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# Fiscal Architecture and the Analysis of Public Expenditure Needs and Revenue Capacity

Sally Wallace



Georgia State  
University

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Andrew Young  
School of Policy Studies



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International Studies Program  
Andrew Young School of Policy Studies  
Georgia State University  
Atlanta, Georgia 30303  
United States of America

Phone: (404) 651-1144  
Fax: (404) 651-3996  
Email: [ispaysps@gsu.edu](mailto:ispaysps@gsu.edu)  
Internet: <http://isp-aysps.gsu.edu>

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## Fiscal Architecture and the Analysis of Public Expenditure Needs and Revenue Capacity

### I. Introduction

Powerful economic, demographic, and institutional and technological changes are occurring throughout the world. The concentration of world population has moved from the developed to the developing economies, the distribution of income in most countries has become increasingly disparate, some developing countries are witnessing unprecedented increases in the percent of elderly—others in the young. The natural growth rate in population is 1.4 percent per year worldwide; but developing countries populations are growing much more quickly than the populations of developed countries (1.7 percent versus 0.1 percent<sup>1</sup>). According to population projections, the developing countries will increase their share of world population from 81.67 percent in 2000 to 86.2 percent in 2050.<sup>2</sup> These changes imply pressures for public expenditures that are different depending on the type of economic and demographic change occurring. At the same time, the capacity of traditional revenue sources is affected by similar factors. The current natural rate of population increase

These changes are largely beyond the control of any country, but they cannot be ignored in the development of any effective fiscal policy. Nor can the institutional factors that govern a country and the technological changes faced by all countries. These factors affect anti-poverty policy as well as more general fiscal policy. This is because, when taken together, these forces define the "fiscal architecture" of a poor country's expenditure needs and its revenue-producing potential. As such, they establish the framework for developing policies that make "fiscal sense" in defining a society's practical options for policy design and implementation. A simple example is as follows. A country in which property rights are not well established and will not be for a number of years would be ill-advised to count on a market-based property tax to generate stable revenues in the near future. The importance of recognizing these parameters and the opportunities they provide for (and the limitations they place on) policymakers has been magnified in the past decade, as the pace of globalization of markets for products and services has accelerated sharply. Understanding how the new trends may affect the rate of growth in revenue collections and change the composition of client populations may enable policy makers to redesign expenditure programs and revenue instruments to stabilize a country's long-term finances.

The challenge of the fiscal architecture analysis is to systematically identify (on a spending category-by-spending category basis and then, in parallel, on a revenue type-by-revenue type basis) the needs for public expenditures and revenue generating capacity of a country and/or region. This analysis largely focuses on the development of a methodology to determine the

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<sup>1</sup> Reported by the Population Reference Bureau (2001).

<sup>2</sup> United Nations (2001). These projections do include the offsetting effect of the impact of HIV/AIDS. In some countries, the presence of AIDS has lowered life expectancy by as much as 15 years (UN, 2001).

effect of these changes on “fiscal health”—the necessary expenditures based on needs of the population and the necessary revenue needed to comply with these needs.

In most countries, current budgeting practices do not incorporate specific socio-economic or demographic factors into expenditure nor revenue projections. In fact, there are many ways to do so, and the particular methods are based on available data as well as the policy concentrations of each individual government. It is also important to note that many of the trends that will be discussed in this module are long-term trends—changes that have begun and will continue over the next couple of decades. The impact of these changes on the fiscal structure of countries is also a long-term issue. For example, the aging of the population takes place slowly over time so we do not expect to see a dramatic change of the aging population on expenditures in any one year. However, if a government does not incorporate the increased population to be served by, say, pension payments, then the country could be faced with a growing crisis over time as pensioners are not cared for.

There is limited information currently available to help determine the appropriate government responses to the economic, demographic and institutional changes facing highly indebted poor countries (HIPCs). In some developed economies, there is an empirical literature dealing with the effect of economic and demographic variables and public finances. In HIPCs and other developing countries, there is little econometric analysis currently available to assist governments in determining the influence of these factors on public finances. In many cases there is also little historical data from which to establish precedents or develop parameters that define how the factors influence public finances. Cross country studies may give us some information regarding how these variables affect revenues and expenditures, but in many cases the circumstances of any one country is too specific to make cross-country studies useful.<sup>3</sup> The methodology suggested in this module is a “bottoms up” approach—meaning that we build up the components of revenues and expenditures from as detailed a base as possible.

The analysis follows the lines of a “policy matrix” which lists the underlying variables that influence revenues and expenditures and affect future policy choices aimed at meeting expenditure needs. Thus, for example, in the study of the demographic structure, this module will examine the relationship among factors such as the distribution of income, urban versus rural populations, age, gender, and even migration characteristics of a society and the need for different public services (e.g., literacy, programs, water and sewerage, safety nets for the aged). The goal of the module is to help policy makers understand the potential impact of the important economic, demographic and institutional changes on the ability of a government to finance public goods.

With respect to the economic structure, the study will analyze the nations’ economic base in terms of potential tax handles. The influence of these demographic and economic factors on both expenditures and revenues will be considered in identifying possible policy options for meeting expenditure needs within the context of a fixed budget constraint. Similarly the parameters of institutional realities (e.g., agricultural training, trade policies) and technologies (e.g., farming techniques, access to the new electronic commerce for exploiting the global

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<sup>3</sup> There are exceptions to this especially when tax bases or expenditure programs are very similar across countries.

marketplace) can affect which expenditures are likely to be demanded in the future and the taxes one can exploit.

This module is structured as follows. The next section presents an overview of the more important economic, demographic and institutional changes over the past 20 years that are identified in available data and country reports.

The third section identifies the structure for thinking about how countries should (or could) determine their expenditures and potential revenues. This section uses international experiences with these methods and summarizes their limitations and usefulness for highly indebted poor countries. The fourth section uses the summary of the third and is dedicated to a systematic presentation of the variables that influence revenue and expenditures across countries with a detailed discussion of data and alternative specifications of variables.<sup>4</sup> This section will include two detailed tables, one for expenditures by type and the other revenues by source, and a list of economic, demographic, institutional and technological factors that influence these expenditures and revenues. The aim is to provide some hierarchy of these variables in terms of most to least likely influence. In cases where empirical literature has reached a consensus on parameters, these parameter ranges will be included.

The final section of the paper summarizes the policy options available to the highly indebted poor countries for future fiscal health, given the constraints implied by their fiscal architecture and incorporating the data limitations of countries. The policy options are summarized in a fashion that takes account of the data constraints facing countries and the available data regarding the actual forecasted trends in the underlying economic, demographic and institutional factors.<sup>5</sup> This matrix is not finalized, but it gives an indication of the magnitude of the impacts of these changes on the fiscal base of a country and some policy options to deal with these pressures.

## II. Economic, Demographic, Institutional and Technological Trends

Worldwide, we constantly see significant changes in the level and composition of populations, the distribution of income and its composition, and the level of education and health. Countries around the world have also witnessed changes in their economic structure, trading partners, and technology. These demographic and economic changes hold obvious implications for public finances of countries.

Which trends hold the most significant implications for public finances in highly indebted nations? From a public finance perspective, there are certain variables that heavily influence the fiscal health of most all nations. The difference between highly indebted countries and the developed world are the trends of these variables and the relative magnitudes of the effects of

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<sup>4</sup> For example, the UNDP indicators will be discussed along with data available from the IMF, World Bank, and individual countries.

<sup>5</sup> The methodology and many of the examples included in this report focus on the effect of socio-economic, demographic, and institutional factors on the public finances of the central government. The methods, however, are generalizable and can be applied to analysis of subnational government finances as well. However, socio-economic and demographic data are typically harder to come by at the subnational level so that the level of detail of the analysis may not be as great as that for the central government level analysis.

certain variables on public finances. The core set of important factors and their influence on public finances are as follows. These factors should not be analyzed in isolation, rather they are an integrated set of issues, and in many cases, they influence one another.

### Demographic factors

Since public expenditures are typically some function of the client population, a very basic relationship between public expenditures and demographic factors is as follows:

$$\partial Exp_i = \partial(clientpopulation) \times \partial(productionexpense)$$

In this expression, the left hand side is the change in expenditure for a particular spending category,  $exp_i$ , and the right hand side of the equation contains the components of the change in expenditures. These are changes in the client population (elderly for retirement programs, school aged children for school expenditures, etc.) and changes in the costs of production associated with the cost of inputs (wages, materials, etc.). Demographic changes can influence both components of the expenditure calculation. For example, consider a change in the age distribution of the population. If a population is becoming increasingly elderly, this will increase the need for expenditures for retirement and health based expenditures. However, such a trend will also influence the direct cost of providing those services as labor shortages may also ensue.

A simplified expression for the relationship between public revenues and demographic and economic factors may also be expressed as follows:

$$\partial Rev_i = \partial(taxbase) \times \partial(taxrate)^6$$

In this case, the tax base is determined by the particular revenue source. For personal or individual income taxes, this would be some measure of taxable income, for consumption taxes, it would be a measure of consumption, etc. Economic and demographic changes will directly influence these tax bases. In the case of a consumption-based revenue source, the level of population will affect the total potentially taxable consumption and the age distribution of the population will affect the type of consumption made. Traditionally, a more elderly population consumes a different type of market basket of goods than does a younger population. The breadth of a country's tax base will determine how much revenues will fluctuate as a result of these demographic changes. The tax rate, while exogenous to these demographic and economic changes, is a policy variable that can be used to compensate for changes in the tax base. For example, we can decompose the relationship between the percent change in individual income tax revenues (*ITR*) and personal income (*income*) as follows (referred to as the elasticity of revenue with respect to income):<sup>7</sup>

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<sup>6</sup> This assumes a given (constant) level of enforcement effort.

<sup>7</sup> A similar decomposition could be done for other revenue sources as well. In each case, the second term on the right hand side is based on the difference between the taxable base and the overall level of economic activity. In general, the larger the difference between these, the less impact a general change in economic activity will have on the tax base.

$$(\% \Delta ITR) / (\% \Delta Income) = (\% \Delta ITR / \% \Delta taxable\ income) * (\% \Delta taxable\ income / \% \Delta income)$$

On the right hand side of this expression, the first term is referred to as the “rate elasticity” and the second term is the “base elasticity.” This expression demonstrates that public finances are a function of both economic and demographic changes (since they directly affect taxable income in this example), and institutional factors (since they affect the divergence between economic activity measured as “income” and taxable activity measured here as “taxable income”). If demographic patterns are such that the tax base for the individual income tax is shrinking (if there are proportionately less working age individuals in the population), we would project a decline in revenues from the individual income tax. To maintain constant revenues in light of these demographic changes, the tax rate itself could be increased to make up for the reduced tax base. Such a policy change is not without cost, but this example simply shows the trade-offs available to policy makers.

In the remainder of this section, we discuss specific economic and demographic factors and their potential impacts on public finances. As noted later, the impact of these factors will vary by country, due to the specific circumstances of each country, the type and level of public goods provision, and the type and level of revenues.

**Population.** Population projections suggest that the developing world will continue to see the largest growth in population through the next half-century (Box 1). In each country, the level and change in the population directly implies fiscal pressures (or relaxation) associated with public goods demands of the population. Economies of scale aside, if a country wishes to maintain a given level of services, a large and growing population requires a higher level of public expenditure, which may or may not be commensurate with an expanded revenue base. Population growth by itself does not imply any direct revenue related impacts, but the distribution of population growth (by age distribution, labor force, and physical location) does have implications for revenues. These issues will be discussed below.

Box 1  
Estimated Growth Rate of Population

The United Nations Development Program produces a variety of statistics for specific countries. In their *Human Development Report*, they provide forecasts of some important economic and demographic trends. As discussed in that report, the worldwide trend is for a decrease in the average annual growth rate of the population. However, the developing countries and the least developed countries are projected to have the highest annual percent growth in population for the period 1995-2015—1.48 and 2.41 respectively. These estimates are down from 2.1 and 2.6 respectively for the years 1970-1995.

There is a significant amount of variation in population growth among countries, as seen by the following figures:

Country	Average Annual Growth Rate 1970-1995 (%)	Average Annual Growth Rate 1995-2015 (%)
Bangladesh	2.32	1.61
Bolivia	2.29	2.09
Ethiopia	2.73	3.09
Ghana	2.84	2.67
Guatemala	2.86	2.6
Honduras	3.17	2.38
Kenya	3.5	2.35
Nicaragua	2.83	2.3
Tanzania	3.19	2.57
Zambia	2.66	2.48

Source: UNDP, 2000, see site: <http://www.undp.org/hdro/population.htm>

A set of underlying factors associated with population growth or decline is also important. These factors include the composition of migration: are migrants national (rural/poor) or international? National migrants may or may not be of the same ethnic/linguistic group as that of the native urban residents. International migrants usually belong to a different group. These groups may need/want services in their language and/or may face discrimination/segregation. The reaction may bring about social tensions, leading to an increased demand for policing services in addition to direct increases in demands for particular services.

Also, the pattern of out migration is important as it could result in a different mix of native individuals with a different concentration of needs and demands and taxpaying capacity. The reaction may bring about social tensions, leading to an increased demand for policing services in addition to direct increases in demands for particular services. The U.N. projects that international migration will continue to be an important demographic trend in the 21<sup>st</sup> century.

According to the UN, developed regions will gain about 2 million people per year over the next 50 years (UN, 2001).<sup>8</sup>

The implications of international migrants are difficult to quantify as they tend to develop over time and are based on a critical mass of migrants.<sup>9</sup> Extreme cases, such as immigration due to a natural disaster, civil war, etc. are not predictable and so would not enter into an analysis of revenue nor expenditure forecasting. Lessons regarding these types of shocks should be taken from past experience and plans for uses of budget surplus and international aid could be put into place.

If population growth (or decline) comes largely from increases in domestic population, another set of forces comes into play. Domestic population growth is a function of life expectancy and fertility rates. Depending on the specific driving force in increased or decreased population growth, the country should expect different sets of fiscal pressure; more children, more educational expenditures, more elderly, more health-related expenditures. These issues will be discussed in more detail in the section on age distribution.

Urban/rural mix: A long standing issue in low income countries is the migration from rural to urban areas as individuals seek out a better standard of living. The combination of differentially growing urban and rural areas is that there will be changes in the demand for the mix in the type of housing, education services, transportation services, and health services as city living can give rise to different health problems than rural areas. Also, the delivery of services will be influenced by the concentration of population in the country. As noted by Bahl and Linn (1992), migrants often settle in areas where land is cheap and services are lacking. The migrants eventually pressure the government (often by basic humanitarian need) to service these difficult to reach outskirts of the cities.

Economies of scale may mitigate the increased expenditure pressure associated with the move to cities, but this depends on the level and growth of the migration. Evidence suggests that the general increased demand for relatively expensive services and infrastructure will be greater than reduced costs associated with the economies of scale arguments. While some of these expenditure issues are local government issues, they will also involve the central government due to the nature of demands for basic services and the sheer magnitude of the urban population in various countries.

The move to cities also influences the potential tax base as many migrants to the city seek out employment opportunities that may be in the formal sector. Bahl and Linn (1992) note that while tax capacity may be increased by this movement of people, the central government may not be well positioned to capture the increased capacity. This is due to the nature of the tax capacity expansion that is more likely in the form of indirect taxes versus income taxes. Local

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<sup>8</sup> The UN, *World Population Prospects The 2000 Revision* summarizes these and other population related statistics and forecasts. The highlights of the report are available at: <http://www.un.org/esa/population/wpp2000h.pdf>

<sup>9</sup> Most countries keep migration statistics in their statistics or customs divisions. Examples of some available data can be found at: [http://www.ilo.org/public/english/protection/migrant/ilmdb/links.htm#NATIONAL\\_MIGRATION\\_AUTHORITIES](http://www.ilo.org/public/english/protection/migrant/ilmdb/links.htm#NATIONAL_MIGRATION_AUTHORITIES)

governments are often in a better position to reach these indirect tax handles than is the central government. Therefore, increases in the GDP associated with movement to the cities may not yield a commensurate increase in taxable income for the central government—at least not without significant investment (or reinvestment) in tax administration.

The U.N. Population Division reports that urbanization will continue into the 21<sup>st</sup> century. Between 2000-2005, the average annual rate of growth in urban populations in less developed nations is 2.7 percent and for rural populations it is 0.6 percent. The same projections for the least developed nations are 4.5 percent and 1.6 percent respectively. While these statistics imply slower growth in urbanization than found in the last two decades, the continued difference in population growth rates between urban and rural areas will continue to force governments to respond to changes in demands of these two potentially very different populations within one country. Also, there are outliers in these statistics—countries for which we anticipate huge percentage increases in the size of central cities. Some examples include Tegucigalpa in Honduras with a projected increase in population of over 100 percent from 1995 to 2015; Bamako in Mali with a projected increase of over 144 percent for the same period; and Kampala, Uganda with an increase of 167 percent for the same period (UNDP, *Human Development Report*, 2001).

Age distribution: The developed countries around the world are grappling with the consequences of an aging population. Interestingly, some poor countries are faced with a growing concentration of elderly while others are not. Currently, one out of every ten people are 60 years old or older, by 2050, this will be one out of every five people (UN, Population Division, Department of Economic and Social Affairs, 2001). This distribution is quite different between developed and developing countries. In developed countries, the graying of the population is well underway while the aging of populations in many developing countries is a relatively new phenomenon. However, the pace of aging is now greater in the developing countries.<sup>10</sup> For 1995-2000, the average life expectancy at birth in the less developed regions was 62.9 (50.3 for the least developed nations); by 2045 it is expected to reach 75 years of age (69.7 for the least developed nations). This is an increase of 19 percent for all developing nations and 38 percent for the least developed nations. By contrast, the growth in life expectancy for the developed regions is 9.2 percent over the same long-range forecast (U.N. Population Division, 2001). Over the next 50 years, the median age of individuals in the least developed countries will grow by 45 percent (from 18.2 years of age in 2000 to 26.5 years of age in 2050). The developed regions median age will grow by 24 percent.

An aging population can have varied consequences on the public finances of a country. First, if aging is the result, in part, of a higher life expectancy, then this will increase the number of housing units required in a given urban area and often urban sprawl as older people remain in oversized, older, and close to the center of the city, housing units. Second, whatever the cause of an aging population, it requires a different mix of public services (more adapted housing and social services, less education) and a slow down of the provision of other services (transit, etc.). Third, an aging population receives a greater part of its income as pensions rather than salaries,

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<sup>10</sup> For a summary on the aging of the population worldwide, see U.N. Population Division, Department of Economic and Social Affairs, 2001: <http://www.un.org/esa/population/wpp2000h.pdf>

while its overall income is lower. This will reduce the yield from wage/income taxes to support general public services and government pension systems. The elderly may also be afforded special exemption treatment for the property tax, which would put more pressure on the finances of the urban areas than of the rural areas.<sup>11</sup> Finally, an aging population may consume less of taxable goods and more of untaxed goods (staples sold in the underground economy) and services (medication, health care). The information in Box 2 presents a specific example of the case of government pensions and the pressure of a growing elderly population on this expenditure. A spreadsheet file, depratio.xls (also presented as Appendix A) provides an example of the calculation of the dependency ratio for a number of countries. As noted there, countries like Ecuador and Nicaragua should expect significant pressure associated with an increase in the dependency ratio of over 50 percent from 2000-2025 while Zambia and Ethiopia could expect some relief as their dependency ratios are projected to decrease over the same period (according to the population projections used).

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<sup>11</sup> In many countries, land is passed on from one family member to the next. Rural land is more likely to be passed on than urban housing (apartments, etc.). The taxation of land and other property in rural areas would be relatively unaffected while the urban housing would see a reduced capacity over time if the elderly continued to live in their homes as they aged and if the government afforded the elderly a property tax break.

Box 2  
Government Pensions and Growth in the Elderly Population  
Source of Potential Fiscal Pressure

In many countries, government pensions for elderly are financed from payroll taxes on the working population.<sup>12</sup> A system that breaks even or develops a surplus on an annual basis will see total payroll tax revenues equal to the total benefit payout:

$$P_b * B = t * P_w * w$$

Where  $P_b$  is the number of pensioners,  $B$  is the benefit per pensioner,  $t$  is the payroll tax rate,  $P_w$  is the number of workers and  $w$  is the average wage per worker. This relationship can be rearranged to state:

$$t = (P_b/P_w) * (B/w)$$

The first term on the right hand side of the equation is the dependency ratio—the ratio of working population to pensioners. The second term is the replacement ratio—the ratio of average benefits paid to wages that supply the financing for the pension system.<sup>13</sup> As the number of beneficiaries grows relative to the number of laborers, the dependency ratio grows and if a system does not have adequate reserves, there will not be enough payroll tax revenue to support the increased benefits liability. If wages grow faster than benefits, some of the impact of the dependency ratio may be offset. If wages and benefits grow proportionately, the government would eventually have to increase payroll tax rates to maintain a given level of real benefits in the face of increasing elderly population.

If we assume that two countries start with a pension system that is not in deficit nor in surplus, we can see how much fiscal pressure the number of beneficiaries places on the available labor force. Take the cases of Guatemala and Ethiopia. The U.S. Census, International Data Base provides information on the distribution of the population by age for individual countries and forecasts of this distribution.<sup>14</sup> If we assume an average wage that increases as the same percentage as pension benefits and full labor force participation, the dependency ratios for each country change from 2000 to 2025.

For Guatemala, the population estimates result in a dependency ratio in 2000 of 12.9 (pensioners to workers) and in 2025, 15.3.<sup>15</sup> This means that to keep an annual balance in the pension fund, payroll taxes would have to increase by 1.9 times the replacement ratio. In Ethiopia, the trend is projected to be quite different with a dependency ratio in 2000 of 11.7 and a ratio in 2025 of 9.9. This reverse trend in Ethiopia is largely a result of the smaller gains in life expectancy in that country. If wages grew faster than benefits, some of the change in the dependency ratio would be offset by a higher replacement ratio.

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<sup>12</sup> There are exceptions to this pay as you go financing of pensions. Chile and Argentina, among others, have instituted a partially privatized pension system. In cases of privatized pensions or fully funded pensions, the

In countries that are experiencing a surge in the percentage of younger people the fiscal pressures will also be present, but will reflect increased demand for housing, education, and preventative types of health care. Depending on where the age “bubble” exists, the impact on revenue could be quite varied. Younger families tend to spend more money on food and housing (largely non-taxed commodities), and add less in income taxes. If the age distribution change is occurring due to increases in the active labor force, we expect to see an increased demand for services, transportation, and other goods (which are more likely to be taxed if not provided publicly).

Education expenditures are an important case to consider in the context of changes in the fiscal architecture of a country. In many countries, education expenditures are set, theoretically, based on the needs of a client population and the costs of provision—the number of school aged children and the costs of labor, for example. In practice, there is evidence that many countries use more of an incremental approach to forecasting education expenditures (this is true with other expenditures as well). The increment could be based on general inflation or the perceived price increases associated with educational expenditures. The result is that standards are not maintained, physical infrastructure is kept in some places that is it not needed, while it is not supported in others.<sup>16</sup> If education expenditures were based on some sort of minimum standard or minimum requirement, expenditures would be more closely related to the client population—school children.

One example of the calculation of minimum foundations (also known as minimum standards or basic standards) is based on a school financing formula in the state of Georgia, USA. This example has immediate relevance as it demonstrates the potential impacts of demographic and institutional variables on the necessary level of expenditures for an important class of public goods.

Consider the following minimum standards formula for educational expenditures:

$$\text{Expenditure need} = \sum_{i=1}^n (\text{CFTE}_i * \alpha_i) * \text{Pop}_i$$

In this formulation,  $I=1, \dots, n$  programs (kindergarten, 1-6, high school, special education, vocational programs, etc.), CFTE is the cost per full time equivalent student, pop is the

individual theoretically saves for their own retirement thus reducing the government exposure to an increase in the aged population. However, in many countries that use a privatization scheme for pensions, there is a public pension component as well.

<sup>13</sup> This formulation follows that found in Rosen (1999).

<sup>14</sup> This database also contains population pyramids—graphs of the distribution of population by age. These graphs are very good summaries of the age related pressures facing countries around the world. See: <http://www.census.gov/ftp/pub/ipc/www/idbpyr.html>

<sup>15</sup> The actual ratios would be higher since not all eligible labor actually enters the tax-paying labor force. If the distribution of labor force participation remained constant, the percentage change in the dependency ratios would be equivalent to those presented here.

<sup>16</sup> Specific examples of the problems with this type of budgeting in the countries of the former Soviet Union are found in Martinez-Vazquez and Boex (2000), Bahl et. al. (1999), and Martinez-Vazquez and McNab (1999). In many regions of the Russian Federation, this incremental budgeting approach continues to be used.

population in the specific program, and  $\alpha$  is the weight assigned each individual program. The weights are determined by policy and special needs typically receive a higher weight. The CFTE is a function of a number of specific inputs:

- Staff salaries/FTE
- Operations expenses/FTE<sup>17</sup>
- School administration expenses/FTE
- Staff development expenses/FTE
- Facility operation expenses/FTE

Each of these expenses is estimated based on an analysis of the operations of various schools. A review of the schedule of expenses is done on a regular basis and costs are adjusted accordingly. If this type of minimum standards were done at the national level, the costs would reflect adjustments for differences in the price levels in regions of the country.<sup>18</sup>

The formula can be an important indicator of the impact of changing age demographics on the basic education needs of the population. The change in expenditure need for a percent change in the school-aged population (by program) is the weighted value of the CFTE. A country that is experiencing growth in the school-aged population will see increased expenditure pressure. Since the CFTE will vary depending on the type of school program, the distribution of age within the school-aged subset will also be very important. The case example found in the attached spreadsheet file, edexp.xls (also copied as Appendix B), demonstrates the implications of different age distributions on the minimum expenditure needs of a population. In that example, the age distribution for four countries is shown, and assuming that education programs for younger children require expenditure equal to 1.25 that of older children, we see that for Guatemala, under the assumptions presented, the minimum education expenditures could increase by over 50 percent over the next twenty five years. In Kenya, we actually see a decrease in the minimum needs (given the assumptions) due to the decline in the number of children in the country. Since education is a major expenditure category in all countries, these examples demonstrate the magnitude of the pressure on basic provision of services. This spreadsheet can be used for any country by plugging in the appropriate age distribution forecast.<sup>19</sup>

Determining expenditures based on this type of minimum foundations incorporates the effects of the demographic trends related to the school aged population. If the population changes due to an increase or decrease in school aged children, the expenditure estimate will immediately reflect the forecasted change in age distribution. If the intention of the government is to offer some basic level of services, this disaggregate approach increases the transparency of the forecasted level of expenditure. If the level of public expenditures is determined in an ad hoc or incremental fashion, the pressure associated with the economic and demographic changes may not be immediately evident to the policy makers in a particular country.

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<sup>17</sup> These include instructional costs such as materials, travel, and classroom equipment.

<sup>18</sup> This expenditure needs formulation is for operating expenses. Capital needs would be analyzed and budgeted separately and are a function of the population to be served as well as the state of current infrastructure.

<sup>19</sup> An internet link is provided to one source of forecast at the U.S. Bureau of the Census.

A number of countries employ this sort of minimum standards to public expenditures with significant externalities for the economy. In India, the Finance Commission determines the level of intergovernmental grants from the central government to states based in part on minimum standards for education and other large-scale programs. Every five years, the distribution formula may be adjusted for changes in expected needs to meet the minimum standards.

Box 3  
Incremental Budgeting in Practice

In Leningrad Oblast, Russian Federation, the regional government establishes a minimum expenditure budget for the municipalities. The minimum expenditures for education are theoretically based on needs determined as a function of the number of school aged children as well as the cost of existing infrastructure in each municipality. A very complicated formula is used to calculate standard expenditures per student and these expenditure “norms” are used as a weight the average regional per capita expenditure for education in the previous year. Year by year, if the actual expenditures do not reflect the standard expenditures per student, the correspondance between needs and projected expenditures can be lost. Additionally, the government treats the expenditure needs for existing infrastructure as part of the standard expenditures. There is no evidence of a systematic analysis of infrastructure needs. The incentives regarding infrastructure become perverse—officials are encouraged to keep old and underutilized infrastructure on board as they are compensated via the minimum expenditure forecasts.

The U.N. Population Division projects that the least developed countries will see a growth in the population aged 0-14 by 1.26 percent per year; for the group 15-59, 2.38 percent per year, and for those over 60, 3.37 percent per year from 2000-2050. These figures suggest that the HIPC's will experience the highest growth in overall population and will see pressures from all age categories, but the growth of the elderly will be the most dominant trend for the group of countries as a whole.

Family size and composition: The number of family members in a household and the composition (dual or single wage earner, dual or single care giver) are also important factors for the overall fiscal health of a country. While directly related to the overall population and the age distribution issues discussed above, the average size of a family has its own implications for consumption and possibly income tax bases. Larger families consume more of certain goods such as basic foodstuffs, but not necessarily more on a per capita basis. Economies of scale can influence household consumption and larger (smaller) families could be equated to smaller (larger) levels of per capita consumption. This in turn could influence the overall level of consumption tax growth. Additionally, families with dual caregivers can potentially afford to split production between household production and market production. On a per capita basis,

more dual caregiver families could give rise to less market labor on a per capita basis.<sup>20</sup> Single caregiver families imply their own pressures such as an increased demand for childcare.

Fertility is one measure that influences the size of families. Fertility in the HIPCs and other developing countries has historically been higher than that for developed countries. According to UN projections, the fertility of the least developed nations is expected average 2.51 children per woman in 2045-2050; down from 5.47 for 1995-2000. While a significant reduction in fertility is expected, the fertility rate for the least developed countries is significantly higher than that of other regions in the world (U.N. Population Division, 2001).

Health and education. The overall level of health and education in a country is certainly a factor in the distribution of the population, income and employment. From this perspective, these trends will show up in data on income distribution, labor supply, overall population growth, etc. Taken alone, however, we can identify trends in health and education that require significant public expenditure and may impinge on revenue potential. One of the most important trends in this arena is the level and growth of HIV/AIDS cases in a number of countries. The population projections presented above incorporate the effects of the HIV/AIDS epidemic in some countries. The U.N. Population Division reports that in many of the countries with the highest percentage of population AIDS deaths projected, the population is expected to continue to grow due to high fertility rates. The U.N. projects that the population of Botswana would be 43 percent higher without HIV/AIDS; South Africa would be 39 percent higher; and Swaziland would be 38 percent higher.

The indirect influence of percent of the population infected with HIV/AIDS should come through the statistics on labor supply, population, life expectancy, etc. The direct budgetary impacts of increased health care demands and increased demand for the care of those infected and sick as well as the care of orphan children and elderly parents is not included in the aggregate statistics. The level of expenditure forecasted for these direct effects is both a function of the policy decisions of individual countries as well as the technology and medicines available within individual countries. The direct effects also include public expenditures made for educational programs aimed at stemming the spread of AIDS.

The revenue effects of the AIDS epidemic are also significant, but should be contained within other economic aggregates such as labor supply and family composition and the distribution of income and earnings.

How do other health and education variables affect the fiscal underpinnings of a country? If we looked at statistics such as infant mortality, nutrition of children, and percent of children with access to schools, we would find that most countries have made gains in these areas over the last

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<sup>20</sup> As previously noted, many of the trends that are discussed are endogenous to the entire macroeconomic system. If the government is producing a macroeconomic forecast of major economic aggregates such as labor supply, GDP, consumption, etc., they should be considering these effects. If, for example, there are larger families, then, all else equal, there would be less increase in consumption associated with a given population increase. The composition of the family may also imply a change in the distribution of income, etc. In many countries, the macroeconomic forecast itself does not sufficiently account for these economic, demographic and institutional changes. For purposes of this module, it is important to highlight those factors that may be incorporated into other macroeconomic variables so that there is no doubling weighting of these factors.

decade. The benefits of many of these human capital investments find their way to the revenue side of the budget via increased earnings potential. Long-term forecasts of GDP and personal income would incorporate the returns to these human capital investments. Long-term demographic forecasts will incorporate these investments in higher life expectancy and changes in the age distribution of the population and the need for future health care (which might be less intense, but could be demanded for an increased number of years).

In the short-run, as the government raises the bar for basic public expenditures including human capital expenditures for education and health, there is pressure on the expenditure side of the budget to continue to support at least a minimum level of these expenditures. The actual affect of trends of increased human capital investment on the budget largely a policy decision regarding maintenance or expansion of public services to enhance health and education outcomes.

### Economic factors

The structure of industry and output.<sup>21</sup> A country's revenue base is largely determined by the structure of industry and the output produced and the composition of employment that goes along with production. Property taxes make more sense as a sustainable revenue source for non-service oriented economies; value added taxes may be more or less important depending on the importance of export in a country's economy. At the same time, industry structure and output have direct implications for expenditures, both short and long term. A country that is heavily invested in dying industries will need to consider expenditures aimed at retraining, and decommissioning of various parts of the country's infrastructure.

Among low-income countries, the World Bank reports that agriculture as a percent of GDP has fallen from 26.4 percent of GDP in 1995 to 25.8 percent in 1999. The longer term trend is more dramatic as the agricultural value added as a percent of GDP has fallen across low-income countries from 43 percent in 1970 to 26 percent in 1999.<sup>22</sup> The sector with the largest gain is in the service sector, which has increased from 42.3 percent of GDP in 1995 to 43.8 percent in 1999. There is some expectation that the general growth in the service sector will continue, although there is quite a bit of variation among countries. These estimates typically control for exports, which provide good tax handles. In countries where agricultural exports are important, it is the impact of domestic agricultural production that is captured in the regression estimates.

While the level of employment and overall output is an important determinant of revenue, the changing structure of industry and output may have a significant impact on property taxes and on taxes paid by businesses. An expanding service sector could reduce tax handles in a country due to the less physical nature of production. Service sector increases usually come from small businesses, self-employed and underground activities—all hard-to-tax. A simple correlation between the ratio of taxes to GDP and the growth in service value added shows that as services grow in importance, there is a decrease in taxes as a percent of GDP.<sup>23</sup>

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<sup>21</sup> This will also encompass the distribution of employment among industries.

<sup>22</sup> Employment in agriculture has also fallen as a percent of the labor force, although not as dramatically as the decline in value added. For more information see: [http://www.worldbank.org/data/wdi2001/pdfs/tab1\\_5.pdf](http://www.worldbank.org/data/wdi2001/pdfs/tab1_5.pdf)

<sup>23</sup> The attached files, industry.xls and ind.sas contain data and a SAS file for estimating this coefficient.

Specific taxes will be influenced by the sectoral shifts in the economy. Typically, the service sector is less heavily invested in tangible property and capital, which can cause a reduction in the amount of equipment and machinery subject to property tax. Although the property tax is a small revenue source in most HIPCs, its' potential as a more important revenue source could be affected by this issue. There is some evidence in the developed countries that capital per employee is greater in the manufacturing versus service sector (this is has not been tested for the agricultural sector). In the U.S. the ratio of capital to employee has grown over time, faster than the reduction in manufacturing base in the U.S. (Wallace, 1996) thus offsetting the potential reduction in property tax revenues due to a decline in manufacturing. If the industrial sector in developing countries were not becoming more capital intensive, there is reason to suspect the viability of long-term growth in property tax bases with the shift from manufacturing to services.

Property taxes are often levied on inventories as well as fixed capital. Service oriented businesses tend to have hold less inventory and therefore would further reduce the long-term elasticity of a property tax. The VAT base could be also be affected by the sectoral shift in production. Again, if the manufacturing sector is more capital intensive and the VAT is a consumption-based VAT, then less capital expenditures could actually increase the VAT base.

One of the primary divisions of output production is the difference between the agricultural and non-agricultural sectors. In many developing countries, a heavy concentration on agriculture corresponds to reduced tax handles and a reduced level of public services (Tanzi). This is borne out by empirical evidence that shows that taxes as a percentage of GDP are significantly lower for countries with a higher concentration of agriculture. The caveat to using existing estimates of the relationship between taxes as a percent of GDP and the share of agricultural output to GDP is that countries may become more (or less) efficient in taxing agricultural output over time. Tanzi's study uses 1988 data and determines that a one percentage point increase in agriculture to GDP results in a decrease in total taxes to GDP by 0.12 percentage points.<sup>24</sup> Countries that continue to rely heavily on agriculture may not see a natural growth in revenue potential, but this could be partially offset by fewer expenditure pressures as well. However, if agriculture is aimed at increasing the export share of GDP, this could be a drain on the tax base as agricultural exports in many countries are exempt from the VAT, an important revenue source.

International experience with other economic sectors show that mining is a good tax handle in that it is positively related to taxes as a percent of GDP as are exports. These findings have been robust to various specifications, years of data and countries (Bahl, Kim, and Park, 1986, Bahl, Martinez, and Wallace, 1995). Finally, exports are positively correlated with per capita revenues as they represent a significant tax handle.

The composition of output will impact externalities linked to production and therefore public expenditures. Primary activities are more affected by international prices for resources than tertiary ones thus making for more volatile revenues. Primary and secondary industries pollute more than tertiary ones (air/water) and often use more publicly provided services, such as water/sewer and transportation (roads).

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<sup>24</sup> This specification is linear and the resulting parameter estimate will not necessarily be accurate for large percentage point changes from the mean. Other studies also find a negative relationship between the concentration of agriculture in the economy and taxes as a percent of GDP.

Distribution and composition of income. The greater the importance of self-employment, the more difficult it is to tax labor income, since tax laws make it easier to hide self-employment income than wage income (tax avoidance), while self-employment more easily accesses the informal untaxed economy (tax evasion) than wage employment. In the same vein, an increase in real income or in marginal tax rates may tilt the compositions of labor income towards fringe benefits, which may not be included in the local income tax bases. Another difficult to tax option is home employment. The trends in this distribution will impact the relative revenue alternatives of a country and hold implications for expenditures on tax enforcement. The treatment of foreign employment and the level of foreign employment is another consideration.

The actual composition of income is important to the revenue base of any country.<sup>25</sup> Very broadly, as the composition of total personal income tilts toward the lesser-taxed components of income, the revenue base is eroded. In most countries, transfer payments (subsidies, pensions, food reimbursements), are not taxed. A country that is witnessing an increasing share of personal income in these types of income will be faced with increasing fiscal pressure due to the tax base erosion.

In many countries, data on the composition of income are difficult to obtain. The World Bank publishes information on the distribution of government expenditures. While it is a leap, the level and growth in social service expenditures may be an indication of the importance of transfer payments in the economy. These data indicate a general increase in these expenditures around the world. If this is an indication of an increased concentration of transfer payments relative to overall personal income, then this could again signal stress on the finances of a particular country.

The distribution of income will itself have implications for expenditures and revenues. On the expenditure side, a growing poor population can trigger higher social expenditures in countries that have non-discretionary rules regulating social expenditures.

Resource endowment. Some countries may be favored by a natural resource base that could give rise to a large revenue source. While there is little a country can do to get claim to resource endowments, there are ways to utilize these endowments. The ability to turn these resources into actual budget revenues depends on the structure of taxation in a country, the ability of the tax administration to collect such taxes, and the level of extraction of these resources. Some countries may need to expend significant public resources to be able to realize the revenue potential of these bases.

Other institutional factors also influence the usefulness (in a public finance sense) of these resource endowments. For example, in many countries, there is a struggle between the central and subnational governments over ownership of property rights and revenue generated by taxing raw materials including oil, natural gas, and minerals. The central government in many countries

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<sup>25</sup> Tanzi points out that the underlying economic structure may be an important determinant of the tax structure itself. It is no surprise that the income tax is a less important revenue source in developing countries than in developed countries—compensation comprises a much smaller share of national income in developing countries (40 percent to 70 percent for developed nations).

of the former Soviet Union were forced to enter into special sharing arrangements with subnational governments that were physically located on resource rich lands. However, the revenue generation is still far below capacity, especially for oil due to the difficulties associated with the extraction and distribution of these resources. Significant infrastructure investment will be needed to realize the revenue capacity associated with the rich level of natural resources in many countries.

#### Institutional factors<sup>26</sup>

The economic and demographic changes discussed above do not occur in isolation. Each trend will be heavily influenced by past, present, and future policies of the individual nations and of those countries that are trading partners.

Property rights. While in industrial countries the ownership of assets is clearly established, this is not always the case elsewhere. In transitional economies, the ownership of housing units built by state-owned firms who have now been privatized is not always clear. In other countries, the cadaster (land and/or tax) is incomplete, leading to difficulties in determining land ownership or, at least, responsibility for tax payment. The clarity of property rights and the trends in establishing property rights will have significant impacts for both expenditures (off-loading of responsibilities of the government) as well as revenues (property and land tax bases). the level of privatization. There are large disparities among countries in the overall level of privatization of industry, housing, etc. Depending on the level of privatization and the attempts at reform, a country could be at a disadvantage in terms of budgetary pressure, when mixed with demographics of their country. Privatization will also influence the usefulness of property taxation to central and subnational governments. The case of Peru provides an interesting case study of the implication of the effects of institutions on the potential for taxation of property.<sup>27</sup>

The rules determining local taxes. In some countries, local governments set their tax base and tax rates, in others, they only set their tax rates and, in the remainder, neither. Tax-rate setting powers matter since they allow local governments to increase revenue in line with increasing spending. To avoid dangerous tax competition, these tax rates can be set locally within a range specified nationally. As noted above, some of the expansion in tax bases may be more available to subnational levels of government. It is in the interest of all levels of government to take advantage of expanded tax handles where appropriate. If subnational governments have no authority and/or no incentive to seek out new or expanding tax bases, the finances of the entire country can be crippled in the process.

The rules determining transfers. Some transfer schemes such as budget-balancing grants or expenditure-specific grants lead to improper behavior, while others such as equalization grants if well designed do not. To the extent that the grant structure is an ad hoc system of central to subnational transfers, the infrastructure for local government budgeting and expenditure

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<sup>26</sup> We do not specifically discuss fiscal policy rules such as balanced-budget rules, borrowing and debt or reserve limit rules. For a concise discussion of these issues, see Kopits and Symansky (1998).

<sup>27</sup> For more information, see: <http://www.worldbank.org/developmentnews/archives/html/jan31-feb4-00.htm>

management will likely be hampered due to a lack of experience. Additionally, gap-filling grant systems will reward initiative by subnational governments to expand their revenue base.<sup>28</sup>

The rules determining spending. The degree of freedom of subnational governments in determining their spending varies from very large (elected officials no/ supervision by central authorities) to nonexistent (central authorities decide central expenditures) with various degrees of freedom in-between. Efficiency of public expenditures and response to changes in demographic and other factors can be enhanced if subnational governments have some degree of autonomy in determining local spending.

The social safety net. The social safety net is a response to the economics of the country but the structure of the safety net can be a self-fulfilling prophecy. If the welfare system is comprised largely of price controls, the efforts to reform will be quite different from market-based welfare systems. The level of the safety net is also important—it is quite difficult to transition away from high subsidy levels. The pressures in some countries from an increase in the elderly population will relate directly to this issue.

The level of barter and the underground economy. These factors, which are both institutional and economic, will directly influence revenue reform and expenditure reform. In countries in which the level of barter and/or underground activity is large, the resources expended at certain reforms will likely be less productive without additional resources for solving accounting and general tax compliance issues. To some extent, the level of importance of these issues is captured in the economic and demographic variables of income and industry.

Technological change. The ability to produce and the way in which production occurs changes constantly. The ability to increase the welfare of individuals through new vaccines and treatments, more efficient modes of transportation, and sound structural buildings occurs at differing rates among countries. For poor countries, the issue often is that the countries do not have access to technology rather than the type of technological advance occurring within these countries.

One change that has influenced economies around the world is the “e-revolution.” The increase use of e-technology for work, consumption and leisure activities can have various consequences. Well-equipped urban areas can see their national/international competitiveness improve, while others will lag behind. At the same time, e-commerce can give rise to tax base leakages—consumption based taxes are more difficult to collect when exchanges take place via the internet as coordination is needed among local and national governments. In developed countries, estimates of revenue losses from leakages associated with internet business (both business to business and business to consumer) are relatively small at this point—less than 3 percent of sales tax revenues in the U.S. The projection is that these revenues losses will grow significantly over time, especially with the expansion of business-to-business transactions.

The growth of the internet is important in the HIPCs. Statistics show a large increase in the use of the internet in all countries including the developing nations. Currently 45 percent of internet

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<sup>28</sup> There have been many studies that analyze alternative grant formulas in various countries. See Bird (1992), Martinez-Vazquez and Boex (1999).

usage occurs in the U.S., but that is expected to change rapidly. A unique survey of the use of the internet by corporations in developing countries put some data to this issue and finds that the use of the internet is extensive in these countries. Of the firms surveyed, over 75 percent were connected to the internet.<sup>29</sup> If this trend continues, it could enhance the ability of companies in developing countries to expand their revenue base, but the natural growth in tax revenues may not be able to keep up with the business activity. Given the difficulty with taxation of internet transactions, the growth in business via the internet could reduce the revenue bases in some countries.<sup>30</sup>

Voting rights and behavior. How important the voice of the individual is in a country could have significant impacts on the revenue capacity and expenditure demands of a population. In the specific economic and demographic changes discussed above, the assumption is that the demands of the population will be heard. This could happen through social unrest or more peacefully, through voting for general levels of expenditures and types of taxes. Such voting could occur directly or indirectly through elected officials. If voting is an important component of the policy process, the economic and demographic changes could impinge on public finances more quickly than in the cases in which the population has less opportunity to express their demands. However, as opposed to the cases where the demands are unmet until some crisis is reached, adjusting to changes in demands and revenue structures brought about by economic and demographic changes by some type of representation could be smoother and potentially less costly.

#### Summary: International Experience with Economic and Demographic Trends

As noted above, the trends in many of the economic and demographic variables are varied from country to country. There are, however, some overwhelming trends that one can find in the publicly available data produced by a variety of sources. The information presented in Table 1 summarizes some of these trends by country and region for the last 20 years. Among these trends is the graying of the population, the continued urbanization of countries, and general population growth even in the face of the HIV/AIDS epidemic in many countries. The service sector will continue to increase in importance as a component of the economic base and while agriculture will slightly reduce its prevalence in economic bases of HIPC's, it will continue to be an important source of production. General export growth will be a positive force in the growth of the tax potential of countries.

These many and varied changes in economic and demographic structures suggest that countries will be faced with various changes to their revenue capacity and expenditure needs. It is not possible to determine the magnitude or direction of change for each country, but we can surmise the combinations of change due to these major changes in the underlying economic base and demographic structure. That exercise is handled via the policy matrix that is presented in the final section of this module.

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<sup>29</sup> The study is admittedly biased toward firms with a higher probability to be connected. The report was prepared by John Daly and Robert Miller (2000).

<sup>30</sup> The World Bank also publishes statistics on computer and internet availability. For more information see the following site: [http://www.worldbank.org/data/wdi2001/pdfs/tab5\\_10.pdf](http://www.worldbank.org/data/wdi2001/pdfs/tab5_10.pdf)



Table 1  
Selected Indicators

Country	Average Annual Growth in real GDP per capita 1990-98 (%)	Annual Population Growth Rate 1995-2015 (%)	Average Annual Growth in % Population aged 10-14, 1980-99 (percent of age group)	Annual Growth in Urban population (%) 1995-2015	Growth in private consumption (average annual % growth: 1980-98)	Services: Value Added as a Percent of GDP: 1980 and 1998 (%)	Average Annual Growth in Exports: 1980-90 and 1990-98 (%)
El Salvador	3.06	1.83	-0.9	2.72	3.0		
Ethiopia	1.25	3.09	-0.4	5.77	-0.4		
Ghana	1.67	2.67	-0.9	4.15	0.2		
Honduras	0.7	2.38	-2.2	3.65	-0.1		
Kenya	-0.7	2.35	-0.6	4.64	0.4		
Nicaragua	-0.2	2.30	-1.6	3.01	-2.2		
Zambia	-1.7	2.48	-0.8	3.41	-3.6		
Low income countries						30 ; 38	5.9 ; 11.1

Sources: World Development Report, World Bank (2000), UNDP Human Development Indicators, U.N. Population Division

### III. Structure for analysis of expenditures and revenues

There are various ways to evaluate how these economic, demographic, institutional and technological variables and trends influence revenues and expenditures. Each method, however, comes back to a basic set of relationships that are designed to simulate (estimate, project or calculate) some measure of expenditure needs (minimum foundations, basic expenditures, etc.) and tax capacity. In various countries, there have been systematic studies of expenditure needs and tax capacity. There is also a literature that empirically examines the determinants of expenditures and revenues based on cross-country analysis. The effect of economic and demographic changes on expenditure and revenue determinants has rarely been the centerpiece of the existing empirical research. However, since the existing empirical studies often seek to uncover the determinants of revenues and expenditures, the application of these studies to the future via changes in these determinants is a direct and obvious application of the existing work.

The vast majority of methods used to evaluate expenditure and revenues do not incorporate institutional variables since these are approximately the same in a particular country across expenditure and revenue categories. There has been very little research done to date on the implications of technological change and changes in other institutional variables on the fiscal status of a country. These issues will be discussed in the final section as they pertain to the policy options available to countries.

Expenditure determination.<sup>31</sup> It makes intuitive sense to differentiate between a cost-reimbursement approach to expenditure determination and a client-based (people-based) approach. In the case of the former, expenditures are derived by calculating the cost of physical inputs—how many miles of roads, how far water has to travel, etc. In the second case, expenditures are determined based on characteristics of the client-population: how many and what is the distribution of school-aged children? What is the health of the elderly population, etc.

In practice, there are few examples of purely cost-based or purely client-based expenditure determination, since most countries use a combination. At one point in time, in most cases, a country had clients in mind when developing expenditure forecasts, but over time, the projections may be based solely on more physical measures such as infrastructure or economic factors such as inflation. So we may speak of a continuum of expenditure determination approaches. At one end is a pure cost-based method, at the other end a pure client-based approach.

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<sup>31</sup> This section discusses the methods used to determine and forecast government expenditures. It does not discuss a method for estimating *how* expenditures got to their present levels among countries. Although history is important for projecting expenditures, we assume that the base year of expenditures is taken as given. For more information regarding the theories of expenditure growth, see Bahl (1986), Lindblom (1959), and Borchering and Deacon (1972).

#### Box 4

##### Along a Continuum—Approaches to Expenditure Forecasting

**Current services budget:** Under this type of budgeting, expenditures are based on programs already in place. Changes in expenditures are a function of changes in costs of personnel, supplies, etc. The cost increases (or decreases) could be a function of inflation and/or a change in the client population. This type of budgeting

**Norms-based expenditure determination:** This type of budgeting sets norms or coefficients for expenditures for very detailed expenditures by function. For example, educational expenditures may be a function of the number of school kids, the size of school, a pre-set amount of supplies per student and a government set wage per teacher. These budget policies have been common in the countries of the former Soviet Union (The World Bank, 1996).

**Client-based expenditure determination:** In this type of budgeting, the government would set some minimum standard of expenditure, such as the education example presented above. Norms-based expenditures are a type of client based expenditure estimate but norms will typically include the costs of the maintenance of facilities without an analysis of the need for infrastructure.

**Incremental budgeting:** This type of budgeting uses the expenditures of the previous year as the base for expenditure forecasting. Typically, the actual level of expenditures is used and these may or may not reflect client-based expenditures. With incremental budgeting, determining the effects of economic and demographic changes on expenditure demands is very difficult.

Within the context of client-based measures, there are several approaches to the estimation of client-based expenditures: minimum expenditure requirements, standard expenditure requirements, minimum foundations, and representative expenditure systems. In all cases, there is an institutional “layer” assumed in the estimation of expenditures. For example, the central government may set a standard for education expenditures or road maintenance. These institutional details directly influence the level of expenditure.

The most direct way to determine the effect of economic, demographic and institutional changes on expenditures is to develop a detailed estimate of expenditure needs by major category such as education, health and hospitals, social welfare, transportation, etc. By determining the components of expenditures from the “bottom up” we can provide insight into the importance of the economic and demographic trends in HIPC’s on expenditure pressure. This does not imply

that countries currently budget expenditures according to a detailed analysis of costs and client-base. In fact, many countries use an incremental type of expenditure forecasting and adjust budgeted expenditures based on past expenditures adjusted by an inflation factor. The point of this module is to demonstrate *how* changes in fiscal architecture can impose pressures on public finances. If a country does not account for these factors, they should expect to see increased pressure for changes in the level of expenditure.

There is no one way to estimate basic expenditures, but countries tend to follow a general method as follows:<sup>32</sup>

1. Estimate minimum required expenditures for different service categories on a per client basis

Options for calculating minimum expenditures:

- Education: teachers' wages, rental costs, percentage of students with physical disabilities, percentage of children from low-income families
- Health: cost of health care professionals, infant mortality, life expectancy, population density
- Transportation: wages, road grade, annual precipitation, population density
- Police and fire: wages, crime rate, number of fires per capita, population density
- Social welfare: minimum wage, distribution of age, distribution of income, unemployment rate
- Public administration and other: population, average wage

2. Multiply the per client expenditure by the number of clients per service category

Determining the appropriate calculation for minimum expenditures is a difficult task.<sup>33</sup> In many cases, severe data constraints prevent governments from making such specific calculations. However, based on international experiences, we can at least offer some lessons on the direction of fiscal pressure associated with the important economic and demographic variables that form public demands for expenditures. Over time, a country may be able to develop a database that would incorporate the data necessary to make more specific calculations of expenditure needs.

The examples presented earlier in this module showed how a decomposition of education and pension expenditures can provide information regarding how economic and demographic changes could influence the needs for these types of expenditures. There are some results of

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<sup>32</sup> This summary of experiences is presented in Alm (1999).

<sup>33</sup> Data is a severe constraint in some countries. Box 5 presents some relevant data sources.

expenditure determination from other countries that show that income is a significant determinant of various types of public expenditures and per capita income is positively related to social services, in particular.<sup>34</sup> There is virtually no empirical study of the effects of sectoral changes on the demand for services, although there is some evidence of the influence of diseconomies of scale for certain services.

Revenue determination. What constitutes the tax handles of a particular country is the central issue in developing an adequate revenue base. Many countries use revenue systems that do not naturally take advantage of these tax handles. Some countries use systems left over from a previous regime (transition countries are a good example), others simply do not adjust their revenue structures to keep up with changes in their economic and demographic bases. The result is that in many cases, an inappropriate set of taxes, fees and levies are relied upon to generate adequate levels of revenue.

In this section we will analyze how to estimate the effects of economic and demographic change on the revenue structure of a country. This is done in reference to the specific institution structures of countries. This analysis will help to summarize the policy options available to countries, which is the subject of the final section of this module.

Measures of tax capacity. Tax capacity can be thought of as the ability of a country to raise revenue based on its economic and demographic base. Tax capacity measures attempt to estimate the tax base broadly and without immediate reference to specific laws regarding taxation or revenue collection. Tax capacity measures represent the potential tax base available. How a country translates its capacity (potential) into revenues is often referred to as tax effort—taxes collected as a ratio of tax capacity. The tax effort measure incorporates issues of collection, tax evasion, and specific exemptions in the law, etc. Countries for which tax effort is high are able to capture a significantly large portion of their taxable capacity; countries for which the tax effort is low miss a large portion of their capacity either due to the specific structure of their taxes, tax evasion, or administrative issues related to collection.

Tax capacity measures can be helpful in estimating the effect of economic and demographic changes on the revenue side of the budget but represent only the starting point for such an analysis. If a capacity estimate can yield an estimate of the total potential tax base, the appropriate tax law would have to be “layered” over the capacity estimate. For example, some cross-country studies estimate the capacity of the individual income tax as a function of personal income in a country. Across countries, those that tax a larger portion of total personal income will have a larger tax effort index, all else held constant. Within any one country, while measuring tax effort is important to the policy debate, if some portion of personal income is not taxable (for example, pension income), then estimates of the untaxed portion should be subtracted from the base. Also, cross-country studies of tax capacity imply an average tax rate that may not be applicable to any particular country. Again, an individual country would have to adjust the average tax rate to take account of the laws governing taxation that are applicable.

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<sup>34</sup> In the U.K., various expenditure determinants have been explored over a number of years. In Japan, each expenditure item is very specifically planned based on cost and demographic data.

Cross-country studies of tax capacity can be illuminating in the context of economic and demographic change. Estimates of tax capacity implicitly incorporate current trends in these variables, and a decomposition analysis can be done to “pull out” the most important trends and project them forward. Starting the revenue analysis via a cross-country approach may be helpful to any one country as each country can learn from others how to potentially increase its level of revenue. Also, these cross-country studies give some rough indication of the effect of changes in aggregate tax bases (brought about by economic and demographic changes) on tax revenues in a world-wide context. In the absence of other information, this is a good starting point for understanding the impact of economic changes on the revenue bases of individual countries.

A number of studies have estimated tax effort by regressing the ratio of taxes to GDP against a variety of tax handles. Previous studies include Tait, et. al. (1979), Bahl (1971), and Bahl et. al. (1996). In general, taxes as a percent of GDP are estimated as a function of aggregate tax base variables including the share of mining in GDP, the share of agriculture in GDP, and the share of exports in GDP. The empirical studies find that the larger the share of agriculture to GDP, the lower the level of taxes to GDP, the higher the level of non-mineral exports to GDP, the higher the tax to GDP ratio, and the higher the level of income, the higher the share of taxes to GDP (overall taxes are income elastic). These results give us some indication of the effect of changes in the economic base on overall taxes. In countries where exports are falling, we might expect fiscal pressure associated with a decrease in the growth of tax revenues; in countries where income growth has slowed, the rate of growth in tax revenues is also expected to decline. The openness of an economy is also seen to be positively and significantly related to the relative level of taxes. Openness is typically defined as exports plus imports as a share of GDP.

Another approach to measuring tax effort accounts for the capacity to collect *each* tax. Imposing the average international tax rate to those taxes levied in a particular country, we can estimate the total level of tax revenues that *should* be collected if a country imposed the same average tax rate used by other countries. Comparing this predicted value (estimated at the average tax rate) to actual collections gives us another measure of tax effort, by each major tax. Since it is not possible to evaluate the tax base for each country in to do an international comparison, it is usual to use proxies for the tax base of major taxes.

To calculate the average tax rate for each major tax one can estimate regressions for personal income taxes, corporate income taxes, indirect taxes (including sales and value added taxes), import revenues and export revenues. The level of revenue is expressed as a function of tax base variables and other control variables. A number of empirical studies have estimated this representative tax system. Most studies use available data from the World Bank and International Monetary Fund (Government Finance Statistics--GFS). One possible model for the representative tax system is as follows.<sup>35</sup> Other versions may include additional taxes, when data are available.

$$\begin{aligned} \text{Personal income tax revenues} &= b + b \text{ GDP} + b \text{ GDPSQ} \\ \text{Corporate income tax revenues} &= b + b \text{ LNGDP} \end{aligned}$$

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<sup>35</sup> Bahl (1972) developed this method for making inter-country comparisons that related the tax effort index to the intensity of use of specific types of taxes.

Total import revenues =  $b + b \text{ COMPIMP} + b \text{ COMPISQ}$   
Total export revenues =  $b + B \text{ LNCOMPEXP}$   
Indirect tax revenues =  $b + b \text{ LNGDP}$

where GDP = gross domestic product  
GDPsq = GDP squared  
LNGDP = natural log of GDP  
COMPIMP = Value of commodity imports  
COMPISQ = COMPIMP squared  
LNCOMPEXP = natural log of the value of commodity exports

This model was estimated by Martinez and Wallace (2001) and is typically referred to as the representative tax system. The results show that personal income taxes are relatively elastic, while corporate tax revenues are less responsive to changes in overall levels of income. Exports and indirect taxes are also relatively elastic. Import revenues are subject to a variety of institutional regulations and this may yield a tax base that does not necessarily grow in a predictable fashion with the level of imports. Estimates by Bahl, et. al (1996) are consistent with the estimates and elasticities discussed.

A bottoms-up approach. As was true for expenditure estimation, an alternative approach to analyzing the effect of economic and demographic changes on revenues is to build the base of each major tax and highlight the components that are expected to change with the economic and demographic trends. This method can be referred to as the bottoms-up approach as it starts with the smallest unit of analysis (the individual or the firm) and builds the applicable tax base. The tax law can be layered on the estimates of the tax base.<sup>36</sup> It is the best method for determining the influence of economic and demographic changes on the revenues of a country because by establishing the identities of the various revenue sources, one can directly determine the fiscal pressures associated with changes in economic and demographic variables.

For each tax, one can develop an identity that decomposes the economic, demographic and institutional factors affecting the revenue source. Here we make that decomposition for import duties, VAT, corporate income taxes, and individual income taxes. The methodology can be expanded to other revenue sources as well.

We start by decomposing each major revenue source, this allows us to determine what source information is needed to estimate the impact of various factors on the tax base. This decomposition shows the relationship between aggregate statistics (GDP) and the tax base and between the potential tax base and the actual tax base. Once the components of the tax base are determined, the tax structure can be layered on the tax base. This will take account of the

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<sup>36</sup> In theory, the macroeconomic forecasts developed in a country should incorporate the economic and demographic trends that are important in a country. In that case, estimates of personal income and corporate income, etc. would include the effects of these changes. In many countries, the macroeconomic forecasts are not detailed enough to allow for accurate revenue forecasting. For example, estimates of personal income may incorporate the effects of slower growth in the labor force, but there is no decomposition between wage income and pension income. If the macro forecast does decompose the composition of income, then these estimates can be used to forecast the revenue and the forecast will obviously incorporate the economic and demographic trends of the country.

specific rules for each tax. In each case, the more complication to the system, the more specific information is needed for each tax.<sup>37</sup>

The first step is to identify the relationship between the revenue from various sources and aggregate variables in the economy. We do this to identify where parameters currently exist and where additional work needs to be done to forecast taxes in light of the changes faced by countries. This decomposition also shows us what factors need to be analyzed in light of the economic and demographic changes in a country.

Import duties (ID):

$$ID = ID/T_xM * T_xM/Total M * Total M/GDP * GDP$$

Where  $T_xM$  is taxable imports (a function of institutional details), Total M is total imports (a function of the structure of industry, consumer demand, etc.), and GDP is gross domestic product. The ratio of total imports to GDP is the relative price of imported goods, which will influence the base as well. In a country where there are multiple import rates depending on the type of good, this relationship should be expressed for each main category of import for tax purposes. If an economic base were very stable, historical relationships between GDP and taxable income could be used to project the level of revenue (this applies to all the examples in this section). In such a case, total imports would remain a constant share of GDP, and if no new exemptions were put in place and tax rates stayed constant, the relationship between the tax base and actual revenues would be relatively constant.

However, due to the number of other changes in the economy, relying on historical relationships among these components will yield inaccurate forecasts. In the case of import duties, the level of imports is usually projected based on some model that should include income and output composition in the home country. The taxable component of the potential base (total imports) is a function of the law that exists in the country. If the country lightly taxes imports demanded by the elderly, then the growth of import revenues could be negatively influenced in countries that witness this demographic impact. Unfortunately, parameter estimates of the determinants of imports are not easily found. Countries would need to invest in developing such parameters. The tax structure gets “layered” on the potential tax base via parameters for the taxable share of imports and the tax revenue from the taxable share. In countries that have significant import growth, if the tax rates are relatively low, only part of the growth is captured.

VAT:

$$VAT_i = VAT_i/T_xCon_i * T_xCon_i/GDP * GDP$$

Where  $VAT_i$  is the VAT revenue from sector I,  $T_xCon_i$  is the taxable consumption in sector I (a function of the tax law), GDP measures general economic activity. The first expression on the right hand side is the effect of the tax rate, which is typically known. The second expression

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<sup>37</sup> It would be best to have a micro-data set of individual observations for certain taxes, particularly those with multiple marginal rates. In most countries such data are not available so we proceed with a more aggregate “bottoms up” approach.

incorporates the economic and demographic variables that affect consumption of a particular commodity relative to GDP. In some limited cases, empirical estimates exist that would provide an estimate of this parameter. In many countries, the survey work to establish such a parameter has not been done.

A detailed analysis of the economic and demographic trends will uncover increased or decreased consumption of certain types of goods. Decomposing the VAT by sector will allow us to estimate the impact of these trends on VAT. For example, the growing elderly population in many countries will typically reduce consumption of durable goods. The VAT associated with manufacturing would therefore be expected to decline in importance due to the trend in the elderly population. As this is an important component of the revenue base for many countries, it signals a significant fiscal impact. A similar decomposition can be made for excise taxes or general sales taxes, by sector.

Corporate Income Tax:

$$CIT_i = CIT_i/T_xIncome_i * T_xIncome_i/Corporate Profits_i * Corporate Profits_i/ GDP * GDP$$

In this case the taxable income by sector ( $T_xIncome$ ) is a function of the tax law and the general economic trends of a country. The level of corporate profits (the general tax base) is also a function of the economic situation of a country. If the growth in output in a country is due to growth in the home-production sector, we would expect that the growth in taxable income (and therefore the corporate income tax) would decrease over time. In addition, if the demographic make-up of a country leads to a reduction in the sectors that are important corporate tax players (manufacturing), the corporate tax revenue will suffer as well as the VAT revenue for the associated industry. In all countries, it is important to analyze the taxable income in as much detail as possible by projecting the taxable income by sector. For each sector, the analysis of taxable income and corporate profits should include a forecast of the effect of changes in consumption and general economic activity on the tax base. Few estimates exist to help analyze the general issue of the effect of changes on the corporate tax base (corporate profits/GDP).

Individual Income Tax:

$$IIT_i = IIT_i/T_xIncome_i * T_xIncome_i/Personal Income * Personal Income/GDP * GDP$$

Similar to the decomposition for corporate income tax revenue, the individual income tax revenue by sector of the income distribution will be affected by the tax law as well as by the changing demographics of a country. The “i” here refers to segments of the income distribution. If increased poverty increases the percentage of transfer payments in total income, and transfer payments are largely untaxed, then while GDP may grow, the growth in individual income tax revenues will be stymied by the changing composition of income. Unless a country were to change its tax law to capture the non-taxed sectors, tax revenues will continue to slow in such an instance. Like all of the cases presented, this highlights the problem with trying to use aggregate relationships of potential tax bases to GDP in light of significant economic and demographic changes.

## Data Issues

In all of the cases discussed above, various data are needed to support analysis of the underlying trends as well as the fiscal impacts of each economic/demographic type. It is well known that socioeconomic data is hard to come by in the best of circumstances. In many countries, national agencies do undertake various censuses—population, income, households, employment, consumption, etc. Unfortunately, these data tend to be out of date in most countries—they are not regularly updated due to a lack of funds. However, more aggregate data such as GDP per sector, total household consumption, etc. can provide at least the basis for the analyses described in the previous sections.

There are a variety of data sources, domestic and international for many countries. Some of these sources are summarized in Box 5. Additionally, the World Bank has developed a data warehouse of various household surveys and other data from countries around the world. The specific data sets and availability can be found at:

Box 5  
Economic, Demographic and Public Finance  
Data Sources

The World Bank

Sources include: Individual government data, World Bank and IMF staff compilations, private and public international organizations

Data types include: By country, variety of categories of data from agriculture, to governance, finance, urban development and others. Data are aggregate by year, with some reference to growth rates, per capita amounts and real values. Subcategories can be very detailed.

Link: <http://worldbank.org/data/databytopic/databytopic.html>

The International Monetary Fund

Sources include: Individual governments and IMF staff compilations.

Data types include: Aggregate macroeconomic statistics by country including output, prices, currency levels, government fiscal balances, capital flows.

Link: <http://www.imf.org/external/pubs/ft/weo/2001/01/data/index.htm>

United National Development Project: Department of Economic and Social Affairs, Population Division, Statistics Division, Human Settlements Division

Sources include: Individual governments, the World Bank, the IMF, OECD, other public international agencies

Data types include: By country, human development indices, health profile, child survival indices, population trends, education, energy use, urbanization, national income accounts, and economic development measures, and others. May include subnational government data.

Link: <http://www.undp.org/hdro/highlights/statistics.html>,  
<http://www.un.org/sea/>

Population Reference Bureau

Sources include: Individual country data, United Nations (divisions), U.S. Census Bureau.

Data types include: By country, detailed data on population, age distribution, marital status, family composition, immigration, major health issues, and basic environmental concerns.

Link: <http://www.prb.org/>

International Labour Organization

Sources include: United Nations, individual countries

Data types include: By country and region, detailed data on labor, employment, labor standards, human rights, international labor migration, and others.

Link: <http://www.ilo.org/public/english/info/index.htm>

#### U.S. Census Bureau International Data Base

Sources include: Individual countries and U.S. Census Bureau.

Data types include: By country, population and population growth, detailed age distribution and growth, fertility rate, distribution of population by sex.

Link: <http://www.census.gov/ftp/pub/ipc/www/idbnew.html>

#### IV. Policy Alternatives

The previous sections presented a discussion of the potential impact of various economic, demographic, institutional and policy trends on public finances and developed alternative methods for incorporating these trends into a country's revenue and expenditure projections. Whether a country chooses to budget for these expenditure or revenue pressures is of each country's choosing. The revenue pressures will be directly felt as the growth in revenue is altered by the various economic and demographic factors. For many tax sources, decomposing the composition of revenues reveals a number of relationships—some a function of the underlying tax base and some a function of the structure of a particular revenue source. In most cases, there are few parameters that estimate the relationship of the underlying tax base and changes in demographics and economic structure. Many countries use aggregate, historical relationships between GDP and tax bases to forecast future tax revenues. As noted above, these forecasting methods tend to mask the effect of important changes in fiscal architecture on the underlying revenue base.

The expenditure pressures may not immediately yield commensurate changes in expenditure policy—pressures may be felt by overcrowding of schools and transit systems, the development of arrears for pension and welfare payments, and increased pollution and declining health in the cities.

The direction of fiscal pressure for any one country is a complicated combination of the variables described above. While the paucity of empirical data on the behavioral aspects of these trends in developing countries prevents us from making very specific estimates of the effects of these changes on the fiscal status of countries, the direction of pressure is obvious in many of the cases.

This section is dedicated to summarizing the expected effects of the general trends in the economic and demographic variables on revenue and expenditure pressures of HIPCs. Where appropriate, we include parameter estimates of the effects of these trends on revenues and expenditures. The purpose of this final section is to pull together the changes in the fiscal architecture of countries and suggest policy options for dealing with these pressures, given the overlying institutional framework of a country.

What options does a country have to deal with these pressures? As noted at the on-set, the economic and demographic structure (and changes within) of a country along with its institutions allow some forecasts of fiscal pressures and some constraints on policy options. However, there is the added complication that fiscal policy changes may further induce behavior and could offset the intended impact of a policy change. Take the example of increasing tax rates to deal with the erosion of the VAT base in some countries. Will higher tax rates naturally yield a commensurate increase in tax revenue? Empirical estimates show that the response of tax revenues to tax rate increases is less than one (Bogetic and Hassan). Increases in tax rates may give rise to increased tax evasion and/or tax avoidance behavior. So, while a policy option to raise tax rates remains, it may not be the best option.

Given the vast number of trends in economic and demographic variables and the number of institutions that also influence fiscal pressures for countries, it is difficult to generalize the effects of the trends on fiscal pressures across countries. A systematic way to investigate these trends is to take each major economic, demographic and institutional variable and summarize the potential implications on revenues and expenditures, by major category. The actual effect in each country will be different, but international experience and economic theory will assist in analyzing the direction of change. The following table (Table 2) of effects and impacts incorporates the most important issues discussed in this module. They are among the issues that will have the largest budgetary impact for countries. An individual country could determine that there are other, specific components of fiscal architecture that influence their country. The addition of such variables is a good exercise for practitioners in each individual country.

In Table 2, the main economic, demographic and institutional variables affecting revenues and expenditures are in the left most column of the table. The second column summarizes basic trends that are in evidence around the world. In some cases, there are two distinct (different) trends. In such cases, there are two entries for these changes. The third through last columns summarize the effects of the main trends or institutions on revenues and expenditures by type. In these cells, parameter estimates are included where applicable. By reading down any one of the expenditure or revenue columns, a country could highlight its own situation and summarize the projected impact on fiscal stress in the country.

The final table (Table 3) pulls the entire analysis together. The first column in this table repeats the economic and demographic trends, the second column summarizes the trend, the third column summarizes the information from the Table 2 to set the stage of issues, and the last column summarizes the policy options available to countries, within broad categories related to institutional structures. The interaction of the institutional structures is highlighted in the summary policy columns (last column in Table 3). Any one country will find that the rows of Table 2 are more or less important and the policy options from Table 3 are varied. These tables are meant to be a general guide regarding what impacts countries might expect due to their fiscal architecture and changes in it, and policy alternatives that have been used in other countries. There will at times, in some countries, be competing issues—perhaps a country is seeing an increase in the elderly population and an increase in the number of dependent children. Each country needs to weigh the impact of each economic and demographic change and prioritize the policy options available.

The summary economic and demographic trends and the forecasts for factors such as age, urbanization, health, family composition, composition of income, and labor market behavior generally point to increased fiscal stress. This comes about both through revenues as well as expenditures. These trends are not universal, but more countries than not are expected to see an aging population with increased urbanization. These two factors will put a lot of stress on the social expenditures such as pensions and the health system and will also tend to be associated with slower increases in the VAT base. The best general policy advice available to countries experiencing these trends is to investigate the potential benefits of fiscal decentralization as a means to increase revenue mobilization and investigate the appropriateness of the current revenue base.

The revenue potential associated with decentralization is not universal—rural areas may not have the opportunity for expanded revenue potential. However, there is no “rule” that decentralization would have to come to all parts of a country equally. Local government taxes such as the property tax may not be possible in the near-term due to data constraints, lack of property rights, and rules governing the intergovernmental fiscal situation may not easily allow for any significant decentralization. Analysis of the current system of taxes is also important as is the analysis of the exact tax laws. Are certain industries unfairly discriminated against via higher tax rates and reduced exemptions? Is the tax administration in a position to capture the increased revenue potential associated with the growth in the service sector and internet taxation?

The information in Table 3 outlines some potential revenue options based on the economic and demographic trends presented. The applicability of these policies across countries is heavily influenced by the institutional structure of the individual countries. This matrix should be used as a starting point for thinking about the potential issues and solutions, and should generate more specific matrices of this type for each individual country.



Table 2  
Summary of Fiscal Architecture and Projections of Fiscal Pressures

Variable	Basic Trend	Effect on: VAT	Import Duties	Corporate Income Tax	Individual Income Tax	Education	Social Safety Net	Primary Health	Roads/Transport
<b>Demographic Changes</b>									
Age Distribution	Increased Elderly relative to working aged	Increased consumption of non-taxable goods, reduce growth in VAT	Increased demand for imports	Reduced consumption of durable goods, reduce CIT	Reduced taxable income, reduced IIT	Reduced demand	Increase in the number of clients, increasing expenditures	Increase in the number of clients and intensity of care, increased costs	Ambiguous
Age Distribution	Increased young children relative to working aged	Increased consumption of food, usually taxed at lower rate, reduce growth in VAT	Ambiguous	Neutral	Many reduce tax base due to demand for one parent to stay home	Increased demand	Increased young increases potential welfare caseload, increasing expenditures	Increased demand for expenditures	Neutral
Urbanization	Increased urbanization	May reduce due to the potential growth in the underground economy	Neutral	May reduce importance of corporate tax as tends to expand self-employed sector	May reduce importance of the individual income tax as tends to expand self-employed sector	Increased demand, but potential economies of scale	Increased demand, but may be a longer-run issue  Parameters: 0.05-0.3 (diseconomies of scale an issue)	Increased demand	Increased demand for urban transport
Family Size and Composition	Increasing number of dependent children, stabilizing	If basic foodstuffs and clothing are exempt, a reduction	Neutral/increase Dependent on the treatment of children's goods	Neutral (first-round effects)	May reduce due to increased need for care in the home	Increased demand	Increased demand	Increased demand	Neutral

Variable	Basic Trend	Effect on: VAT	Import Duties	Corporate Income Tax	Individual Income Tax	Education	Social Safety Net	Primary Health	Roads/Transport
	family size								
Health	Increased Incidence of AIDs	As a share of consumption, decrease due to increased share of medical purchase (often exempt)	Increase if medical related supplies/equipment are taxable	Neutral	Decrease due to the associated decrease in labor supply	Potential decrease due to decrease in life expectancy for infants	Increase due to costs associated with unemployment and orphans	Increase due to basic needs	Neutral
Education	Increased access and participation	Long-term effect is positive as economic potential expands	Long-term effect is positive as economic potential expands, less direct impact than with VAT	Long-term effect is positive as economic potential expands	Long-term effect is positive as economic potential expands, most direct revenue impact over the long-run due to labor supply effects	Increase, but could be decreasing in unit costs over times	Mixed—could increase life expectancy thus increasing demand for pension expense, but could also increase private pensions. Also, may reduce welfare benefits in the long run due to increased economic opportunities	Mixed—could increase due to longer life expectancy but decrease in costs associated with healthier births and lifestyle choices	Neutral in the medium term.
<b>Economic Base Changes</b>									
GDP	Continued, by slower growth	Increase: Parameters: 0.4-0.6	Neutral	Increase	Increase	Increased demand Parameter estimates: 0.35-0.6	Relatively neutral	Increase Parameter estimates: 0.4-0.8	Increased demand – more expenditures
Service sector growth (output composition)	Growth in sector as a	More ambiguous	Increase due to demand for more	Decrease due to decrease in	Decrease due to tax handles	Neutral	Neutral	Neutral	Demand for access will increase—

Variable	Basic Trend	Effect on: VAT	Import Duties	Corporate Income Tax	Individual Income Tax	Education	Social Safety Net	Primary Health	Roads/Transport
	share of GDP	than for CIT, IIT, evidence slightly for negative impact	technology	tax handles					could pressure expenditures for telecommunications
Computerization/internet useage	Growing use of internet for business	Potential positive impact associated with increased imports to support networks; negative impacts due to difficulty with nexus	Increase due to demand for more technology	Decrease due to difficulty in determining nexus and administration	Ambiguous	Neutral	Neutral	Neutral	May eventually increase the demand for roads, increase for telecommunications related infrastructure to support networks
Composition of income	Increase in self-employment income	May reduce VAT due to informal networks	Relatively neutral	Decrease due to administrative problems associated with collection	Decrease due to administrative problems associated with collection	Neutral	May reduce payroll taxes and thus impinge on funds for social safety net expenditures	Neutral	Neutral
Composition of income	Increase in transfer payments (particularly for the elderly)		Neutral	Neutral	Decrease due to exemptions for transfer income in most countries	Neutral	Increase in expenditures	Associated demographics could result in an increase in expenditures	Neutral

<b>Variable</b>	<b>Basic Trend</b>	<b>Effect on: VAT</b>	<b>Import Duties</b>	<b>Corporate Income Tax</b>	<b>Individual Income Tax</b>	<b>Education</b>	<b>Social Safety Net</b>	<b>Primary Health</b>	<b>Roads/Transport</b>
Resource endowment	Not applicable	The impact of resource endowments is to increase revenue potential over time. However, the cost associated with extraction of resources is often high. Output prices (and therefore revenue potential) are also heavily influenced by world markets. Many countries have faced severe tension, to the point of war, over the distribution of revenues from natural resources. Countries choosing to focus on natural resource taxation for future revenue generation should be cautious and realistic about the potential for growth of such revenue sources.				Neutral	Neutral	Neutral	Increase demand to support growth of infrastructure to tap natural resources

Table 3  
Policy Options

Variable	Trend	Summary of fiscal impact	Summary of options
<b>Demographic Changes</b>			
Age	Increasing percentage of elderly	Reduced tax base, reducing revenue growth, increased expenditure pressure from social services and housing	Adjust payroll tax system for pension payments, increase age for full benefits, means test benefits, means test income tax exemptions  <b>Institutional issues:</b> Ability to means test benefits, importance of voter behavior (do the elderly vote? Do they have a large impact?)
Age	Increasing percentage of children	Increased health and education expenditures	Encourage local governments to consolidate schools where local control is significant, exam cost structure of schools, consider cost-reimbursement for some services based on ability to pay (income)  <b>Institutional issues:</b> Constitutionality of access to education and health care, availability of local discretion over potential user fees and charges
Urbanization	Increasing urbanization	Increased expenditure pressure for major services including education, health, transport and housing	Allow local income tax based on earnings, where revenue autonomy is allowed  Encourage fees and charges for municipal services  Increased use of the

Variable	Trend	Summary of fiscal impact	Summary of options
			<p>property tax in cases where institutions would support the tax</p> <p><b>Institutional issues:</b> Intergovernmental fiscal system would need to allow local government discretion over local income taxes and user fees</p> <p>Property rights would have to be established to make property tax (of any form) viable. Data would need to be developed by parcel.</p> <p>Where significant growth in the underground economy is found, simple forms of taxation such as by access to electricity, water, etc. could be most useful to bring potential taxpayers into the system.</p>
Family Size and Composition	Increasing number of dependent children, stabilizing overall family size	In a relative sense, may reduce the tax base depending upon treatment of foods and clothing. Will lead to an increase in demand for basic services including education, social safety net and primary health care.	<p>The increasing number of dependent children comes largely from the health related issue of AIDs in many countries. Countries may wish to, or need to, earmark revenue sources to provide for the children. Options include payroll taxes on wages, special wealth taxes on capital income. Due to the redistributive nature of such expenditures, this is largely a central government issue.</p> <p><b>Institutional issues:</b></p>

Variable	Trend	Summary of fiscal impact	Summary of options
			<p>The strength of family ties is important and a possible resource. If the labor force is not expanding and business has contracted, payroll taxes are not a good option. International aid efforts could be important for this issue.</p>
Health	Increased incidence of AIDs	<p>Reduced revenue potential due to earnings ability and consumption of medical products (often exempt). Increased pressure on social and health services</p>	<p>Countries experiencing AIDs epidemics could appeal to the international community for assistance. The fiscal effects of health issues could be mitigated by an overall rationalization of the revenue system—closing outdated loopholes, increasing tax administration.</p> <p><b>Institutional issues:</b> Countries with widespread epidemics will be hard-pressed to find revenue “release valves” to solve the pressures of increased expenditures. Governments will have to focus on working within tight budget constraints.</p>
Education	Increased participation and availability	<p>Long-term revenue growth should be expected, with some additional expenditure pressures in the near-term (especially for schools)</p>	<p>A country that witnesses higher educational achievement is in a good position to analyze their tax system vis-à-vis the potential over a longer time frame.</p> <p>Short-term pressures on educational expenditures could be mitigated by a series of user fees and</p>

Variable	Trend	Summary of fiscal impact	Summary of options
			<p>charges. Care should be taken with such fees so as not to reduce participation.</p> <p><b>Institutional issues:</b> Local governments may not be able to charge for educational services.</p>
<b>Economic Base Changes</b>			
GDP	General growth, but slowing	Increase in most revenue bases but increase in expenditure demands as well—not necessarily expenditure needs	<p>Government could choose to ignore increased income-driven demands, but in a representative government, this could result in new elections, in a less representative government this could result in unrest</p> <p>Revenue estimates should take heed of the slowing growth in GDP and be wary of using incremental forecasting for revenues</p> <p><b>Institutional issues:</b> Voting rights and behavior can influence the speed with which governments respond to the changes in demand.</p> <p>Long-term capital financing (if available) could be a resource toward building for the future, but should be wary of the reduced rate of growth in GDP.</p>
Service sector growth	As a share of GDP, service sector is growing in most countries	As a share of GDP, could reduce the growth of tax revenues due to increased outlets for tax evasion	Review of taxes for small business, institution of imputed taxes and/or taxes with thresholds to increase the revenue obtained from

Variable	Trend	Summary of fiscal impact	Summary of options
			<p>this hard to tax sector</p> <p><b>Institutional issues:</b> In countries with no history of using imputed or presumptive taxes, start-up costs to doing so can be prohibitive. Other options include more simple forms of business taxes such as licensing.</p>
Computerization/internet usage	Growing use of internet for business throughout the world.	There is an expected expenditure pressure related to telecommunications infrastructure. The revenue impact is less clear, although it is likely that domestic tax sources would decline due to the difficulty with taxing internet transactions.	<p>Long-term education and development of tax administration needs to take place to enable taxation of this form of commerce.</p> <p><b>Institutional issues:</b> The strength of the tax administration is crucial to capturing the revenue potential associated with this expanding form of commerce. A weak administration will not be able to begin taxing such commerce and will increase the tax evasion problem associated with the internet. Trade agreements and relations with other countries will increase or decrease the potential to tax this form of commerce. In some countries, this extends to subnational levels of government.</p>
Composition of income	Increase in self-employment	Reduced growth in revenue bases due to difficulty associated with taxing self-	Review of taxes for small business, institution of imputed taxes and/or taxes with thresholds to increase

Variable	Trend	Summary of fiscal impact	Summary of options
		employed	<p>the revenue obtained from this hard to tax sector</p> <p><b>Institutional issues:</b> In countries with no history of using imputed or presumptive taxes, start-up costs to doing so can be prohibitive. Other options include more simple forms of business taxes such as licensing.</p>
Composition of income	Increase in transfer payments as a percent of income	Reduced revenue bases for income taxation.	<p>Consideration over the costs of preferential treatment for transfer payments, need to control for leakages in tax basis regarding exemptions, special treatment, etc.</p> <p><b>Institutional issues:</b> Means-testing transfer payments may or may not be an option. Taxing transfer payments for higher income individuals may or may not be an option. Privatization of pension benefits on a small scale is possible in some countries as a long-run potential alleviation tactic for the expenditure drain.</p>
Resource endowment	Varies by country	Significant revenue potential in many countries. There is an associated increase in expenditure pressure for infrastructure development.	<p>Severance taxes, export duties, permits and development fees can be utilized to expand resources for infrastructure development.</p> <p><b>Institutional issues:</b> Central and local</p>

Variable	Trend	Summary of fiscal impact	Summary of options
			<p>government rights over natural resources can be divisive if not well established before expanding this revenue source. Intergovernmental fiscal relations need to specify sharing rules and assignment issues.</p> <p>Trade relations with surrounding countries are important determinants of the success of this revenue source. For example, oil extraction will be lucrative to public finances if the oil can be transported out of the producing nation to customers.</p>

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Appendix A  
 Dependency Ratio Examples  
 Dependency Ratio Examples

Country	Ecuador	Ethiopia	Guatemala	Ghana	Honduras	Kenya	Nicaragua	Zambia
Population 2000								
20-59 years old	6066	24275	5234	8256	2551	12228	2120	3460
older than 60 years old	824	2844	679	1030	327	1280	215	370
Population 2025								
20-59 years old	10460	46356	10790	14487	4881	19234	4100	6335
older than 60 years old	2151	4594	1649	2231	782	2298	639	489
Dependency Ratio								
2000	0.135839	0.117158	0.1297287	0.124758	0.128185	0.104678	0.101415	0.106936
2025	0.2056	0.0991	0.1528	0.1540	0.1602	0.1195	0.1559	0.0772
Percent Change in Dependency Ratio	51.39%	-15.41%	17.80%	23.44%	24.99%	14.14%	53.68%	-27.82%

Data source: <http://www.census.gov/ftp/pub/ipc/www/idbsum.html>  
 file: depratio.xls

## Appendix B Minimum Education Expenditure Case

### Example of Minimum Education Expenditures

Country:	Ecuador	Guatemala	Ghana	Kenya
<b>Age Distribution</b>				
Year = 2000				
5-9 years of age	1569	1768	2791	4247
10-14 years of age	1475	1585	2615	4201
15-19 years of age	1351	1370	2063	3846
Year = 2025				
5-9 years of age	1639	2463	2453	3149
10-14 years of age	1632	2363	2409	3186
15-19 years of age	1622	2232	2398	3333
<b>Percent Growth in Population</b>				
Years: 2000-2025				
5-9 years of age	4.46%	39.31%	-12.11%	-25.85%
10-14 years of age	10.64%	49.09%	-7.88%	-24.16%
15-19 years of age	20.06%	62.92%	16.24%	-13.34%
<b>Weight for educational programs</b>				
Programs for children aged 5-9	1.25	1.25	1.25	1.25
Programs for children aged 10-14	1.15	1.15	1.15	1.15
Programs for children aged 15-19	1	1	1	1
<b>Projected percentage change in minimum expenditures (unit costs held constant) from 2000-2025</b>				
Assumed change in unit costs	0	0	0	0
Expenditures for children aged 5-9	5.58%	49.14%	-15.14%	-32.32%
Expenditures for children aged 10-14	12.24%	56.45%	-9.06%	-27.79%
Expenditures for children aged 15-19	20.06%	62.92%	16.24%	-13.34%
<b>Projected percentage change in minimum expenditures (unit costs increase 0.5 percent per year) from 2000-2025</b>				
Assumed change in unit costs per year	0.50%	0.50%	0.50%	0.50%
Expenditures for children aged 5-9	6.27%	55.28%	-17.03%	-36.36%
Expenditures for children aged 10-14	13.77%	63.50%	-10.19%	-31.26%
Expenditures for children aged 15-19	22.57%	70.78%	18.27%	-15.01%

Data source: <http://www.census.gov/ftp/pub/ipc/www/idbsum.html>  
file: edexp.xls

