lower tax revenue buoyancy—particularly, income tax buoyancy—is a potential contributory factor. The tax-to-GDP ratio can also be increased significantly if Armenia improves its VAT productivity by broadening the base, removing exemptions, and improving its VAT refund mechanism to boost tax morale and reduce the willingness to stay in the informal, shadow economy.

The main contribution of the paper to the literature has been to extend the conventional determinants of tax potential to include measures of institutional quality and shadow economy in a panel data framework. The empirical analysis of the paper shows that Armenia's tax effort falls short of its potential by as much as 6½ percent of GDP and that improvements in institutions as well as policy measures designed to reduce the size of the shadow economy are important factors in boosting tax performance. While further work may be necessary to determine the exact channels of influence of institutions on tax collection and shadow economic activity—which presumably work through tax morale and cost of evasion—this paper helps document some of the above links and offers new clues for a more ambitious research agenda.

The recent legislative amendments in Armenia to tax the construction sector in 2007 and the agriculture sector in 2008 are steps in the right direction, but they also entail a stepped-up effort in improving the institutional working of the tax administration that is ultimately in charge of implementing the tax laws and collecting the stipulated tax receipts.

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Table 1. Armenia: Tax Revenues of Central Government
(In percent of GDP)

	1994	1996	1997	1998	1999	2000	2001	2002	2003	2004
Tax revenue	11.5	10.6	12.9	13.6	16.1	14.8	14.3	14.6	14.0	14.1
Value-added tax	2.7	3.3	4.9	6.2	6.9	6.5	6.7	7.0	6.6	6.2
Excises	0.4	1.7	2.3	2.0	2.2	2.5	2.6	2.6	2.4	2.1
Enterprise profits tax	5.7	2.5	2.0	1.3	2.2	2.0	1.3	1.3	1.1	1.7
Personal income tax	1.2	1.3	1.8	1.4	1.8	1.3	0.9	0.9	1.0	1.1
Land tax	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Customs duties	0.4	0.9	1.3	1.1	0.8	0.8	0.8	0.7	0.7	0.7
Other taxes	0.8	0.5	0.4	1.1	1.7	1.3	1.4	1.4	1.4	1.3
Presumptive Income Tax	...	0.1	0.1	0.4	0.5	0.4	0.4	0.5	0.5	0.6
Simplified Tax	...	...	...	...	...	0.0	0.2	0.3	0.3	0.4
Property tax	...	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Memorandum items:										
Direct taxes 1/	6.9	3.9	3.8	2.7	4.0	3.3	2.3	2.2	2.1	2.8
Indirect taxes	4.6	6.8	9.1	10.9	12.1	11.5	12.1	12.4	11.9	11.3

Source: Armenian Authorities; authors' calculations

1/ Consists of enterprise profit tax and personal income tax.

Table 2. CIS: Tax Revenue, 1998-2004 1/

	(In percent of GDP)									
	1998	1999	2000	2001	2002	2003	2004	1998-04	2000-04	
Armenia *	13.6	16.1	14.8	14.3	14.6	14.0	14.1	14.5	14.4	
Azerbaijan *	11.4	11.9	12.1	12.5	13.0	13.3	13.6	12.5	12.9	
Belarus	26.2	26.6	26.6	25.6	24.0	25.5	25.6	25.7	25.5	
Georgia *	12.8	12.1	12.2	12.5	12.7	12.2	15.4	12.9	13.0	
Kazakhstan	16.8	16.0	20.0	22.3	21.0	23.2	23.6	20.4	22.0	
Kyrgyz Republic *	14.7	12.3	11.7	12.4	13.9	14.2	14.9	13.4	13.4	
Moldova *	23.5	18.4	18.7	17.5	18.5	20.3	21.5	19.8	19.3	
Russia	24.4	24.1	27.4	27.8	27.1	26.3	28.2	26.5	27.4	
Tajikistan *	10.9	11.8	11.4	12.4	13.2	13.2	13.4	12.3	12.7	
Turkmenistan	13.5	13.3	17.9	18.3	14.4	13.4	14.5	15.0	15.7	
Ukraine	25.5	22.5	21.3	20.0	21.5	21.7	19.6	21.7	20.8	
Uzbekistan *	29.4	27.9	26.3	23.4	22.8	23.1	23.4	25.2	23.8	
Memorandum items:										
Arithmetic average										
CIS 12	18.5	17.7	18.4	18.3	18.1	18.4	19.0	18.3	18.4	
CIS 11	19.0	17.9	18.7	18.6	18.4	18.8	19.4	18.7	18.8	
CIS 7	16.6	15.8	15.3	15.0	15.5	15.8	16.6	15.8	15.7	
CIS 6	17.1	15.7	15.4	15.1	15.7	16.1	17.0	16.0	15.9	
Median										
CIS 12	15.7	16.1	18.3	17.9	16.6	17.3	17.5	17.4	17.5	
CIS 11	16.8	16.0	18.7	18.3	18.5	20.3	19.6	19.8	19.3	
CIS 7	13.6	12.3	12.2	12.5	13.9	14.0	14.9	13.4	13.4	
CIS 6	13.7	12.2	12.2	12.5	13.5	13.8	15.1	13.2	13.2	

Source: Country officials and authors' calculations.

1/ Excludes social security contributions. CIS 7 is marked by *. CIS 11 and CIS 6 exclude Armenia.

Table 3. Armenia: Structure of Central Government's Tax Revenues
(In percent of tax revenues)

	1994	1996	1997	1998	1999	2000	2001	2002	2003	2004
Tax revenue	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Value-added tax	23.5	30.6	38.0	45.9	43.0	43.7	46.5	47.8	47.4	44.2
Excises	3.9	16.1	18.0	14.9	13.7	17.2	18.4	17.8	17.2	15.2
Enterprise profits tax	49.6	23.8	15.5	9.4	13.5	13.3	9.3	8.8	7.7	12.0
Personal income tax	10.5	12.5	14.2	10.3	11.1	8.8	6.5	6.3	7.4	7.7
Land tax	1.9	2.8	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Customs duties	3.7	8.4	10.2	8.1	5.1	5.7	5.8	4.9	4.7	4.7
Other taxes	7.0	4.3	3.2	8.1	10.3	8.5	9.5	9.4	9.8	9.1
Presumptive Income Tax	...	0.7	0.6	3.0	3.1	2.6	2.6	3.2	3.5	4.4
Simplified Tax	...	...	...	...	...	0.1	1.2	1.8	2.2	2.7
Property tax	...	0.9	0.3	0.2	0.2	0.1	0.1	0.0	0.0	0.0
Memorandum items:										
Direct taxes 1/	60.1	36.3	29.7	19.8	24.6	22.1	15.9	15.1	15.1	19.7
Indirect taxes	39.9	63.7	70.3	80.2	75.4	77.9	84.1	84.9	84.9	80.3

Source: Armenian Authorities; authors' calculations..

1/ Consists of enterprise profit tax and personal income tax.

Table 4. CIS: Direct taxes, 1998-2004 1/
(In percent of tax revenues)

	1998	1999	2000	2001	2002	2003	2004	1998-04	2000-04
Armenia *	19.8	24.6	22.1	15.9	15.1	15.1	19.7	18.9	17.6
Azerbaijan *	38.2	36.6	38.7	31.9	32.7	34.6	39.2	36.0	35.4
Belarus	30.2	29.3	29.4	30.0	26.9	25.4	28.0	28.4	27.9
Georgia *	21.5	23.4	25.5	24.3	23.8	27.7	28.1	24.9	25.9
Kazakhstan	23.5	27.9	41.2	42.2	40.6	41.6	44.8	37.4	42.1
Kyrgyz Republic *	17.8	19.2	18.0	21.9	21.0	20.0	18.8	19.5	19.9
Moldova *	18.8	19.9	18.0	20.9	21.4	21.4	20.0	20.1	20.3
Russia	26.3	28.8	28.7	31.0	28.0	28.3	30.5	28.8	29.3
Tajikistan *	19.1	19.9	16.2	15.1	13.6	11.5	12.6	15.4	13.8
Turkmenistan	30.3	33.5	25.3	21.2	29.2	33.0	30.6	29.0	27.9
Ukraine	36.7	38.7	40.0	43.4	43.3	47.9	45.0	42.1	43.9
Uzbekistan *	33.3	31.9	28.8	32.8	32.1	29.4	29.0	31.1	30.4
Memorandum items:									
Arithmetic average									
CIS 12	26.28	27.81	27.67	27.54	27.30	28.00	28.86	27.64	27.87
CIS 11	26.87	28.10	28.18	28.60	28.42	29.17	29.69	28.43	28.81
CIS 7	24.05	25.08	23.92	23.26	22.81	22.82	23.92	23.69	23.34
CIS 6	24.77	25.16	24.22	24.49	24.10	24.10	24.63	24.50	24.31
Median									
CIS 12	24.93	28.34	27.10	27.14	27.45	28.00	28.55	28.62	27.90
CIS 11	26.32	28.80	28.67	29.98	28.01	28.32	28.98	28.81	27.93
CIS 7	19.77	23.35	22.10	21.86	21.42	21.37	20.01	20.06	20.35
CIS 6	20.28	21.65	21.78	23.08	22.61	24.53	24.07	22.48	23.12

Source: Country officials and authors' calculations.

1/ Excludes social security contributions. CIS 7 is marked by *. CIS 11 and CIS 6 exclude Armenia.

Table 5. CIS: Revenues from Direct taxes, 1998-2004 1/
(In percent of GDP)

	1998	1999	2000	2001	2002	2003	2004	1998-04	2000-04
Armenia *	2.7	4.0	3.3	2.3	2.2	2.1	2.8	2.8	2.5
Azerbaijan *	4.4	4.3	4.7	4.0	4.2	4.6	5.3	4.5	4.6
Belarus	7.9	7.8	7.8	7.7	6.4	6.5	7.2	7.3	7.1
Georgia *	2.7	2.8	3.1	3.0	3.0	3.4	4.3	3.2	3.4
Kazakhstan	4.0	4.5	8.3	9.4	8.5	9.6	10.6	7.8	9.3
Kyrgyz Republic *	2.6	2.4	2.1	2.7	2.9	2.8	2.8	2.6	2.7
Moldova *	4.4	3.7	3.4	3.7	4.0	4.3	4.3	4.0	3.9
Russia	6.4	6.9	7.9	8.6	7.6	7.4	8.6	7.6	8.0
Tajikistan *	2.1	2.3	1.8	1.9	1.8	1.5	1.7	1.9	1.7
Turkmenistan	4.1	4.5	4.5	3.9	4.2	4.4	4.4	4.3	4.3
Ukraine	9.3	8.7	8.5	8.7	9.3	10.4	8.8	9.1	9.1
Uzbekistan *	9.8	8.9	7.6	7.7	7.3	6.8	6.8	7.8	7.2
Memorandum items:									
Arithmetic average									
CIS 12	5.0	5.1	5.3	5.3	5.1	5.3	5.6	5.2	5.3
CIS 11	5.2	5.2	5.4	5.6	5.4	5.6	5.9	5.5	5.6
CIS 7	4.1	4.1	3.7	3.6	3.6	3.7	4.0	3.8	3.7
CIS 6	4.3	4.1	3.8	3.8	3.9	3.9	4.2	4.0	3.9
Median									
CIS 12	4.2	4.4	4.6	3.9	4.2	4.5	4.9	4.4	4.4
CIS 11	4.4	4.5	4.7	4.0	4.2	4.6	5.3	4.5	4.6
CIS 7	2.7	3.7	3.3	3.0	3.0	3.4	4.3	3.2	3.4
CIS 6	3.6	3.2	3.3	3.4	3.5	3.9	4.3	3.6	3.7

Source: Country officials and authors' calculations.

1/ Excludes social security contributions. CIS 7 is marked by *. CIS 11 and CIS 6 exclude Armenia.

Table 6. CIS: Revenues from VAT, 1998-2004 1/
(In percent of GDP)

	1998	1999	2000	2001	2002	2003	2004	1998-04	2000-04
Armenia *	6.2	6.9	6.5	6.7	7.0	6.6	6.2	6.6	6.6
Azerbaijan *	4.2	4.2	4.1	4.8	5.5	5.7	5.4	4.8	5.1
Belarus	8.8	8.7	9.0	8.4	8.3	7.9	7.7	8.4	8.3
Georgia *	4.4	4.4	4.8	5.4	5.6	4.5	6.3	5.0	5.3
Kazakhstan	...	4.4	4.4	4.9	4.7	5.0	4.4	4.6	4.7
Kyrgyz Republic *	5.8	4.6	4.6	5.7	6.4	6.6	7.3	5.8	6.1
Moldova *	12.3	7.6	8.4	7.9	9.0	10.1	10.7	9.4	9.2
Russia	6.4	5.9	6.3	7.2	7.0	6.7	6.4	6.5	6.7
Tajikistan *	1.9	2.3	2.5	3.4	4.8	5.1	5.7	3.7	4.3
Turkmenistan	5.1	5.1	6.7	6.2	5.4	5.2	5.6	5.6	5.8
Ukraine	7.3	6.4	5.6	5.1	6.0	4.7	4.3	5.6	5.1
Uzbekistan *	9.4	7.3	7.5	6.5	6.0	5.5	5.5	6.8	6.2
Memo:									
Arithmetic average									
CIS 12	6.5	5.7	5.8	6.0	6.3	6.1	6.3	6.1	6.1
CIS 11	6.6	5.5	5.8	6.0	6.2	6.1	6.3	6.0	6.1
CIS 7	6.3	5.3	5.5	5.8	6.3	6.3	6.7	6.0	6.1
CIS 6	6.3	5.1	5.3	5.6	6.2	6.3	6.8	5.9	6.0
Median									
CIS 12	6.2	5.5	5.9	6.0	6.0	5.6	5.9	5.7	5.9
CIS 11	6.1	5.1	5.6	5.7	6.0	5.5	5.7	5.6	5.8
CIS 7	5.8	4.6	4.8	5.7	6.0	5.7	6.2	5.8	6.1
CIS 6	5.1	4.5	4.7	5.5	5.8	5.6	6.0	5.4	5.7

Source: Country officials and authors' calculations.

1/ Excludes social security contributions. CIS 7 is marked by *. CIS 11 and CIS 6 exclude Armenia.

Table 7. CIS: Tax Revenue buoyancy, 1998-2004 1/

	Total taxes	VAT	Direct taxes	Nominal GDP growth
Armenia *	0.93	0.97	0.55	11.8
Azerbaijan *	1.19	1.39	1.15	15.0
Belarus	0.99	0.97	0.96	67.1
Georgia *	1.22	1.41	1.57	11.0
Kazakhstan	1.34	1.04	1.71	19.7
Kyrgyz Republic *	1.02	1.27	1.13	15.2
Moldova *	0.96	0.99	1.05	20.4
Russia	1.08	1.04	1.14	28.5
Tajikistan *	1.12	1.65	0.82	30.4
Turkmenistan	1.01	1.01	1.02	27.4
Ukraine	0.83	0.59	1.03	19.2
Uzbekistan *	0.88	0.76	0.84	36.6
Memorandum items:				
Arithmetic average				
CIS 12	1.05	1.09	1.08	25.2
CIS 11	1.06	1.10	1.13	26.4
CIS 7	1.05	1.21	1.02	20.1
CIS 6	1.07	1.25	1.09	18.6
Median				
CIS 12	1.02	1.03	1.04	20.1
CIS 11	1.02	1.04	1.05	20.4
CIS 7	1.02	1.27	1.05	15.2
CIS 6	1.07	1.33	1.09	17.2

Source: Country officials and authors' calculations..

1/ Excludes social security contributions. Each entry denotes elasticity of a revenue category with respect to nominal GDP. CIS 7 is marked by *. CIS 11 and CIS 6 exclude Armenia.

Table 8. Descriptive Statistics

	mean	St. Deviation	min	max	Source
<i>Tax-to-GDP (percent)</i>	15.7	7.7	0.1	50.0	IMF's Government Financial Statistics database; and various IMF staff reports.
<i>GDPPC ('000 USD)</i>	8.92	9.16	0.39	63.61	IMF's World Economic Outlook database
<i>COMPOSITE</i>	67.6	12.9	21.5	94.0	International Country Risk Guide (ICRG)
<i>BUREAUCRATIC</i>	2.3	1.2	0.0	7.0	International Country Risk Guide (ICRG)
<i>INF (percent)</i>	0.5	5.9	-0.97	237.6	IMF's World Economic Outlook database
<i>AGRIC (percent)</i>	16.7	14.1	0.1	63.8	World Bank's World Development Indicators database
<i>URBAN (percent)</i>	57.3	23.5	6.0	100.0	World Bank's World Development Indicators database
<i>TRADE (percent)</i>	81.2	50.6	0.4	416.7	IMF's World Economic Outlook database
<i>OIL (binary)</i>	0.2	0.4	0.0	1.0	World Bank's World Development Indicators database
<i>SHADOW (percent)</i>	29.9	14.6	6.7	69.8	Schneider (2005); Schneider and Savasan (2005); For Armenia also from Tunyan (2005)
<i>CORPTAX</i>	32.0	10.1	0.0	75.0	World Bank's World Development Indicators database
<i>REALGR</i>	.04	.30	-.66	12.96	IMF's World Economic Outlook database
<i>VIOLENCE (binary)</i>	0.1	0.3	0.0	1.0	Constructed based on the data compiled by Monty G. Marshall, Center for Systemic Peace http://members.aol.com/CSPmgm/warlist.htm

Table 9. Imputing a Proxy for Tax Morale
 Dependent Variable Shadow Economy as a percent of GDP

	OLS	Random Effects	Fixed Effects		
	(1)	(2)	(3)	(4)	(5)
<i>Time trend</i>	0.958 (8.46)***	0.718 (17.05)***	0.676 (15.59)***	0.783 (17.94)***	0.733 (18.13)***
<i>GDPPC</i>	-0.001 (10.38)***	-0.001 (12.27)***	-0.001 (10.85)***	-0.001 (12.76)***	-0.001 (12.12)***
<i>COMPOSITE</i>	-0.210 (2.92)***	-0.287 (2.25)***	-0.248 (1.94)*		-0.254 (2.12)**
<i>COMPOSITE-SQ</i>		0.003 (2.79)***	0.002 (2.59)**		0.002 (2.84)***
<i>BUREAUCRATIC</i>				-7.006 (4.57)***	
<i>BUREAUCRATIC-SQ</i>				1.249 (4.92)***	
<i>CORPTAX</i>	-0.135 (2.89)***	-0.055 (3.92)***	-0.052 (3.68)***	-0.059 (3.96)***	
<i>INF</i>	-0.805 (1.12)	-1.291 (8.44)***	-1.337 (8.78)***	-0.414 (8.82)***	-1.326 (8.98)***
<i>VIOLENCE</i>	1.556 (0.80)	0.415 (0.63)	0.256 (0.39)	1.432 (2.14)**	0.222 (0.37)
Latin America	2.816 (2.66)***	6.060 (2.26)**			
Asia Pacific	-4.488 (4.17)***	-3.155 (1.12)			
Middle East and Central Asia	-2.809 (2.08)**	-0.482 (0.16)			
Africa	2.445 (1.50)	5.484 (1.57)			
Low Income Countries	-0.227 (0.13)	6.699 (2.36)**			
Low Middle Income Countries	4.112 (3.29)***	9.026 (4.08)***			
Constant	47.644 (8.32)***	34.160 (6.83)***	34.931 (7.52)***	38.164 (17.60)***	33.381 (7.88)***
Observations	526	526	526	541	589
Number of countries	115	115	115	116	136
R-squared	0.72	0.68	0.65	0.68	0.65

Note: * implies significance at 10 percent; ** at 5 percent; *** at 1 percent confidence level. Absolute value of *t* statistics in parentheses.

Table 10. Baseline Regression Results
Dependent Variable: Total Tax Revenue as a percent of GDP

	Random Effects		Fixed Effects		
	(1)	(2)	(3)	(4)	(5)
<i>GDPPC</i>	0.00003 (1.31)	0.00003 (1.27)	0.00003 (1.25)	0.00003 (1.03)	0.00003 (1.01)
<i>COMPOSITE</i>	0.055 (4.57)***	0.058 (4.75)***	0.059 (4.85)***	0.056 (4.40)***	0.056 (4.41)***
<i>SHADOW-hat</i>	-0.090 (2.57)**	-0.148 (3.49)***	-0.150 (3.55)***	-0.148 (3.30)***	-0.149 (3.32)***
<i>INF</i>	-0.120 (2.34)**	-0.197 (3.28)***	-0.201 (3.34)***	-0.169 (2.30)**	-0.171 (2.32)**
<i>OIL</i>	-0.342 (0.35)	0.554 (0.50)	0.558 (0.50)	-1.232 (0.87)	-1.234 (0.87)
<i>AGRIC</i>	-0.012 (0.52)	0.001 (0.05)	0.007 (0.28)	0.001 (0.05)	0.002 (0.09)
<i>URBAN</i>	0.067 (2.27)**	0.158 (3.72)***	0.160 (3.78)***	0.174 (3.79)***	0.175 (3.81)***
<i>TRADE</i>	0.004 (0.87)	0.001 (0.17)	0.001 (0.23)	0.000 (0.05)	0.000 (0.03)
Armenia-1997			3.882 (2.12)**	3.744 (2.08)**	3.394 (1.75)*
Armenia-1999			1.907 (1.05)	2.106 (1.18)	2.466 (1.28)
<i>REALGR</i>				2.401 (3.02)***	2.389 (3.00)***
Armenia * <i>REALGR</i>					0.637 (0.50)
Latin America	-7.326 (4.01)***				
Asia Pacific	-5.038 (2.56)**				
Middle East and Central Asia	-8.858 (4.51)***				
Africa	0.152 (0.07)				
Low Income Countries	2.561 (1.18)				
Low-Middle Income Countries	3.770 (2.33)**				
Constant	12.99 (5.77)***	7.17 (3.53)***	6.91 (3.40)***	6.69 (3.06)***	6.62 (3.02)***
Observations	1132	1132	1132	1078	1078
Number of countries	118	118	118	118	118
R-squared	0.34	0.04	0.05	0.05	0.05

Note: * implies significance at 10 percent; ** at 5 percent; *** at 1 percent confidence level.
 Absolute value of *t* statistics in parentheses.

Table 11. Robustness Tests I
 Dependent Variable: Total Tax Revenue as a percent of GDP

	Robust SE	Corrected for AR(1)	without CORPTAX	Truncated Sample
	(1)	(2)	(3)	(4)
<i>GDPPC</i>	0.00003 (1.15)	0.00003 (0.58)	0.00002 (0.94)	0.00005 (1.37)
<i>COMPOSITE</i>	0.059 (4.09)***	0.059 (3.03)***	0.041 (3.93)***	0.046 (3.93)***
<i>SHADOW-hat</i>	-0.150 (2.92)***	-0.150 (1.59)		
<i>SHADOW-hat2</i>			-0.106 (2.75)***	-0.165 (3.75)***
<i>INF</i>	-0.201 (2.84)***	-0.201 (1.55)	-0.137 (2.48)**	-0.222 (3.56)***
<i>OIL</i>	0.558 (0.44)	0.558 (0.35)	0.670 (0.58)	3.328 (1.93)*
<i>AGRIC</i>	0.007 (0.21)	0.007 (0.12)	-0.003 (0.13)	0.013 (0.59)
<i>URBAN</i>	0.160 (3.75)***	0.160 (2.02)**	0.144 (3.51)***	0.150 (3.47)***
<i>TRADE</i>	0.001 (0.15)	0.001 (0.08)	0.007 (1.45)	0.017 (3.23)***
Armenia-1997	3.882 (8.49)***	3.882 (7.67)***	3.731 (1.96)*	4.045 (2.29)**
Armenia-1999	1.907 (5.68)***	1.907 (15.03)***	1.968 (1.04)	1.880 (1.07)
Constant	6.91 (3.15)***	6.91 (1.59)	7.55 (4.18)***	6.88 (3.72)***
Observations	1132	1132	1361	1044
Number of countries	118	118	141	119
R-squared	0.05	0.05	0.04	0.05

Note: * implies significance at 10 percent; ** at 5 percent; *** at 1 percent confidence level.
 Absolute value of *t* statistics in parentheses.

Table 12. Robustness Tests II
Dependent Variable: Total Tax Revenue as a percent of GDP

	OECD	LMC	LIC	EUR	LAC	APD	MCD	AFR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>GDPPC</i>	0.0001 (3.88)***	0.0011 (4.80)***	0.0002 (0.23)	0.0002 (5.43)***	0.0000 (0.22)	0.0000 (0.40)	0.0008 (3.37)***	0.00042 (1.21)
<i>COMPOSITE</i>	0.055 (1.43)	0.040 (2.29)**	0.051 (1.87)*	0.006 (0.22)	0.080 (4.31)***	0.060 (2.69)***	0.089 (3.51)***	0.055 (1.81)*
<i>SHADOW-hat</i>	-0.018 (0.20)	-0.222 (2.43)**	-0.186 (1.43)	-0.026 (0.37)	-0.255 (2.75)***	-0.094 (0.81)	-0.493 (5.05)***	0.019 (0.13)
<i>INF</i>	-1.735 (0.34)	-0.288 (2.33)**	-0.195 (1.06)	-0.042 (0.23)	-0.336 (2.72)***	1.177 (0.72)	-3.162 (2.73)***	0.080 (0.39)
<i>OIL</i>			-1.268 (0.69)			3.954 (2.79)***	-4.290 (2.97)***	
<i>AGRIC</i>	-0.047 (0.22)	0.028 (0.71)	0.000 (0.01)	0.125 (2.12)**	0.278 (4.02)***	0.260 (3.00)***	-0.158 (2.46)**	-0.012 (0.31)
<i>URBAN</i>	0.100 (1.66)*	0.133 (1.66)*	0.133 (1.02)	0.168 (2.75)***	0.546 (4.31)***	0.359 (3.50)***	0.126 (1.23)	-0.011 (0.08)
<i>TRADE</i>	-0.044 (3.64)***	0.004 (0.40)	0.048 (4.27)***	-0.061 (6.57)***	0.014 (1.52)	-0.048 (3.97)***	0.026 (1.89)*	0.061 (5.25)***
Armenia-1997		3.121 (1.99)**					2.143 (1.48)	
Armenia-1999		2.581 (1.69)*					2.232 (1.64)	
Constant	9.58 (1.37)	7.24 (2.19)**	10.13 (3.72)***	10.56 (2.26)**	-26.93 (3.71)***	-3.71 (0.75)	13.60 (2.93)***	8.70 (3.03)***
Observations	279	299	263	361	214	155	165	237
Number of countries	24	32	27	36	20	17	21	24
R-squared	0.14	0.2	0.11	0.17	0.23	0.24	0.34	0.18

Note: * implies significance at 10 percent; ** at 5 percent; *** at 1 percent confidence level. OECD—Organization for Economic Cooperation and Development, LMC—Low Middle Income countries, LIC—Low Income countries; EUR—Europe; LAC—Latin American and Caribbean; APD—Asia Pacific; MCD—Middle East and Central Asia; AFR—Africa. Absolute value of *t* statistics in parentheses.