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Public Investment and Poverty Reduction in Tanzania: Evidence from Household Survey Data

Shenggen Fan, David Nyange and Neetha Rao

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ABSTRACT

Several recent IFPRI studies have measured the effects of public spending on growth and poverty reduction in selected Asian countries using pooled time-series and cross-region data. However, many African countries lack such data. Using Tanzania as a test case, this study demonstrates how household survey data can be used to assess the impacts of public investments on growth and poverty. A two step procedure is used. First, household survey data are used to link household welfare measures to human capital and household access to infrastructure and technology, while controlling for other community and household characteristics. The second step links household human capital and access to infrastructure and technology to past public investments in these factors. As in the Asian studies, the growth effects (measured as per capita income) of investments in agricultural research, roads, and education are found to be large. But unlike Asia, no clear distinction emerges between the measured impacts for high and low potential areas. In many high potential areas, returns to investments are still high and there is no sign of any diminishing marginal returns. This suggests that there has been insufficient public investment in all kinds of regions. Nevertheless, the results show that there is opportunity to improve on the growth and poverty impacts of total public investment through better regional targeting of specific types of investment. For example, additional investments in rural education have attractive growth and poverty impacts in all regions, whereas additional investments in roads and agricultural research are better spent in the central and southern regions of the country.

PUBLIC INVESTMENT AND POVERTY REDUCTION IN TANZANIA: EVIDENCE FROM HOUSEHOLD SURVEY DATA

Shenggen Fan, David Nyange and Neetha Rao[*]

1. INTRODUCTION

Prior to recent policy reforms, Tanzania pursued state-led economic growth guided by the political ideology of *Ujamaa*, or African socialism. The country began to undertake macroeconomic policy reforms in line with structural adjustment programs in the mid-1980s. These reforms were considered necessary for creating macroeconomic stability for sustained economic growth. Amongst other things, the reforms entailed rationalization of government spending on the public sector and more conservative fiscal policies, including downsizing the civil service and removing some government subsidies to sectors like agriculture.

As a result of the macroeconomic reforms, Tanzania has experienced a significant improvement in its economic indicators. For example, inflation has fallen from 30% in 1995 to 4.4% in 2004; foreign exchange reserves increased from the equivalent of 6 weeks of merchandize imports in 1995 to 18 weeks in 2002; the official exchange rate became more stable; and GDP grew at 5.2% in 2004, up from 2.6% in 1995.

Despite these achievements, the decline in poverty has been disappointing, particularly in rural areas. Comparison of poverty indicators calculated from the national household budget surveys shows that poverty declined by only 3% during the 1990s (from 39 to 36%). In urban areas (excluding Dar es Salaam), the incidence of poverty declined from 29 to 26%, while in rural areas it fell from 41 to 39%. Only Dar es Salaam experienced a statistically significant decline in poverty, from 28% to 17%.

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The failure to reduce poverty faster has raised concerns about the effectiveness of the policy reforms in improving the welfare of ordinary Tanzanians, particularly in rural areas. In 2001, the government of Tanzania adopted a medium-term strategy for poverty reduction in the form of a Poverty Reduction Strategy Paper (PRSP) which, among other things, envisages increased public investment in strategic sectors that are likely to have greater impact on poverty. The priority sectors are basic education, primary health care, rural roads, water supply, agricultural (including livestock) research and extension, the judiciary and HIV/AIDS. The PRSP envisages halving poverty from 1990 levels by 2010.

This paper analyzes how public spending priorities might be changed to contribute more effectively to this poverty reduction goal. The specific objectives of the study are to:

➢ Review and document changes in the level and composition of public investment in Tanzania, and the reasons behind these changes.

➢ Estimate the growth and poverty impacts of different types of public investments and the interaction effects that can arise between them.

➢ Provide guidance on future priorities for government investment.

Because of the diversity of agroclimatic conditions in Tanzania, the analysis is undertaken at national and regional levels. The regions used in the analysis are as follows.[1]

• *Northern zone*. This zone includes Arusha and Kilimanjaro. The zone has a rainfall of 1,000 mm or more per annum. The major agricultural commodities are coffee, banana and dairy products. The zone is part of an important tourist area which provides good non-farm opportunities for local people.

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[1] This regional division is summarized by the authors from *Basic Data: Agriculture and Livestock, 1993/4; Comprehensive Food Security Program,* Volume 1, Ministry of Agriculture, 1992

- *Southern Highlands*. This zone has three regions: Mbeya and Iringa, and Ruvuma. Rainfall is abundant, greater than 1,500 mm per annum. Maize and legumes are the major agricultural products. It is one of the maize surplus areas in the country. Coffee and tea are also grown in the highlands.

- Northern Coast. This zone includes Dar es Salaam, the Coast, Morogoro, and Tanga. Annual rainfall ranges from 500 to 1,000 mm. Fishing is an important activity. Rice and cashew nuts are major agricultural products. It has the country's major urban area, with good infrastructure such as main roads, railway lines and ports. Non-farm jobs are an important source of income.

- Southern Coast. Two regions, Lindi and Mtwara, are in this zone and they are similar to the Northern Coast with an annual rainfall of 500 - 1,000 mm. Fishing is an important economic activity. The predominant farming system is cassava and cashew nuts. However, infrastructure is less developed than it is in the Northern Coast.

- Lake Victoria. This zone contains four regions: Mwanza, Shinyanga, Mara, and Kagera. Annual rainfall ranges from 1,000 to 1,500 mm. Despite abundant rainfall, Shinyanga region is prone to drought and is semi-arid. The predominant farming system is cotton, sorghum, millet and livestock. Rich in minerals, mining is an important economic activity. Fishing is for both local consumption and export.

- Western zone. Kigoma and Rukwa are located in this zone. Annual rainfall is between 1,000 to 1,500 mm. Maize and cassava are the two major crops grown in the region. Both industry and infrastructure lag behind other regions.

- Central zone: Tabora, Dodoma, Singida regions are located in this zone. It is the driest zone in the country with an annual rainfall of less than 500 mm. The major crops are millet and sorghum. Livestock activity is important. Overgrazing and soil erosion are serious environmental problems in the central zone.

2.   REFORMS, GROWTH AND POVERTY REDUCTION

Tanzania is among the least developed countries with a 2003 per capita GDP of less than $300 measured at the official exchange rate, or $600 measured in purchasing power parity (PPP). Agriculture contributes about 45% of GDP and employs 80% of the population. Three-quarters of Tanzania's export earnings come from the agricultural sector. Major export crops are coffee, cotton, tea, tobacco, cashew nut and sisal. Staples are maize, rice, sorghum, millet, cassava and potatoes. Most of the population lives in rural areas where they are largely engaged in agriculture. For the past several decades, the country has experienced several major changes in political and economic systems.

Broadly speaking, Tanzania's economic policies can be subdivided into 3 phases: post-independence (1961-66 – Phase I), socialism (1967-85 – Phase II) and reforms (1986-present – Phase III).

Phase I: Post-independence, 1961-66

Phase one was characterized by a market economy with economic policy favoring the development of the private sector. Autonomous farmers' cooperatives operated in areas producing export crops. Throughout this period, the economy remained fairly open and markets were free from government intervention.

As shown in Table 1, the economy performed well during this period. Real GDP grew at 5.7% per year driven in large part by the agricultural sector. Agricultural value added averaged 53% of GDP compared to 5.3% for the manufacturing sector. Per capita income grew by 2% per year, the highest rate ever recorded in Tanzania since Independence. Inflation was less than 4% per year and there was a favorable balance of payments and stable prices. Nearly 60% of export earnings came from the primary agricultural crops (Amani et al., 2003).

Table 1. **Trends in Tanzania's Economic Performance, Public Expenditure and Social Indicators, 1961 - 2001**

	1961-1966	1967-1979	1980-1985	1986-1992	1993-2001
Real GDP growth rate (%)	5.7	4.7	1.1	5	3.8
Per capita income growth (%)	2	0.7	-1.5	1.2	0.5
Inflation rate (%)	4	10	36.1	30	18
Agriculture value added (% of GDP)	53	41	50	54	49
Manufacturing value added (% of GDP)	5.3	1.1	7	8.1	7.4
Exchange rate (official)	5	7	12	174	736
Balance of payment (% of GDP)	3.5	-4.3	-5	-16.1	-11
Goss investment (% of GDP)	18.5	24.3	19.9	28	21
Public Expenditure (share in %)					
Agriculture	-	10.5	7.3	5.6	2.68
Education	-	13.1	10.7	6.6	11
Health	-	6.3	5.2	5	5.6
Public debt	-	7.5	17.9	28.3	14
Selected human and social indicators					
Primary school enrollment ratio		91.4	87.8	70.2	67.2
Calories per capita		2,265	2,246	2,171	1,946

Source: Calculated and extracted from National Bureau of Statistics (*Economic Surveys* - various years); Bank of Tanzania (*Economic Bulletin* - various issues/years), Dar es Salaam; and World Development Indicators (2003). Public expenditure shares runs from 1967/68 to 1999/ 2000. Human and social indicators from AfDB (2002), *Selected Statistics* (First column for 1979 only)

Phase II: Socialism, 1967-85

In 1967, Tanzania adopted socialist policies under the slogan of the 'Arusha declaration.' Under socialism most private enterprises including financial institutions were nationalized and managed as state companies. State companies had a monopoly in all sectors despite continued operation of private enterprises. Government fixed prices for staples foods, export crops and essential goods and took control of farmers' cooperatives.

Economic performance during the period was somewhat uneven. Real GDP growth averaged 4.7% per year. Investment was high throughout the 1970s though it declined in 1973-75. Growth in per capita income was still positive at 0.7% per year and inflation averaged 10% per year. The balance of payments worsened (–4.3% of GDP).

Exports accounted for 11.4% of GDP, mainly dominated by traditional agricultural exports, which accounted for almost 60% of total exports. Producers of export cash crops faced declining prices due to inefficiency of the marketing boards. The share of imports to GDP (16.4%) was higher than that of exports, hence a negative trade balance.

Economic performance continued to worsen and reached a crisis level between 1980 and 1985 when inflation soared to 36% per annum and the balance of payment deteriorated. The government instituted crisis policies and strategies including the National Economic Survival Programs (NESP) of 1981 and 1982, and the 1983 Structural Adjustment Program (SAP). The goals were to increase export revenue and eliminate food shortages through tighter control of public expenditure and increased production. In 1983, a modest devaluation was attempted with some positive effects on agro-exports but the gap between the official and parallel rates widened. As shown in Table 1, real GDP growth fell and in some years it was negative. Per capita income fell by 1.5% per year during 1980-85. Agricultural growth declined though its contribution to the economy remained high at 50% of GDP. The number of parastatals increased from about 40 entities in 1966 to about 450 by the mid-1980s (Amani et al., 2003).

Phase III: Reform period, 1986-present

Deregulation of the economy started gradually in 1986. Agriculture being the largest economic sector was naturally a priority of the reforms. Reforms that specifically targeted the agricultural sector included: withdrawal of government from fixing producer and consumer prices; reduction of export taxes; and removal of agricultural subsidies, particularly in farm inputs and crop marketing. Other reforms included removing the government's monopoly in marketing food staples and export crops; privatization of state-owned companies; and promotion of the private sector. Reforms that indirectly affected the agricultural sector included removal of controls over foreign exchange and interest rates, and rationalization of government spending through strict fiscal policies and downsizing of the civil service.

The early stages of the reform process yielded mixed results. From 1986 to 1992, real GDP grew on average at 5% per year, and per capita income by 1.2% per year. Agricultural production increased significantly, and growth of the manufacturing sector turned from a negative 4% per year between 1967 and 1985 to positive growth thereafter, in spite of the fact that many industries eventually collapsed due to increased import competition. Investment increased slightly with development of the private sector. However, agricultural investment remained low, inflation heightened (to 30% per year) and the trade balance was still negative. There was a massive devaluation (official exchange rate increased from 51.7 in 1986 to 335 shilling per US dollar in 1992) although the premium in the parallel foreign exchange market increased. Given export incentives and increased diversification into non-traditional exports, commodity exports rose steadily in real terms. Imports also grew by 56% and accounted for 28% of GDP compared to 9% for exports.

In the post-reform period of 1993 to 2001, real GDP continued to grow at around 3–5% per year, and per capita income grew by at less than 1% per year. The dominance of the agriculture sector is still notable although a few other sectors such as tourism, mining and transport are now more important than before. Macroeconomic stability has remarkably been achieved, with inflation falling to a single digit rate (e.g., 6% in 2000). Foreign exchange reserves increased from the equivalent of 6 weeks worth of imports in 1995 to more than 4 months worth of imports in 2000 (URT, Economic Survey, 1996 and 2001). The official and parallel exchange rates were unified and now determined by market forces.

In the 1970s, the proportion of the government's budget spent on public services was at its highest, as should be expected of a socialist economy. For example, education was allocated 13% of the total budget while agriculture received 10.5% (Table 1 and Figure 1). Primary education was subsidized by the government and free to all children. Primary health services were also free despite their relatively small budget share (6%). During Phase II Tanzania was ranked highly in human development and social development indicators. However, as economic performance worsened, the government

could not sustain the financing of public services and their budget shares had declined sharply by the beginning of the reform era.

Three factors seem to have contributed to the low government spending on public services during the reform period. First, reform in public sector required spending to be commensurate with government revenue mobilization. Second, servicing of public debt whose share in the budget had increased from 7.5% in the 1970s to 28%. Third, foreign aid flows fell just before the reforms as donors became more critical of the country's development policy (Bigsten at al., 1999). As the share of government spending in public services declined, some of human and social indicators worsened.

Figure 1.   The Structure of the Government Budget in Tanzania

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                        ┌─────────────────┐
                        │   EXPENDITURE   │
                        └────────┬────────┘
                ┌────────────────┴──────────────┐
        ┌───────────────┐              ┌─────────────────┐
        │   RECURRENT   │              │   DEVELOPMENT   │
        └───────────────┘              └────────┬────────┘
                                ┌───────────────┴──────────────┐
                    ┌───────────────────────┐      ┌───────────────────────┐
                    │ Ministerial and Regional │    │   Local government    │
                    │                       │      │   (Urban and Rural)   │
                    └───────────┬───────────┘      └───────────┬───────────┘
                        ┌───────┴───────┐              ┌───────┴───────┐
                    ┌───────┐   ┌─────────┐        ┌───────┐   ┌─────────┐
                    │ Local │   │ Foreign │        │ Local │   │ Foreign │
                    └───────┘   └─────────┘        └───────┘   └─────────┘
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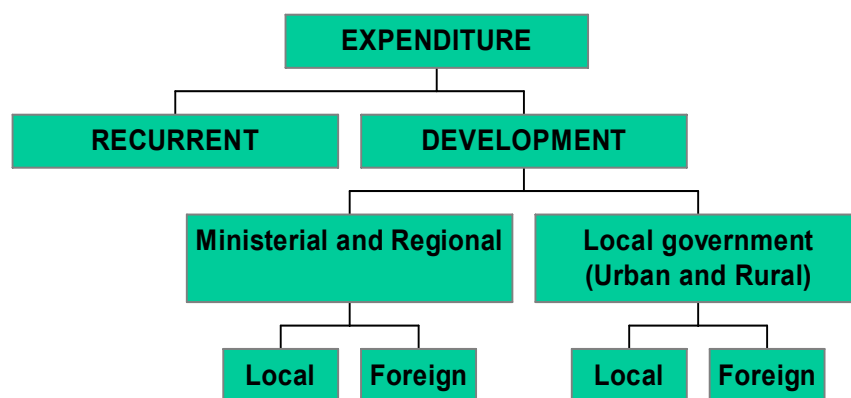
In the late reform period, the declining trend in public spending was reversed. For instance, the share of education and health in total expenditure grew while the share of public debt declined and is expected to decline further following Tanzania's admission into the HIPC. In 2002/03, the Ministry of Agriculture's budget was twice as large as in the preceding year. This increase in the public service budget was in response to the PRSP, which emphasized public spending in sectors judged likely to have the greatest impact on poverty reduction.

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Agricultural Growth

Agriculture is the most important economic sector in Tanzania, contributing about 50% of total GDP over the past four decades (Table 1). For the past ten years (1990-2000), the sector has also grown more rapidly than in most other African countries with an annual growth rate of 3.1%. Correspondingly, AgGDP per worker in constant 1995 US$ increased from 177 in 1990 to 191 in 2000.

However, the level of real agricultural growth achieved during the past decade has not been sufficient to bring about a significant reduction in the number of rural poor. Rapid population growth of 2.8% per year has meant that per capita agricultural GDP only grew by 0.3% per year. Given the importance of agriculture as the mainstay of rural livelihoods, agriculture must grow much faster if rural poverty reduction is to become a reality in Tanzania. Several factors have contributed to the modest performance of the agricultural sector in the country. One factor has been the heavy reliance on hand hoe cultivation in rainfed agricultural systems. In these situations, and in the absence of major technological breakthroughs or diversification into higher value crops, the rate of growth of the agricultural labour force tends to be a major determinant of the agricultural sector's growth potential. In addition, the incentive structure over the past decade has not encouraged growth or investment in the agricultural sector. Agriculture's barter terms of trade, which measures the relative change in agricultural producer prices compared to the price of industrial goods, has not changed significantly over the past decade. The farmers' share of retail or export prices is another indicator of agriculture's incentive structure. As a result of market liberalization for the major food crops, margins between producer prices and consumer prices have narrowed significantly. For the major export crops, the farmer's share in export prices has generally increased over time, but the magnitude has remained modest. Moreover, despite the rationalization and streamlining of taxes in recent years, there are still significant direct and indirect taxes on many marketed agricultural products (Ministry of Agriculture, UTR, 2001).

Poverty Reduction and Poverty Reduction Strategy

Lack of rapid economic growth, particularly agricultural growth, on a per capita basis has led to little progress in poverty reduction in Tanzania. Between 1991 and 2001, the poverty rate declined only marginally from 38.6% to 35.7% at the national level when the 'basic needs' poverty line is used (Table 2). When the 'food poverty' line is used, it declined from 21.6% to 18.7%. As in many other developing countries, the poverty rate in rural Tanzania is substantially higher than in urban areas. For example, in Dar es Salaam, only 17.6% of population is under the 'basic needs' poverty line while in rural areas the rate is 40.8%. Moreover, the reduction in poverty in rural areas has been much smaller than in urban areas. Between 1991 and 2001, the urban poverty rate was reduced by more than 10 percentage points, but in rural areas it was reduced by only 2 percentage points.

Table 2.   Poverty in Tanzania, 1991/92 and 2000/01

		Dar es Salaam	Other Urban Areas	Rural Areas	Mainland Tanzania
1991/92	Food Poverty	13.6	15	23.1	21.6
	Basic Needs	28.1	28.7	40.8	38.6
2000/01	Food Poverty	7.5	13.2	20.4	18.7
	Basic Needs	17.6	25.8	38.7	35.7

Source: Household Budget Surveys (1991/92 and 2000/01).

Poverty rates are high in most regions of the country (Table 3), but are highest along the south coast (Lindi and Mtwara) and along Lake Victoria (Mara, Mwanza, and Shinyanga).

Since Independence in 1961, several national development plans have been formulated. Despite differences in their proposed interventions, all had a common goal of alleviating illiteracy, disease and poverty. The latest plan is the 2000 Poverty Reduction Strategy Paper (PRSP). The PRSP is an integral part of the HIPC process, focusing on poverty alleviation in the medium term (2010).

Table 3.   Poverty Rate by Administrative Region, 2000-01

Region	Basic Needs	Food	Region	Basic Needs	Food
Dodoma	34	13	Morogoro	29	14
Arusha	39	25	Mtwara	38	17
Coast	46	27	Mwanza	48	30
Iringa	29	10	Rukwa	31	12
Kagera	29	18	Ruvuma	41	27
Kigoma	38	21	Shinyanga	42	22
Kilimanjaro	31	11	Singida	55	28
Lindi	53	33	Tabora	26	9
Mara	46	36	Tanga	36	11
Mbeya	21	8			
			TOTAL	36	19

Source: Household Budget Survey (2000/01)

The overall PRSP goal is to halve the number of persons below the poverty line between 1990 and 2010. Among specific PRSP objectives are: reduce the number of rural poor and the number of food poor by 50%, reduce illiteracy by 100%, increase the rural poor's access to clean and safe water from 48.5 to 85%, reduce the infant mortality rate by 50%, restore life expectancy to at least 52 years and reduce the prevalence of child malnutrition from 43 to 20%. But if the country continues along the same trajectory as in the 1990s, it will be impossible to achieve these goals. Tanzania will need to make significant changes and achieve much higher economic and agricultural growth over the next 5 to 10 years. Realigning public spending will be key to achieving those goals.

3.   GOVERNMENT SPENDING AND PUBLIC CAPITAL

Public expenditure is broadly categorized into the 'recurrent' and 'development' budgets (Figure 1). While recurrent expenditure finances the daily operations of the government (e.g., salaries for its employees and overheads), and delivery of public services (e.g., school books and medicines), development budget expenditure pays for public investment (e.g., public civil works on roads, bridges, and waterlines). Each budget is further subdivided into Ministerial, Regional and Local Government expenditure.

Total government expenditure increased from 326 billion shillings in 1986 to 602 billion shillings (all measured in 1995 constant prices) (Table 4). Since GDP grew at about the same rate, public spending as a percent of GDP remained almost unchanged at 17%. The budget allocation to different sectors was more erratic over time, partly reflecting a high dependence on fluctuating donor support (Table 4). More than 60% of the government's budget is financed by donors. Spending on social services grew the fastest, at an annul rate of 9%. As a result its share in total government expenditure grew from 14% in 1986 to 25% in 1999. Spending on economic services has also been erratic, increasing from 64 billion shillings in 1986, peaking at 135 billion shillings in 1995, and then falling to 36 billion shillings in 1996. Not until 1999 did spending on economic services recover (to 128 billion shillings).

Agriculture

In 1998, Tanzania spent only 1.3% of its Agricultural GDP (AgGDP) on agriculture and this percentage had fallen to less than one by 2000 (Figure 2). As a percentage of total government spending, agriculture accounted for only 4% in 1998, a decline from 5.8% in 1986. This is disturbing despite the fact the government has called for higher priority for agriculture. These shares are also low even when compared to other African countries. For example, African countries on average spent 6% of their AgGDP on agriculture in 1998 (Fan and Rao, 2003).

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Figure 2.   Share of Government Expenditure in Selected Sectors (%)
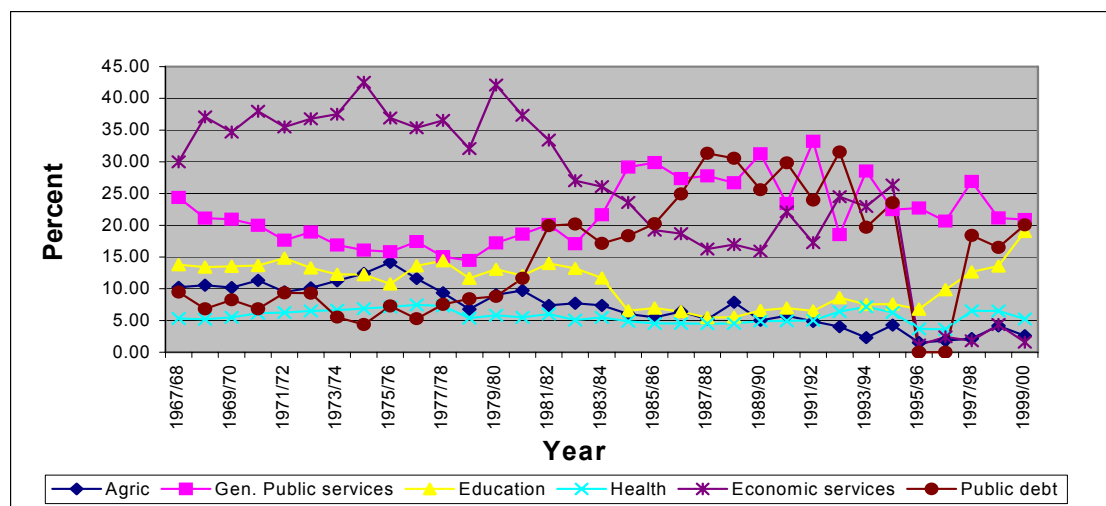
Agricultural research and development expenditure in Tanzania doubled between 1996 and 2000 in constant dollars. As a percentage of AgGDP, it increased from a low of 0.2% in 1996 to 0.4% in 2000 (ASTI database). By comparison, Uganda spent 0.4% of AgGDP in 1996 and increased this share to 0.5% in 2000. Kenya spent 2.3% of its AgGDP on agricultural research in 1996, increasing this percentage to 2.7% in 2000.

Education

Since 1986, total government expenditure on education has increased from 22 billion shillings in 1986 to 82 billion shillings in 1999 in constant prices. This represents an annual growth rate of more than 10%. As a percentage of GDP, it rose from 0.9% in 1988 to 2.3% in 1999. As a share of total expenditure, it increased gradually from 6.9% in 1986 to 14% in 1999. This share compares favorably with other African countries, which averaged 15% in 1998 (Fan and Rao, 2003).

There has been some improvement in the levels of education attained in recent years. For example, the number of persons who have completed primary school increased from 60.9% to 62% for males and 51% to 54.3% for females between 1992 and 1996 (Appendix Table A10). Enrollment rates have also increased in most regions of the country (Appendix Table A11).

Table 4.   Government Expenditures in Tanzania, 1985 Constant Billion Tanzania Shillings

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Total	325.73	374.25	418.82	507.07	452.09	539.88	445.74	575.55	524.36	514.29	413.40	520.41	576.99	602.10
General Public Services [1]	96.74	102.35	116.81	134.35	141.36	126.56	115.73	162.71	149.70	115.49	120.28	140.93	174.47	147.59
Defense	48.70	54.19	43.81	45.93	38.84	33.44	39.00	39.08	25.60	32.67	33.84	37.60	52.03	47.96
Social Services	47.08	52.76	57.61	70.68	64.96	80.86	74.89	91.25	92.80	77.50	53.03	88.27	121.75	148.04
Education	22.53	24.02	22.89	28.90	29.77	37.51	35.47	42.96	39.59	38.97	28.13	51.34	73.08	81.84
Health	14.59	16.99	18.78	25.12	22.26	26.64	28.52	32.54	37.57	32.17	15.29	18.85	37.60	39.19
Other Social services [2]	9.96	11.75	15.93	16.67	12.93	16.71	10.90	15.74	15.64	6.36	9.62	18.08	11.07	27.02
Economic services	64.24	69.87	66.65	85.36	72.03	119.55	75.62	130.04	120.28	135.48	35.80	63.93	90.77	128.20
Agri, fishing & forestry	19.08	24.07	21.11	27.52	19.81	30.98	23.50	23.27	22.48	21.97	6.29	9.63	17.27	24.85
Mining, mfg & constr.	14.54	12.87	10.34	10.80	8.57	16.41	8.56	9.14	10.86	6.00	6.78	21.53	1.71	5.99
Water & electricity	4.78	7.53	7.65	11.33	10.42	14.58	9.04	9.57	29.79	26.84	0.34	0.38	9.80	15.09
Roads & bridges	9.87	11.09	12.32	12.36	13.87	24.42	16.80	34.96	34.17	39.60	n.a.	n.a.	n.a.	n.a.
Transport & comm	7.51	9.11	7.90	11.23	5.62	19.59	10.85	36.18	13.00	32.42	16.99	24.08	44.68	61.41
Other econ services	8.45	7.47	7.30	12.12	13.75	13.57	6.85	16.93	9.98	8.66	5.40	8.31	17.31	20.84
Others [3]	68.98	95.07	133.94	170.75	134.90	179.47	140.50	152.46	135.99	153.14	170.45	189.68	137.97	130.31
Public debt	65.52	93.27	131.83	153.95	115.70	161.14	122.80	134.17	103.31	121.13	n.a.	n.a.	106.08	99.42

1 Includes general administration, external affairs and public order and safety
2 Includes housing, community amenities, community development and sanitary services
3 Includes public debt, financial and capital subscriptions, and pension and gratuity

Health

Health development expenditure increased from $14.6 billion shillings in 1986 to 39.2 billion shillings in 1999, in constant prices. This is about half the level of spending on education (Table 4). A Ministry of Health report states that in 1999/2000, expenditure on health per person averaged US$11.37, including private, out of pocket expenses (Tanzania Ministry of Health, 2001).

The average life expectancy at birth for Tanzanians increased from 40.7 years in 1960 to 50 years in 1990. It fell thereafter to 48 years by 2000, probably because of the impact of the rapid increase in HIV/AIDS.

The infant mortality rate (IMR) has also fallen substantially in most regions (Appendix Table A7). The number of infant deaths under five years of age was 244 (per 1000 infants under five) in 1975 and fell to 169 deaths in 1995. Indeed, Gupta et al. (2002) find that increased expenditure on education and health care has improved both access to and attainment in schools and reduced mortality rates for infants and children.

Appendix Table A5 shows that patients must still travel considerable distances to reach their nearest health center or hospital. In 2000/01, people in most regions had to travel at least 10-30 kilometers to the nearest hospital. People in Rukwa fair the worst, having to travel 66 kilometers to the nearest hospital.

Roads

Public expenditure on roads and transport systems has increased over the years (Table 4), but the total length of available roads remains low (Appendix Table A3). Rural roads account for more than 60% of the total road length and less than 1% of rural roads are paved. Even 38% of the trunk roads remained unpaved in 2000. There is also large regional variation in access to road infrastructure (Appendix Table A4).

4. MODEL SPECIFICATION AND ESTIMATION

This study builds on a conceptual framework and modeling approach developed and applied by IFPRI in a number of Asian countries (Fan, Hazell, and Thorat, 2000; Fan, Zhang, and Zhang, 2002; and Fan, Somchai, and Nuntaporn, 2004). Unlike most former studies on government spending and investment, the IFPRI approach attempts to capture synergies across investments and a) compare and rank returns of various types of investment, and b) calculate the number of poor people raised above the poverty line for additional units of expenditure on different items. The Asian studies used time series of secondary data at regionally disaggregated levels, but such secondary data rarely exist or are unreliable for most African countries, including Tanzania. A recently completed IFPRI study of Uganda (Fan, Zhang and Rao, 2004) shows how the approach can be adapted for use with household level data and official regional data on public expenditure, both of which are more widely available in Africa. The use of household level data has both advantages and disadvantages. The advantage is that large numbers of observations at the household level can be obtained, giving good coverage of different regions and types of households (e.g. rural vs. urban, farming vs. non-farming, and asset rich vs. asset poor). This makes statistical estimation more reliable and permits greater disaggregation of the impacts of public investment by different types of regions and households. A disadvantage is the difficulty of controlling for endogeneity effects that may arise in pubic access variables at the household level.

Several previous studies have also used household level data to link household access to infrastructure, technology and human capital with their per capita income or expenditure, poverty status and income distribution (e.g. Deininger and Okidi, 2003 and Nkonya, et al., 2004). But these studies have not linked household welfare indicators to government investment at the regional and national levels, as is attempted in this study of Tanzania.

Model

Total household income (*TOTALIN*) is modeled as:

(1)   TOTALIN = f (HA, HC, CC, Z),

Where *HA* is a set of household production assets used for agricultural production; *HC* is a set of household characteristics, and *CC* is a set of community characteristics. The individual variables are defined in Table 5. The variable *Z* represents other effects that are not captured by the variables included in the equation; e.g. regional agro-climatic conditions, and social and economic policies. Since these variables are not easy to quantify, regional dummy variables are used to control for their effects.

Table 5.   Definition of Variables Used in the Model

Variable name	Definition and Explanation
poverty	A binary variable defined as 1 when the household is below the poverty line, and otherwise as 0.
depr	Ratios of dependents defined as total number of dependents divided by total number of workers in the family
hhhsex	A binary variable defined as 1 when household head is male and 0 otherwise.
hhhage	Age of household head
hhhmarr	Marriage status of household head defined as 1 if married and 0 otherwise.
hhhedu	Years of education of household head
transpkm	Distance in km of the household from public transportation facility.
gelec	A binary variable of electricity access defined as 1 if connected and 0 otherwise.
landp	Land owned by household per person.
fertc	A binary variable of fertilizer use defined as 1 if used and 0 otherwise.
seedc	A binary variable of high-yielding seed defined as 1 if used and 0 otherwise.
totalin	Total household income
urban	A binary variable for urban vs. rural household defined as 1 if urban and 0 otherwise.
land	Total land owned by household.
labor	Total number of labor in household (total number of adults).

Once estimated, equation (1) can be used to simulate the additional income generated for a particular household from improved human capital or better access to

infrastructure and technology. Then, using the estimated increase in income at the household level, the change in a household's poverty status resulting from improved human capital or access to infrastructure and technology can be determined. For example, one can easily calculate the income effect of shortening the distance a household must travel to reach a feeder road. Given this income increase and an appropriate poverty line, it is then possible to calculate whether a household's poverty status will be changed.

Poverty is also modeled more directly as a function of *HA*, *HC*, and *CC*.

(2)   POVERTY = f (HA, HC, CC, Z),

Where the poverty status of a household is measured as a binary variable. Estimation of equation (2) by OLS will result in biased estimates hence a probit model was used instead. STATA, a statistical and econometric software package developed by StataCorp, was used as its command *DPROBIT* automatically calculates the marginal effects of each independent variable.

5. DATA SOURCES AND VARIABLE DEFINITIONS

The Household Budget Survey (HBS) is the primary data source used in our analysis. HBS is designed and conducted by the National Bureau of Statistics (NBS) in Tanzania, usually at intervals of 10 years. This study utilizes data from the 2000/01 survey.

HBS covers households in rural and urban areas in all 20 administrative regions. It is based on a multistage, stratified sample, whose sampling frame is generated from census data. Two households in each Primary Sampling Units-PSU (small geographical areas) are surveyed in each month (hence 24 households per PSU in a year). The final sample size after data cleaning is 22,178 households.

The HBS questionnaire contains information on demographics, housing, asset ownership, annual (past year) income, monthly consumption expenditure (food and non-food), annual expenditure on durables and household's access to public services (e.g., electricity, clean water, school, health facility, public transport, etc). Details about this questionnaire are available in the 2000/01 Household Budget Survey report (NBS, 2002).

Poverty

The poverty line used in this study was adopted from previous work of a Tanzanian study team led by NBS and Oxford Policy Management experts (URT, 2002). The decision to adopt the NBS poverty line was taken intentionally so as not to differ from the "nationally recognized" poverty line. Regional poverty indicators (2000/01) are calculated by adjusting the poverty line to regional price differences using regional price indices.

Two poverty lines were constructed, namely food and basic needs poverty lines. The food poverty line is based on per capita consumption expenditure for a 'basket of food items' reported by the poorest 50% of the population.[2] The share of total

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[2] The median quantity consumed per adult equivalent per day was tabulated for all food items whose consumption was recorded in the survey. The quantities of each item consumed were then adjusted for age and sex composition of households to get adult equivalents after taking into account differences in days per

expenditure on non-food items for the poorest 25% of the population was then used to adjust this poverty line to obtain a basic needs poverty line.

Income

HBS recorded information on incomes and sources of incomes earned by household members over a period of 12 months. The questionnaire has various income source codes which enabled aggregation of income into agricultural, non-agricultural and other broader sources of income. Agricultural income includes cash from sale of crops and livestock and a market value for that part of own production consumed by the household. Non-agricultural income includes items such as cash from services provided, sale of assets, and revenue received in goods and services. Wages and salaries from employment were also recorded.

Rural versus Urban

HBS is based on the government classification of residential areas, which has four categories, namely: city, municipalities, towns and rural areas. However, HBS modifies the city group so that only Dar es Salaam is included. Mwanza is classified as a municipality.

Access to public services

The HBS questionnaire has a section where the distances from a household residence to various facilities are recorded. In our analysis the distances are used as a proxy for access to public services. The facilities enumerated are public transport, primary school, secondary school, clean water source, market, shop, primary health facility, etc. In the model, distance is anticipated to be positively related to poverty and negatively related to income. For access to electricity, a binary variable is used: coded 1 for households connected to the electricity grid and 0 otherwise.

month, so that the sum of their calorific values equaled 2,200 calories per day, the defined minimum necessary for an adult. These quantities were then priced using median unit prices calculated from the survey data. The sum of these values gave the cost of meeting the minimum adult calorific requirement with a food consumption pattern typical of the poorest 50 per cent of the population

Education

Except for the case of no education (which was recoded as 0), codes for education are proportional to the number of years of schooling achieved.

Government Expenditure

Information on government expenditure for public investment is published annually in *Government Budget Estimates* (Makadirio ya Fedha za Serikali). Such reports contain revenue and budget 'estimates' at the beginning of the each financial year and revenues and expenditures from the previous financial year. The budget division of the Ministry of Finance (formally under the Planning Commission) has overall charge for budget preparation using estimates and proposals submitted by other government ministries and departments. Though budget reports are made available to other government ministries, university and public libraries, none of these actors has maintained a consistent series of archives. However, in recent years the Ministry of Finance has computerized its budgeting and expenditure system, which will facilitate the availability of such information in the future. Data series for this report were gathered from budget documents collected from various public offices and libraries.

6.   RESULTS

The estimated household income equations by zone are shown in Table 6. The coefficients of the urban dummies are positive and statistically significant at the 10% level for all regions, implying that urban households enjoy higher income.   The difference between rural and urban areas is particularly strong in the Northern Coast, Lake Victoria, and the Western, Central and Southern zones.

The coefficients on the land ownership variable are positive and statistical significant in 6 of the 7 zones.   This shows the importance of access to land in determining total household income.   Even in urban areas, a large percentage of households own land and are engaged in agricultural production. The land coefficient is the largest in the Southern Highlands, the most important agricultural and livestock zone in the country.

Family labor supply is also an important determinant of household income in all regions.   The coefficients are positive and statistically significant in all regions.   For every 1% increase in family labor force, total household income increases by between 0.27 and 0.51%.

The gender of the household head is not a significant factor in affecting household income in most zones. Only in the Central and Southern Coast zones are the coefficients statistically significant at the 10% level, indicating that male heads lead to higher incomes. The marital status of the household head does not have a significant impact on household income in any zone.

The education level of household heads is statistically significant for all zones implying that household income is highly correlated with human capital. The effects are the largest in zone 4, followed by zones 3 and 2.

Table 6.   Estimated Total Household Income Equations by Zone, 2000/01

TOTALIN			urban	land	labor	hhhsex	hhhmarr	hhhedul	trapkml	gelec	fertc	seedc	constant
Zone 1	N = 770	Coeff.	0.1408	0.1589	0.4435	0.0963	0.0081	0.4317	-0.0140	0.7530	0.3237	0.2044	11.2683
(Northern)		Std. Err.	0.0803	0.0405	0.0848	0.0992	0.0939	0.0806	0.0485	0.0954	0.1038	0.0861	0.1716
	$R^2 = 0.2867$	P > |t|	0.0800	0.0000	0.0000	0.3320	0.9320	0.0000	0.7730	0.0000	0.0020	0.0180	0.0000
Zone 2	N = 1283	Coeff.	0.7563	0.1564	0.4435	0.1242	0.0648	0.6097	-0.0018	0.6271	0.4083	-0.0556	10.5692
(Northern Coast)		Std. Err.	0.0861	0.0408	0.0691	0.0976	0.0927	0.0771	0.0426	0.0783	0.1155	0.0805	0.1853
	$R^2 = 0.3525$	P > |t|	0.0000	0.0000	0.0000	0.2030	0.4840	0.0000	0.9660	0.0000	0.0000	0.4900	0.0000
Zone 3	N = 1691	Coeff.	0.7130	0.0607	0.5078	0.0297	0.0315	0.6151	0.0838	0.9146	0.5996	0.1104	10.3251
(Lake Victoria)		Std. Err.	0.0801	0.0347	0.0644	0.0922	0.0887	0.0676	0.0366	0.0788	0.2978	0.0847	0.1584
	$R^2 = 0.3153$	P > |t|	0.0000	0.0800	0.0000	0.7470	0.7230	0.0000	0.0220	0.0000	0.0440	0.1930	0.0000
Zone 4	N = 748	Coeff.	0.6963	0.0358	0.2726	-0.0088	0.1529	0.7064	-0.1914	0.6915	0.5346	-0.2440	10.5055
(Western)		Std. Err.	0.1080	0.0510	0.1010	0.1273	0.1350	0.1093	0.0503	0.1197	0.1779	0.1030	0.2770
	$R^2 = 0.3483$	P > |t|	0.0000	0.4830	0.0070	0.9450	0.2580	0.0000	0.0000	0.0000	0.0030	0.0180	0.0000
Zone 5	N = 1250	Coeff.	0.7692	0.1083	0.4866	0.1735	0.0706	0.5212	-0.1138	0.6953	-0.0493	0.3580	10.4240
(Central)		Std. Err.	0.0856	0.0328	0.0750	0.0874	0.0882	0.0697	0.0419	0.0872	0.1526	0.0783	0.1712
	$R^2 = 0.3344$	P > |t|	0.0000	0.0010	0.0000	0.0470	0.4230	0.0000	0.0070	0.0000	0.7460	0.0000	0.0000
Zone 6 (South Highlands)	N = 1165	Coeff.	0.4141	0.3006	0.4732	-0.0063	0.0196	0.5142	-0.2502	0.9089	0.1060	0.1858	10.9035
		Std. Err.	0.0773	0.0357	0.0879	0.0902	0.1001	0.0774	0.0380	0.1082	0.0710	0.0864	0.1875
	$R^2 = 0.3422$	P > |t|	0.0000	0.0000	0.0000	0.9440	0.8450	0.0000	0.0000	0.0000	0.1360	0.0320	0.0000
Zone 7	N = 758	Coeff.	0.9208	0.2136	0.3883	0.1997	0.1978	0.3101	-0.0081	0.6168	0.4028	0.2466	10.9107
(Southern Coast)		Std. Err.	0.1179	0.0358	0.1012	0.1147	0.1109	0.1083	0.0609	0.1056	0.1606	0.1382	0.2556
	$R^2 = 0.3509$	P > |t|	0.0000	0.0000	0.0000	0.0820	0.0750	0.0040	0.8950	0.0000	0.0120	0.0750	0.0000

The distance to public transportation is a statistically significant factor in determining household income in the Western, Central, and Southern Highlands; the shorter the distance to a public transportation facility, the higher household income. Access to electricity significant increases household income in all zones.

Fertilizer use has a positive and statistically significant impact in all zones except the Central zone and Southern highlands. Only 15% of all households used fertilizer in 2000. This indicates that there is untapped potential to use fertilizer to increase agricultural production and income.

On average, about 20% of households purchased seeds of high-yielding varieties in 2000. Households that purchased such seeds had substantially higher incomes in five regions.

Table 7 presents the results from the estimated poverty determination equation (equation 2). Not surprisingly, the higher the ratio of dependents to adults the more likely a household will be poor. The coefficients are significant at the 1% level for all zones. The gender of household head does not have a significant impact on poverty. This is consistent with the impact on income shown in Table 6. However, the older a household head then the greater the probability of the household being poor. Marriage also has a statistically significant impact on the probability of a household being poor; with married household heads have a higher probability of being poor than single heads.

A striking result is the large and statistically significant impact of the educational attainment of the household head on the probability of being poor. An additional year of education for a household head reduces the probability of the household being poor by 1 to 1.7%, depending on the region.

Access to public transportation, measured as the distance to the nearest public transportation facility is statistically significant in 5 regions. In those cases, each kilometer reduction in the distance to a public transportation facility reduces the probability of a household being poor by 0.22 to 0.33%.

Table 7.   Estimated Poverty Determination Equation by Zone, 2000/01

Poverty			depr	hhhsex	hhhage	hhhmarr	hhhedu	transpkm	gelec	landp	fertc	seedc
Zone 1	N = 2040	dF/dx	0.0119	-0.0042	0.0010	0.0170	-0.0021	0.0033	-0.0399	-0.0253	-0.0198	-0.0122
(Northern)		Std. Err.	0.0051	0.0068	0.0004	0.0079	0.0010	0.0013	0.0149	0.0046	0.0091	0.0073
	Pseudo R^2 = 0.162	P > |z|	0.0000	0.5140	0.0000	0.0020	0.0010	0.0000	0.0000	0.0000	0.0040	0.0420
Zone 2	N = 4067	dF/dx	0.0497	-0.0128	0.0022	0.0523	-0.0114	0.0030	-0.0838	0.0001	-0.0655	-0.0310
(Northern Coast)		Std. Err.	0.0065	0.0149	0.0003	0.0119	0.0014	0.0010	0.0112	0.0000	0.0177	0.0126
	Pseudo R^2 = 0.1353	P > |z|	0.0000	0.3820	0.0000	0.0000	0.0000	0.0010	0.0000	0.0000	0.0080	0.0230
Zone 3	N = 3964	dF/dx	0.0674	-0.0036	0.0018	0.0579	-0.0156	0.0002	-0.1323	-0.0005	-0.1292	0.0167
(Lake Victoria)		Std. Err.	0.0075	0.0187	0.0005	0.0168	0.0017	0.0010	0.0145	0.0010	0.0348	0.0187
	Pseudo R^2 = 0.0993	P > |z|	0.0000	0.8480	0.0000	0.0010	0.0000	0.8580	0.0000	0.6020	0.0150	0.3610
Zone 4	N = 1933	dF/dx	0.0552	0.0123	0.0026	0.0180	-0.0171	0.0029	-0.1103	-0.0107	-0.0818	0.1202
(Western)		Std. Err.	0.0110	0.0261	0.0006	0.0251	0.0024	0.0014	0.0245	0.0079	0.0301	0.0314
	Pseudo R^2 = 0.0932	P > |z|	0.0000	0.6400	0.0000	0.4810	0.0000	0.0340	0.0000	0.1800	0.0210	0.0000
Zone 5	N = 3172	dF/dx	0.0580	0.0203	0.0028	0.0287	-0.0140	0.0024	-0.1126	-0.0314	-0.0401	-0.0143
(Central)		Std. Err.	0.0085	0.0171	0.0005	0.0165	0.0017	0.0009	0.0139	0.0071	0.0295	0.0187
	Pseudo R^2 = 0.1237	P > |z|	0.0000	0.2450	0.0000	0.0880	0.0000	0.0130	0.0000	0.0000	0.2210	0.4560
Zone 6	N = 3163	dF/dx	0.0606	0.0143	0.0011	0.0427	-0.0161	0.0022	-0.1184	-0.0057	-0.0223	-0.0294
(South Highlands)		Std. Err.	0.0074	0.0156	0.0005	0.0146	0.0019	0.0009	0.0121	0.0038	0.0129	0.0155
	Pseudo R^2 = 0.1187	P > |z|	0.0000	0.3690	0.0150	0.0050	0.0000	0.0170	0.0000	0.1480	0.0920	0.0730
Zone 7	N = 2095	dF/dx	0.0988	-0.0008	0.0044	0.0574	-0.0145	0.0004	-0.1225	-0.0282	-0.0885	0.0293
(Southern Coast)		Std. Err.	0.0131	0.0241	0.0006	0.0213	0.0025	0.0015	0.0218	0.0074	0.0478	0.0359
	Pseudo R^2 = 0.1245	P > |z|	0.0000	0.9740	0.0000	0.0090	0.0000	0.8100	0.0000	0.0000	0.1280	0.3980

Connection to electricity is another important factor in determining the probability of a household being poor. The coefficients of the dummy variable for electricity connection are statistically significant in all zones. If a household is connected to electricity, the probability of being poor falls by between 4 and 13%, depending on region.

Land ownership is important in reducing poverty in the Northern, Central, and Southern coast zones. These are the most important agricultural regions; so not too surprisingly access to land provides an important pathway out of poverty.

The dummy variable for fertilizer use is highly correlated with the probability of a household being not poor. Only in two zones, the Central zone and Southern Coast, is fertilizer purchase not a statistically significant variable. In contrast, seed purchases are less correlated with poverty reduction, the coefficients are only significant in four zones, and only three of those coefficients are negative.

7.   MARGINAL RETURNS TO PUBLIC INVESTMENT

Marginal Returns to Physical Public Capital

Using the estimated coefficients from Table 6, we first calculate the marginal returns to investment in terms of additional physical units of the public capital stock. The results are shown in Table 8. For education, every additional year of schooling for a household head increases the household's per capita income by 6,225 shilling (equivalent to a 4% increase over the 2000/01 income level). This is the average for the country as a whole. The returns are highest in the Northern Coast and Lake Victoria regions and lowest in the Western zone and Southern Coast.

Table 8.   Returns to Investment per Physical Unit of Capital, 2000/01

	Education	Roads	Agricultural Research	Electricity
	One More Year of Education for Household Head	*Per Km Reduction in Distance to Public Transportation*	*If Seed Used*	*If Connected*
Northern Zone	3,711	2,055	34,219	128,104
Northern Coast	12,160	599	-	157,747
Lake Victoria	11,551	-	12,753	102,721
Western Zone	2,914	8,250	-	57,403
Central Zone	5,820	14,039	53,931	101,441
South Highlands	7,229	48,394	31,518	153,331
Southern Coast	1,842	813	40,307	101,358
Average	*6,225*	13,479	*18,961*	*128,887*

Note: "-" indicates statistically insignificance.

For road investments, each kilometer of added proximity to a public transportation facility increases per capita income by 13,479 shillings, or an 8.5% increase. The largest returns arise in the Southern Highlands and Central zone.

The returns to agricultural research investment are proxied by the use of high-yielding seed. If a household uses high-yielding seed, per capita income in the family increases by 18,961 shilling, a 12% increase. Agricultural areas like the Northern and

Central zones, Southern Highlands, and Southern Coast have much higher returns than the national average.

Accessing electricity has a tremendous impact on household income. If a household is connected with electricity, per capita income increases by 128,887 shilling, or 81%. Large impacts arise in all zones.

Marginal Returns to Spending

In order to calculate benefit-cost ratios as well as the poverty reducing effect of an additional unit of spending or investment, we need to estimate the unit costs of each investment. To convert annual government expenditures on public capital into stocks in monetary terms, we use the following procedure:

(3) $\qquad K_t = I_t + (1-\delta)K_{t-1}.$

Where K_t is the capital stock in year t, I_t is gross capital formation in year t, and δ is the depreciation rate. To obtain initial values for the capital stock, we used a similar procedure to that used by Kohli (1982).

$$K_0 = \frac{I_0}{(\delta + r)}.$$
(4)

Equation (4) implies that the initial capital stock in year 0 (K_0) is capital investment in year 0 (I_0) divided by the sum of the real interest (r) and depreciation rates. We assume real interest and depreciation rates of 5% for Tanzania.

We obtained the unit cost of each investment by dividing the total value of the capital stock by the corresponding stock of physical capital. For example, in the case of roads we divided the total value of the capital stock of roads by the total length of roads. These calculations were done separately for each of the seven zones to give locally relevant data.

To arrive at the results in Table 9, some additional assumptions are necessary. We assume a linear relationship between a) increases in the capital stock of roads and the

average distance households must travel to a public transport facility, and between b) government spending on education and the number of years of schooling achieved by household heads. We also assume a linear relationship between the stock of agricultural research investment and the adoption of modern seeds by households. Since data on agricultural research spending are not available at the regional level, we allocated national research expenditure to the regions in the same proportions as their share in total national investment in agriculture.

Table 9.   Returns to Investment per Shilling Invested , 2000/01

	Education	Roads	Agricultural Research	Electricity
	Shilling per Shilling Investment	*Shilling per Shilling Investment*	*Shilling per Shilling Investment*	*Shilling per Shilling Investment*
Northern Zone	5.81	1.78	9.23	
Northern Coast	13.41	0.18	-	
Lake Victoria	9.50	-	15.79	
Western Zone	14.01	12.00	-	
Central Zone	8.66	14.22	46.92	
South Highlands	7.71	19.73	14.69	
Southern Coast	5.75	0.92	21.51	
Average	*9.00*	*9.13*	*12.46*	

Note: "-" indicates statistically insignificance

For every one shilling invested in education by the government, household incomes increase by 9 shillings on average (Table 9). That is, the benefit/cost (B/C) ratio is 9 for the country as a whole. The B/C ratios are large for all zones, ranging from 5.8 in the Southern Coast and Northern zones to 14.0 in the Western zone.

At the national level, the B/C returns to road investment are similar in magnitude to those for education. Every shilling invested by the government increases household income by 9.13 shillings. The regional differences are large, however, with the largest returns arising in the Southern Highlands, and the Central and Western areas.

For every shilling spent on agricultural research, average household income rises by 12.5 shillings. This is the largest B/C ratio of all the investments considered in this

study. The regional differences for agricultural research spending are also large. The Central zone has the largest return, followed by the Southern Coast, Lake Victoria, and South Highlands. The Northern Coast and Western areas have negative returns, but these are not statistically significant and should be interpreted as zero.

We are not able to calculate benefit-cost ratios for electricity due to lack of data on government spending on electricity by region. For agricultural research, we used the share of regional agricultural expenditures in the national total to assign the national agricultural research expenditures to each region, but for electricity, we do not have such data)

Table 10 presents our estimates of the number of poor households lifted out of poverty for every one million shillings of investment. As discussed earlier in describing equation (1), we used a two-step approach to arrive at these estimates. Equation (1) provides estimates of the impact of another physical unit of a right hand side variable on each household's income (Table 8). Using these estimated income increases we then calculated the change in each household's poverty status by assuming that all the additional income would be consumed and calculating whether this would be sufficient to put them above the poverty line. Then using population data on the number and size of households, we estimated the number of poor people lifted above the poverty line. Given the unit cost estimates for different investments, we then calculated the number of poor lifted out of poverty per additional dollar of investment. Simler et al. (2004) argue that this approach is preferred to using a reduced form equation like our equation (2) for the reasons given in footnote 3.[3]

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[3] As indicated by Simler et al (2004), there are several disadvantages in assessing poverty impact through the reduced form poverty determination equation. First, it is inefficient. It involves a loss of information because the information on the household living standards above the poverty line is deliberately suppressed. All nonpoor households are thus treated alike, as censored data. Second, there is an element of inherent arbitrariness about the exact level of the absolute poverty line, even if relative differentials in cost of living, as established by the regional poverty lines, are considered robust. Different poverty lines would imply that household consumption data would be censored at different levels. The estimated parameters of the poverty model would therefore change with the level of poverty line used. While this change in parameter estimates conveys some information about stochastic dominance, modeling consumption directly has the potentially attractive feature that the consumption model estimates are independent of the poverty line. The link with household poverty level is established in a subsequent, discrete step. Third, estimation

The results in Table 10 show that on average another one million shillings of investment in education will lift 43 poor people out of poverty. This is larger than the number of poor people lifted out of poverty for a similar investment in agricultural research or roads. Education investments help poor people in all regions, but the greatest benefits arise in the Western (91.5) and Central (54.6) zones and Lake Victoria (43.4), and the least in the Northern zone (18.2).

Table 10.   Poverty Reduction per Million Shillings Invested, 2000/01

	Education	Roads	Agricultural Research	Electricity
	No. of Poor Reduced Per Million Shillings	*No. of Poor Reduced Per Million Shillings*	*No. of Poor Reduced Per Million Shillings*	*No. of Poor Reduced for 1% Increase in Connection*
Northern Zone	18.23	1.83	16.54	28,003
Northern Coast	30.02	0.56	-	75,479
Lake Victoria	43.40	-	57.03	379,323
Western Zone	91.49	65.72	-	87,400
Central Zone	54.56	74.60	81.13	150,715
South Highlands	26.48	60.37	21.38	108,915
Southern Coast	29.91	13.78	40.91	93,278
Average	*43.10*	*26.53*	*40.39*	*141,962*

Note: "-" indicates statistically insignificant

For roads, every one million shillings invested lifts 27 poor people out of poverty. Road investments have much larger poverty impacts in the Central and Western regions and in the South highlands. They have negligible poverty impact in the Northern zones and Lake Victoria.

Investments in agricultural research are almost as beneficial for the poor as similar investments in education. However, they do not have a significant impact on poverty in the Northern Coast and Western zones. Research investments in the Central Zone have twice as large an impact on poverty than the national average.

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of the consumption or income model avoids strong distributional assumptions that would typically be necessary for nonlinear limited dependent variable models. As a final comparison of the two methods, it is also worth noting that, once household consumption or income is modeled, the household's poverty level is readily determined.

If 1% more households are connected to electricity, more than 140 thousand poor people will be lifted out of poverty. The effects are particularly large in Lake Victoria, the Central zone and the Southern Highlands. These impacts cannot be put on an expenditure basis because data limitations prevent us calculating unit costs.

8. CONCLUSIONS

Despite recent improvements in Tanzania's economic performance, poverty remains widespread and shows few signs of diminishing. This is in part because the country's investment in human capital and rural infrastructure and technology has been allowed to stagnate. This paper has shown that there is both need and opportunity to use public investments funds more efficiently to achieve national economic growth and poverty reduction goals.

Additional investments in rural education can have very favorable impacts on poverty, raising about 43 poor people above the poverty line per million shillings spent. Education investments also lead to sizeable increases in per capita income per shilling spent, with an average benefit/cost ratio of 9. These impacts are strong and statistically significant in all regions of the country. Therefore, increased investments in education should be a priority in all regions of the country.

Rural road investments also have a large impact on per capita incomes with an average benefit/cost ratio of 9.13. Their impact on poverty per shilling spent is about half that of investments in education; each shilling spent raises about 27 poor people out of poverty. Unlike education investments, roads have much more diverse impacts across regions. Their poverty and growth impacts are most favorable in the South Highlands and Central and Western zones, and least favorable in the Northern parts of the country. This implies that regional targeting is appropriate.

Investments in agricultural research also have a large impact on rural poverty, raising about 40 persons out of poverty per million shillings spent, and have the largest impact on incomes with an average benefit/cost ratio of about 12. Again, regional targeting is important because while the impacts are very favorable in the Central and Southern part of the country, they are much less attractive elsewhere.

As one of a series of similar IFPRI studies, this paper has shown how household level data can be used to analyze the growth and poverty impacts of public investments. Many of the results are found to be statistically significant and there is little evidence of

the kinds of multicollinearity problems that arise when secondary level data are used as in IFPRI's Asian studies. However, use of household level data does have its weakness for these purposes. The causal relationship between household income and education level can work in both directions. The wealth variables (such as land) included in our income and poverty equations should have controlled for endogeniety of the education variable, but some remaining reverse causality problems may still exist.

Another weakness of the study is the lack of reliable investment and public capital data, especially disaggregated by region in African countries like Tanzania. To over come this problem, we had to use unit costs estimated from fragmentary data on government investments to calculate cost-benefit ratios.

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Appendix: Regional Data

Subnational-level data on growth, poverty, and public spending by various investment items are not easily available for most developing countries. Tanzania is no exception, although these data have become more accessible. Most of such data are compiled from different sources. Moreover, the definitions, scope, and coverage of the variables may vary over time and across regions. For these reasons, this appendix includes some of the recently released regional level data used in our analysis, which might be of more general interest.

Table A1.   Regional GDP (Current Billion Shillings)

Region	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Arusha	35	43	56	74	95	119	156	214	265	328	384	447	510	580
Cost	10	13	17	21	28	35	48	61	75	94	111	130	141	154
Dodoma	16	20	27	34	45	57	75	98	121	152	179	208	226	263
Iringa	27	33	42	56	72	90	117	156	195	239	285	331	360	423
Kagera	18	22	28	37	48	61	80	106	131	163	193	224	262	288
Kigoma	11	14	18	24	31	40	53	70	85	107	126	146	159	188
Kilimanjaro	20	25	33	42	55	69	91	119	147	183	217	253	275	309
Lindi	10	13	17	22	28	36	48	63	78	96	114	133	144	158
Mara	16	20	26	34	43	55	73	95	117	147	174	202	248	255
Mbeya	28	33	42	56	74	93	120	162	201	248	293	341	370	436
Morogoro	22	27	36	46	59	74	97	128	159	196	234	273	296	362
Mtwara	14	17	22	28	37	47	62	82	101	126	193	238	255	295
Mwanza	35	42	53	71	93	117	152	204	254	313	395	460	573	727
Rukwa	19	22	27	37	48	61	78	106	133	163	192	223	243	248
Ruvuma	18	22	27	37	48	61	79	107	132	163	192	224	243	241
Shinyanga	38	45	56	76	99	125	161	218	272	335	370	430	520	586
Singida	14	18	22	30	38	49	64	84	105	130	153	178	194	201
Tabora	18	22	29	38	49	62	81	107	133	165	195	227	247	262
Tanga	19	24	32	41	53	66	88	115	141	175	209	244	282	335
TOTAL	**468**	**582**	**760**	**990**	**1276**	**1608**	**2125**	**2797**	**3453**	**4282**	**5125**	**5978**	**6705**	**7591**

Source: National Bureau of Statistics, United Republic of Tanzania

Table A2. **Total Salary/Annual Wage Bill (Million Shillings)**

Region	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Arusha	312	328	374	412	479	139	173	180	248	280	280	892	982	1033	1239	1486	1784	2141	2677	2822	3246	3441
Coast	65	87	70	79	108	6	5	7	7	8	20	82	90	95	114	137	164	197	246	260	299	317
Dodoma	226	178	184	202	272	4	2	2	2	2	4	53	59	662	74	89	106	127	160	169	194	206
Iringa	191	241	279	312	450	61	47	49	57	64	64	512	564	593	711	853	1024	1229	1537	1621	1863	1974
Kagera	140	113	127	136	558	11	13	4	20	23	58	87	96	101	121	145	174	209	261	275	317	336
Kigoma	75	89	101	103	147	1	1	1	1	1	1	7	8	8	10	12	14	17	21	22	26	28
Kilimanjaro	292	311	355	417	437	85	114	120	147	166	243	1053	1158	1218	1462	1753	2104	2525	3157	3330	3829	4058
Lindi	69	110	152	201	216	11	10	11	11	12	16	9	9	10	12	14	17	20	26	27	31	32
Mara	76	100	127	166	168	28	24	39	30	34	54	111	122	129	154	185	222	256	333	351	404	428
Mbeya	152	143	152	182	177	30	26	57	63	71	75	280	308	324	389	466	559	671	839	885	1018	1079
Morogoro	273	339	374	441	279	121	154	165	280	317	383	1289	1418	1492	1789	2146	2576	3092	3865	4077	4687	4968
Mtwara	87	110	120	144	447	10	5	6	6	6	11	3	4	4	4	5	6	7	9	9	11	12
Mwanza	255	268	304	339	171	64	69	80	80	91	137	523	575	605	726	871	1045	1254	1568	1654	1902	2016
Rukwa	63	68	89	108	389	0	1	0	0	0	0	1	1	1	2	2	2	2	3	3	4	5
Ruvuma	63	67	76	87	97	8	9	10	10	12	13	39	43	46	55	65	79	95	119	125	142	150
Shinyanga	140	165	190	224	137	17	25	28	53	60	70	211	232	244	293	351	421	505	632	666	766	812
Singida	76	88	101	116	272	2	2	3	4	4	6	9	10	10	12	15	17	20	26	27	33	35
Tabora	124	123	127	130	118	5	8	10	12	13	18	84	93	97	117	140	168	202	252	266	306	324
Tanga	447	487	526	578	182	139	153	204	251	284	320	824	907	954	1144	1373	1647	1977	2471	2607	2999	3179
Total	**3123**	**3414**	**3824**	**4376**	**5105**	**740**	**841**	**973**	**1281**	**1448**	**1494**	**6070**	**6677**	**7625**	**8,428**	**10,108**	**12,129**	**14,546**	**18,202**	**19,196**	**22,077**	**23,400**

Source: URT

Table A3.   Road Network by Region (kilometers)

Region	Up to 1996				Up to 2000				Total Roads 2000	
	Trunk roads		Rural roads		Trunk roads		Rural roads			
	Paved	unpaved	Paved	Unpaved	Paved	unpaved	Paved	Unpaved	Paved	Unpaved
Arusha	223	223.3	0	1153	266	280	10	1228	276	1508
Coast	278	56	0	774.7	349	58	0	796	349	854
Dodoma	146.5	421.7	5	691.3	133	425	5	699	138	1124
Iringa	479	514.8	0	1182.2	477	413	25	988	502	1401
Kagera	112	395.8	0	1016.7	214	391	0	15156	214	15547
Kigoma	240.5	51	64.7	553.6	5	465	0	595	5	1060
Kilimanjaro	0	469.6	0	635.3	240	151	66	630	306	781
Lindi	198.2	246.8	0	565.3	233	230	0	728	233	958
Mara	200	136.5	0	656.5	169	159	0	678	169	837
Mbeya	351	276	0	1291.9	364	293	0	1540	364	1833
Morogoro	421	141.4	0	1013.5	418	142	0	736	418	878
Mtwara	127	88	8.9	623.1	108	102	12	763	120	865
Mwanza	135	135.3	0	1247.6	130	279	0	1084	130	1363
Rukwa	0	941.7	0	1370.8	10	825	0	1268	10	2093
Ruvuma	166	547	0	717.4	177	505	3	1371	180	1876
Shinyanga	209.8	130.1	0	964.1	199	155	0	948	199	1103
Singida	3.5	606.8	0	863.4	8	600	0	979	8	1579
Tabora	0	669.5	0	1100.3	5	641	6	1060	11	1701
Tanga	298	0	12	1029.4	267	57	32	1044	299	1101
Total	**3589**	**6051**	**91**	**17450**	**3772**	**6171**	**159**	**18650**	**3931**	**24821**

Source: *Ministry of Works, The United Republic of Tanzania*

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Table A4.   Mean Distance/Time to Facility by Region, 2000/01

Region	Shop (km)	Bank (km)	Primary School (km)	Secondary School (km)	Charcoal/ Firewood (km)	Health Center (km)	Hospital (km)	Drinking Water (mins)
Arusha	2.8	16.7	1.9	6.4	2.8	3.8	11.8	14.3
Coast	1.0	28.1	1.7	13.1	1.7	3.0	24.5	29.1
Dodoma	1.8	47.3	2.8	19.4	2.7	5.8	35.3	19.1
Iringa	0.9	36.1	1.5	12.7	3.6	4.8	18.9	10.0
Kagera	2.1	32.9	2.5	12.0	1.9	4.3	25.1	29.1
Kigoma	1.6	29.6	1.7	14.3	6.2	2.9	20.2	19.2
Kilimanjaro	0.2	12.9	0.9	5.0	1.5	1.9	9.5	9.1
Lindi	1.1	33.3	1.2	25.1	1.6	4.7	22.7	29.1
Mara	1.6	20.8	1.8	6.9	2.9	4.2	13.4	29.0
Mbeya	3.9	23.6	1.3	8.7	1.9	2.6	20.7	9.4
Morogoro	2.3	52.0	1.7	16.0	2.8	3.7	24.0	14.4
Mtwara	0.6	31.5	1.1	16.6	3.2	4.7	19.2	29.3
Mwanza	1.3	36.2	1.7	9.4	1.9	4.1	30.1	14.9
Rukwa	2.6	76.7	1.3	21.3	5.0	4.1	66.0	9.3
Ruvuma	0.8	25.8	0.9	9.2	2.0	3.6	21.0	9.9
Shinyanga	2.7	34.8	2.7	20.5	4.2	5.9	18.9	19.3
Singida	1.6	24.0	1.9	9.5	10.4	3.4	12.8	29.1
Tabora	2.1	25.1	3.0	15.0	2.5	4.7	13.7	19.3
Tanga	1.8	37.8	2.3	18.8	3.2	5.3	29.0	14.1

Source: *Household Budget Survey, 2000/01, National Bureau of Statistics, The United Republic of Tanzania.*

Table A5.   Percentage of Households with Facilities by Region, 2000/01 (Percent)

Region	Dwelling made of modern materials	Dwelling with earth floor	No use of toilets	Within 2 kilometers of a primary school	Within 1 kilometer of drinking water source	Electricity mains
Arusha	53	77	16	54	41	11
Coast	33	81	3	66	31	6
Dodoma	33	84	8	49	51	6
Iringa	48	80	1	74	48	6
Kagera	53	75	5	45	22	2
Kigoma	21	91	1	59	58	6
Kilimanjaro	85	58	3	79	55	18
Lindi	16	88	3	79	17	5
Mara	43	72	14	64	24	10
Mbeya	53	66	4	64	71	9
Morogoro	45	78	6	72	54	10
Mtwara	28	83	7	72	29	5
Mwanza	42	78	8	62	38	5
Rukwa	16	90	12	75	54	4
Ruvuma	42	66	1	83	53	5
Shinyanga	24	85	10	48	29	3
Singida	21	89	10	56	53	5
Tabora	24	85	3	55	20	4
Tanga	41	83	19	57	25	7

Source: Household Budget Survey, 2000/01, National Bureau of Statistics, The United Republic of Tanzania.

Table A6. **Electricity Sales (Million kilowatt hours)**

Region	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Arusha	49	53	51	57	57	58	56	64	70	71	76	81	97	84	84	98	113	167	159	173	162	126	156
Coast	1	1	1	1	1	1	1	1	1	1	1	1		1	7	2	5	6	6	6	6	1	1
Dodoma	10	10	9	11	10	11	15	14	18	23	22	24	33	36	36	36	39	39	37	40	37	40	39
Iringa	8	8	7	6	5	9	19	64	56	61	70	99	93	87	89	81	137	90	86	93	87	41	69
Kagera	3	4	3	4	3	3	5	4	4	5	6	6	8	11	11	12	19	18	17	17	16	16	18
Kigoma	3	3	3	4	3	4	4	5	4	7	7	7	7	9	10	10	9	9	9	9	8	7	10
Kilimanjaro	23	22	23	22	34	36	39	44	49	66	66	71	83	88	78	70	87	112	107	116	109	106	91
Lindi	1	1	1	1	1	2	2	2	3	4	5	5	6	7	4	5	5	5	5	6	6	5	9
Mara	3	9	13	14	16	13	9	12	8	6	12	12	15	21	20	18	17	18	17	20	19	18	24
Mbeya	10	10	12	14	19	26	26	30	31	35	62	85	50	55	60	60	77	69	66	71	67	86	81
Morogoro	35	39	40	40	36	39	43	66	67	71	78	73	89	99	94	102	102	102	97	105	98	73	87
Mtwara	4	5	4	5	4	5	5	6	5	7	7	6	10	13	12	14	19	16	15	16	15	21	29
Mwanza	49	42	54	30	29	31	38	32	30	30	42	45	49	58	58	63	58	74	71	77	72	82	78
Rukwa			1	0	1	1	2	2	3	4	4	4	6	7	10	7	9	10	10	10	9	8	8
Ruvuma	2	2	2	2	2	2	2	2	4	5	6	7	9	12	10	10	17	11	10	11	10	9	9
Shinyanga	4	4	4	5	5	6	6	7	6	8	9	10	46	61	51	35	31	41	39	43	40	38	36
Singida	1	2	1	1	1	2	2	3	3	6	6	7	6	9	10	13	12	10	10	10	9	11	12
Tabora	7	6	4	4	5	9	9	11	10	11	13	14	19	19	19	16	24	22	21	23	22	72	49
Tanga	68	76	88	77	70	70	69	86	82	95	96	107	129	88	112	110	118	133	127	138	129	89	101
Total	**282**	**295**	**319**	**297**	**303**	**329**	**352**	**452**	**453**	**516**	**588**	**583**	**755**	**765**	**775**	**762**	**898**	**952**	**909**	**984**	**921**	**849**	**1888**

Source: *The Economic Survey, The Planning Commission, United Republic of Tanzania, various years*

Table A7.   **Infant Mortality Rate (IMR) per 1000**

Region	1975		1985		1995	
	IMR	Under 5 IMR	IMR	Under 5 IMR	IMR	Under 5 IMR
Arusha	108	179	75	119	52	78
Coast	121	204	113	189	105	174
Dodoma	133	225	132	222	130	220
Iringa	152	257	130	220	111	187
Kagera	133	225	130	219	127	212
Kigoma	163	269	115	192	81	137
Kilimanjaro	76	119	67	104	59	90
Lindi	151	255	140	236	129	218
Mara	140	236	125	211	112	189
Mbeya	161	267	124	209	96	163
Morogoro	140	236	125	211	112	189
Mtwara	161	267	138	233	119	202
Mwanza	139	233	115	192	95	157
Rukwa	170	283	131	221	101	172
Ruvuma	145	245	113	188	88	143
Shinyanga	150	252	110	183	81	131
Singida	137	231	96	157	67	106
Tabora	140	236	101	166	73	116
Tanga	112	187	106	186	100	166

Source: Poverty and Welfare Monitoring Indicators, Vice President's Office, URT, Nov 1991

Table A8.   Child Morbidity: Diarrhea prevalence* last 2 weeks

Region	1992		1996	
	Births 3 yrs	**Births 5 yrs**	**Births 3 yrs**	**Births 5 yrs**
Arusha	28.3	22.9	20.8	14.8
Coast	23.4	18.5	6.8	4.7
Dodoma	20.3	17.1	23.9	14.7
Iringa	20	13.3	17.8	12
Kagera	7	5.9	25.7	20.3
Kigoma	16.5	11.8	31.8	25.2
Kilimanjaro	15.8	10.7	14.5	9.6
Lindi	23.3	17.8	17.5	13
Mara	14.6	11.1	16	11
Mbeya	11.8	12.1	27	18.7
Morogoro	31.8	22.3	18.2	12.9
Mtwara	13.8	10.3	14	11.2
Mwanza	9.1	7.6	9.8	7.8
Rukwa	17.5	13.6	31	22.2
Ruvuma	15.3	10.3	11.3	7.4
Shinyanga	11.6	8.4	10.8	7.3
Singida	25.8	20.7	22.8	18.2
Tabora	8.8	6.5	20.8	18.5
Tanga	16.1	12.2	17.8	13.5
Total	**16.8**	**12.9**	**18.9**	**13.7**

Source: ORC Macro. 2003. MEASURE DHS+ STAT compiler. http://www.measuredhs.com, 31 March 2003.

* Percentage of children under three (five) years who had diarrhea and diarrhea with blood in the two weeks preceding the survey, and the percentage of children who diarrhea in the preceding 24 hours, by selected background characteristics.

Table A9.   Child Nutrition, Anthropometric: Weight for age, percentage of children below the specified benchmark

Region	1992				1996			
	Births 3yrs before survey		Births 5yrs before survey		Births 3yrs before survey		Births 5yrs before survey	
	-3 SD	-2 SD	-3 SD	-2 SD	-3 SD	-2 SD	-3 SD	-2 SD
Arusha	7	26.1	5.7	28.5	8.3	31.1	9.2	35.1
Coast	12.4	38.8	10.5	37.4	10.8	35.4	8.4	34.3
Dodoma	9.6	33.3	7.1	36.7	8.1	40.5	7.5	34.2
Iringa	9.2	28.2	12.5	37.1	20.5	53	14.7	48.2
Kagera	3.8	23.3	6	26.8	16.3	36	11.2	36
Kigoma	4.4	29.4	7.5	34.1	6.7	42.3	7.6	43.1
Kilimanjaro	6.2	23	7	25.9	3.3	18.5	4	21
Lindi	12	32.7	11.1	30.1	18.3	47.6	13.4	41.4
Mara	3.5	17.7	2.5	18.7	12	29.3	5.7	18.9
Mbeya	10.9	25.8	9.4	25	5.4	17.6	6.8	20.8
Morogoro	8.4	35.3	8.1	33.2	12.6	29.5	7.3	25.5
Mtwara	9.3	47.2	11.4	48.3	10.3	33.6	8.7	35.6
Mwanza	5.9	14.7	5.2	20.8	7.2	26.1	6.3	27
Rukwa	3.5	24.1	5	26.7	9.9	25.9	9.7	30.5
Ruvuma	7.8	28	9.2	33.3	7.4	28.7	7.1	29.4
Shinyanga	6.7	24.1	7	21	6.3	26.3	5	27.8
Singida	5.5	34.7	7	33.9	10.7	30.4	9.8	28.4
Tabora	4.3	28.5	5.2	24.7	5.9	15.7	2.7	14.2
Tanga	3	19.9	6	31.4	8.3	40.5	8.1	36.2

Source: ORC Macro. 2003. MEASURE DHS+ STAT compiler. http://www.measuredhs.com, 31 March 2003.

*Nutritional status by background characteristics: Percentage of children under three (five) years who are classified as undernourished nutritional status: height-for-age, weight-for-age and weight-for-height by selected background characteristics.

<u>Note</u>: Each index is expressed in terms of the number of standard deviation (SD) units from the median of the NCHS/CDC/WHO international reference population. Children are classified as malnourished if their z-scores are below minus two or minus three standard deviations (-2 SD or -3 SD) from the median of the reference population. The percentage below -2 SD includes children who are below -3 SD.

Table A10. Educational Level of Household Population*

REGION	1992						1996					
	Male Level of education			Female Level of education			Male Level of education			Female Level of education		
	No education	Primary	Secondary	No education	Primary	Secondary	No education	Primary	Secondary	No education	Primary	Secondary
Arusha	40.9	52.5	4.6	41.6	49.9	6.3	40.3	53.5	4.4	50.9	44.9	2
Coast	43	54.1	2.1	55.4	42.9	1.3	33.4	60.4	4.2	47.6	49.8	1.1
Dodoma	40.1	58.7	1.2	47.8	51	1.1	39.5	55.6	3.9	46.7	50.5	2.2
Iringa	34.1	62.4	2.8	50.3	47.6	1.3	36.1	60.4	2.7	42.9	53.5	3.1
Kagera	31.7	60.9	7	47.6	48.8	3.4	28.8	64.4	4.3	42.4	55.7	1
Kigoma	40.7	57.3	1.7	52	47.4	0.3	35.6	61.3	2.3	44.3	53.7	0.4
Kilimanjaro	18.4	75.2	5.5	23.6	70.5	5.7	13.8	77.4	7.6	21.5	72	5.2
Lindi	45.9	51.3	1.7	53.6	45.1	0.2	36.3	59.2	3.1	40.8	54.7	2.2
Mara	35.2	61.6	3	44.4	54.9	0.5	26.7	68.9	2.9	36.7	61.5	0.9
Mbeya	29.4	66.2	4.3	43.4	55.9	0.5	29.6	62.9	6.3	35.8	61	2.1
Morogoro	33.9	62.9	3.2	49.1	49.6	1.2	34.2	62.2	2.5	45	53.9	0.8
Mtwara	37.7	61.7	0.4	59.1	40.6	0	35.7	62.2	1.3	48.5	49.9	0.4
Mwanza	36.3	59.6	3.6	47.4	51	1.5	35.5	61.9	2.1	49.7	48	2
Rukwa	39.5	57.6	2.5	53.8	45.4	0.6	34.9	62.8	2.1	50.5	47.5	1.7
Ruvuma	25.9	71.1	2.2	33.5	65.3	0.7	24.1	71.2	3.6	28.7	68.3	1.8
Shinyanga	40.8	55.9	2.3	57.9	40.7	1.4	38.4	55.3	4.8	49.1	46.4	3.3
Singida	39.4	57	3.3	46.6	50.6	2.6	37.1	59	2.5	44.1	53.1	1.7
Tabora	38.6	58.9	2.5	54.7	43.8	1.3	32.4	62.9	3.9	44.4	51.5	1.9
Tanga	27.6	69.2	3.2	39.8	58.6	1.2	27.6	69.9	1.3	39.6	59.7	0.4
Total	34.4	60.9	4.2	46.1	51	2.4	31.6	62	4.8	41.7	54.3	2.8

Source: ORC Macro. 2003. MEASURE DHS+ STAT compiler. http://www.measuredhs.com, 31 March 2003.

* *Percent distribution of the de-facto male and female household population age 6 and over by highest level of education attended, according to selected background characteristics.*

Table A11.   Tanzania: Primary School GER*

Region	1995	2000	Region	1995	2000
Arusha	73	79.4	Morogoro	79	80.9
Coast	74	92.2	Mtwara	78	72.7
Dodoma	67	73.9	Mwanza	75	76.1
Iringa	87	93.2	Rukwa	65	67.8
Kagera	66	67.4	Ruvuma	80	86.5
Kigoma	66	74.1	Shinyanga	73	70.1
Kilimanjaro	100	91.9	Singida	75	86.1
Lindi	64	50.8	Tabora	63	50.5
Mara	92	84.8	Tanga	77	76.9
Mbeya	80	85.5			

Source: Basic Statistics in Education, Ministry of Education and Culture, The United Republic of Tanzania, various years.

* Gross Enrolment Ratio

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