Chapter 5 Estimating the Macroeconomic Costs of the HIV/AIDS Epidemic

This study applied various macroeconomic models to estimate the costs of HIV/AIDS in Ukraine, building on similar work done in Ukraine and Russia. The purpose is to use the most recent available data and methodology to provide a plausible range for the magnitude of the impact of the epidemic.

The literature on the macroeconomic costs of HIV/AIDS is large and continuously expanding.[7] Among the analytical tools used for modelling are a neoclassical growth model[8] (based on the aggregated variables, such a model necessarily misses microeconomic effects on heterogeneous households), various types of computable general equilibrium (CGE) macroeconomic models,[9] and macroeconometric models.[10] As a rule, data requirements rise with the complexity of the model.[11] Incorporating a mechanism for disease transmission and modelling its effects adds another layer of complexity.

Several studies of the economic costs of HIV/AIDS have been conducted in the Russian Federation. Similar to Ukraine, Russia has experienced one of the world's fastest growing epidemics over the past five years (according to the UNAIDS 2003 estimate, 860,000 infected or 1.1 percent adult (15-49) prevalence). Its apparent shift from an IDU-driven to a generalized epidemic is similar to that of Ukraine.
A World Bank team has developed a simple growth model (Ruehl, Pokrovsky, and Vinogradov [2002]). UNDP developed a 35-sector CGE model based on Russian input-output tables (UNDP [2004] and Sharp [2004b]). The International Labor Organization (ILO) has developed a model that combines an infection probability profile with a partial equilibrium economic model to assess the impact of HIV/AIDS on population, labor force, sustainability of the pension fund, costs of short-term disability benefit, health care

[7] International literature on modeling the economic impacts of HIV/AIDS has been thoroughly summarized and reviewed in Haacker (2004b). Cross-sectional estimations are reported in Over (2002), Cuddington (1993a and b), Cuddington, Hancock, and Rogers (1994), and Cuddington and Hancock (1994), among others. A one-sector growth model with two types of labor, an exogenous saving rate, and a closed-economy assumption is discussed in Haacker (2004a). Open economy with perfect capital mobility is modelled in Freire (2004). Haacker (2002a) studies the effects of HIV/AIDS on the public sector and on economic growth in both closed- and open-economy settings. A model covering the informal sector is proposed in Haacker (2002b). Intertemporally optimizing consumers investing in human capital with the presence of AIDS is considered in Bell, Devarajan, and Gersbach (2004). Arndt and Lewis (2001) examine implications of the HIV/AIDS epidemic in South Africa for sectoral employment and economic growth using a computable general equilibrium (CGE) model. An overlapping generations (OLG) framework with human capital is used. Studies of the impact of intervention strategies on the dynamics of the epidemic include Lewis (1989), IUSSP (1993), Kaplan and Brandeau (1994), and FitzSimons, Hardy, and Tolley (1995). The experience of developing countries battling the epidemic, including prevention policies, socioeconomic determinants of the epidemic, and AIDS' direct impact on the health sector and households, is discussed in Ainsworth, Fransen, and Over (1998).

[8] A neoclassical growth model can be either aggregated (one-sector, two-factor) or disaggregated by type of labor (skilled/unskilled) and/or by sector. Open- and closed-economy assumptions yield different results. Haacker (2004a) demonstrates that a perfect capital mobility assumption yields more negative per capita effect and highlights shortcomings of an aggregate approach in modelling the economic impact of AIDS.

[9] CGE models contain behavioral equations for consumers/firms derived from the microeconomic optimization theory and can be either comparative static or dynamic (the latter are based on the intertemporal optimization or are recursive dynamic). There are single and multi-country models developed for various analytical purposes, all with varying degreea of sectoral disaggregation. They are formulated in either a representative consumer or an OLG framework. Financial assets may or may not be included in the model.

[10] Based on aggregate economic theory and a time series analysis technique, macroeconometric models often lack theoretical structure. Econometric estimation often proves to be technically challenging in transition and developing-economy settings.

[11] Econometric estimates of core model parameters (such as elasticities of substitution in consumption and production input bundles) need to be obtained for CGE models. Multi-sectoral models require input-output tables often unavailable in developing and transition countries.

expenditures for employees, and changes of employment on GDP (ILO [2004], reported in Sharp [2004a]).

Barnett et al. (2001), in work funded by the U.K. Department for International Development and The British Council, evaluated the epidemic's social and economic impact in Ukraine. It is the most widely cited study to date used successfully for policy advocacy. Since the epidemic situation has been changing rapidly since 2001, and new data have become available, the AIDS research and policy community need a re-evaluation of that study. Modeling also needed to be extended to capture the epidemic's macroeconomic effects using the recently available methodology.

Given the degree of uncertainty about the magnitude of the epidemic and its impacts on the factors of production and economic parameters, this study attempted to apply several models for the analyses. Comparing model implications establishes a plausible range for the magnitude of the effects. Lack of data on the costing and effectiveness of many preventive programs (harm reduction, sex education, and condom distribution) limited this study to a projection of the impact of prevention and treatment to ART while acknowledging that other measures are also important and can have significant socioeconomic impact. To ensure comparability of the results, all three models use the same inputs generated by demographic and epidemiological forecasting module and the same scenarios with respect to the costs of treatment and ART. A simple growth model, a macroeconometric model, and a CGE model were all applied to evaluate the macroeconomic costs of HIV/AIDS in Ukraine. Both macroeconometric and CGE models are multisectoral, allowing us to study the differential effects of the epidemic on various sectors of the economy. While different in theoretical structure, both models demonstrate strong sectoral effects.

Simple Growth Model

This section analyzes the application of a simple growth model based on a hypothetical baseline "no-AIDS" scenario and two of the epidemic scenarios (optimistic and pessimistic) constructed in Chapter 3.[12] Three scenarios with respect to the cost of ART, the level of hospitalization of AIDS patients, and the cost/coverage of hospitalization are considered: scenario A is "ARV-low, HOSP(italization)-low"; scenario B is "ARV-high, HOSP-low"; and scenario C is "ARV-high, HOSP-high." Detailed descriptions of the scenario assumptions, methodological approach, data inputs, and model results are in Annex 5. In this section, the optimistic scenario builds on the possible policy intervention that extends availability of ART to a greater number, compared to the pessimistic scenario. It also assumes that the measures of the Ukrainian National Program to Fight HIV/AIDS are successfully implemented, with a corresponding reduction in the rates of MTCT, etc. By calculating the number of avoided new HIV cases and using the Ukrainian cohort life expectancies, the Disability Adjusted Life Years (DALYs) prevented through the intervention are calculated and discussed.

Model Results

Cost scenario A, ARV-low, HOSP-low, would result in the following compared to the baseline in 2014:

- Reduction in the level of output in constant prices by 0.7 percent (optimistic scenario) and 1.3 percent (pessimistic),
- Per capita output unchanged,
- Reduction in average GDP growth rate over 2004-14 of 0.06 percent (optimistic) and 0.11 percent (pessimistic),
- Reduction in capital stock by 0.2 percent (optimistic) and 0.3 percent (pessimistic),
- Reduction in labor supply by 1 percent (optimistic) and 1.5 percent (pessimistic), and
- Reduction in investment by 0.7 percent (optimistic) and 1.3 percent (pessimistic).

[12] Epidemic scenarios differ in their assumptions about the size and dynamics of the most-at-risk populations, yielding different estimates of adult prevalence rates. In our optimistic scenario, adult HIV prevalence rate peaks at 2% in 2010 and in the pessimistic one at 3.5% in 2014. Reduction in the vertical transmission rate (15.9% in 2003) is faster in the optimistic scenario (to 10% in 2004 and then to 5% in 2014) than in the pessimistic one (gradual reduction to 10% in 2014). Availability of ART to those who need it increases from 1% in 2004, to 30% in 2010, and further to 50% in 2014 in the optimistic scenario and to 5% in 2005 and holding at that level until 2014 in the pessimistic one.

The order of effects generated by the model is modest. Scenarios B and C with respect to the cost of ARV therapy and hospital treatment have only marginal effect on the macroeconomic variables (see Annex 5 Table A5-2).

Total AIDS-related medical expenditure is higher in the optimistic scenario compared to the pessimistic one, reaching an annual amount of UAH 628 million by 2014. More than 56 percent of the 2014 total medical expenditure in the optimistic scenario is devoted to ART. This contrasts to a less than 10 percent share of ART in the pessimistic case, where most of the budget is allocated to hospital care. In both cases, HIV/AIDS-related costs represent about 4 percent of the MOH budget. At the same time, mortality and morbidity outcomes in the pessimistic scenario are significantly worse compared to the optimistic scenario: in the former, the total number of infections, the adult prevalence rate, and the number of those needing ART exceed those in the optimistic scenario by a factor of 1.7-1.8, the number of new AIDS cases and annual AIDS deaths by a factor of 1.8-1.9, and the number of new annual HIV infections and annual births to HIV-positive mothers by a factor of 3.2-3.7 (see Tables 5-1 and 5-2).

Table 5-1. Estimated Annual Medical Expenditure Associated with HIV/AIDS Prevention and Treatment in 2014

100,000 UAH

Medical expenditure, including:	Optimistic	Pessimistic
ART	353.0	51.9
AIDS care	275.8	504.5
Total medical expenditure	628.8	556.4
Medical expenditure as a percentage of MOH budget	4.19 percent	3.71 percent

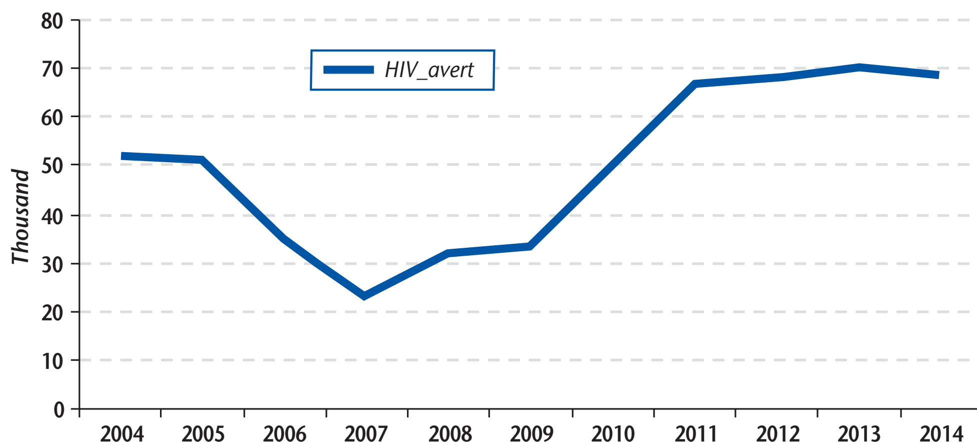
Source: Authors' calculations.

Table 5-2. Projected Epidemic Outcomes, 2014, Scenario Analysis

HIV/AIDS Summary: 2014	*Optimistic*	*Pessimistic*	*Ratio (pessimistic to optimistic)*
Number infected with HIV, thousands	478.5	820.4	1.71
Adult prevalence rate, percentage	2.0	3.5	1.76
New annual HIV infections, thousands	29.0	94.0	3.24
Cumulative number needing ARV treatment, thousands	94.0	155.0	1.65
New annual AIDS cases, thousands	36.8	67.3	1.83
Annual HIV+ births, thousands	0.5	1.7	3.69
Annual AIDS deaths, thousands	34.8	64.9	1.86
Annual AIDS deaths per thousand	0.8	1.5	1.89
Cumulative AIDS deaths, thousands	301.3	526.4	1.75
AIDS orphans, thousands			
Dual	26.0	42.0	1.62
All	105.0	169.0	1.61
Life expectancy, years			
Total	68.5	66.7	0.97
Male	63.4	61.6	0.97
Female	72.9	71.0	0.97
Population, hundred thousands	43.9	43.7	0.99

Source: Authors' calculations.

Figure 5-1. Number of HIV Infections Averted by Realizing "AIDS Optimistic" Rather Than "AIDS Pessimistic" Scenario, 2004-14



Source: Authors' calculations.

Analysis of Optimistic versus Pessimistic Epidemic Scenarios as a Policy Intervention

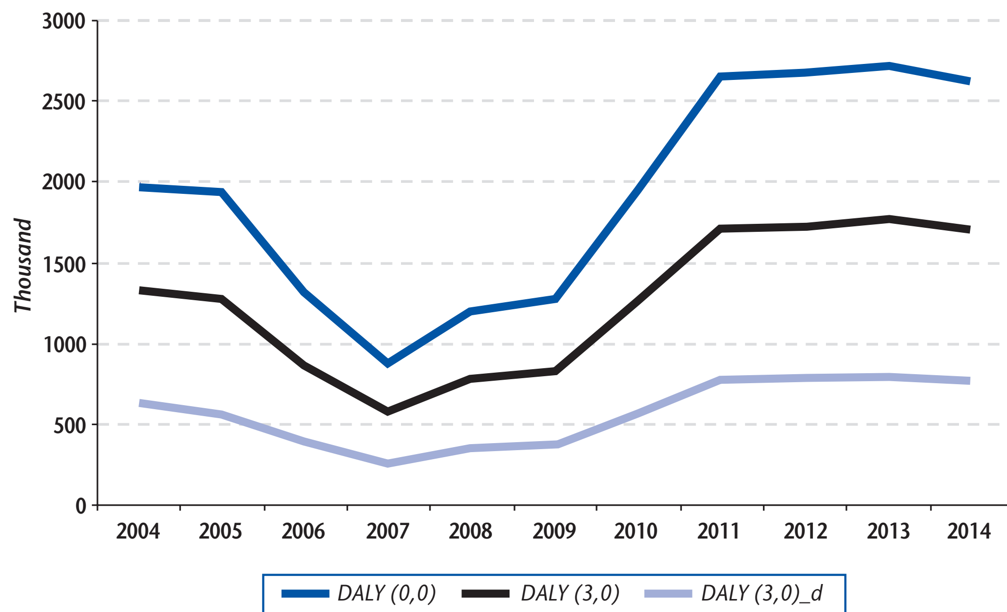
The incidence-based methodology for the economic evaluation of the HIV intervention programs used in this study follows the methodology of the Global Burden of Disease (GBD) study (see Murray, Lopez, and WHO [1994]; Murray and Acharya [1997]; Murray et al. [2000]; and Murray and Lopez [2000]) and uses the Disability Adjusted Life Year (DALY) measure. See Annex 6 for detailed discussion of the GBD methodology.

The underlying pessimistic and optimistic epidemiological scenarios rest on an assumption about the availability of ART. The study assumes 100 percent public financing of the therapy and examines the cost-effectiveness of such a policy intervention measured in public expenditure per DALY saved/avoided.

To construct the DALY measure, the number of new HIV cases avoided each year was predicted for 2004-14 based on the Spectrum AIM projections. The cases avoided were recorded by age-sex group for each year. As Figure 5-1 demonstrates, extension of ART to 50 percent of those in need (optimistic), compared to 10 percent (pessimistic) by 2014, would prevent 50,000 new HIV infections per year on average over 2004-14.

For each prevented case, the Years of Life Lost (YLL) was calculated based on the cohort life expectancy, and the Years Lost to Disability (YLD) was calculated based on the assumptions about the duration of the disease and its severity, presented in Annex 6 Table A6-1. It is assumed that on average, a child develops full-blown AIDS in 6 years and dies in 7 years and 3.5 months. An adult develops AIDS within 8 years and dies in 12.4 years. Based on the disability weights from Annex 6 Table A6-1, DALYs averted were calculated for 2004-14, with three

Figure 5-2. Number of DALYs Averted by Realizing "AIDS Optimistic" Rather Than "AIDS Pessimistic" Scenario, 2004-14



Source: Authors' calculations. *Note:* See footnote on page 27 for legend description.

measures constructed.[13] Results are presented in Figure 5-2.

Depending on the measure used, in excess of 21 million undiscounted DALYs (13.8 million DALYs discounted at 3 percent) would be saved over 2004-14 if the optimistic scenario is followed instead of the pessimistic one. In low-cost scenario A, this would be achieved at an average cost of 11-37 UHA per DALY (depending on whether an undiscounted or a discounted DALY measure is used), which translates into a total average health expenditure of 9-29 UHA per DALY after taking into account the corresponding reduction in AIDS hospitalization costs. The average annual cost per averted HIV infection is 419 UHA (or 328 UHA net of avoided hospitalization costs). The high-cost scenario C generates an average cost of 54-184 UHA per DALY (depending on definition), which translates into the total average health expenditure of 17-57 UHA per DALY (after accounting for avoided hospitalization costs). The average annual cost, net of avoided hospitalization costs, per averted HIV infection in the high-cost scenario is 762 UHA. Provision of ART appears to be a highly cost-effective intervention in this hypothetical comparative analysis of optimistic and pessimistic scenarios. Details of the results are in Annex 6 Table A6-3.

Macroeconomic Model

In this section, a macroeconometric model is used to evaluate the economic costs of Ukraine's epidemic, using the labor force projections from our epidemic scenarios. The impact of HIV/AIDS on sectoral employment during 2004-14 is estimated and used as an input into the macroeconometric model. The methodology for model estimation and application is discussed in Annex 7.

Predicted decline in the level of GDP depends on the measure of GDP used (product or expenditure). GDP (production) shortfall is larger due to the direct impact of reduced employment (a reduction of 1.6-3.0 percent by 2014). GDP (expenditure) measured though the basic macroeconomic identity falls by 1.4-2.7 percent in the range of epidemic scenarios. Gross investment falls by 1.5-2.8 percent compared to the benchmark, and budget revenue declines by 1.3-2.6 percent by 2014, depending on the epidemic scenario. The estimations show only slight decreases in savings, imports, and average labor productivity (output per employee).

Sectoral Analysis

The model allowed us to estimate value-added in separate sectors of economic activity (in constant 1996 prices) for the following sectors: agriculture, hunting, forestry and fishing industry; mining; manufacturing; production and distribution of electricity, gas, and water (EGW); construction; wholesale and retail trade, trade in transport facilities and repair services; transport and communications; financial services; real estate operations, leasing and services to legal entities; government services; health and social services; education; and other services. The epidemic's estimated impacts on these sectors are presented in Table 5-3 on page 28.

As follows from Table 5-3, the agriculture, hunting, forestry, and fishing industry is the most affected (a decline of 1.2-2.3 percent compared to the "no-AIDS" scenario in 2014), followed by transport and communications (a reduction of 1.2-2.2 percent), and construction (minus 1-1.8 percent). The gap between sectoral outputs in "no-AIDS" and "with-AIDS" scenarios widens as the epidemic unfolds.

The results for agriculture are explained by the fact that the regions worst affected by HIV/AIDS produce almost 80 percent of Ukraine's total agricultural output. Losses in the labor force and a high estimated labor intensity in the agricultural production function lead to an overall strong sectoral effect. Annex 7 Table A7-3 ranks the oblasts with regard to major agricultural producers in terms of the HIV prevalence in 2004, with 1 corresponding to the lowest prevalence rate and 5 the highest. Most agricultural employment is located in the areas with a relatively high HIV prevalence. Due to the unavailability of rural/urban prevalence data, this was the best feasi-

[13] Three measures are DALY (0,0), undiscounted; DALY (3,0), discounted at 3 percent; and DALY (3,0)_d (discounted), with YLL discounted back from the time of death to the time of infection.

Table 5-3. Macroeconometric Model: Estimated Difference in Sectoral Output in Two Epidemic Scenarios, 2005-14

Percentage difference from "no-AIDS" scenario	2005	2014	2005	2014
	OPTIMISTIC		PESSMISTIC	
All sectors	-0.35	-0.90	-0.31	-1.73
Agriculture, hunting, forestry, & fishing	-0.29	-1.20	-0.26	-2.31
Mining	-0.03	-0.10	-0.03	-0.19
Manufacturing	-0.09	-0.23	-0.08	-0.43
EGW	-0.07	-0.20	-0.06	-0.38
Construction	-0.26	-0.95	-0.23	-1.83
Wholesale & retail trade	-0.05	0.16	-0.05	-0.31
Transport & communications	-0.27	-1.17	-0.23	-2.24
Financial services	-0.05	-0.23	-0.05	-0.44
Real estate	-0.03	-0.08	-0.03	-0.16
Government services	-0.09	-0.41	-0.08	-0.79
Health & social services	-0.03	-0.11	-0.03	-0.20
Education	-0.19	-0.67	-0.16	-1.29
Other services	-0.11	-0.22	-0.10	-0.43

Source: Authors' calculations.

ble way to estimate the effect of HIV/AIDS on agricultural labor. The magnitude of the effect is explained by the particular form of the estimated production function.

State Statistics Committee of Ukraine (Derzhkomstat 2004a) data indicate that the worst-affected oblasts in terms of the HIV prevalence are the ones with the highest output per worker and the highest agricultural wages that drive inward migration. Table A7-4 reports nominal wages by oblast, confirming that Dnipropetrovsk, Donetsk, Zaporizhya, Kyiv, Lugansk, Odesa, and Kharkiv Oblasts report wages significantly above the national average. All of these oblasts are at or above the national HIV prevalence rate.

Multisector CGE Model

A 20-sector computable general equilibrium (CGE) model was also developed and applied to study the epidemic's macroeconomic effects. Model description, methodology, and results are in Annex 8. Based on the general methodological approaches discussed above (e.g., Sharp [2002]; Ruehl, Pokrovsky, and Vinogradov [2002], and Haacker [2004 a and b]), the impact of HIV/AIDS on the economy was modeled as three distinct shocks, as follows:

Reduction in labor supply. A 1.5 percent, 2 percent, and 4 percent decline in labor force endowment is assumed for optimistic, medium, and pessimistic scenarios, respectively, based on the labor force projections of Chapter 4. The most pessimistic scenario in terms of labor supply shock is based on the projected magnitude of labor force decline in the most-affected regions. See Annex 8 for details on the distribution of shocks by type of labor.

Reduction in labor productivity. The study assumed a 1.5 percent, 4 percent, and 7 percent reduction in labor productivity in optimistic, medium, and pessimistic scenarios, respectively. Changes in labor productivity were modeled through the Total Factor Productivity (TFP) score, distributed according to the factor shares by type of labor (using Annex 8 Tables A8-1 and A8-2).

Increase in public spending. Based on the epidemic and cost scenario projections provided earlier, the public expenditure related to HIV/AIDS will increase within the range 0.2 percent, 2 percent, and 3.5 percent of the government budget, for the optimistic, medium, and pessimistic scenarios, respectively.

Based on these types of shocks, three scenarios were applied. One scenario (Scenario 2 or "Medium") has three subscenarios within it, referred to here as scenarios 4-6 and listed in the tables under "Medium subscenarios."

- **Scenario 1:** Optimistic: 1) drop in labor supply of 1.5 percent; 2) decrease in labor productivity of 1.5 percent; and 3) increase in public spending by 0.2 percent;

- **Scenario 2:** Medium: 1) drop in labor supply of 2.0 percent; 2) decrease in labor productivity of 4.0 percent; and 3) increase in public spending by 2.0 percent;
- **Scenario 3:** Pessimistic: 1) drop in labor supply of 4.0 percent; 2) decrease in labor productivity of 7.0 percent; and 3) increase in public spending by 3.5 percent;
- **Scenario 4:** Drop in labor supply of 2.0 percent;
- **Scenario 5:** Decrease in labor productivity of 4.0 percent;
- **Scenario 6:** Increase in public spending of 2.0 percent.

Scenarios 4-6 were used to evaluate the relative importance of the underlying shocks in generating the overall effect.

Estimated Macroeconomic Implications

Table 5-4 documents the negative impact of HIV/AIDS across all scenarios. Total welfare and GDP substantially decrease under all six scenarios, including those with single shocks, and the gap

Table 5-4. CGE Model: Macroeconomic Implications of the Epidemic, Scenario Analysis

MACRO INDICATORS	Benchmark	Scenarios			Medium subscenarios		
		Pess-c	*Med-m*	*Opt-c*	*Reduced labor*	*Lower TFP*	*Higher public spending*
Welfare (equivalent variation, change in percentage)	-	-8.3	-4.6	-2.2	-2.6	-3.3	0.0
GDP Index (change in percentage)	-	-5.5	-3.1	-1.6	-1.8	-2.3	0.2
Private investment (change in percentage)		-9.0	-5.0	-2.4	-2.8	-3.6	0.0
Real factor return (change in percentage)							
– Return to capital	-	-7.03	-3.87	-1.90	-2.22	-2.55	-0.11
– Wage rate for unskilled labor	-	-7.46	-4.17	-1.78	-1.93	-3.55	-0.03
– Wage rate for skilled labor	-	-2.58	-1.70	0.07	0.55	-3.56	0.05
– Wage rate for highly skilled labor	-	-1.42	-1.05	0.37	0.89	-3.18	0.14
Aggregate exports (UAH billion)	113.24	102.54	107.12	110.40	110.05	108.52	113.18
Aggregate imports (UAH billion)	109.92	99.09	103.74	107.05	106.69	105.18	109.84
Total exports (change in percentage)	-	-9.46	-5.41	-2.51	-2.82	-4.17	-0.06
Total imports (change in percentage)	-	-9.86	-5.63	-2.61	-2.94	-4.31	-0.08
Tariff revenue (share of public budget)	10 %	9 %	9 %	10 %	10 %	10 %	10%
Indirect tax revenue (share of public budget)	49 %	55 %	52 %	51 %	51 %	51 %	50%
Indirect tax rate (weighted average)	12 %	15 %	13 %	12 %	12 %	12 %	12%
Consumer Price Index (change in percentage)	-	-0.75	-0.42	-0.18	-0.20	-0.34	-0.01
Producer Price Index (change in percentage)	-	-3.01	-1.59	-0.66	-0.77	-0.90	-0.29
Real exchange rate (change in percentage)	-	-1.60	-0.77	-0.34	-0.43	-0.25	-0.19

Source: Authors' calculations.

widens from optimistic to pessimistic scenarios. Increased expenditure on care and treatment raises public and private consumption and decreases savings and investments. Private investment falls by 9 percent in the pessimistic scenario, following the 7 percent reduction in real rate of return to capital. The latter is due to the reduced marginal product of capital following the loss of labor.

The reduction in labor productivity (modeled as a shock to TFP) is the strongest driver of the negative impact, followed by the reduction in labor supply. Increased public spending yields a smaller effect. Return to labor (wages) declines in all scenarios except the optimistic one. Separating out the effects of reduced labor supply and lower productivity, we find that as skilled and highly skilled labor becomes scarcer, their factor payment (wages) goes up. Nevertheless, the labor productivity factors act in the opposite direction, pushing wages down, and the combined effect is a fall in wages. Note from Table 5-4 that both exports and imports fall, driven by the changes in domestic supply and demand.

Table 5-5. CGE Model: Sectoral Implications of HIV/AIDS Epidemic, Scenario Analysis

		Scenarios			Medium subscenarios		
OUTPUT INDEX	*Benchmark*	*Pess-c*	*Med-m*	*Opt-c*	*Reduced labor*	*Lower TFP*	*Higher public spending*
Agriculture, hunting	1.00	1.02	1.01	1.00	1.00	1.01	1.00
Fishery	1.00	0.99	1.00	1.00	0.99	1.00	1.00
Mining of coal and peat	1.00	0.91	0.95	0.98	0.97	0.97	1.00
Production of non-energy materials	1.00	0.67	0.81	0.91	0.91	0.84	1.00
Food-processing industries	1.00	0.98	0.99	1.00	0.99	1.00	1.00
Textile and leather industry	1.00	0.99	1.02	1.01	1.01	1.05	0.98
Woodworking, pulp and paper industry, publishing	1.00	1.03	1.03	1.01	1.00	1.04	1.00
Petroleum refinement	1.00	0.95	0.97	0.99	0.99	0.98	1.00
Manufacture of chemicals, rubber and plastic products	1.00	0.89	0.95	0.98	0.98	0.96	1.00
Manufacture of other non-metallic products	1.00	0.90	0.95	0.98	0.97	0.97	1.00
Metallurgy and metal processing	1.00	0.63	0.78	0.91	0.90	0.81	1.00
Manufacture of machinery and equipment	1.00	0.91	0.96	0.97	0.97	0.99	1.01
Other	1.00	0.74	0.84	0.93	0.93	0.86	1.00
Electric energy	1.00	0.90	0.95	0.98	0.97	0.96	1.00
Public utilities	1.00	0.94	0.97	0.98	0.98	0.98	1.00
Construction	1.00	0.93	0.96	0.98	0.98	0.98	1.00
Trade	1.00	0.94	0.97	0.98	0.98	0.98	1.00
Hotels and restaurants	1.00	1.21	1.12	1.04	1.04	1.12	1.00
Transport	1.00	1.20	1.11	1.04	1.04	1.10	1.00
Post and telecommunications	1.00	1.01	1.01	1.00	1.00	1.02	1.00
Other services	1.00	1.00	1.00	1.00	0.99	1.01	1.00

Note: All benchmark indexes equal unity (or 100 percent), reflecting the starting (benchmark) position for the change.

Source: Authors' calculations.

Sectoral Implications

The HIV/AIDS epidemic is estimated to have important sectoral impacts, depending on the factor intensity of the sector and the distribution of skill classes within the sector labor force (see Table 5-5). Sectors with labor-intensive production and a high share of skilled and highly skilled labor appear to be the most affected. Examples include the mining of coal and peat and production of non-energy materials sectors (the share of skilled and highly skilled is about 44 percent in each). Separate simulations under the medium scenario reveal that decline in labor supply and labor productivity has a relatively equal impact on sector output, given a slightly higher weight on labor productivity in some sectors. Similar results are observed for sectoral exports (see Annex 8 Table A8-5).