THE SOCIOECONOMIC IMPACTS OF PUBLIC AND PRIVATE INVESTMENTS IN INFRASTRUCTURE DEVELOPMENT IN BURKINA FASO

by Yacouba Ouédraogo

Dissertation presented for the degree of
Doctor of Philosophy (PhD) in Development Finance in the Faculty of Economic and Management Sciences at Stellenbosch University

Supervisor: Professor Paul Kibuuka, University of South Africa

Co-Supervisor: Professor Charles Adjasi, Stellenbosch Business School

Degree of confidentiality: A

Graduation: December 2023

investments in transport infrastructure by tax sharply increased CPI. Secondly, a reduction in CPI was observed with a downward trend. This downward trend was due to increased supply of goods and services due to investment in transport infrastructure. It should be noted that the inflationary trend occurs in the short term following the implementation of large infrastructure investment projects. However, the increased infrastructure investment would reduce the inflation rate in the long term (Looney, 1990). The two-step sequential evolution of CPI was also observed when increased investment in transport infrastructure was financed by official development assistance. First, increasing investment in transport infrastructure financed by official development assistance reduced CPI. Second, CPI increased with an upward trend over time. The decline in CPI may be explained by the positive externalities (lower transport cost, time savings, etc.) generated by the additional investments in transport infrastructure. Overall, the simulation results showed that increased investment in transport infrastructure by tax was more favourable to households' purchasing power than other financing modes, such as debt and ODA, which depressed the purchasing power of households in Burkina Faso.

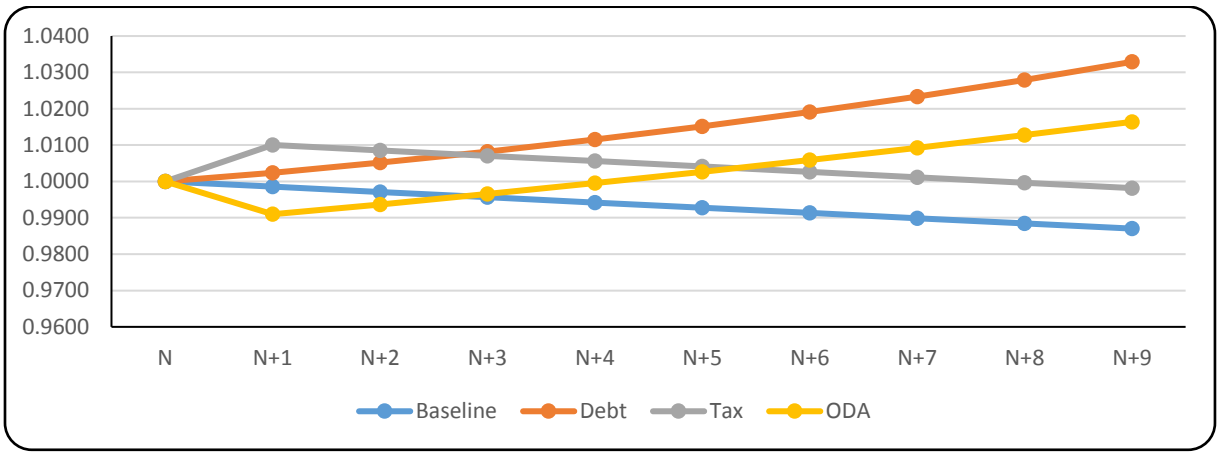

Figure 5.2: Evolution of CPI in the baseline scenario and per financing source following an increase in investment in transport infrastructure

5.2.1.3 Impact on imports

Burkina Faso's imports, over the period 2008-2017, increased on average by 13.53% per year. Analysis of the simulation results indicated that an increase in investment spending in transport infrastructure positively impacted Burkina Faso's imports, regardless of the source of financing considered. These simulations also indicated that this impact grew through ODA and positively impacted Burkina Faso's imports more than financing by tax or debt (see Figure 5.3).

This positive impact on imports may be explained by the Dutch disease caused by the inflow of new investments from ODA. According to Gacem (2007), Dutch disease occurs mainly from

how public expenditure is financed, particularly if an increase in public spending is financed through ODA. Dutch disease results in an appreciation of the exchange rate, negatively impacting the competitiveness of local products in favour of foreign products on the domestic market.

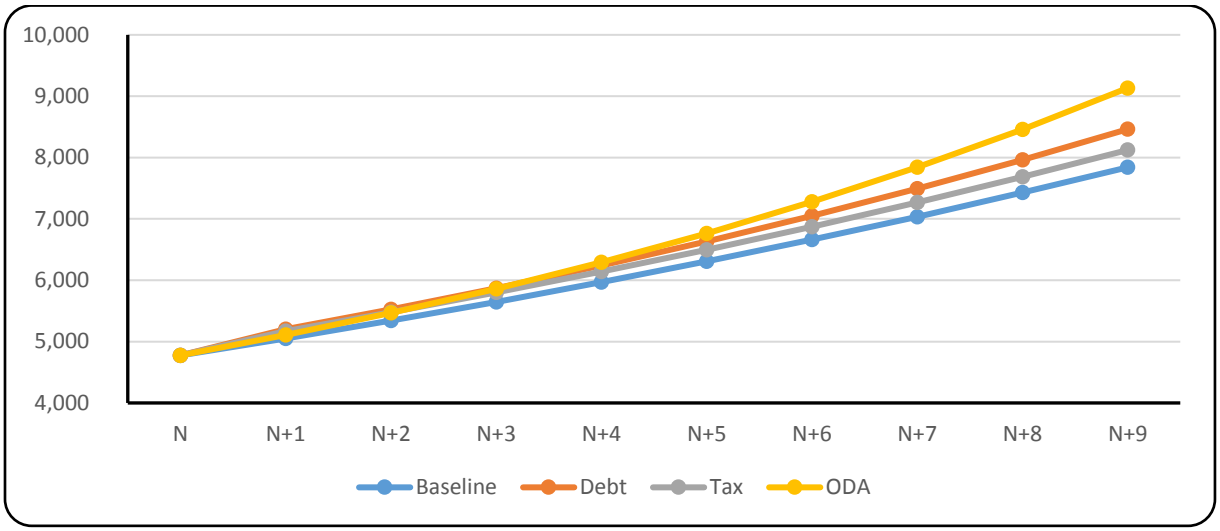

Figure 5.3: Evolution of imports in the baseline scenario and per financing source following an increase in investment in transport infrastructure

5.2.1.4 Impact on exports

Over the period 2008–2017, Burkina Faso's exports experienced an average increase of 9.80% per year. However, despite the work undertaken to improve the competitiveness of national products on the international market, the country's exports remained low and below $4 000 (see Figure 5.4).

Overall, the simulations showed that increased investment in transport infrastructure positively impacted exports when financed by tax or borrowing. The simulation also indicated that the positive impact on exports increased over the years. These positive impacts may be explained by the improvement in private enterprises' productive capacity driven by the construction of new transport infrastructure. Barro (1990) found a relationship between transport infrastructure, private productivity and total factor productivity. Therefore, increased productivity positively and significantly affected domestic production and the country's exports.

Conversely, increased investment in transport infrastructure through official development assistance negatively impacted Burkina Faso's exports. Again, ODA financing may result in an exchange rate appreciation through the Dutch disease, negatively impacting the country's exports.

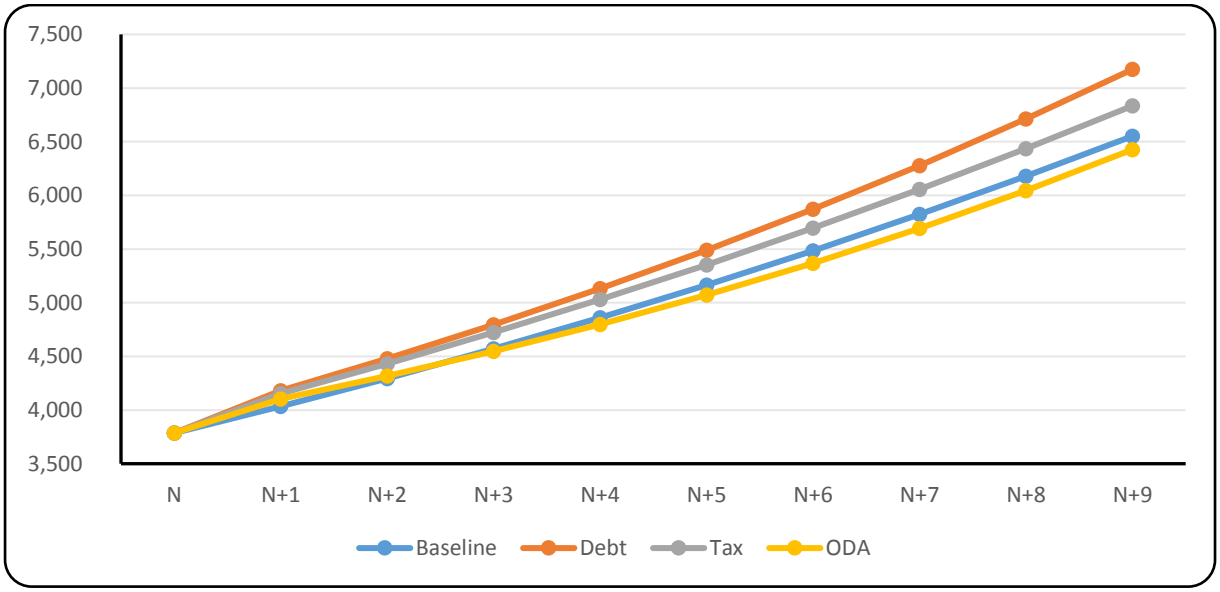

Figure 5.4: Evolution of exports in the baseline scenario and per financing source following an increase in investment in transport infrastructure

5.2.1.5 Impact on the budget balance

Burkina Faso exhibited a budget balance deficit throughout the study. However, the results of the simulations, as shown in Table 5.1, indicated that an increase in investment in transport infrastructure via tax or ODA did not impact the budget balance.

Table 5.1: Trends in the budget balance following an increase in investment in transport

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline	276 661	276 661	276 661	276 661	276 661	276 661	276 661	276 661	276 661	276 661
Debt	276 661	367 279	415 367	467 750	524 754	586 725	654 031	727 066	806 247	892 018
Tax	276 661	276 661	276 661	276 661	276 661	276 661	276 661	276 661	276 661	276 661
ODA	276 661	276 661	276 661	276 661	276 661	276 661	276 661	276 661	276 661	276 661

Conversely, a debt-financed increase in investment further exacerbated the budget balance deficit, as shown in Figure 5.5 below.

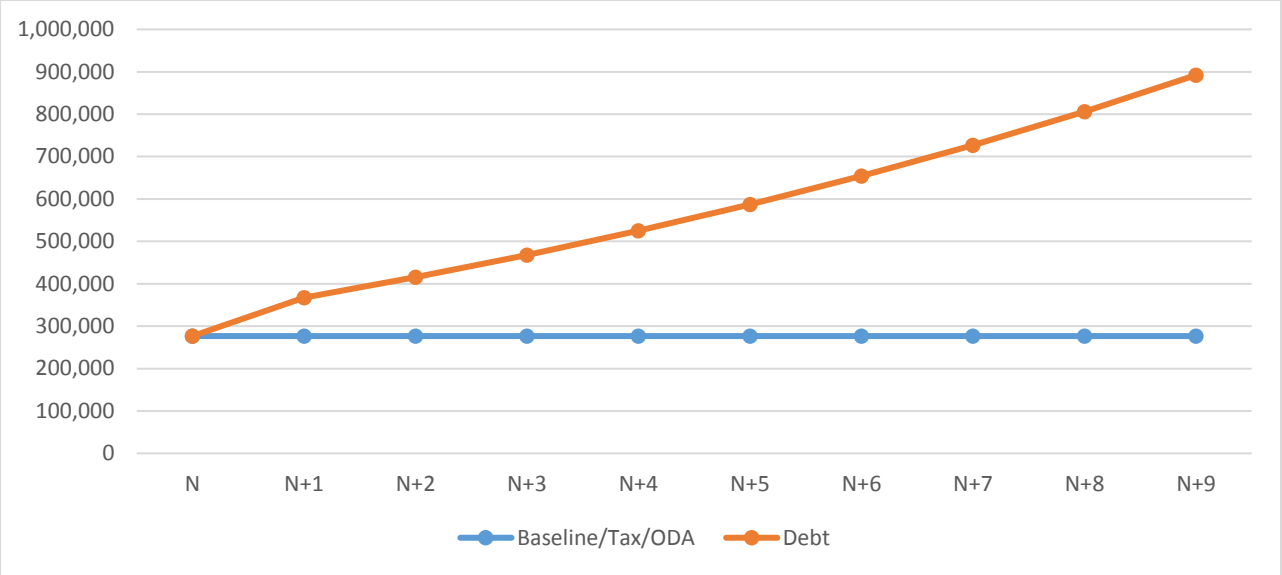

Figure 5.5: Evolution of budget balance in the baseline scenario and per financing source following an increase in investment in transport infrastructure

5.2.1.6 Impact on current account

Burkina Faso's trade balance was in deficit from 2008 to 2017. The deficit in the balance of payment affected the country's current account. The results of the simulation indicated that an increase in investment in transport infrastructure negatively impacted the current account of Burkina Faso, irrespective of the funding source, as reported in Table 5.2 below.

Table 5.2: Trends in current account following an increase in investment in transport

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline	-1 375 376	-1 408 255	-1 432 611	-1 446 248	-1 446 533	-1 430 303	-1 393 755	-1 332 312	-1 240 459	-1 111 535
Debt	-1 375 376	-1 456 650	-1 528 563	-1 604 665	-1 685 203	-1 770 438	-1 860 646	-1 956 118	-2 057 164	-2 164 109
Tax	-1 375 376	-1 452 466	-1 521 202	-1 593 387	-1 669 189	-1 748 783	-1 832 350	-1 920 084	-2 012 182	-2 108 855
ODA	-1 375 376	-1 452 594	-1 521 341	-1 593 535	-1 669 342	-1 748 937	-1 832 504	-1 920 232	-2 012 322	-2 108 982

Figure 5.6 below shows that regardless of the funding source, increased investment in transport infrastructure further worsened Burkina Faso's current account deficit.

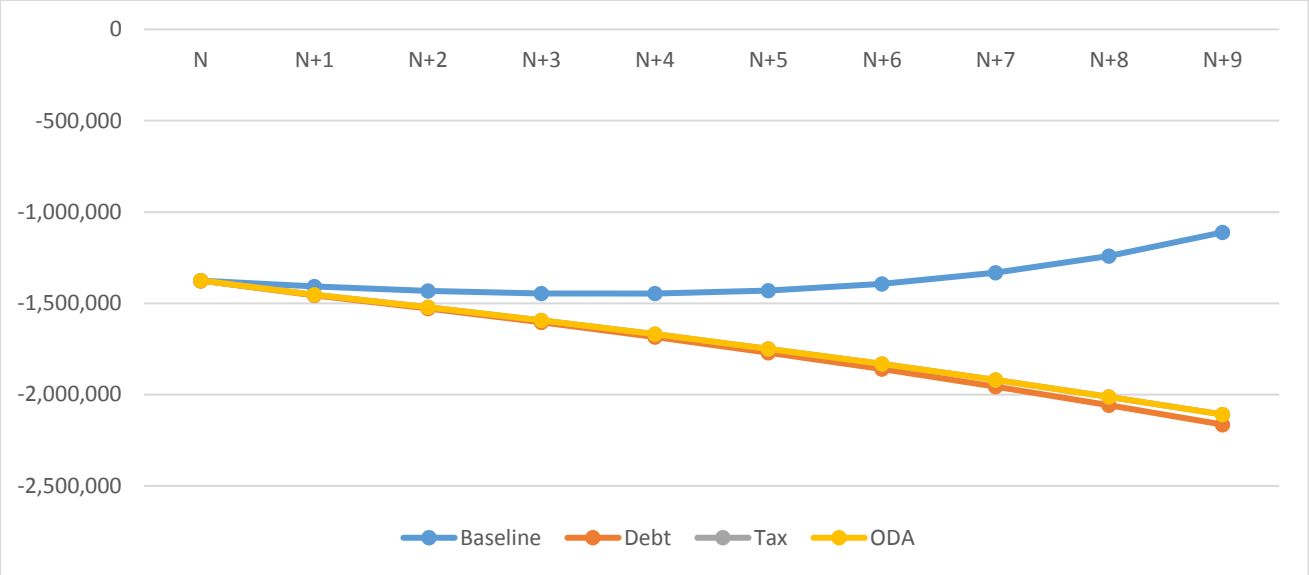

Figure 5.6: Evolution of the current account in the baseline scenario and per financing source following an increase in investment in transport infrastructure

5.2.2 Impact on activities, factor markets, institutions and commodity market

Sectoral output production, factor production income and factor production costs were the indicators considered for simulations.

5.2.2.1 Impact on sectoral output production

The combination of capital, labour and intermediate goods produced output, which value included the value of intermediate, capital and labour inputs. The simulation of sectoral output production considered three economic sectors: the primary, secondary and tertiary sectors, and savings related to these sectors. Results of the simulations indicated that regardless of the financing source considered for transport infrastructure, sectoral output production increased over the years, as shown in Tables 5.3, 5.4 and 5.5 below.

Table 5.3: Trends in sectoral output production for debt-financed transport infrastructure

Year	*N*	*N+1*	*N+2*	*N+3*	*N+4*	*N+5*	*N+6*	*N+7*	*N+8*	*N+9*
Baseline_Primary	1 027 598	1 089 462	1 154 737	1 223 602	1 296 242	1 372 853	1 453 641	1 538 820	1 628 615	1 723 262
Baseline_Mining	1 463 137	1 560 301	1 662 491	1 769 947	1 882 919	2 001 668	2 126 466	2 257 598	2 395 360	2 540 061
Baseline_Secondary	2 137 751	2 268 896	2 407 165	2 552 925	2 706 560	2 868 473	3 039 085	3 218 837	3 408 191	3 607 631
Baseline_Tertiary	6 462 759	6 801 327	7 156 492	7 529 047	7 919 817	8 329 664	8 759 491	9 210 237	9 682 886	10 178 464
Savings_Primary	1 027 598	1 084 136	1 150 896	1 222 046	1 297 874	1 378 685	1 464 802	1 556 572	1 654 361	1 758 558
Savings_Mining	1 463 137	1 580 680	1 698 213	1 823 435	1 956 822	2 098 876	2 250 131	2 411 147	2 582 520	2 764 878
Savings_Secondary	2 137 751	2 271 052	2 415 179	2 568 752	2 732 381	2 906 711	3 092 431	3 290 270	3 501 002	3 725 449
Savings_Tertiary	6 462 759	7 141 705	7 535 042	7 951 192	8 391 494	8 857 363	9 350 298	9 871 881	10 423 787	11 007 783

Table 5.4: Trends in sectoral output production for tax-financed transport infrastructure

Year	*N*	*N+1*	*N+2*	*N+3*	*N+4*	*N+5*	*N+6*	*N+7*	*N+8*	*N+9*
Baseline_Primary	1 027 598	1 089 462	1 154 737	1 223 602	1 296 242	1 372 853	1 453 641	1 538 820	1 628 615	1 723 262
Baseline_Mining	1 463 137	1 560 301	1 662 491	1 769 947	1 882 919	2 001 668	2 126 466	2 257 598	2 395 360	2 540 061
Baseline_Secondary	2 137 751	2 268 896	2 407 165	2 552 925	2 706 560	2 868 473	3 039 085	3 218 837	3 408 191	3 607 631
Baseline_Tertiary	6 462 759	6 801 327	7 156 492	7 529 047	7 919 817	8 329 664	8 759 491	9 210 237	9 682 886	10 178 464
Tax_Primary	1 027 598	1 086 746	1 153 639	1 224 324	1 299 004	1 377 892	1 461 211	1 549 196	1 642 094	1 740 163
Savings_Mining	1 463 137	1 562 313	1 667 928	1 779 149	1 896 250	2 019 517	2 149 247	2 285 754	2 429 362	2 580 411
Tax_Secondary	2 137 751	2 273 547	2 416 212	2 566 843	2 725 863	2 893 711	3 070 851	3 257 769	3 454 971	3 662 992
Tax_Tertiairy	6 462 759	7 131 175	7 513 442	7 914 920	8 336 546	8 779 299	9 244 203	9 732 329	10 244 797	10 782 774

Table 5.5: Trends in Sectoral Output Production for ODA-financed transport infrastructure

Year	*N*	*N+1*	*N+2*	*N+3*	*N+4*	*N+5*	*N+6*	*N+7*	*N+8*	*N+9*
Baseline_Primary	1 027 598	1 089 462	1 154 737	1 223 602	1 296 242	1 372 853	1 453 641	1 538 820	1 628 615	1 723 262
Baseline_Mining	1 463 137	1 560 301	1 662 491	1 769 947	1 882 919	2 001 668	2 126 466	2 257 598	2 395 360	2 540 061
Baseline_Secondary	2 137 751	2 268 896	2 407 165	2 552 925	2 706 560	2 868 473	3 039 085	3 218 837	3 408 191	3 607 631
Baseline_Tertiary	6 462 759	6 801 327	7 156 492	7 529 047	7 919 817	8 329 664	8 759 491	9 210 237	9 682 886	10 178 464
ODA_Primary	1 027 598	1 091 512	1 167 112	1 249 945	1 340 735	1 440 278	1 549 446	1 669 196	1 800 577	1 944 741
Savings_Mining	1 463 137	1 536 144	1 607 490	1 685 122	1 769 628	1 861 634	1 961 809	2 070 871	2 189 592	2 318 800
ODA_Secondary	2 137 751	2 280 949	2 438 355	2 610 882	2 800 026	3 007 426	3 234 879	3 484 348	3 757 984	4 058 140
ODA_Tertiary	6 462 759	7 163 456	7 598 788	8 069 830	8 579 743	9 131 969	9 730 250	10 378 656	11 081 612	11 843 922

5.2.2.2 Impact on factor production income

Factor income is the flow of income resulting from the factors of production, which are the inputs required to produce goods and services. It represents income received from the factors of production, which are the resources used to produce goods or services. The simulations disaggregated labour into agricultural, non-agricultural and family labour. Savings were also disaggregated into agricultural, non-agricultural and capital savings. The simulation results, as shown in Tables 5.6, 5.7, and 5.8 below, indicated that factor production income increases over time, regardless of the source of financing for transport infrastructure.

Table 5.6: Trends in production income for debt-financed transport infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_AgriLabour	7 138	7 608	8 076	8 542	9 007	9 471	9 934	10 396	10 858	11 321
Baseline_NonAgriLabour	1 728 140	1 809 702	1 892 321	1 976 079	2 061 057	2 147 329	2 234 970	2 324 050	2 414 640	2 506 808
Baseline_FamilyLabour	60 502	64 585	68 664	72 743	76 825	80 914	85 010	89 118	93 237	97 371
Baseline_Capital	5 532 163	5 864 883	6 198 170	6 532 174	6 867 030	7 202 858	7 539 766	7 877 851	8 217 204	8 557 903
Savings_AgriLabour	7 138	7 806	8 270	8 734	9 197	9 659	10 121	10 583	11 045	11 507
Savings_NonAgriLabour	1 728 140	1 821 602	1 906 145	1 991 782	2 078 598	2 166 676	2 256 092	2 346 921	2 439 236	2 533 108
Savings_FamilyLabour	60 502	66 258	70 311	74 370	78 437	82 514	86 603	90 707	94 826	98 963
Savings_Capital	5 532 163	6 036 367	6 378 706	6 721 792	7 065 760	7 410 734	7 756 823	8 104 127	8 452 735	8 802 729

Table 5.7: Trends in factor production income for tax-financed transport infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_AgriLLabour	7 138	7 608	8 076	8 542	9 007	9 471	9 934	10 396	10 858	11 321
Baseline_NonAgriLabour	1 728 140	1 809 702	1 892 321	1 976 079	2 061 057	2 147 329	2 234 970	2 324 050	2 414 640	2 506 808
Baseline_FamilyLabour	60 502	64 585	68 664	72 743	76 825	80 914	85 010	89 118	93 237	97 371
Baseline_Capital	5 532 163	5 864 883	6 198 170	6 532 174	6 867 030	7 202 858	7 539 766	7 877 851	8 217 204	8 557 903
Tax_AgriLabour	7 138	7 813	8 280	8 746	9 211	9 675	10 138	10 601	11 064	11 527
Tax_NonAgriLabour	1 728 140	1 821 000	1 905 343	1 990 819	2 077 507	2 165 481	2 254 816	2 345 583	2 437 853	2 531 694
Tax_FamilyLabour	60 502	66 321	70 398	74 476	78 560	82 651	86 753	90 866	94 994	99 137
Tax_Capital	5 532 163	6 036 978	6 379 536	6 722 804	7 066 925	7 412 024	7 758 215	8 105 599	8 454 268	8 804 305

Table 5.8: Trends in factor production income for ODA-financed transport infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_AgriLabour	7 138	7 608	8 076	8 542	9 007	9 471	9 934	10 396	10 858	11 321
Baseline_NonAgriLabour	1 728 140	1 809 702	1 892 321	1 976 079	2 061 057	2 147 329	2 234 970	2 324 050	2 414 640	2 506 808
Baseline_FamilyLabour	60 502	64 585	68 664	72 743	76 825	80 914	85 010	89 118	93 237	97 371
Baseline_Capital	5 532 163	5 864 883	6 198 170	6 532 174	6 867 030	7 202 858	7 539 766	7 877 851	8 217 204	8 557 903
ODA_AgriLabour	7 138	7 958	8 455	8 949	9 441	9 932	10 421	10 909	11 396	11 883
ODA_NonAgriLabour	1 728 140	1 797 544	1 876 882	1 957 457	2 039 345	2 122 624	2 207 365	2 293 642	2 381 522	2 471 078
ODA_FamilyLabour	60 502	67 550	71 877	76 199	80 520	84 842	89 169	93 501	97 842	102 192
ODA_Capital	5 532 163	6 055 179	6 401 918	6 749 354	7 097 608	7 446 790	7 796 999	8 148 325	8 500 847	8 854 641

5.2.2.3 Impact on factor production price

Factor cost is the cost incurred on the factor of production. It is the cost incurred on goods and services produced by industries and firms. It includes all the production factor costs of producing a given product in an economy. Factor cost includes the cost of land, labour, capital, raw material, transportation, etc. The simulations disaggregated labour into agricultural, non-agricultural and family labour. Savings were also disaggregated into agricultural, non-agricultural and capital savings.

The simulation results showed that regardless of the source of financing, the factor production costs of the transport infrastructure tended to increase over the years, except for capital, which tended to stagnate over time, as shown in Tables 5.9, 5.10 and 5.11 below.

Table 5.9: Trends in factor production cost for debt-financed transport infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_AgriLabour	1.00	1.05	1.09	1.13	1.17	1.21	1.25	1.28	1.32	1.35
Baseline_NonAgriLabour	1.00	1.01	1.02	1.03	1.04	1.05	1.05	1.06	1.06	1.06
Baseline_FamilyLabour	1.00	1.04	1.07	1.10	1.13	1.16	1.18	1.20	1.22	1.24
Baseline_Capital	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.24
Savings_AgriLabour	1.00	1.06	1.10	1.15	1.18	1.22	1.26	1.29	1.32	1.35
Savings_NonAgriLabour	1.00	1.01	1.02	1.03	1.04	1.04	1.05	1.05	1.06	1.06
Savings_FamilyLabour	1.00	1.05	1.08	1.11	1.14	1.17	1.19	1.21	1.23	1.25
Savings_Capital	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

Table 5.10: Trends in factor production price for tax-financed transport infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_AgriLabour	1.00	1.05	1.09	1.13	1.17	1.21	1.25	1.28	1.32	1.35
Baseline_NonAgriLabour	1.00	1.01	1.02	1.03	1.04	1.05	1.05	1.06	1.06	1.06
Baseline_FamilyLabour	1.00	1.04	1.07	1.10	1.13	1.16	1.18	1.20	1.22	1.24
Baseline_Capital	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.24
Tax_AgriLabour	1.00	1.06	1.11	1.15	1.19	1.22	1.26	1.29	1.33	1.36
Tax_NonAgriLabour	1.00	1.01	1.02	1.03	1.03	1.04	1.05	1.05	1.06	1.06
Tax_FamilyLabour	1.00	1.05	1.09	1.12	1.14	1.17	1.19	1.21	1.23	1.25
Tax_Capital	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

Table 5.11: Trends in factor production price for ODA-financed transport infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_AgriLabour	1.00	1.05	1.09	1.13	1.17	1.21	1.25	1.28	1.32	1.35
Baseline_NonAgriLabour	1.00	1.01	1.02	1.03	1.04	1.05	1.05	1.06	1.06	1.06
Baseline_FamilyLabour	1.00	1.04	1.07	1.10	1.13	1.16	1.18	1.20	1.22	1.24
Baseline_Capital	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.24
ODA_AgriLabour	1.00	1.08	1.13	1.18	1.22	1.26	1.30	1.33	1.37	1.40
ODA_NonAgriLabour	1.00	0.99	1.00	1.01	1.02	1.02	1.03	1.03	1.03	1.04
ODA_FamilyLabour	1.00	1.07	1.11	1.14	1.17	1.20	1.23	1.25	1.27	1.29
ODA_Capital	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

5.2.3 Impact on socioeconomic indicators

Socioeconomic indicators included household income, consumption levels, and unemployment rate.

5.2.3.1 Impact on household income

Figure 5.5 below shows that an increase in investment in transport infrastructure in Burkina Faso positively impacted the income of poor and non-poor households, regardless of the financing sources. The simulation result also indicated that the improvement in household

income is increasingly significant over time. In the first phase, investments in infrastructure mainly benefited the construction sector.

The induced effects of these investments spread to all sectors of the economy through intermediate consumption and positively impact household income, employment, enterprise productivity and private-sector investment. Companies were hiring more workers to meet the emerging demand for projects. Thus, salaried households' income increased (Boccanfuso & Savard, 2010).

The simulation also showed that the impact was greater on poor and non-poor households in the scenario of increased investment in transport infrastructure by official development assistance. Increased investments in transport infrastructure tended to benefit poorer households, as shown in Figure 5.7 below.

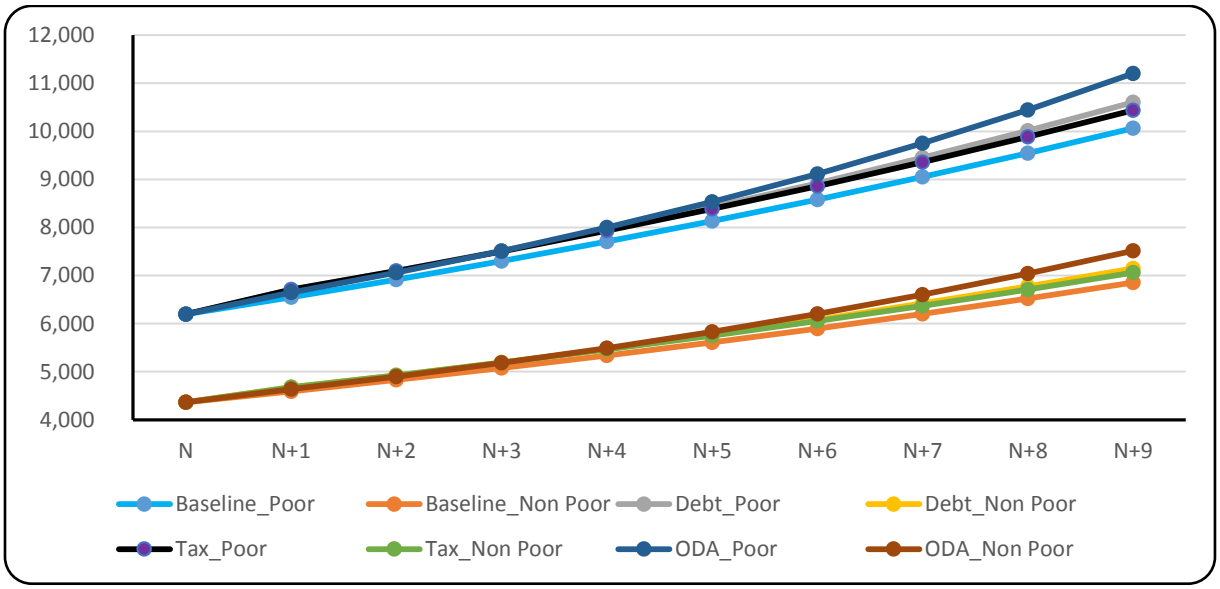

Figure 5.7: Evolution in household income in the baseline scenario and per financing source following an increase in investment in transport infrastructure

5.2.3.2 Impact on consumption levels

The simulation results indicated that increased transport infrastructure investment positively impacted household consumption for both poor and non-poor households regardless of the financing source. Moreover, this positive impact on household consumption can be persistent over time. Therefore, an increase in household income due to the positive effects induced by the construction of new transport infrastructure may explain the improvement in household consumption. The simulation also showed that the positive impact of increased investment in transport infrastructure on consumption was greater for poor households than non-poor households. This is explained by Duesenberry's (1952) demonstration effect, which stipulates

that households determine their consumption level by comparison with a social reference group. With increased income, households tend to adopt better-off household consumption patterns because it confers a certain social status.

As with income, household consumption was also significant when increased investment in transport infrastructure was financed by official development assistance (see Figure 5.8).

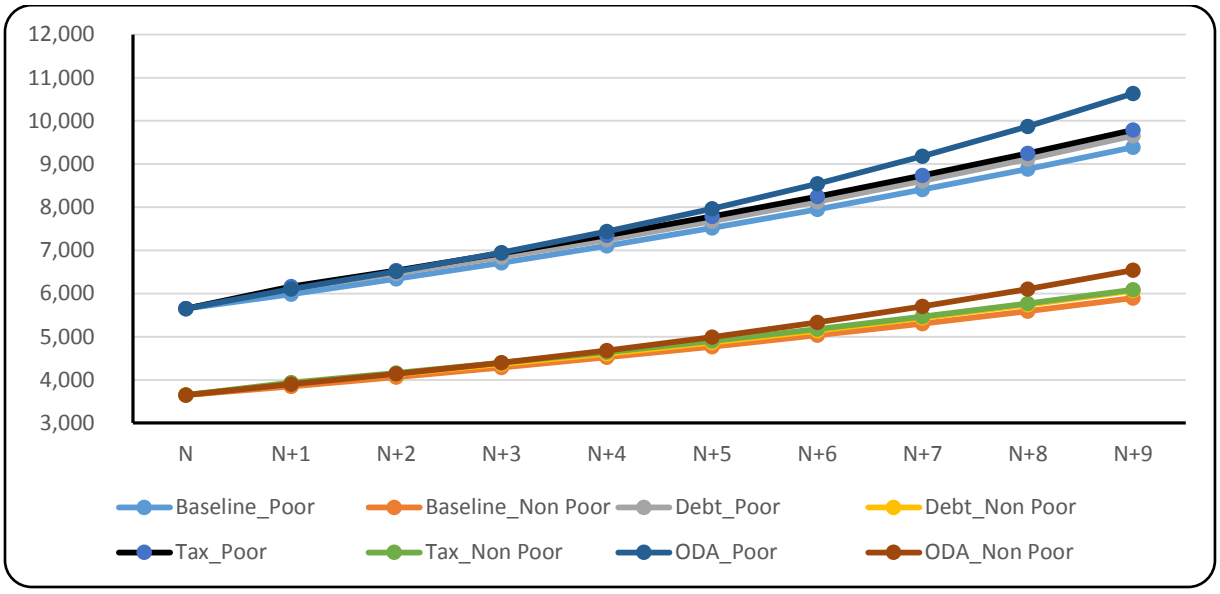

Figure 5.8: Evolution of consumption level in the baseline scenario and per financing source following an increase in investment in transport infrastructure

5.2.3.3 Impact on employment

Over the period 2007-2018, the unemployment rate in Burkina Faso was, on average, 6.42%. The simulation results indicate increased investment spending in transport infrastructure through debt or tax increased unemployment in Burkina Faso (see Figure 5.9). The observed impact on unemployment increased over time due to the crowding-out effect posited by liberal monetarist economists. They asserted that any additional public spending financed by non-banking agents through debt results in high interest rates, thus decreasing private spending from underwriters to borrowed funds to those who would have borrowed at lower rates. This decline in private investment spending impacted employment, hence the increase in the unemployment rate.

The simulation also showed that increased investment in transport infrastructure, through official development assistance reduced Burkina Faso's unemployment level. It translated into a drop in the unemployment rate because financing by ODA did not generate additional charges in terms of tax nor a crowding-out effect on private investments. Positive externalities

were generated for private enterprises; hence, further investments increased private companies' hiring capacity and reduced unemployment.

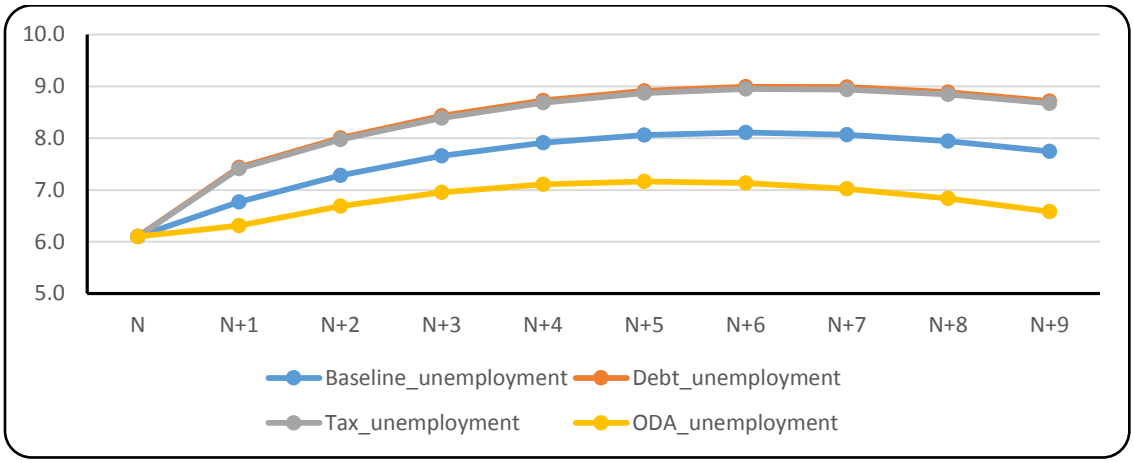

Figure 5.9: Evolution of unemployment rate in the baseline scenario and per financing source following an increase in investment in transport infrastructure

5.3 IMPACT OF INVESTMENTS IN TELECOMMUNICATION ON ECONOMIC GROWTH

5.3.1 Impact on macroeconomic indicators

5.3.1.1 Impact on Real GDP per capita

The simulations showed that increased telecommunication infrastructure investment positively impacted real GDP per capita regardless of the financing scenario considered in Burkina Faso. Furthermore, the positive impact rose over time, noting that the telecommunications infrastructure debt financing had a greater effect on economic growth than tax or ODA financing in Burkina Faso (see Figure 5.10).

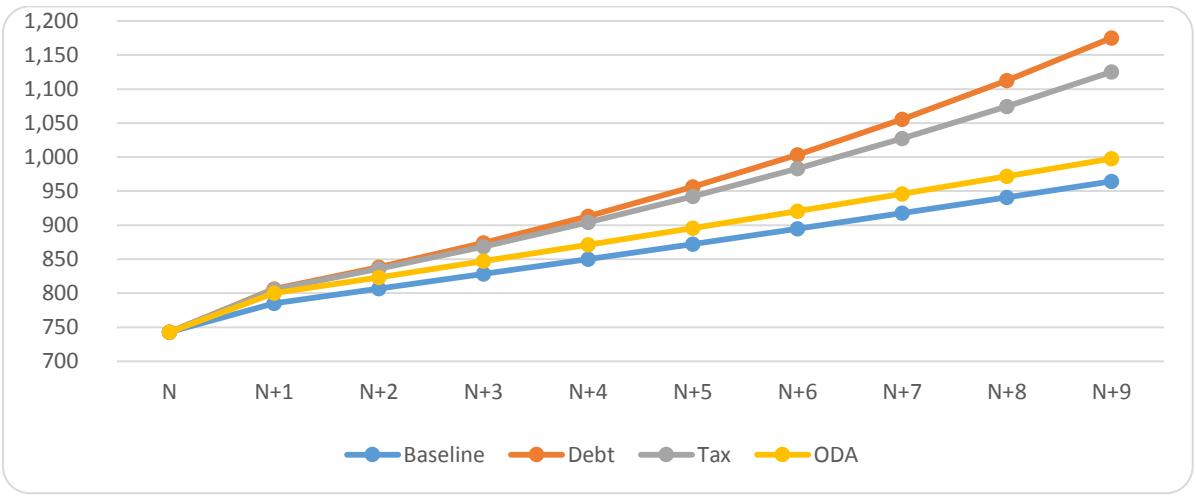

Figure 5.10: Evolution of real GDP per capita in the baseline scenario and per financing source following an increase in investment in telecommunication infrastructure

5.3.1.2 Impact on the Consumer Price Index

Figure 5.11 shows that increased investment spending on telecommunications resulted in a two-step sequential evolution of the CPI. First, a sharp positive impact on the CPI was noted from the second year of investment when new investments are financed by debt. Second, a drop in the CPI was then observed with a downward trend similar to the trend noted for transport infrastructure. The simulation results also showed that increased investment in telecommunication through tax or ODA did not affect CPI.

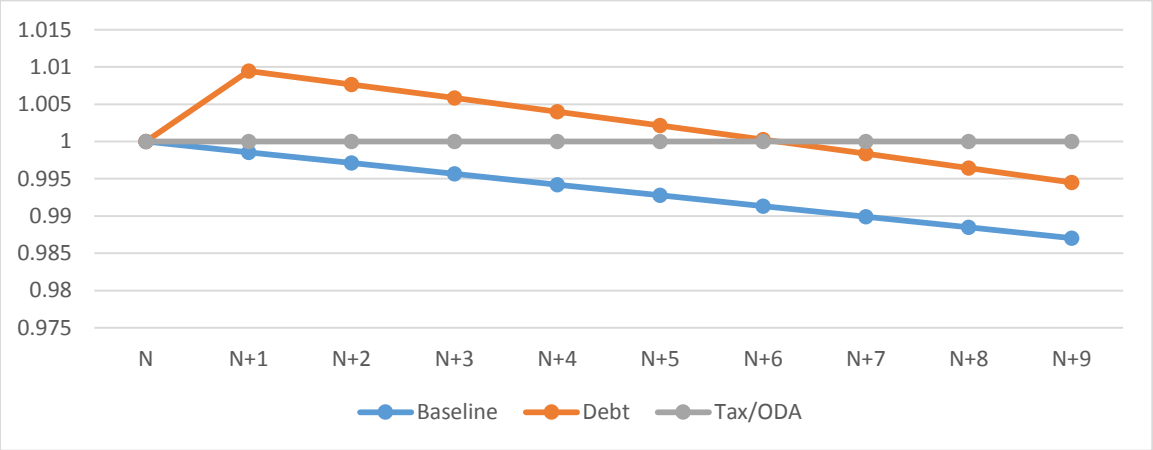

Figure 5.11: Evolution of CPI in the baseline scenario and per financing source following an increase in investment in telecommunication infrastructure

5.3.1.3 Impact on imports

Overall, an increase in investment in telecommunication infrastructure had a positive numeric impact on Burkina Faso's imports regardless of how this increase was financed (see Figure 5.12). Moreover, this positive impact was increasingly significant over time. The simulation results also indicate that debt financing of telecommunication infrastructure had a greater impact on Burkina Faso's imports than other financing sources.

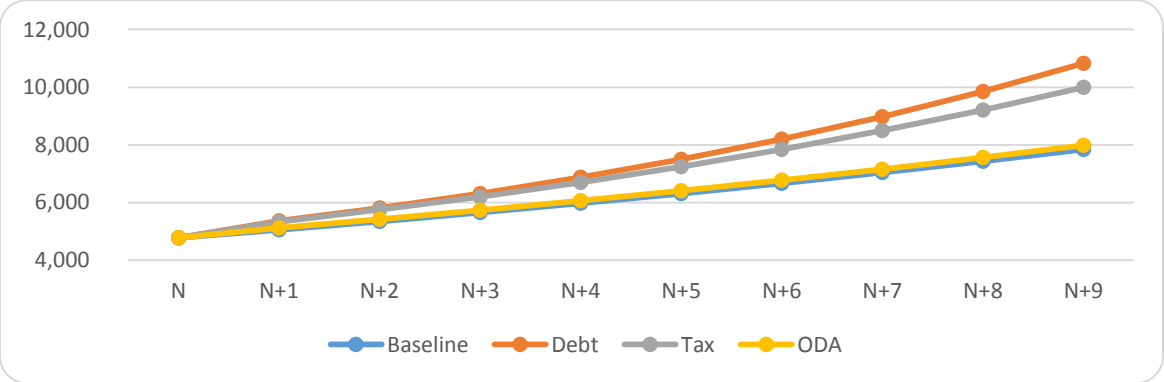

Figure 5.12: Evolution of imports in the baseline scenario and per financing source following an increase in investment in telecommunication infrastructure

5.3.1.4 Impact on exports

Figure 5.13 shows that an increase in investment in telecommunication via debt resulted in a two-step change in CPI in Burkina Faso. Financing new investments by borrowing resulted in a decrease in Burkina Faso's exports in the first instance. Secondly, financing new investments in telecommunication led to an increase in exports with an upward trend over time. The decline in exports reflected crowding-out effects due to the increase in public investments through debt investments at the expense of private investment. An increase in exports noted from the eighth year may be due to a resumption of private investments, increasing private enterprises' productive capacity.

The simulation also showed that increased telecommunication investment through debt or tax negatively impacted exports. Again, an increase in tax on private companies to finance new investments in the telecommunication sector contributed to this negative impact. Increased costs for private companies through taxation resulted in an appreciation in the price of Burkinabè products, thus, a loss of competitive prices on the foreign market and hence, a drop in exports of these products. In contrast, the simulation results of this study indicated that financing new telecommunication investments through ODA positively impacted Burkina Faso's exports.

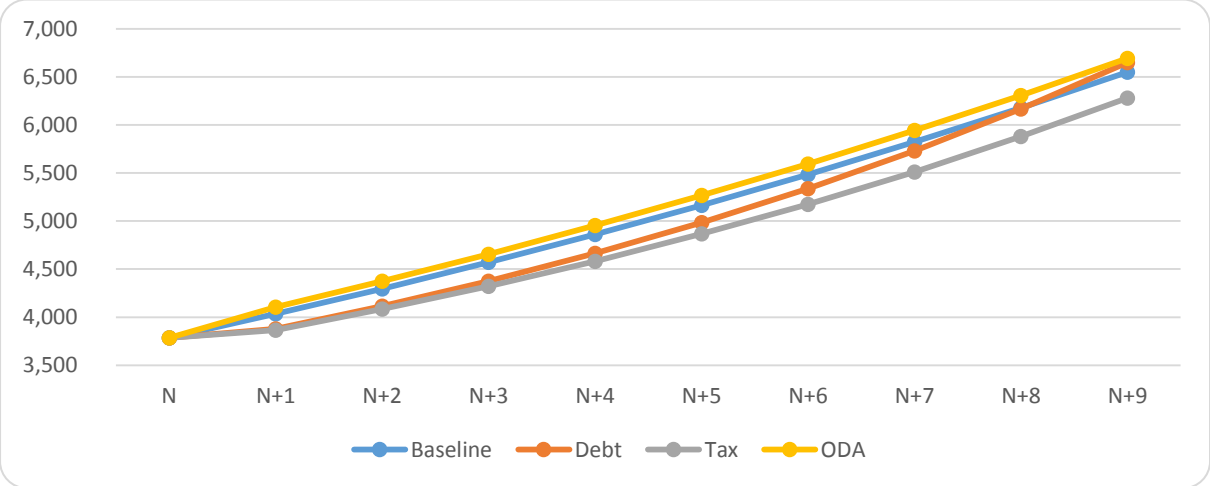

Figure 5.13: Evolution of exports in the baseline scenario and per financing source following an increase in investment in telecommunication infrastructure

5.3.1.5 Impact on the budget balance

Analysis of the simulation results, as indicated in Table 5.12 below, showed that tax or ODA financing of an increase in telecommunication infrastructure did not have an impact on Burkina Faso's budget balance (see Table 5.12 below)

Table 5.12: Trends in the budget balance following an increase in investment in telecommunication

Year	*N*	*N+1*	*N+2*	*N+3*	*N+4*	*N+5*	*N+6*	*N+7*	*N+8*	*N+9*
Baseline	*276 661*	*276 661*	*276 661*	*276 661*	*276 661*	*276 661*	*276 661*	*276 661*	*276 661*	*276 661*
Debt	*276 661*	*367 279*	*415 367*	*467 750*	*524 754*	*586 725*	*654 031*	*727 066*	*806 247*	*892 018*
Tax	*276 661*	*276 661*	*276 661*	*276 661*	*276 661*	*276 661*	*276 661*	*276 661*	*276 661*	*276 661*
ODA	*276 661*	*276 661*	*276 661*	*276 661*	*276 661*	*276 661*	*276 661*	*276 661*	*276 661*	*276 661*

Debt financing, conversely, would further worsen the country's budget balance deficit, as shown in Figure 5.14 below.

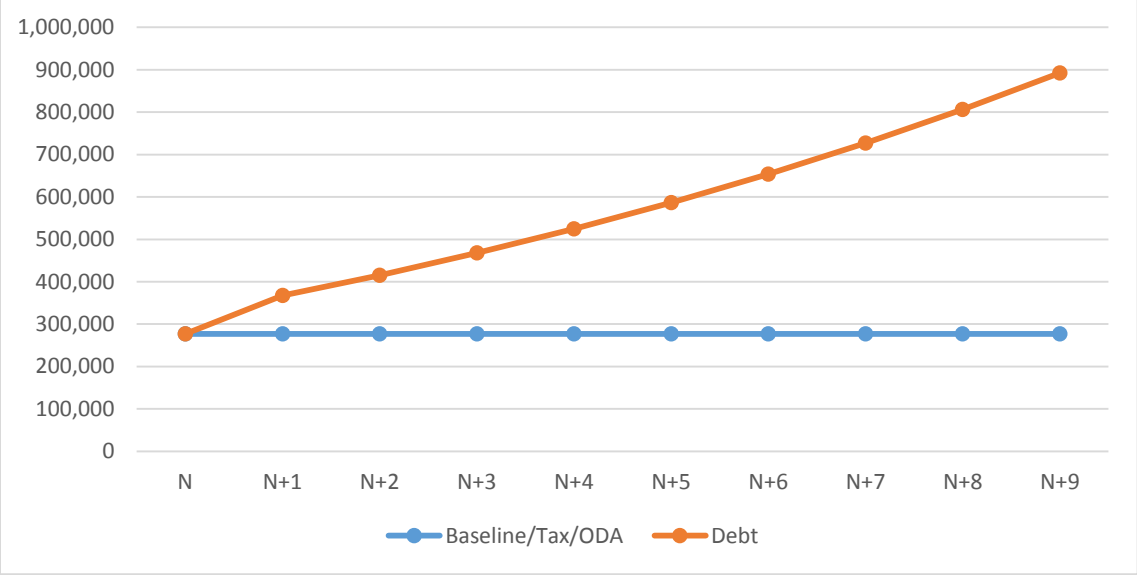

Figure 5.14: Evolution of budget balance in the baseline scenario and per financing source following an increase in investment in telecommunication infrastructure

5.3.1.6 Impact on current account

The simulation showed that an increase in investment in telecommunication negatively impacted Burkina Faso's current account regardless of the funding source (Please see Table 5.13).

Table 5.13: Trends in current accounts following an increase in investment in telecommunication

Year	*N*	*N+1*	*N+2*	*N+3*	*N+4*	*N+5*	*N+6*	*N+7*	*N+8*	*N+9*
Baseline	*-1 375 376*	*-1 438 784*	*-1 505 302*	*-1 575 077*	*-1 648 265*	*-1 725 024*	*-1 805 524*	*-1 889 940*	*-1 978 456*	*-2 071 262*
Debt	*-1 375 376*	*-1 743 894*	*-1 938 158*	*-2 156 527*	*-2 402 128*	*-2 678 491*	*-2 989 595*	*-3 339 914*	*-3 734 470*	*-4 178 882*
Tax	*-1 375 376*	*-1 729 967*	*-1 908 077*	*-2 104 424*	*-2 320 869*	*-2 559 457*	*-2 822 432*	*-3 112 254*	*-3 431 616*	*-3 783 459*
ODA	*-1 375 376*	*-1 442 419*	*-1 509 721*	*-1 580 343*	*-1 654 443*	*-1 732 186*	*-1 813 745*	*-1 899 301*	*-1 989 042*	*-2 083 165*

The decline in the current account has become greater over the years (see Figure 5.15). As for transport infrastructure, the negative impact on the current account, reflected a deficit in the balance of payment. The simulation also indicated that financing new investments in telecommunications through debt further depressed the budget balance compared to tax or ODA financing.

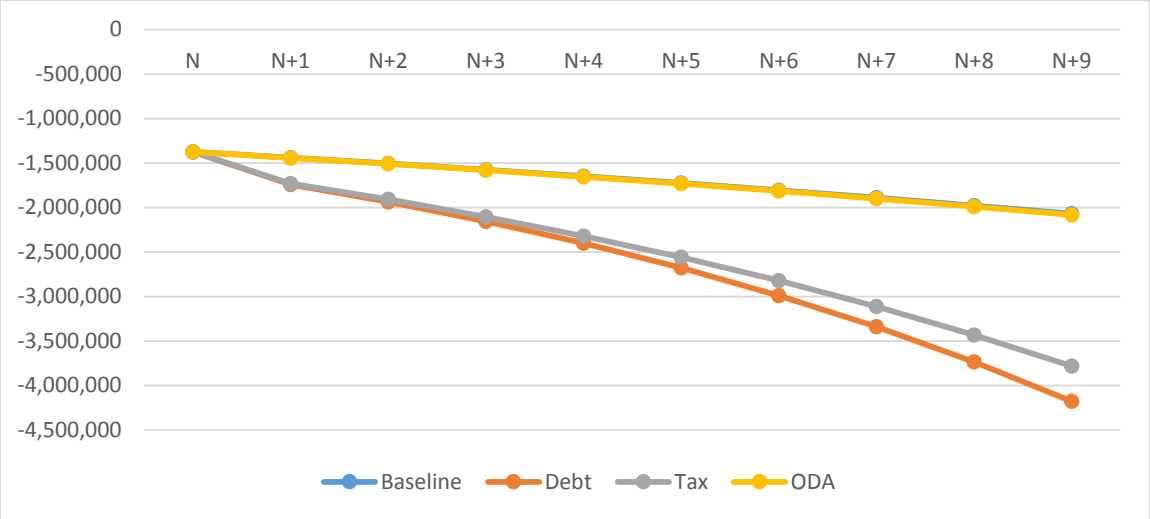

Figure 5.15: Evolution of the current account in the baseline scenario and per financing source following an increase in investment in telecommunication infrastructure

5.3.2 Impact on activities, factor markets, institutions and commodity market

5.3.2.1 Impact on sectoral output production

Similar to the impact on sectoral output production observed for transport infrastructure, sectoral output production increased over time regardless of the financing source envisaged for the telecommunications infrastructure. Tables 5.14, 5.15 and 5.16 below show the trends in sectoral output production.

Table 5.14: Trends in sectoral output production for debt-financed telecommunication infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_Primary	1 027 598	1 089 462	1 154 737	1 223 602	1 296 242	1 372 853	1 453 641	1 538 820	1 628 615	1 723 262
Baseline_Mining	1 463 137	1 560 301	1 662 491	1 769 947	1 882 919	2 001 668	2 126 466	2 257 598	2 395 360	2 540 061
Baseline_Secondary	2 137 751	2 268 896	2 407 165	2 552 925	2 706 560	2 868 473	3 039 085	3 218 837	3 408 191	3 607 631
Baseline_Tertiary	6 462 759	6 801 327	7 156 492	7 529 047	7 919 817	8 329 664	8 759 491	9 210 237	9 682 886	10 178 464
Savings_Primary	1 027 598	1 118 165	1 201 432	1 294 140	1 397 463	1 512 724	1 641 407	1 785 176	1 945 900	2 125 668
Savings_Mining	1 463 137	1 464 900	1 551 872	1 648 654	1 756 376	1 876 279	2 009 728	2 158 225	2 323 425	2 507 152
Savings_Secondary	2 137 751	2 322 806	2 497 640	2 692 512	2 909 892	3 152 548	3 423 582	3 726 463	4 065 072	4 443 742
Savings_Tertiary	6 462 759	7 147 203	7 623 234	8 146 392	8 721 993	9 355 962	10 054 891	10 826 109	11 677 755	12 618 857

Table 5.15: Trends in sectoral output production for tax-financed transport infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_Primary	1 027 598	1 089 462	1 154 737	1 223 602	1 296 242	1 372 853	1 453 641	1 538 820	1 628 615	1 723 262
Baseline_Mining	1 463 137	1 560 301	1 662 491	1 769 947	1 882 919	2 001 668	2 126 466	2 257 598	2 395 360	2 540 061
Baseline_Secondary	2 137 751	2 268 896	2 407 165	2 552 925	2 706 560	2 868 473	3 039 085	3 218 837	3 408 191	3 607 631
Baseline_Tertiary	6 462 759	6 801 327	7 156 492	7 529 047	7 919 817	8 329 664	8 759 491	9 210 237	9 682 886	10 178 464
Savings_Primary	1 027 598	1 096 741	1 163 008	1 232 947	1 306 751	1 384 621	1 466 769	1 553 418	1 644 799	1 741 157
Savings_Mining	1 463 137	1 576 427	1 680 561	1 790 102	1 905 309	2 026 451	2 153 810	2 287 682	2 428 372	2 576 201
Savings_Secondary	2 137 751	2 288 319	2 429 009	2 577 376	2 733 818	2 898 750	3 072 609	3 255 851	3 448 954	3 652 418
Savings_Tertiary	6 462 759	6 987 915	7 357 130	7 744 557	8 151 068	8 577 574	9 025 026	9 494 418	9 986 787	10 503 217

Table 5.16: Trends in sectoral output production for ODA-financed telecommunication infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_Primary	1 027 598	1 089 462	1 154 737	1 223 602	1 296 242	1 372 853	1 453 641	1 538 820	1 628 615	1 723 262
Baseline_Mining	1 463 137	1 560 301	1 662 491	1 769 947	1 882 919	2 001 668	2 126 466	2 257 598	2 395 360	2 540 061
Baseline_Secondary	2 137 751	2 268 896	2 407 165	2 552 925	2 706 560	2 868 473	3 039 085	3 218 837	3 408 191	3 607 631
Baseline_Tertiary	6 462 759	6 801 327	7 156 492	7 529 047	7 919 817	8 329 664	8 759 491	9 210 237	9 682 886	10 178 464
Savings_Primary	1 027 598	1 096 741	1 163 008	1 232 947	1 306 751	1 384 621	1 466 769	1 553 418	1 644 799	1 741 157
Savings_Mining	1 463 137	1 576 427	1 680 561	1 790 102	1 905 309	2 026 451	2 153 810	2 287 682	2 428 372	2 576 201
Savings_Secondary	2 137 751	2 288 319	2 429 009	2 577 376	2 733 818	2 898 750	3 072 609	3 255 851	3 448 954	3 652 418
Savings_Tertiary	6 462 759	6 987 915	7 357 130	7 744 557	8 151 068	8 577 574	9 025 026	9 494 418	9 986 787	10 503 217

5.3.2.2 Impact on factor production income

Tables 5.17, 5.18 and 5.19 below present the results of the simulations on factor production income for telecommunication based on the three funding scenarios.

Table 5.17: Trends in factor production income for a debt-financed telecommunications infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_AgriLabour	7 138	7 608	8 076	8 542	9 007	9 471	9 934	10 396	10 858	11 321
Baseline_NonAgriLabour	1 728 140	1 809 702	1 892 321	1 976 079	2 061 057	2 147 329	2 234 970	2 324 050	2 414 640	2 506 808
Baseline_FamilyLabour	60 502	64 585	68 664	72 743	76 825	80 914	85 010	89 118	93 237	97 371
Baseline_Capital	5 532 163	5 864 883	6 198 170	6 532 174	6 867 030	7 202 858	7 539 766	7 877 851	8 217 204	8 557 903
Savings_AgriLabour	7 138	7 789	8 251	8 713	9 174	9 634	10 094	10 555	11 015	11 476
Savings_NonAgriLabour	1 728 140	1 854 932	1 940 993	2 028 170	2 116 551	2 206 220	2 297 256	2 389 735	2 483 731	2 579 318
Savings_FamilyLabour	60 502	66 114	70 151	74 193	78 243	82 304	86 377	90 465	94 570	98 692
Savings_Capital	5 532 163	5 975 466	6 313 418	6 652 130	6 991 745	7 332 388	7 674 175	8 017 206	8 361 576	8 707 369

Table 5.18: Trends in factor production income for a tax-financed telecommunications infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_AgriLabour	7 138	7 608	8 076	8 542	9 007	9 471	9,934	10 396	10 858	11 321
Baseline_NonAgriLabour	1 728 140	1 809 702	1 892 321	1 976 079	2 061 057	2 147 329	2 234 970	2 324 050	2 414 640	2 506 808
Baseline_FamilyLabour	60 502	64 585	68 664	72 743	76 825	80 914	85 010	89 118	93 237	97 371
Baseline_Capital										
Tax_AgriLabour	7 138	7 793	8 258	8 722	9 185	9 647	10 109	10 570	11 031	11 492
Tax_NonAgriLabour	1 728 140	1 854 570	1 940 413	2 027 415	2 115 657	2 205 214	2 296 163	2 388 576	2 482 525	2 578 081
Tax_FamilyLabour	60 502	66 151	70 211	74 272	78 339	82 414	86 500	90 598	94 710	98 838
Tax_Capital	5 532 163	5 975 840	6 314 028	6 652 937	6 992 714	7 333 491	7 675 384	8 018 499	8 362 931	8 708 766

Table 5.19: Trends in factor production income for an ODA-financed telecommunication infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_AgriLabour	7 138	7 608	8 076	8 542	9 007	9 471	9 934	10 396	10 858	11 321
Baseline_NonAgriLabour	1 728 140	1 809 702	1 892 321	1 976 079	2 061 057	2 147 329	2 234 970	2 324 050	2 414 640	2 506 808
Baseline_FamilyLabour	60 502	64 585	68 664	72 743	76 825	80 914	85 010	89 118	93 237	97 371
Baseline_Capital	5 532 163	5 864 883	6 198 170	6 532 174	6 867 030	7 202 858	7 539 766	7 877 851	8 217 204	8 557 903
ODA_AgriLabour	7 138	7 990	8 486	8 979	9 471	9 960	10 449	10 937	11 424	11 910
ODA_NonAgriLabour	1 728 140	1 823 897	1 904 665	1 986 679	2 070 021	2 154 766	2 240 989	2 328 763	2 418 159	2 509 247
ODA_FamilyLabour	60 502	67 820	72 139	76 455	80 770	85 088	89 410	93 740	98 078	102 428
ODA_Capital	5 532 163	6 000 532	6 343 177	6 686 531	7 030 722	7 375 865	7 722 063	8 069 411	8 417 994	8 767 889

The results showed that factor production income increased over the years, regardless of the financing source for telecommunication infrastructure.

5.3.2.3 Impact on factor production price

The simulation results showed that regardless of the source of financing, the production costs for the transport infrastructure factor tended to increase over the years, except for capital, which tended to stagnate over time, as shown in Tables 5.20, 5.21 and 5.22 below.

Table 5.20: Trends in factor production price - Debt-financed telecommunication infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_AgriLabour	1.00	1.05	1.09	1.13	1.17	1.21	1.25	1.28	1.32	1.35
Baseline_NonAgriLabour	1.00	1.01	1.02	1.03	1.04	1.05	1.05	1.06	1.06	1.06
Baseline_FamilyLabour	1.00	1.04	1.07	1.10	1.13	1.16	1.18	1.20	1.22	1.24
Baseline_Capital	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.24
Savings_AgriLabour	1.00	1.07	1.11	1.15	1.19	1.23	1.27	1.30	1.33	1.36
Savings_NonAgriLabour	1.00	1.03	1.05	1.06	1.06	1.07	1.08	1.08	1.09	1.09
Savings_FamilyLabour	1.00	1.06	1.09	1.12	1.15	1.18	1.20	1.22	1.24	1.26
Savings_Capital	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

Table 5.21: Trends in factor production price for tax-financed telecommunication infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_AgriLabour	1.00	1.05	1.09	1.13	1.17	1.21	1.25	1.28	1.32	1.35
Baseline_NonAgriLabour	1.00	1.01	1.02	1.03	1.04	1.05	1.05	1.06	1.06	1.06
Baseline_FamilyLabour	1.00	1.04	1.07	1.10	1.13	1.16	1.18	1.20	1.22	1.24
Baseline_Capital	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.24
Tax_AgriLabour	1.00	1.07	1.11	1.15	1.19	1.23	1.27	1.30	1.33	1.37
Tax_NonAgriLabour	1.00	1.03	1.04	1.05	1.06	1.07	1.08	1.08	1.09	1.09
Tax_FamilyLabour	1.00	1.06	1.09	1.12	1.15	1.18	1.20	1.22	1.24	1.26
Tax_Capital	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

Table 5.22: Trends in factor production price for ODA-financed telecommunication infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_AgriLabour	1.00	1.05	1.09	1.13	1.17	1.21	1.25	1.28	1.32	1.35
Baseline_NonAgriLabour	1.00	1.01	1.02	1.03	1.04	1.05	1.05	1.06	1.06	1.06
Baseline_FamilyLabour	1.00	1.04	1.07	1.10	1.13	1.16	1.18	1.20	1.22	1.24
Baseline_Capital	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.24
ODA_AgriLabour	1.00	1.10	1.14	1.19	1.23	1.27	1.31	1.35	1.38	1.42
ODA_NonAgriLabour	1.00	1.02	1.03	1.03	1.04	1.05	1.05	1.06	1.06	1.06
ODA_FamilyLabour	1.00	1.09	1.12	1.16	1.19	1.22	1.24	1.27	1.29	1.31
ODA_Capital	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

5.3.3 Impact on socioeconomic indicators

5.3.3.1 Impact on household income

Overall, increased telecommunication investment positively impacted the income of poor and non-poor households, regardless of the financing source (see Figure 5.16). In addition, the impact was greater on poor households' income than non-poor households. Direct and indirect externalities on economic and non-market agents induced by new infrastructure investment were the key contributing factors to household income's observed impact.

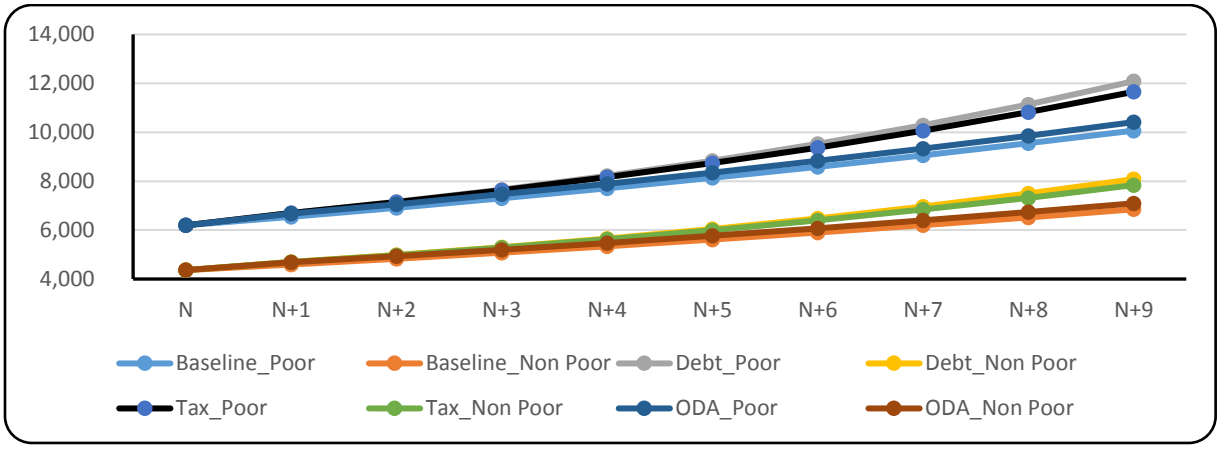

Figure 5.16: Evolution of household income in the baseline scenario and per financing source following an increase in investment in telecommunication infrastructure

5.3.3.2 Impact on consumption levels

Regardless of the financing source, increased telecommunications investment positively impacted household consumption levels in Burkina Faso (see Figure 5.17). These findings were consistent with the economic theory on consumption, stating that household income increases tended to increase consumption levels.

The simulation also indicated that the impact was greater on the level of consumption of poor households, regardless of the financing source considered. As previously noted, the Duesenberry demonstration effect, stipulating that consumers determine their consumption level compared with a social group of reference, may explain this behaviour of poor households.

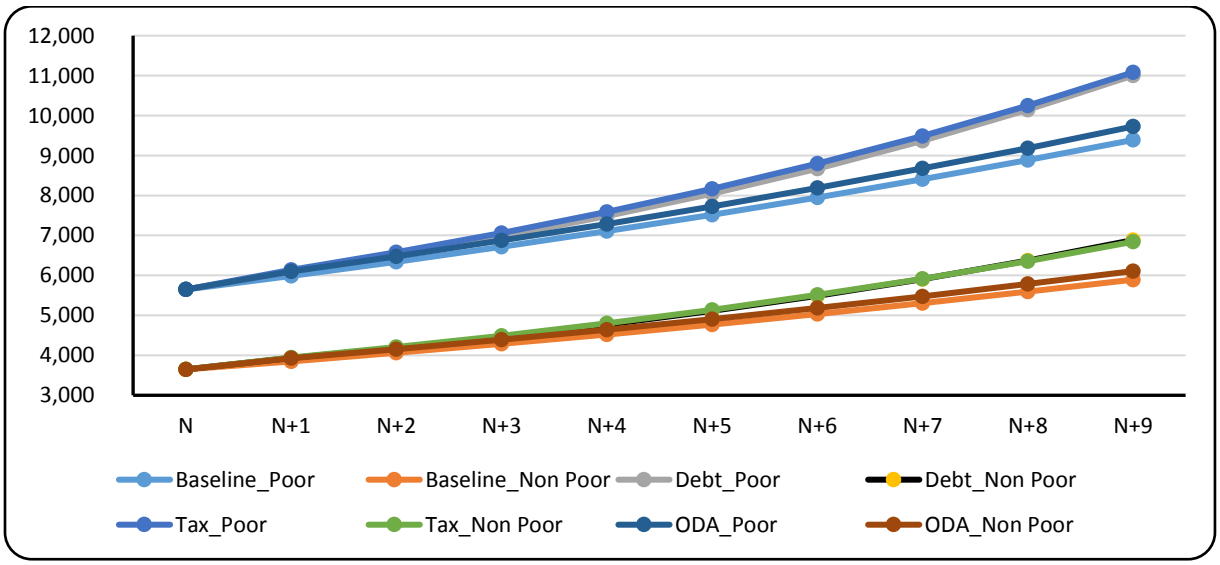

Figure 5.17: Evolution of consumption level in the baseline scenario and per financing source following an increase in investment in telecommunication infrastructure

5.3.3.3 Impact on employment

Overall, the simulations showed that an increase in investment in telecommunications positively impacted the unemployment level in Burkina Faso regardless of the mode of financing envisaged (Figure 5.18). These simulations also showed that this impact became greater over time.

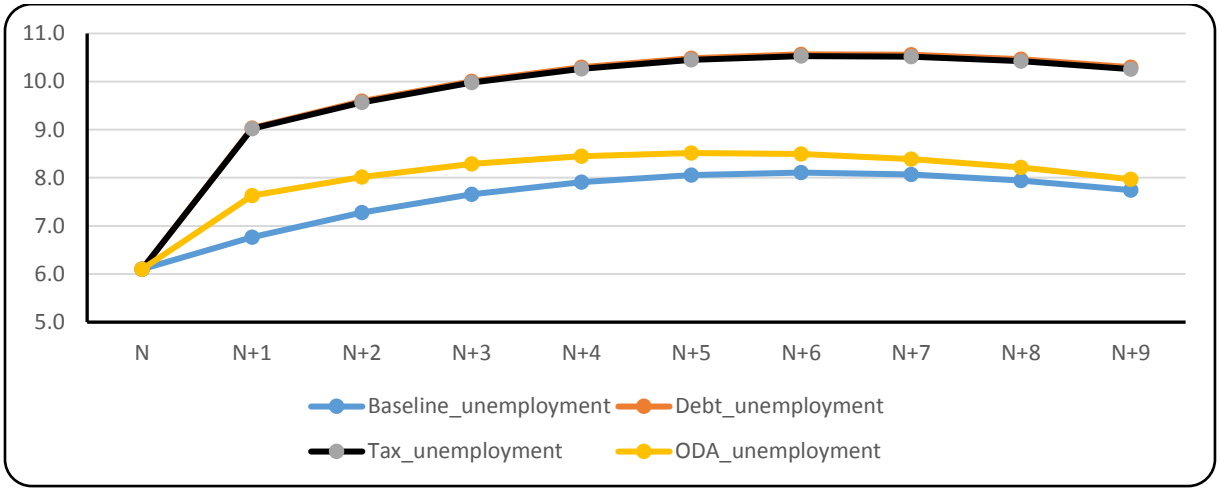

Figure 5.18: Evolution of unemployment level in the baseline scenario and per financing source following an increase in investment in the telecommunication infrastructure

5.4 IMPACT OF INVESTMENTS IN WATER, ELECTRICITY AND GAS ON ECONOMIC GROWTH

5.4.1 Impact on macroeconomic indicators

5.4.1.1 Impact on real GDP per capita

The results of the simulations showed that whatever the financing envisaged, an increase in investment in water, electricity, and gas infrastructure positively affected real GDP per capita in Burkina Faso (see Figure 5.19). These simulations also indicate that the positive impact on growth has increased over the years. Furthermore, a comparative analysis of financing sources showed that an increase in investment in water, electricity, and gas by borrowing was more favourable to real GDP per capita than financing new investments through tax or official development assistance.

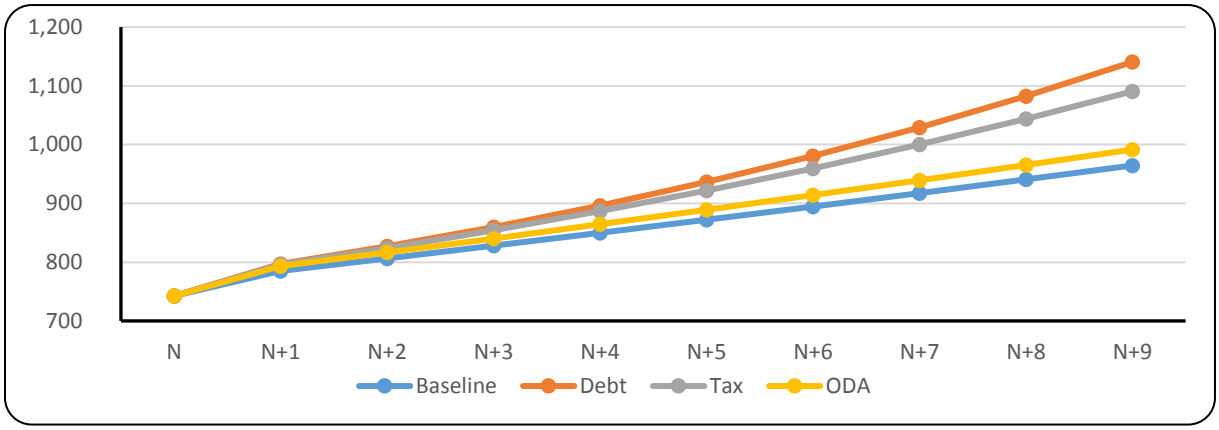

Figure 5.19: Evolution of real GDP per capita in the baseline scenario and per financing source following an increase in investment in water, electricity, and gas infrastructure

5.4.1.2 Impact on the Consumer Price Index

An analysis of Figure 5.16 indicates that over the period 2008-2017, regardless of the funding source, increased investment in water, electricity, and gas infrastructure did not change the purchasing power of Burkinabè households. Thus, CPI remained unchanged at one, despite the economic shock performed.

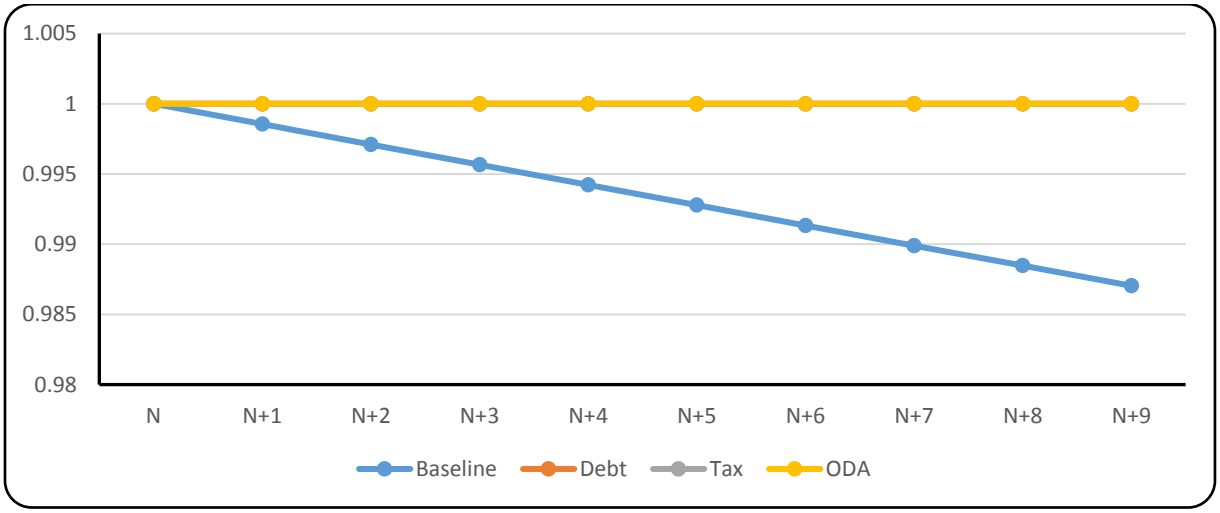

Figure 5.20: Evolution of CPI in the baseline scenario and per financing source following an increase in investment in water, electricity, and gas infrastructure

5.4.1.3 Impact on imports

Figure 5.21 shows that an increase in investment in the water, electricity, and gas infrastructure positively impacted Burkina Faso's imports regardless of the source of financing. The simulation result also showed that the observed positive effect on imports was increasingly significant over time.

However, the impact on imports was greater when the new investment was financed by debt. The positive impact observed was explained by the crowding-out effect caused by increased investment spending in water, electricity, and gas financed by debt. The decline in private investment resulted in a decrease in private companies' productivity, hence benefitting imports. Investing in the energy sector impacted foreign trade more than any other infrastructure sector (Rahman et al., 2020).

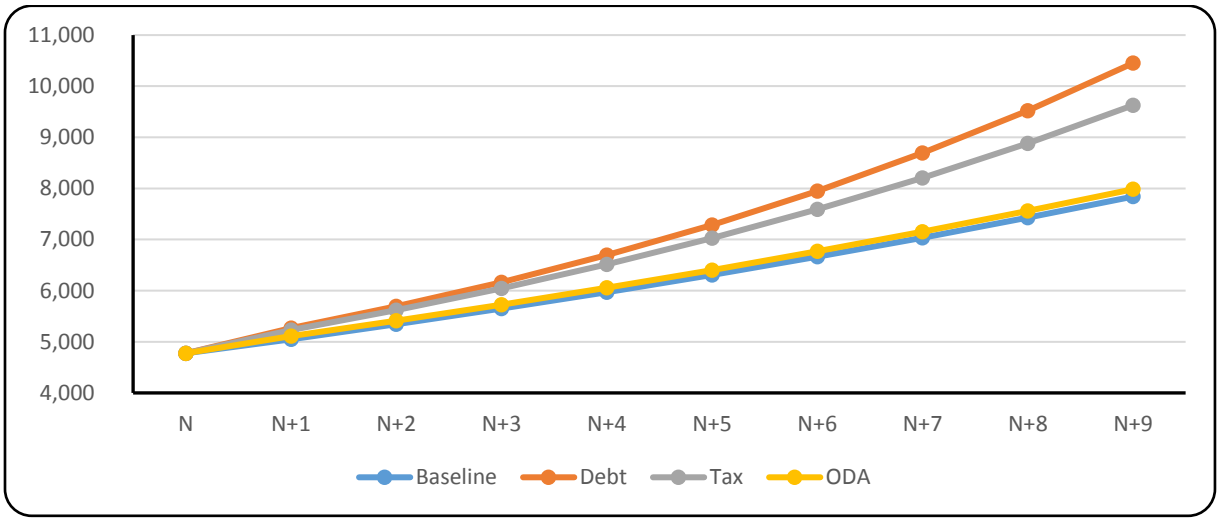

Figure 5.21: Evolution of imports in the baseline scenario and per financing source following an increase in investment in water, electricity, and gas infrastructure

5.4.1.4 Impact on exports

An analysis of the simulation results showed that only financing an increase in investment in water, electricity, and gas infrastructure by ODA positively impacted Burkina Faso's exports from 2008-2017 (Figure 5.22). Financing new investments in water, electricity, and gas through borrowing resulted in a sequential trend in the country's exports. In the first instance, the impact on exports was negative (below the baseline) over 2008-2016 and became positive (above the baseline) from 2016 onwards. The simulation also showed that financing new water, electricity, and gas infrastructure through tax negatively impacted the country's exports throughout the study period.

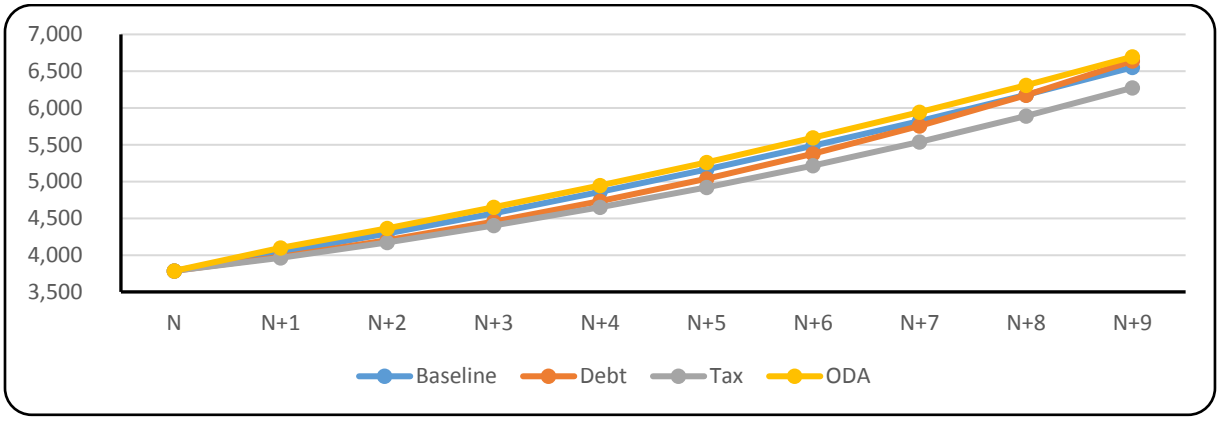

Figure 5.22: Evolution of exports in the baseline scenario and per financing source following an increase in investment in water, electricity, and gas infrastructure

5.4.1.5 Impact on the budget balance

The results of the simulations, as shown in Table 5.23, indicate that increasing investments in water, electricity, and gas infrastructure by borrowing, negatively impacted Burkina Faso's budget balance, which increased over the years.

Table 5.23: Trends in the budget balance following an increase in investment in electricity-water-gas

Year	*N*	*N+1*	*N+2*	*N+3*	*N+4*	*N+5*	*N+6*	*N+7*	*N+8*	*N+9*
Baseline	*276,661*	*276,661*	*276,661*	*276,661*	*276,661*	*276,661*	*276,661*	*276,661*	*276,661*	*276,661*
Debt	*276,661*	*366,372*	*430,490*	*505,898*	*594,245*	*697,403*	*817,493*	*956,914*	*1,118,376*	*1,304,935*
Tax	*276,661*	*276,661*	*276,661*	*276,661*	*276,661*	*276,661*	*276,661*	*276,661*	*276,661*	*276,661*
ODA	*276,661*	*276,661*	*276,661*	*276,661*	*276,661*	*276,661*	*276,661*	*276,661*	*276,661*	*276,661*

Conversely, the results indicate that financing an increase in investment in water, electricity, and gas infrastructure through tax or official development assistance did not impact Burkina Faso's budget balance (see Figure 5.23).

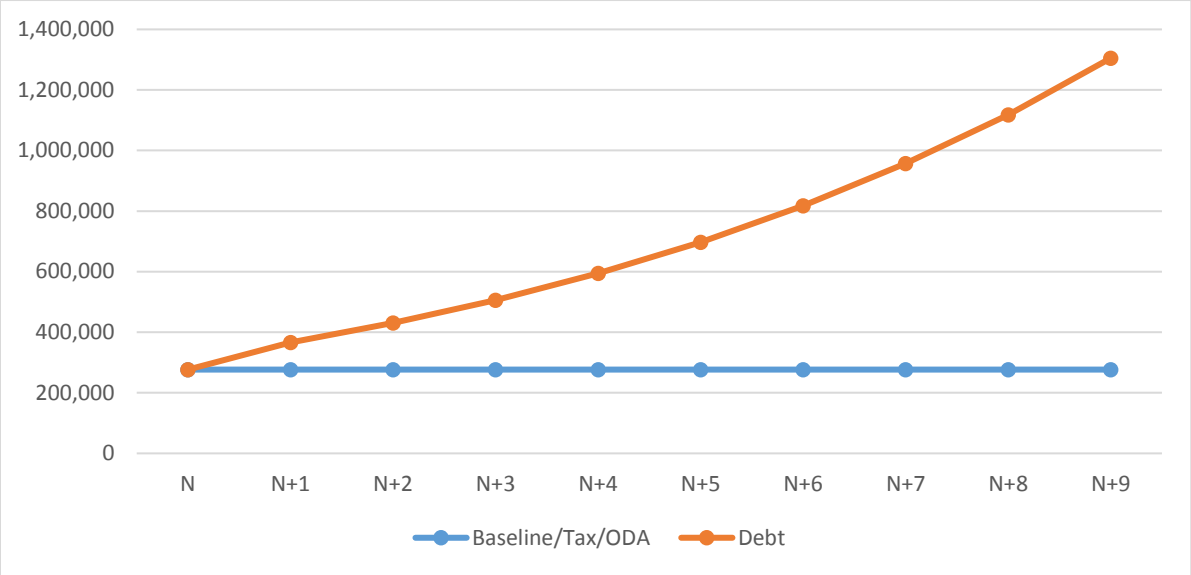

Figure 5.23: Evolution of budget balance in the baseline scenario and per financing source following an increase in investment in water, electricity, and gas infrastructure

5.4.1.6 Impact on current account

The simulation results suggest that increased investments in water, electricity, and gas infrastructure in Burkina Faso negatively impacted Burkina Faso's current account, regardless of the funding source. Debt financing recorded the highest negative impact on the current account compared to tax and ODA. (see Table 5.24)

Table 5.24: Trends in current accounts following an increase in investment in electricity, water, and gas

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline	-1 375 376	-1 438 784	-1 505 302	-1 575 077	-1 648 265	-1 725 024	-1 805 524	-1 889 940	-1 978 456	-2 071 262
Debt	-1 375 376	-1 623 448	-1 806 784	-2 012 782	-2 244 357	-2 504 809	-2 797 872	-3 127 757	-3 499 199	-3 917 515
Tax	-1 375 376	-1 606 271	-1 772 869	-1 956 487	-2 158 846	-2 381 844	-2 627 570	-2 898 319	-3 196 609	-3 525 197
ODA	-1 375 376	-1 447 050	-1 514 775	-1 585 853	-1 660 444	-1 738 716	-1 820 844	-1 907 011	-1 997 409	-2 092 238

The decline in the current account was increasingly important throughout the study (see Figure 5.24).

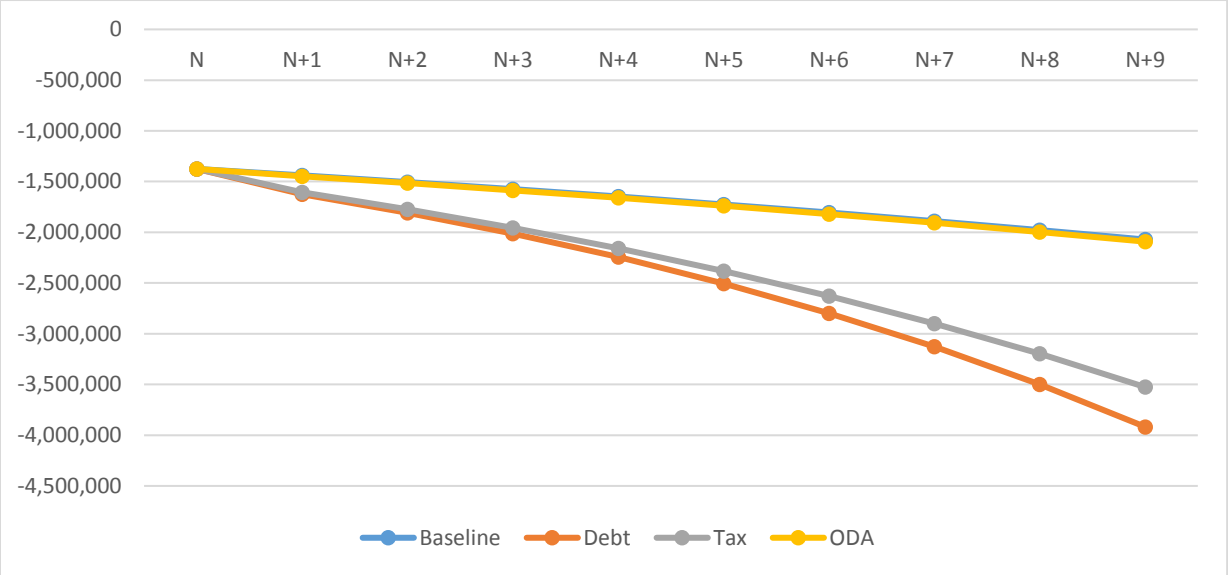

Figure 5.24: Evolution of current account in the baseline scenario and per financing source following an increase in investment in water, electricity, and gas infrastructure

5.4.2 Impact on activities, factor markets, institutions, and commodity market

5.4.2.1 Impact on sectoral output production

Data in Tables 5.25, 5.26 and 5.27 indicate that sectoral output production for the electricity-water-gas infrastructure increased over the years, regardless of the financing source.

Table 5.25: Trends in sectoral output production for debt-financed electricity-water and gas infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_Primary	1 027 598	1 089 462	1 154 737	1 223 602	1 296 242	1 372 853	1 453 641	1 538 820	1 628 615	1 723 262
Baseline_Mining	1 463 137	1 560 301	1 662 491	1 769 947	1 882 919	2 001 668	2 126 466	2 257 598	2 395 360	2 540 061
Baseline_Secondary	2 137 751	2 268 896	2 407 165	2 552 925	2 706 560	2 868 473	3 039 085	3 218 837	3 408 191	3 607 631
Baseline_Tertiary	6 462 759	6 801 327	7 156 492	7 529 047	7 919 817	8 329 664	8 759 491	9 210, 37	9 682 886	10 178 464
Savings_Primary	1 027 598	1 105 013	1 184 440	1 272 802	1 371 209	1 480 907	1 603 297	1 739 953	1 892 641	2 063 338
Savings_Mining	1 463 137	1 531 115	1 614 902	1 708 105	1 811 832	1 927 294	2 055 821	2 198 870	2 358 045	2 535 111
Savings_Secondary	2 137 751	2 306 248	2 473 338	2 659 473	2 867 000	3 098 548	3 357 063	3 645 844	3 968 584	4 329 410
Savings_Tertiary	6 462 759	7 002 191	7 455 454	7 953 184	8 500 389	9 102 655	9 766 207	10 497 973	11 305 658	12 197 824

Table 5.26: Trends in sectoral output production for tax-financed electricity-water and gas infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_Primary	1 027 598	1 089 462	1 154 737	1 223 602	1 296 242	1 372 853	1 453 641	1 538 820	1 628 615	1 723 262
Baseline_Mining	1 463 137	1 560 301	1 662 491	1 769 947	1 882 919	2 001 668	2 126 466	2 257 598	2 395 360	2 540 061
Baseline_Secondary	2 137 751	2 268 896	2 407 165	2 552 925	2 706 560	2 868 473	3 039 085	3 218 837	3 408 191	3 607 631
Baseline_Tertiary	6 462 759	6 801 327	7 156 492	7 529 047	7 919 817	8 329 664	8 759 491	9 210 237	9 682 886	10 178 464
Tax_Primary	1 027 598	1 106 605	1 185 277	1 271 564	1 366 233	1 470 126	1 584 166	1 709 369	1 846 847	1 997 818
Savings_Mining	1 463 137	1 518 377	1 591 563	1 671 311	1 758 225	1 852 950	1 956 177	2 068 648	2 191 162	2 324 576
Tax_Secondary	2 137 751	2 307 124	2 470 786	2 650 344	2 847 380	3 063 625	3 300 974	3 561 506	3 847 493	4 161 419
Tax_Tertiairy	6 462 759	6 985 487	7 418 656	7 887 794	8 396 117	8 947 121	9 544 617	10 192 747	10 896 013	11 659 308

Table 5.27: Trends in sectoral output production for ODA-financed electricity-water and gas infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_Primary	1 027 598	1 089 462	1 154 737	1 223 602	1 296 242	1 372 853	1 453 641	1 538 820	1 628 615	1 723 262
Baseline_Mining	1 463 137	1 560 301	1 662 491	1 769 947	1 882 919	2 001 668	2 126 466	2 257 598	2 395 360	2 540 061
Baseline_Secondary	2 137 751	2 268 896	2 407 165	2 552 925	2 706 560	2 868 473	3 039 085	3 218 837	3 408 191	3 607 631
Baseline_Tertiary	6 462 759	6 801 327	7 156 492	7 529 047	7 919 817	8 329 664	8 759 491	9 210 237	9 682 886	10 178 464
ODA_Primary	1 027 598	1 093 931	1 160 368	1 230 505	1 304 535	1 382 663	1 465 104	1 552 082	1 643 833	1 740 604
Savings_Mining	1 463 137	1 587 684	1 693 152	1 804 125	1 920 866	2 043 652	2 172 772	2 308 528	2 451 233	2 601 216
ODA_Secondary	2 137 751	2 287 477	2 428 955	2 578 194	2 735 599	2 901 591	3 076 614	3 261 133	3 455 632	3 660 622
ODA_Tertiary	6 462 759	6 904 069	7 269 404	7 652 831	8 055 221	8 477 483	8 920 568	9 385 468	9 873 220	10 384 908

5.4.2.2 Impact on factor production income

As per the results of factor production income for transport and telecommunication infrastructure, a positive trend in factor production income was noted for the electricity-water-gas infrastructure, regardless of the three financing sources envisaged. Tables 5.28, 5.29 and 5.30 summarise trends in the data for factor production income.

Table 5.28: Trends in factor production income for debt-financed electricity-water-gas infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_AgriLabour	7 138	7 608	8 076	8 542	9 007	9 471	9 934	10 396	10 858	11 321
Baseline_NonAgriLabour	1 728 140	1 809 702	1 892 321	1 976 079	2 061 057	2 147 329	2 234 970	2 324 050	2 414 640	2 506 808
Baseline_FamilyLabour	60 502	64 585	68 664	72 743	76 825	80 914	85 010	89 118	93 237	97 371
Baseline_Capital	5 532 163	5 864 883	6 198 170	6 532 174	6 867 030	7 202 858	7 539 766	7 877 851	8 217 204	8 557 903
Savings_AgriLabour	7 138	7 739	8 200	8 660	9 119	9 578	10 036	10 495	10 953	11 412
Savings_NonAgriLabour	1 728 140	1 816 422	1 900 386	1 985 446	2 071 687	2 159 191	2 248 035	2 338 293	2 430 039	2 523 342
Savings_FamilyLabour	60 502	65 692	69 715	73 743	77 779	81 825	85 884	89 957	94 046	98 152
Savings_Capital	5 532 163	5 951 191	6 288 517	6 626 593	6 965 555	7 305 526	7 646 614	7 988 920	8 332 532	8 677 532

Table 5.29: Trends in factor production income for tax-financed electricity-water-gas infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_AgriLabour	7 138	7 608	8 076	8 542	9 007	9 471	9 934	10 396	10 858	11 321
Baseline_NonAgriLabour	1 728 140	1 809 702	1 892 321	1 976 079	2 061 057	2 147 329	2 234 970	2 324 050	2 414 640	2 506 808
Baseline_FamilyLabour	60 502	64 585	68 664	72 743	76 825	80 914	85 010	89 118	93 237	97 371
Baseline_Capital	5 532 163	5 864 883	6 198 170	6 532 174	6 867 030	7 202 858	7 539 766	7 877 851	8 217 204	8 557 903
Tax_AgriLabour	7 138	7 745	8 209	8 671	9 132	9 593	10 053	10 512	10 972	11 431
Tax_NonAgriLabour	1 728 140	1 815 937	1 899 706	1 984 609	2 070 726	2 158 132	2 246 900	2 337 101	2 428 805	2 522 081
Tax_FamilyLabour	60 502	65 745	69 791	73 839	77 892	81 953	86 024	90 107	94 203	98 316
Tax_Capital	5 532 163	5 951 696	6 289 240	6 627 496	6 966 608	7 306 700	7 647 887	7 990 269	8 333 938	8 678 978

Table 5.30: Trends in factor production income for ODA-financed electricity-water-gas infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_AgriLabour	7 138	7 608	8 076	8 542	9 007	9 471	9 934	10 396	10 858	11 321
Baseline_NonAgriLabour	1 728 140	1 809 702	1 892 321	1 976 079	2 061 057	2 147 329	2 234 970	2 324 050	2 414 640	2 506 808
Baseline_FamilyLabour	60 502	64 585	68 664	72 743	76 825	80 914	85 010	89 118	93 237	97 371
Baseline_Capital	5 532 163	5 864 883	6 198 170	6 532 174	6 867 030	7 202 858	7 539 766	7 877 851	8 217 204	8 557 903
ODA_AgriLabour	7 138	7 882	8 376	8 867	9 357	9 845	10 332	10 818	11 303	11 787
ODA_NonAgriLabour	1 728 140	1 794 031	1 872 670	1 952 543	2 033 730	2 116 308	2 200 348	2 285 924	2 373 106	2 461 963
ODA_FamilyLabour	60 502	66 901	71 206	75 507	79 806	84 107	88 412	92 724	97 043	101 372
ODA_Capital	5 532 163	5 969 132	6 311 056	6 653 692	6 997 157	7 341 559	7 686 994	8 033 551	8 381 310	8 30,341

5.4.2.3 Impact on factor production price

Similar to the results on the factor production cost for transport and the telecommunications infrastructure, the results of the simulations showed that regardless of the source of financing for the electricity-water-gas infrastructure, factor production costs tended to increase over the years, except for capital which tended to stagnate over time as shown in Tables 5.31, 5.32 and 5.33 below.

Table 5.31: Trends in factor production price for debt-financed electricity-water-gas infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_AgriLabour	1.00	1.05	1.09	1.13	1.17	1.21	1.25	1.28	1.32	1.35
Baseline_NonAgriLabour	1.00	1.01	1.02	1.03	1.04	1.05	1.05	1.06	1.06	1.06
Baseline_FamilyLabour	1.00	1.04	1.07	1.10	1.13	1.16	1.18	1.20	1.22	1.24
Baseline_Capital	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.24
Savings_AgriLabour	1.00	1.06	1.10	1.14	1.18	1.22	1.26	1.29	1.32	1.35
Savings_NonAgriLabour	1.00	1.01	1.02	1.03	1.04	1.05	1.05	1.06	1.06	1.06
Savings_FamilyLabour	1.00	1.05	1.08	1.11	1.14	1.17	1.19	1.21	1.23	1.25
Savings_Capital	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

Table 5.32: Trends in factor production price for tax-financed electricity-water-gas infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_AgriLabour	1.00	1.05	1.09	1.13	1.17	1.21	1.25	1.28	1.32	1.35
Baseline_NonAgriLabour	1.00	1.01	1.02	1.03	1.04	1.05	1.05	1.06	1.06	1.06
Baseline_FamilyLabour	1.00	1.04	1.07	1.10	1.13	1.16	1.18	1.20	1.22	1.24
Baseline_Capital	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.24
Tax_AgriLabour	1.00	1.06	1.10	1.15	1.18	1.22	1.26	1.29	1.32	1.35
Tax_NonAgriLabour	1.00	1.01	1.02	1.03	1.04	1.05	1.05	1.06	1.06	1.06
Tax_FamilyLabour	1.00	1.05	1.08	1.11	1.14	1.17	1.19	1.21	1.23	1.25
Tax_Capital	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

Table 5.33: Trends in factor production price for ODA-financed electricity-water-gas infrastructure

Year	N	N+1	N+2	N+3	N+4	N+5	N+6	N+7	N+8	N+9
Baseline_AgriLabour	1.00	1.05	1.09	1.13	1.17	1.21	1.25	1.28	1.32	1.35
Baseline_NonAgriLabour	1.00	1.01	1.02	1.03	1.04	1.05	1.05	1.06	1.06	1.06
Baseline_FamilyLabour	1.00	1.04	1.07	1.10	1.13	1.16	1.18	1.20	1.22	1.24
Baseline_Capital	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.24
ODA_AgriLabour	1.00	1.08	1.13	1.17	1.22	1.26	1.29	1.33	1.37	1.40
ODA_NonAgriLabour	1.00	1.00	1.01	1.01	1.02	1.03	1.03	1.03	1.04	1.04
ODA_FamilyLabour	1.00	1.07	1.11	1.14	1.17	1.20	1.23	1.25	1.27	1.29
ODA_Capital	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

5.4.3 Impact on socioeconomic indicators

5.4.3.1 Impact on household income

Overall, the simulation results showed that an increase in investment in the water, electricity, and gas infrastructure positively impacted the income of poor and non-poor households, regardless of the financing source. Improvement in income following new water, electricity, and gas investments was increasingly noticeable for poor and non-poor households (see Figure 5.25). However, the results of this study indicate that the impact was greater for poor households than the non-poor.

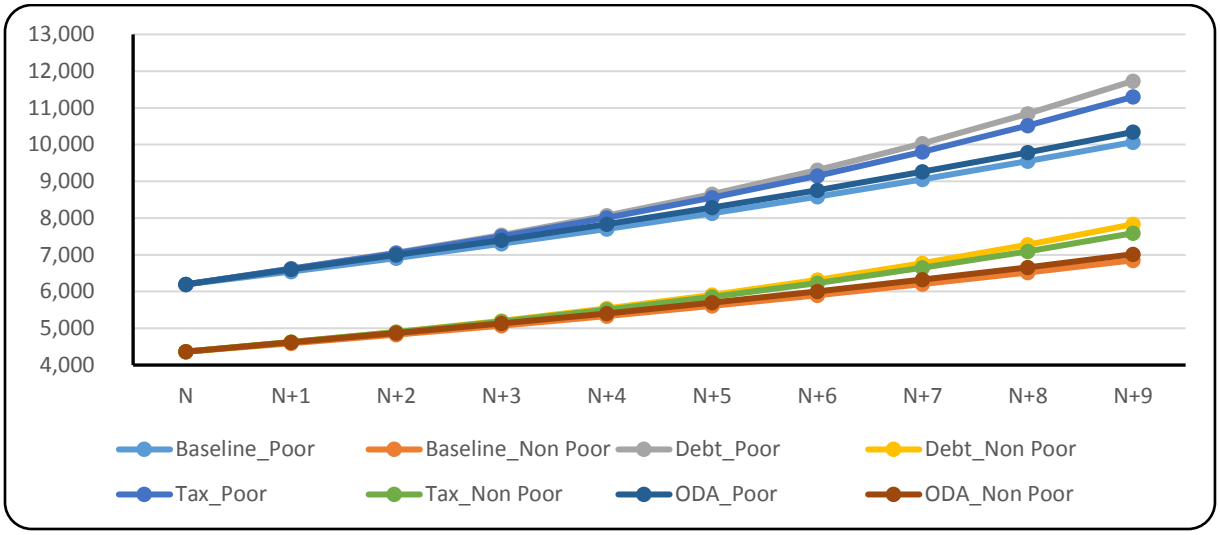

Figure 5.25: Evolution of household income in the baseline scenario and per financing source following an increase in investment in water, electricity, and gas infrastructure

5.4.3.2 Impact on consumption levels

An analysis of the simulation results indicated that the increase in investment expenditure in the water, electricity, and gas sector positively impacted the consumption level of poor and non-poor households in Burkina Faso, regardless of the financing source envisaged (see Figure 5.26). The simulation also shows that the positive impact on household consumption increased over time. However, it should be noted that increased investment spending in water, electricity, and gas had a more positive effect on poor households' consumption level than non-poor households.

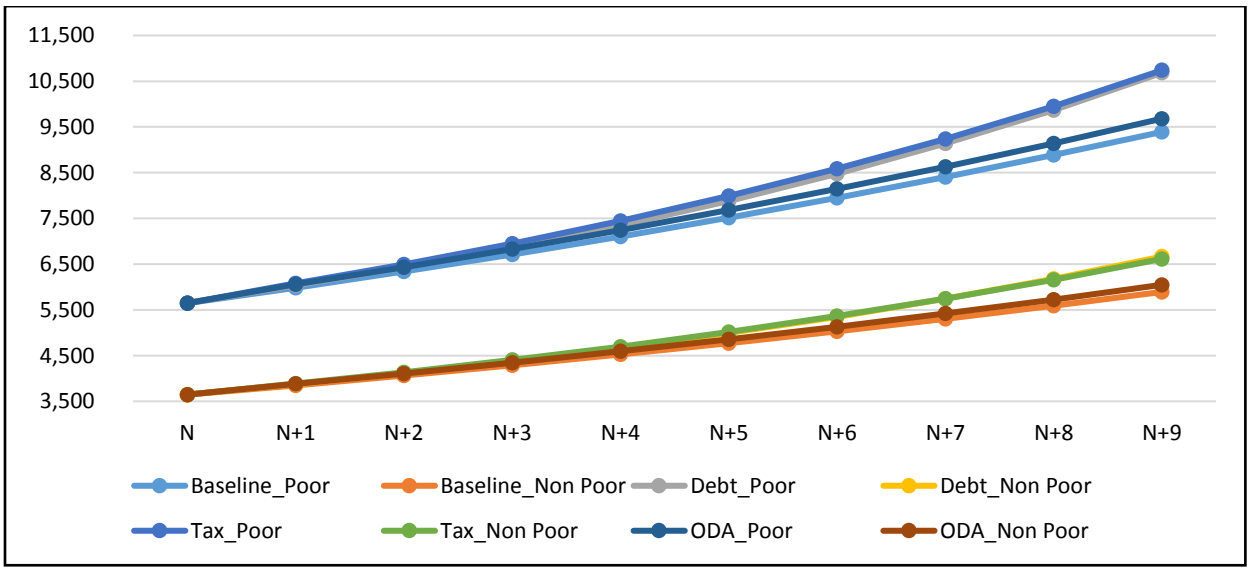

Figure 5.26: Evolution of consumption level in the baseline scenario and per financing source following an increase in investment in water, electricity, and gas infrastructure

5.4.3.3 Impact on employment

A comparative analysis of financing sources indicated that only ODA financing of an increase in investment in water, electricity, and gas infrastructure positively impacted the employment level in Burkina Faso. In addition, financing the water, electricity, and gas infrastructure through ODA decreased the unemployment rate (Figure 5.27). In contrast, increased investment in water, electricity, and gas infrastructure by borrowing or tax had a negative impact on the employment level in Burkina Faso, hence, an increase in the unemployment rate in the country.

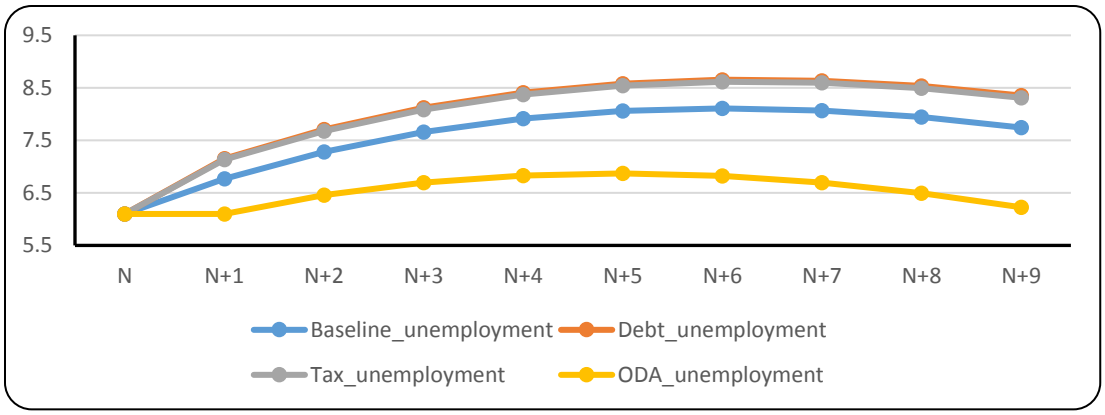

Figure 5.27: Evolution of unemployment rate in the baseline scenario and per financing source following an increase in investment in water, electricity, and gas infrastructure

5.5 SUMMARY OF CHAPTER

Chapter 5 presented the findings of this study. This chapter summarised the results of the four simulations performed to assess the impact of an increase in investment in transport infrastructure, telecommunications and the water, electricity, and gas infrastructure on economic growth in Burkina Faso. These simulations have been carried out, considering three financing sources: debt, tax and ODA. A benchmark equilibrium, which serves as a baseline, is established in the first instance. The impact of the simulation on macroeconomic and microeconomic variables and socioeconomic indicators for each infrastructure sector under study are then measured and compared against the baseline. The study findings highlighted five main trends and provided insights on the impact of infrastructure investments on economic growth in Burkina Faso.

First, investment in infrastructure may positively impact several macroeconomic and microeconomic indicators and socioeconomic indicators, regardless of the financing source. For the transport infrastructure, investment in infrastructure positively affected real GDP per capita, imports, household income, and household consumption levels in Burkina Faso. A positive effect on household income and consumption levels was observed for poor and non-

poor households. However, poor households tended to benefit more than the non-poor. Similarly, telecommunications, water, electricity, and gas infrastructure investment positively affected the same macro- and microeconomic variables and socioeconomic indicators. However, an additional economic indicator, employment level, was positively affected by increased investment in telecommunications infrastructure through ODA.

Secondly, depending on the financing source, investment in Burkina Faso's infrastructure positively affected the country's exports. Tax financing of transport and debt financing positively affected the country's exports. Similarly, ODA financing of telecommunication, water, electricity, and gas infrastructure also positively impacted Burkina Faso's exports.

Third, investment in infrastructure may have a two-step sequential impact on some macroeconomic and microeconomic indicators depending on the financing source. CPI is subject to this bidirectional trend when transport infrastructure is financed through tax and via ODA. For telecommunications, CPI fluctuates in the scenario of debt financing. A bidirectional trend is also observed for exports when water, electricity, and gas funding is provided through debt.

Fourth, increased investment in infrastructure may not change the economic variables regardless of the financing source, as in the case of the CPI for investment in the water, electricity, and gas infrastructure. Similarly, an increase in investment in infrastructure, irrespective of the infrastructure sector via tax or ODA, had no impact on Burkina Faso's budget balance.

Finally, investment in infrastructure may have a negative impact on economic variables depending on the funding source. Debt financing for transport had a negative impact on CPI and employment. Further, it had a negative effect on employment for transport infrastructure, exports for telecommunications and the water-electricity-gas infrastructure. Financing the transport infrastructure by ODA resulted in a negative impact on Burkina Faso's exports. Burkina Faso's budget balance further increased in the scenario of debt financing while the current account decreased, irrespective of the funding source and the infrastructure sector.

It can be noted that investment in infrastructure through different financing sources affected macroeconomic and microeconomic indicators and socioeconomic indicators differently and at varying levels in Burkina Faso. These findings corroborate the economic theory underlying CGE modelling referred to earlier in Chapter 4, stipulating that an economic shock, for instance, a policy change that affects a specific component of the economy, is likely to significantly impact the whole economic system. Moreover, it generates multiple critical

insights that render any analysis of the nexus of investment in infrastructure and economic growth a complex undertaking, as discussed in Chapter 6.

CHAPTER 6: DISCUSSION OF RESULTS IN THE CONTEXT OF THE LITERATURE REVIEW

6.1 INTRODUCTION

As discussed in chapter one, the main objective of this study was to quantify the socioeconomic impact of public and private investment in infrastructure in Burkina Faso. The research investigated the extent to which investment in infrastructure impacts economic growth in Burkina Faso, especially macroeconomic indicators (i) real GDP per capita, (ii) CPI, (iii) imports, (iv) exports, (v) budget balance, (vi) current account, and microeconomic indicators (i) sectoral output production, (ii) factor production income, (iii) factor production costs as well as socioeconomic indicators (i) household income, (ii) household consumption levels, and (iii) unemployment rate in Burkina Faso. Furthermore, this study assessed the main funding sources (i) debt, (ii) tax, and (iii) ODA per type of infrastructure under study: (i) transport, (ii) telecommunications and (iii) water, electricity, and gas infrastructure. The research aims to inform policymakers about the economy-wide impact of investment in infrastructure in Burkina Faso and the proposal of potential policy changes.

6.2 ECONOMY-WIDE IMPACT OF AN INCREASE IN INVESTMENT IN TRANSPORT INFRASTRUCTURE

Economic theory suggests that investment in infrastructure may positively impact economic growth. This research's findings support the view that investment in transport infrastructure would promote growth in Burkina Faso. A 5% national investment in transport infrastructure positively affected Burkina Faso’s economic fundamentals. Table 6.1, Table 6.2 and Table 6.3 below summarise the macroeconomic, microeconomic, and socioeconomic impacts of a 5% increase in investment in transport infrastructure in Burkina Faso.

6.2.1 Macroeconomic effects of an increase in investment in transport

As presented in Table 6.1 below, the Burkinabè economy would register several macroeconomic gains should the country increase investment in transport infrastructure at an annual rate of 5%.

Table 6.1: Macroeconomic effects of an increase in investment in transport infrastructure

	Percent changes (%)		
Macroeconomic variables	Debt	Tax	ODA
Real GDP per capita	0.64%	0.41%	1.29%
CPI	0.63%	0.12%	0.50%
Imports	0.90%	1.81%	0.42%
Exports	0.40%	0.78%	-0.28%
Budget balance	13.89%	0.00%	0.00%
Current account	7.50%	7.20%	7.20%

Real GDP per capita increased regardless of the funding source. Over the last ten years, Burkina Faso registered an average annual growth rate of 5.81%. This growth was mainly driven by the service sector, with an average annual contribution of 40.78% to the total GDP and 2.30% to the annual GDP growth from 2008-2017. Despite this relatively significant economic performance, real GDP per capita in Burkina Faso remains below US$750, as shown in Figure 6.1 at year N.

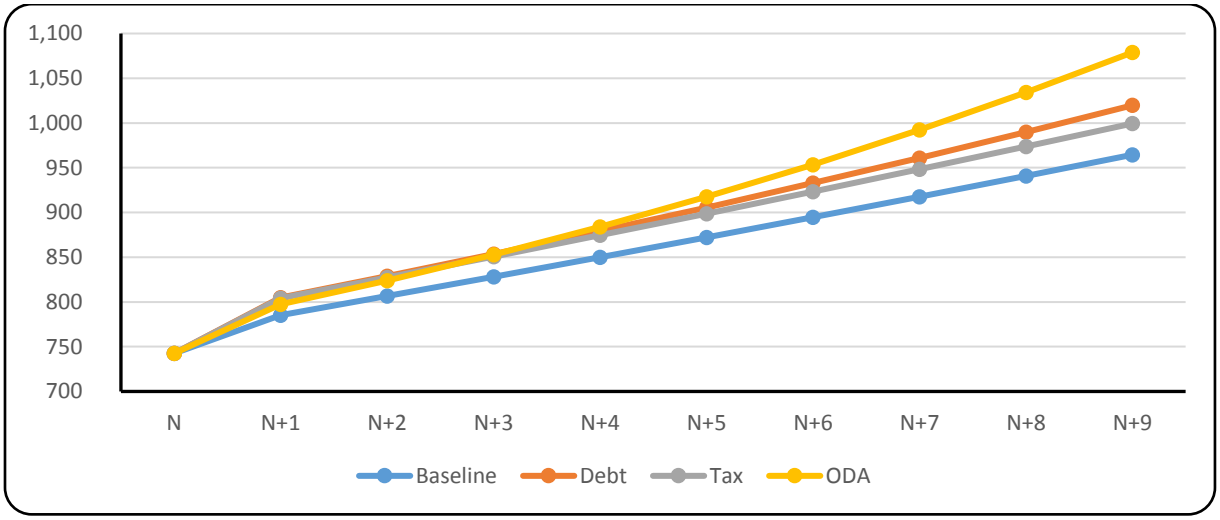

Figure 6.1: Trends in real GDP per capita following an increase in investment in transport infrastructure

Real GDP per capita increased by 0.64% for transport infrastructure financed through debt. It rose by 0.41% for transport infrastructure financed via tax and 1.29% for transport infrastructure financed through ODA. Real GDP per capita increased as imports (see Table 6.1 above), sectoral output production, and factor income (see Table 6.2), as well as household income and consumption levels (see Table 6.3), all went up. Given that household consumption expenditure rose following an increase in investment in transport, and bearing in mind that it represents the biggest share of GDP in Burkina Faso (about 60.96% of GDP in 2019), this explains the basis for the increase in real GDP per capita.

The increase in GDP above the baseline following an increase in transport investments may also reflect the growing capacity of the country to produce more goods and services to supply its domestic market. In this regard, data from the West African Monetary Union indicate that the tertiary sector, especially the service sector, is the main contributor to GDP formation in Burkina Faso. Over the period 2015-2019, the contribution of the tertiary sector to the formation of GDP ranged from 40.4% to 45.1% (UMOA, 2021).

Incremental investment in infrastructure tended to raise economic output and productivity directly as part of GDP formation (Fourie, 2006; Agenor et al., 2006; Fedderke et al., 2008). It also affected GDP as an input to the production process of other sectors. The economic output represented the total value of all goods and services produced in an economy, while productivity measured output per input unit.

These results were consistent with the Keynesian multiplier theory, which asserts that an increase in public or private investment spending positively impacts aggregate output. Further, these results corroborated the endogenous growth theory, which posits that economic growth results from capital accumulation. Finally, the results were similar to those from Herrerias (2010), who found that investment in transport infrastructure significantly impacts long-term economic growth.

In addition, the increase in GDP as a result of an increase in investment in infrastructure may be explained by Burkina Faso's low basic infrastructure endowment. In this respect, several studies, most notably the AfDB (2018), McKinsey (2021), and Collier et al. (2015), have found that countries with a significant deficit in infrastructure are likely to benefit more from additional investments in infrastructure. Since Burkina Faso is a low-income country which ranks 144th among 157 countries in the World Bank's new Human Capital Index (World Bank, 2021), evidence suggests that an increase in investment either in transport, telecommunication or in the water, electricity and gas infrastructure, would result in a rise of GDP in the country. The findings of this study supported Estache (2010), who asserts that the poorer the country, the more infrastructure matters for economic growth.

Moreover, empirical reviews indicated that improvements in the stock of a single infrastructure sector, such as transport, were unlikely to spur significant economic growth. Economic gains derived from an increase in investment in transport may be offset by an infrastructure deficit in other critical sectors, such as power and telecommunications. However, it should be noted that while real GDP per capita increased over the period under study, the scale of growth remained quite modest, implying that investment in infrastructure in Burkina Faso had yet to reach a certain threshold before it could spearhead strong economic performance in the

country. A comparative analysis of the results by funding sources showed a reduced positive impact on real GDP per capita when increased investment spending in transport infrastructure was financed by tax. Ahmed and Miller (2000) have found that public expenditure financed by tax tends to crowd out private investment compared to government expenditure financed through debt.

CPI increased following an increase in investment in transport infrastructure, regardless of the funding source. The average change in CPI from 2010 to 2017 was 106.19 in Burkina Faso – an average annual price increase of goods and services of 6.19%. The simulation results showed that an increase in investment in transport infrastructure financed through debt reduced the purchasing power of consumers in Burkina Faso, resulting in an increase in the CPI (Figure 6.2).

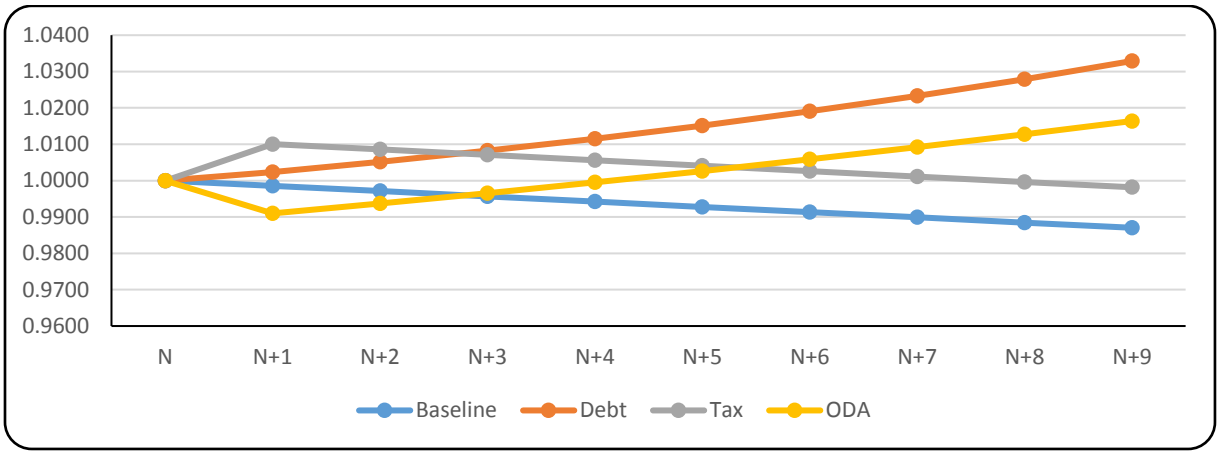

Figure 6.2: Trends in CPI following an increase in investment in transport infrastructure

CPI went up by 0.63% for increased investment in transport through debt, 0.12% for tax financing, and 0.50% for ODA financing. The increase in CPI reflects an increase in the inflation rate, meaning declining purchasing power for consumers in Burkina Faso. Despite the slight depreciation of consumer purchasing power, consumption levels (see Table 6.3) increased due to increased household income. Financing the transport infrastructure by borrowing crowded out private investments, negatively affecting private enterprises' productivity. As a result, goods and services prices increased, which, in turn, increased CPI. This study also showed that financing new investments in transport infrastructure through tax resulted in a two-step sequential trend in CPI. Initially, funding new investments in transport infrastructure by tax sharply increased the CPI. Secondly, a reduction in the CPI is observed with a downward trend. This downward trend is due to increased supply of goods and services due to investment in transport infrastructure.

It should be noted that the inflationary trend occurs in the short term following the implementation of large infrastructure investment projects. However, the increase in infrastructure investment would result, in the long term, in a reduction in the inflation rate. The two-step sequential evolution of CPI is also observed when increased investment in transport infrastructure is financed by official development assistance. First, increasing investment in transport infrastructure financed by official development assistance reduced CPI. Second, CPI increased with an upward trend over time. The decline in CPI may be explained by the positive externalities (lower transport cost, time savings, etc.) generated by the additional investments in transport infrastructure. Overall, the simulation results showed that an increase in investment in transport infrastructure by tax is more favourable to the purchasing power of households compared to other modes of financing, such as debt and ODA, which depressed the purchasing power of Burkinabè households.

Imports, similar to real GDP per capita, also rose, regardless of the funding source. An analysis of the simulation results indicated that increased investment spending in transport infrastructure positively impacted Burkina Faso's imports, irrespective of the source of financing. These simulations also suggest that this impact grows over time.

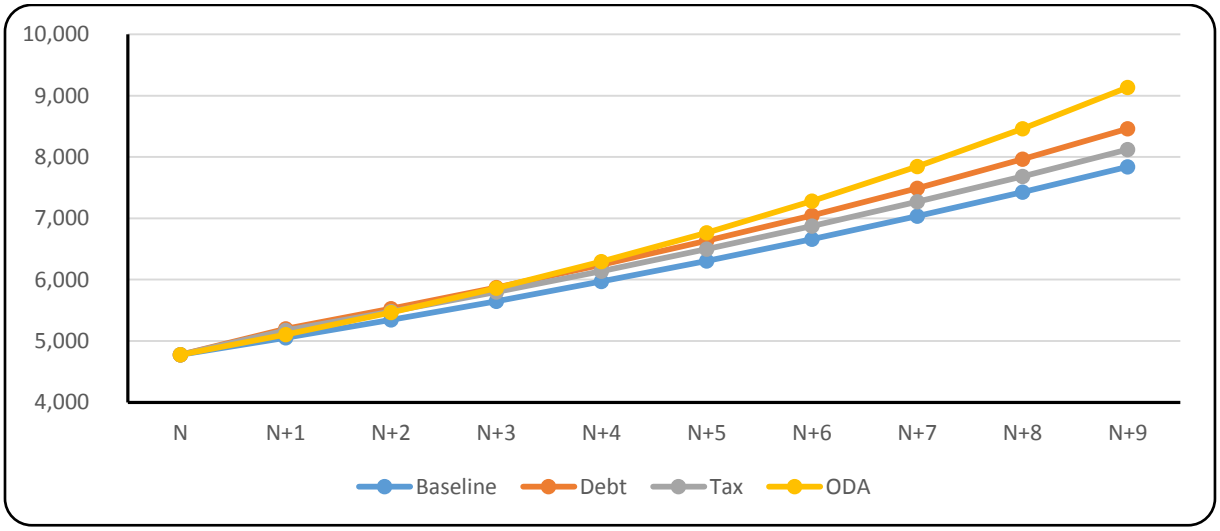

Figure 6.3: Trends in imports following an increase in investment in transport infrastructure

Imports increased by 0.90% for debt-financed transport infrastructure, 0.42% for transport infrastructure financed via tax and 1.81% for transport infrastructure financed through ODA. The increase in imports results from a growing demand for foreign goods and services from domestic public institutions, private companies, and Burkinabè households. The Burkinabè trade balance remains in deficit over the period under study, implying an outflow of capital from the country. Despite the trade deficit, real GDP per capita increased, suggesting growing

imports of productive assets such as machinery and equipment that may improve Burkina Faso's economy in the long run.

A comparative analysis of financing sources showed that an increase in transport investment through ODA has a greater positive impact on Burkina Faso's imports than financing by tax or debt (see Figure 6.3). This positive impact on imports may be explained by the Dutch disease caused by the inflow of new investments from ODA. According to Gacem (2007), Dutch disease occurs mainly from how public expenditure is financed, particularly if the increase in public spending is financed through ODA. Dutch disease results in an appreciation of the exchange rate, negatively impacting the competitiveness of local products in favour of foreign products on the domestic market.

Exports increased following an increase in investment in transport, except for ODA financing (see Figure 6.4 below). Exports rose by 0.40% and 0.78%, respectively, following an increase in investment in transport financed by debt and tax respectively. It fell by 0.28% against the baseline for transport infrastructure financed through ODA. Overall, the simulations showed that increased investment in transport infrastructure positively impacted exports when financed by tax or borrowing. The simulation also indicated that the positive impact on exports increased over the years. These positive impacts may be explained by the improvement in private enterprises' productive capacity driven by the construction of new transport infrastructure. Barro (1990) found a positive relationship between transport infrastructure, private productivity and total factor productivity. Increased productivity positively and significantly affected domestic production and the country's exports. However, the Burkinabè trade balance remained in deficit, implying that the space and scale of changes in exports are insufficient to offset potential economic losses due to the short-term outflow of capital from the country. Conversely, increased investment in transport infrastructure through official development assistance negatively impacted Burkinabè exports. The decline in export following increased investment in transport infrastructure may be explained by the Dutch disease, which tends to appreciate the exchange rate, negatively impacting the country's exports.

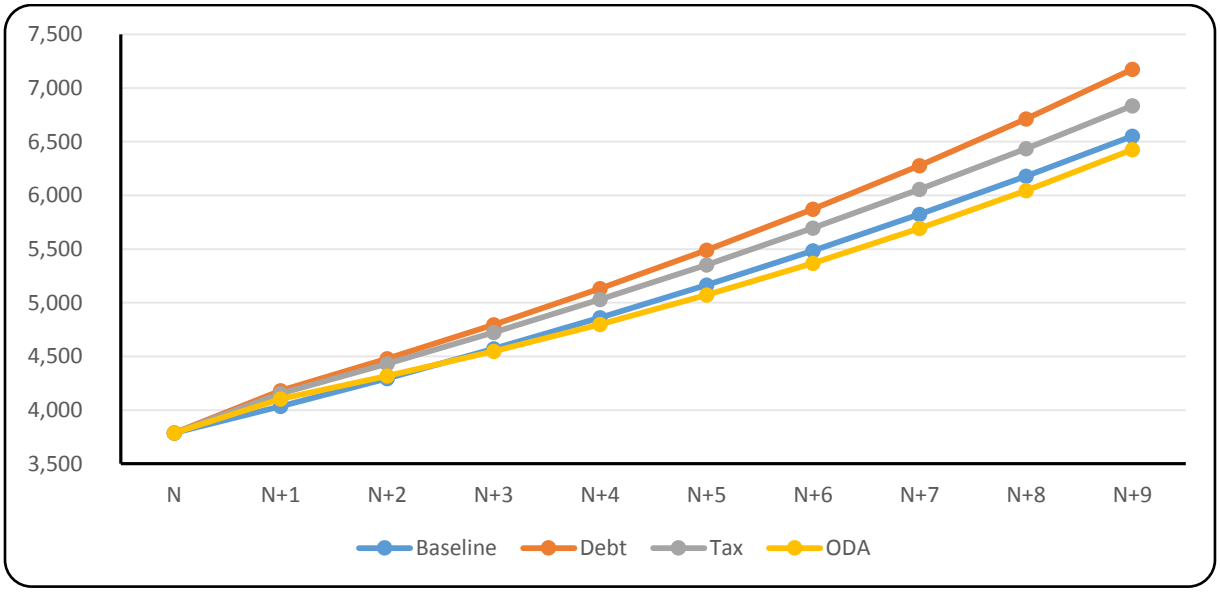

Figure 6.4: Trends in exports following an increase in investment in the transport infrastructure

An increase in investment in transport infrastructure via debt negatively impacted the Burkinabè budget balance, which increased sharply by 13.89%. This trend grew over time. However, it did not impact the budget balance if the increase in investment in transport infrastructure was channelled through tax or ODA. The negative trend in the Burkinabè budget balance following a debt-financed increase in transport infrastructure reflected the long-term negative impact that debt unsustainability might have on the Burkinabè economy.

While borrowing can enable Burkina Faso to finance critical transport infrastructure, the burden of debt repayment may, in the long run, negatively affect the Burkinabè budget balance. It may increase the tension between meeting the Burkinabè development goals and mitigating risks and vulnerabilities linked to debt. Furthermore, if not properly contained, it can result in an economic downturn in the country. The findings of this study corroborated the IMF findings (2016) that the scaling-up scenario in infrastructure investment envisioned by Burkina Faso is likely to be inconsistent with long-term fiscal and debt sustainability. Furthermore, the results support the findings of Mbanda et al. (2017), who found that in South Africa, deficit financing of infrastructure is unlikely to be a viable option in the long term.

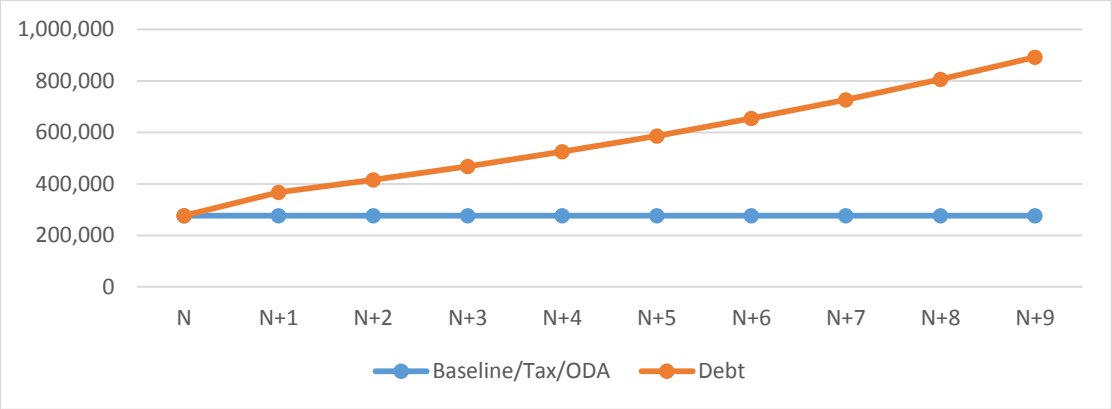

Figure 6.5: Evolution of budget balance in the baseline scenario and per financing source following an increase in investment in transport infrastructure

The Burkinabè trade balance was in deficit over the period 2008-2017. The deficit in the trade balance affected the country's current account, which was also in deficit, resulting in Burkina Faso being a net borrower. The simulation results showed that, regardless of the funding source, financing transport infrastructure further depressed the Burkinabè current account. The current account declined by 7.50% following increased investment in transport via debt. It also fell by 7.20% in the tax or ODA-financed scenarios. The negative impact became greater over time (see Figure 6.6 below)

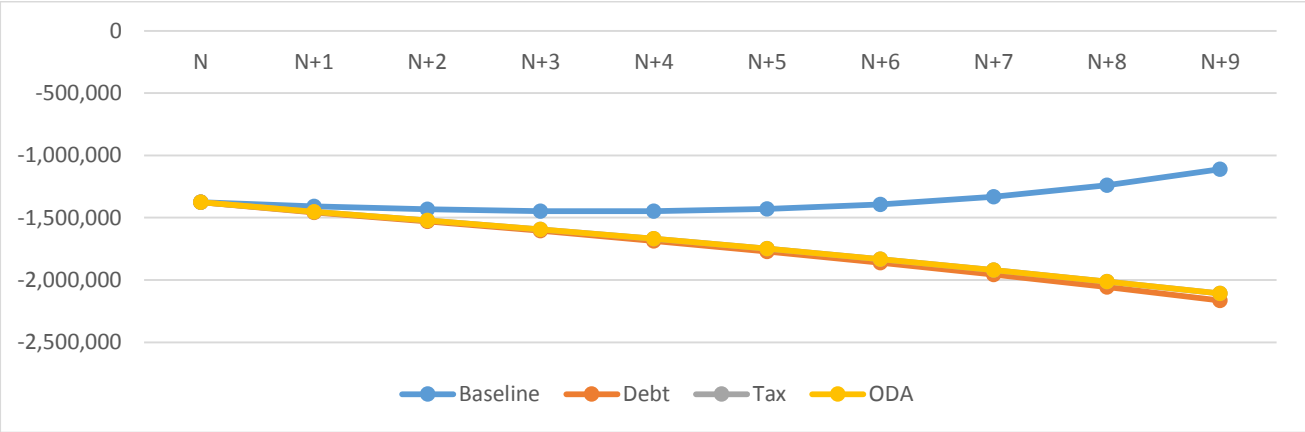

Figure 6.6: Evolution of the current account in the baseline scenario and per financing source following an increase in investment in transport infrastructure

As the balance of trade is a key determinant of the current account, its deficit negatively impacted it. The results indicate that the Burkinabè exports grew at a lower rate than imports over the period under study, meaning that the current account deficit widened. In addition, financing transport infrastructure, particularly by tax, resulted in an increase in the costs of private enterprises in terms of tax and an increase in the prices of local products on the domestic market. As a result, foreign product imports are privileged at the expense of exports.

Moreover, economic gains, including a balanced current account, derived from an increase in investment in transport may be offset by an infrastructure deficit in other infrastructure sectors, such as power and telecommunications. It may also imply that a 5% increase in investment in transport infrastructure in Burkina Faso is below the threshold needed to positively affect the country's current account.

Overall, the results of this study corroborate the economic theory positing that investment in infrastructure positively affects aggregate outputs. Furthermore, the findings of this study provided evidence in support of the earlier empirical studies by Aschauer (1989), Barro (1990), Calderón and Servén (2004), Calderón et al. (2011), Chude (2013), Ogun (2010), Gramlich (1994), German-Soto et al. (2014), Lahirushan et al. (2015), Raihan (2011), and Uddin et al. (2014) which found that investment in transport infrastructure positively affected economic growth. It also supports the findings of several studies in Africa, mostly in South Africa, Nigeria and Tunisia (Bayoudh, 2012; Calderón & Servén, 2010; Fedderke et al., 2006; Kodongo et al., 2016; Mbanda & Chitiga-Mabugu, 2017; Ahmed et al., 2013; Borojo, 2015) that found a positive relationship between infrastructure investment, economic growth, employment and poverty reduction. Considering methodological similarities, the study's results specifically support the findings of Mabuga et al. (2008) in South Africa. They found that incremental investment in transport infrastructure raised GDP, investment and consumption. Furthermore, these results corroborated the findings of Mbanda et al. (2017) in South Africa, who found that infrastructure investment benefited the country's economy. They confirmed that increased investment in infrastructure increased GDP. However, the results did not support their findings relative to the decline in the price level. In the case of Burkina Faso, CPI tended to increase slightly, thereby reducing consumer purchasing power. While most studies had focused on developed and a few developing countries and employed various macroeconomic and econometric methodologies, the conclusions drawn from these countries are directly relevant and similar to the Burkinabè context. The results of this study confirmed that, generally speaking, an increase in investment in transport infrastructure is likely to drive economic growth in Burkina Faso with additional wide-ranging positive effects on the Burkinabè economy.

6.2.2 Microeconomic effects of an increase in investment in transport infrastructure

An increase in investment in transport infrastructure in Burkina Faso would result in microeconomic benefits, as recorded in Table 6.2 below. These microeconomic gains are related to sectoral output production, factor production costs, and factor production income.

Table 6.2: Microeconomic effects of an increase in investment in transport infrastructure

	Percentage change (%)		
Microeconomic variables	Debt	Tax	ODA
Sectoral output production			
Primary	0.24%	0.11%	1.43%
Secondary	0.38%	0.18%	1.39%
Tertiary	0.92%	0.68%	1.79%
Factor production price			
Agri-Labour	0.05%	0.07%	0.44%
Non-agri labour	-0.01%	-0.02%	-0.27%
Family labour	0.05%	0.07%	0.44%
Capital	0.18%	0.18%	0.27%
Factor production income			
Agri-labour	0.19%	0.21%	0.57%
Non-agri labour	0.12%	0.11%	-0.17%
Family labour	0.19%	0.21%	0.57%
Capital	0.33%	0.33%	0.40%

Production of sectoral output grew. The combination of capital, labour and intermediate goods produced output. The value of this output included the value of intermediate input and the value of capital and labour inputs. The simulation of sectoral output production considered three economic sectors, namely the primary, secondary and tertiary, and savings related to these sectors. The primary sector's production increased regardless of the funding source. For example, a 5% increase in transport infrastructure investment would increase the primary sector's production by 0.24%, 0.11% and 1.43% for debt, tax, and ODA financing, respectively, with the latter recording the highest percentage change. Production of the secondary sector also rose. It grew by 0.38% for debt financing of transport infrastructure, 0.18% for tax-financed transport infrastructure and 1.39% for ODA financing. Similarly, the output of the tertiary sector also increased. It rose by 0.92%, 0.98% and 1.79%, respectively, for debt, tax, and ODA financing following an increase in investment in transport infrastructure. Growth in consumption levels recorded in Table 6.3 drove sectoral output production. As economic output increased, it positively impacted GDP formation.

Factor production prices generally went up except for non-agricultural labour. Factor cost is the cost incurred on the factor of production. It is the actual cost incurred on goods and services produced by industries and firms and includes all the costs of the factors of production to produce a given product in an economy. Factor cost includes the costs of land, labour, capital, raw material and transportation. The simulations disaggregate labour into agricultural, non-agricultural and family labour.

Savings were also disaggregated into agricultural, non-agricultural and capital savings. The cost of labour in the agricultural sector rose marginally. Agriculture labour cost – wages paid for labour in agriculture rose by 0.05% for an increase in infrastructure investment through

debt. It also increased by 0.07% in the scenario of tax-financed transport infrastructure. ODA financing increased by 0.44% of the labour cost in the agricultural sector. The cost of labour outside the agricultural sector marginally fell. It went down by 0.01% if an increase in investment in transport was financed through debt. The cost fell by 0.02% in the scenario of debt financing and by 0.27% if the increase was financed through ODA. Family labour costs also increased marginally by 0.05%, 0.07% and 0.44%, respectively, for debt, tax and ODA-financed increases in transport infrastructure. Capital costs rose by 0.18% in the case of an increase in transport infrastructure financed via debt and tax. It went up by 0.27% if the increase in transport investment was financed via ODA.

Factor income is the flow of income resulting from the factors of production, which are the inputs required to produce goods and services. It represents income received from the factors of production, which are the resources used to produce goods or services. The simulations disaggregated labour into agricultural, non-agricultural and family labour. Savings were also disaggregated into agricultural, non-agricultural and capital savings. Income from factor production increased, regardless of the funding source, except for labour outside of the agricultural sector, which fell by 0.17% if an investment in infrastructure was financed through ODA. Income from agriculture labour increased by 0.19%, 0.21% and 0.57%, respectively, in the scenario of an increase in investment financed through debt, tax and ODA. Family labour income also increased by 0.19% if the increase in investment was debt-financed. It rose by 0.21% in the case of debt and 0.57% in the ODA financing scenario. Similarly, capital income increased by 0.33% for debt- and tax-financed scenarios. It rose by 0.40% if the increase in transport investment was financed through ODA.

6.2.3 Socioeconomic effects of an increase in investment in transport infrastructure

A 5% increase in transport infrastructure investment positively affected household income and consumption levels for poor and non-poor households in Burkina Faso, regardless of the funding source (see Table 3 below).

Table 6.3: Socioeconomic effects of an increase in investment in transport infrastructure

	Percent changes (%)		
Socioeconomic variables	**Debt**	**Tax**	**ODA**
Household income - poor	0.61%	0.42%	1.26%
Household income - non-poor	0.49%	0.35%	1.08%
Consumption levels - poor	0.33%	0.49%	1.47%
Consumption levels – non-poor	0.34%	0.39%	1.23%
Unemployment rate*	0.1	0.1	-0.1

* The unemployment rate is expressed as percentage point changes

Household income for poor households increased by 0.61%, 0.42% and 1.26%, respectively, for debt-financed, tax-financed, and ODA-financed scenarios. Concerning non-poor households, their income would rise by 0.49% in the case of an increase in investment in transport infrastructure financed through debt. Their revenue increased by 0.35% for an increased investment financed via tax, which increased by 1.08% in the ODA-financed scenario.

Figure 6.5 below shows that an increase in transport infrastructure investment in Burkina Faso positively impacted the income of poor and non-poor households, regardless of the financing sources.

The simulation result also indicated that the improvement in household income was increasingly significant over time. In the first phase, investments in infrastructure mainly benefited the construction sector. The induced effects of these investments spread to all sectors of the economy through intermediate consumption and positively impacted household income, employment, enterprise productivity and private-sector investment. Companies were hiring more workers to meet the emerging demand for projects. Thus, salaried households' income would increase (Boccanfuso and Savard, 2010).

The simulation also showed that the impact was greater on poor and non-poor households when there was an increased investment in transport infrastructure by official development assistance. Increased investments in transport infrastructure tended to benefit poorer households, as shown in Figure 6.7 below.

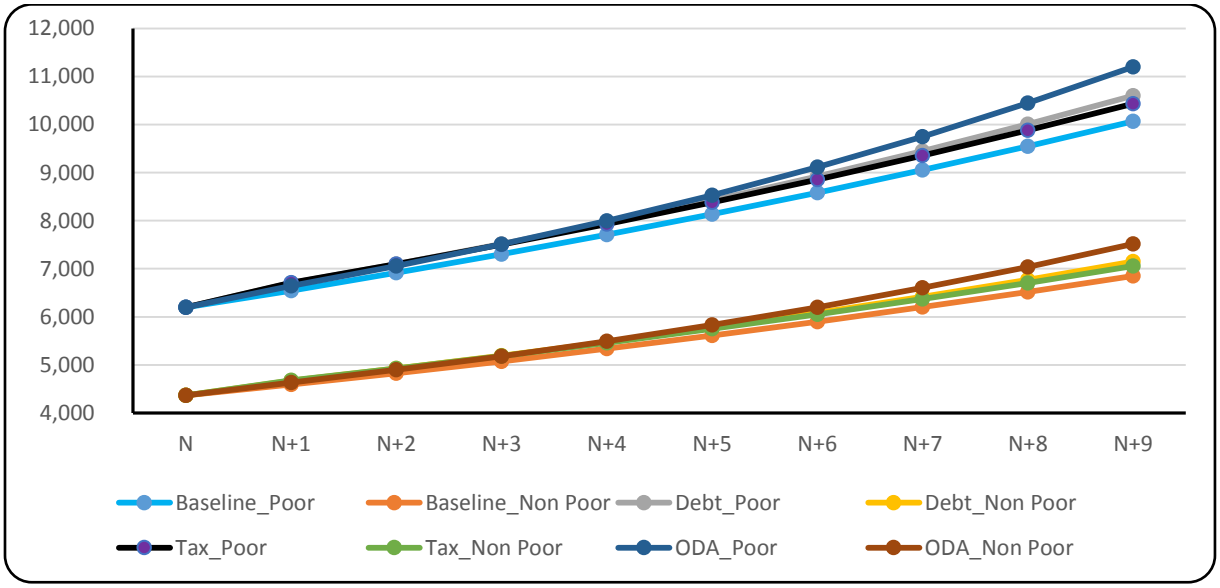

Figure 6.7: Trends in household income following an increase in investment in transport infrastructure

Poor households' consumption levels would increase by 0.33% if an increase in transport infrastructure were financed by debt. It increased by 0.49% in the scenario of tax financing and by 1.47% for ODA financing. In the debt, tax and ODA financing scenarios, consumption levels for non-poor households rose by 0.34%, 0.39% and 1.23%, respectively.

The simulation results indicate that an increase in investment in transport infrastructure positively impacted household consumption for poor and non-poor households, regardless of the financing source. This positive impact on household consumption can be persistent over time. Therefore, an increase in household income due to the positive effects induced by the construction of new transport infrastructure may explain the improvement in household consumption. The simulation also showed that the positive impact of increased investment in transport infrastructure was greater for poor households than non-poor households on the consumption level in the tax and ODA financing scenarios (see Figure 6.8).

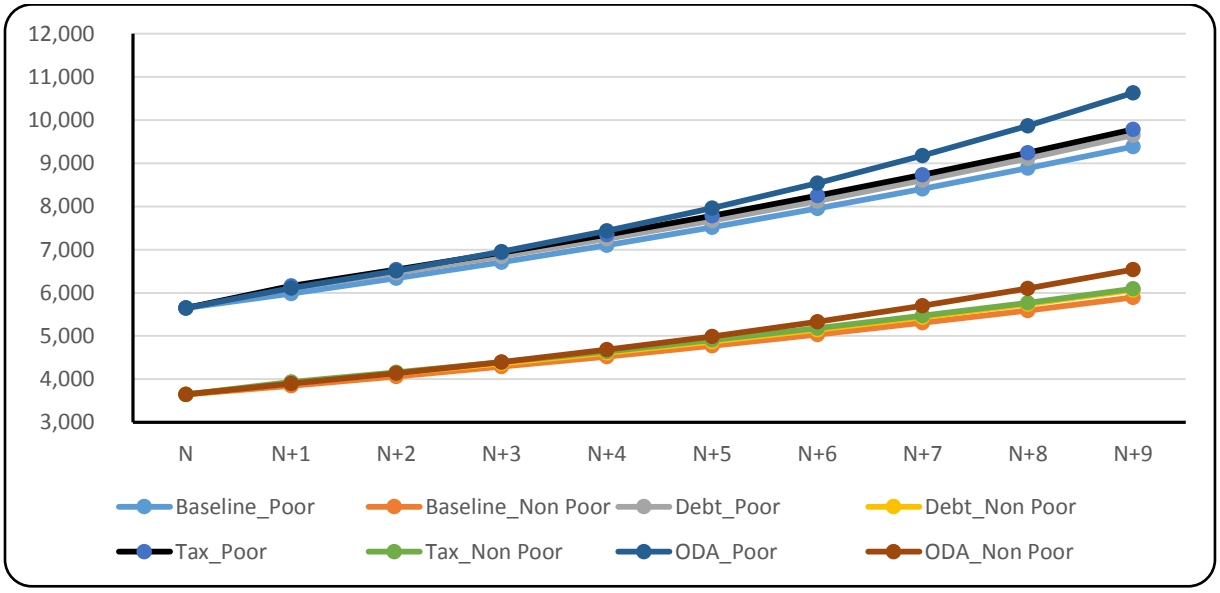

Figure 6.8: Trends in consumption level following an increase in investment in transport infrastructure

Duesenberry's (1952) demonstration effect stipulated that households determine their consumption level by comparison with a social group of reference, which may explain the above trend in the consumption level of households. With increased income, households tend to adopt better-off household consumption patterns because it confers a certain social status. As with income, the household's consumption level is also significant when increased investment in transport infrastructure is financed by official development assistance.

Over the period 2007-2018, the unemployment rate in Burkina Faso was, on average, 6.42%. The results of this simulation indicated that an increase in investment spending in transport

infrastructure through debt or tax increased the level of unemployment in Burkina Faso (see Figure 6.9). The unemployment rate was reduced marginally by 0.1 percentage points in the case of an ODA-financed increase in transport investment, while it grew by 0.1 percentage points in the debt or tax financing scenario.

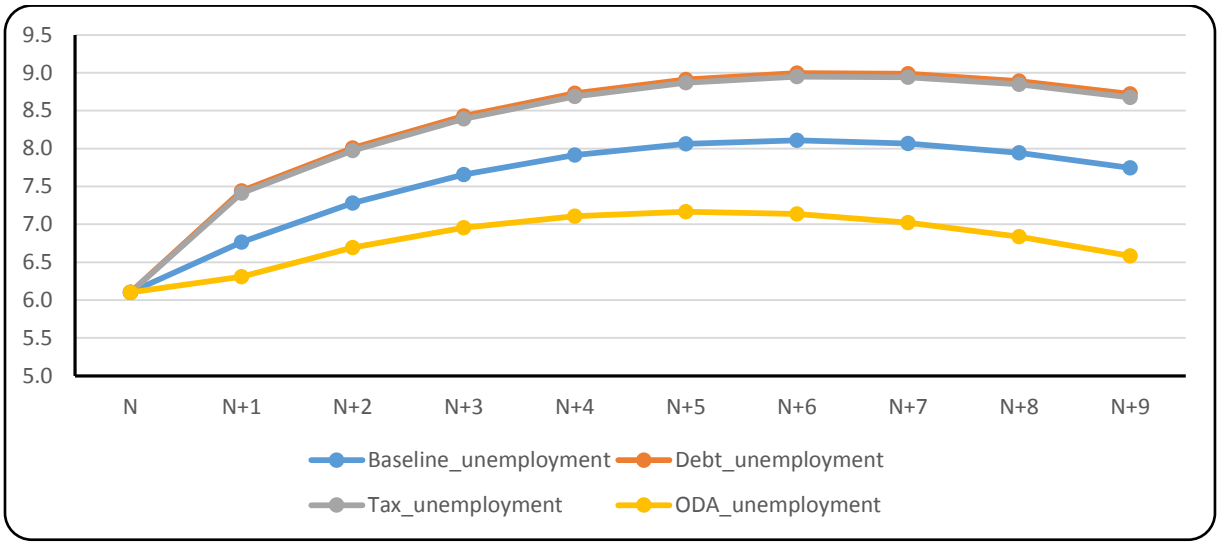

Figure 6.9: Trends in unemployment rate following an increase in investment in transport infrastructure

The observed impact on unemployment increased over time due to the crowding-out effect posited by liberal monetarist economists. They asserted that any additional public spending financed by non-banking agents through debt resulted in high interest rates, thus decreasing private spending from underwriters to borrowed funds to those who would have borrowed at lower rates. This decline in private investment spending impacted employment, hence the increase in the unemployment rate.

The simulation also showed that increased investment in transport infrastructure through official development assistance reduced unemployment in Burkina Faso. Furthermore, it translated into a drop in the unemployment rate because financing by ODA did not generate additional charges in terms of tax nor a crowding-out effect on private investments. Thus, positive externalities were generated for private enterprises; further investments increased the private companies' hiring capacity and reduced unemployment.

6.3 ECONOMY-WIDE IMPACT OF AN INCREASE IN INVESTMENT IN TELECOMMUNICATIONS INFRASTRUCTURE

An increase in investment in the telecommunications infrastructure positively impacted the Burkinabè economy. Tables 6.4, 6.5, and 6.6 below report the macroeconomic,

microeconomic and socioeconomic effects of increased investment in the telecommunications infrastructure in Burkina Faso.

6.3.1 Macroeconomic effects of an increase in investment in telecommunication

The Burkinabè economy would register several macroeconomic benefits should the country increase investment in telecommunications infrastructure. Table 6.4 below records the macroeconomic effects of a 5% increase in investment in telecommunication infrastructure in Burkina Faso.

Table 6.4: Macroeconomic effects of an increase in investment in telecommunication infrastructure

	Percentage change		
Macroeconomic variables	**Debt**	**Tax**	**ODA**
Real GDP per capita	2.3%	1.8%	0.4%
CPI	0.1%	0.0%	0.0%
Imports	3.9%	2.9%	0.2%
Exports	0.2%	-0.5%	0.3%
Budget balance	13.89%	0.0%	0.0%
Current account	8.49%	7.25%	0.07%

Regardless of the funding source, real GDP per capita rose. It increased above the baseline by 2.3%, 1.8% and 0.4%, respectively, for the telecommunications infrastructure financed through debt, tax, and ODA. Real GDP per capita rose as imports, sectoral output production, capital income, household income and consumption levels all rose.

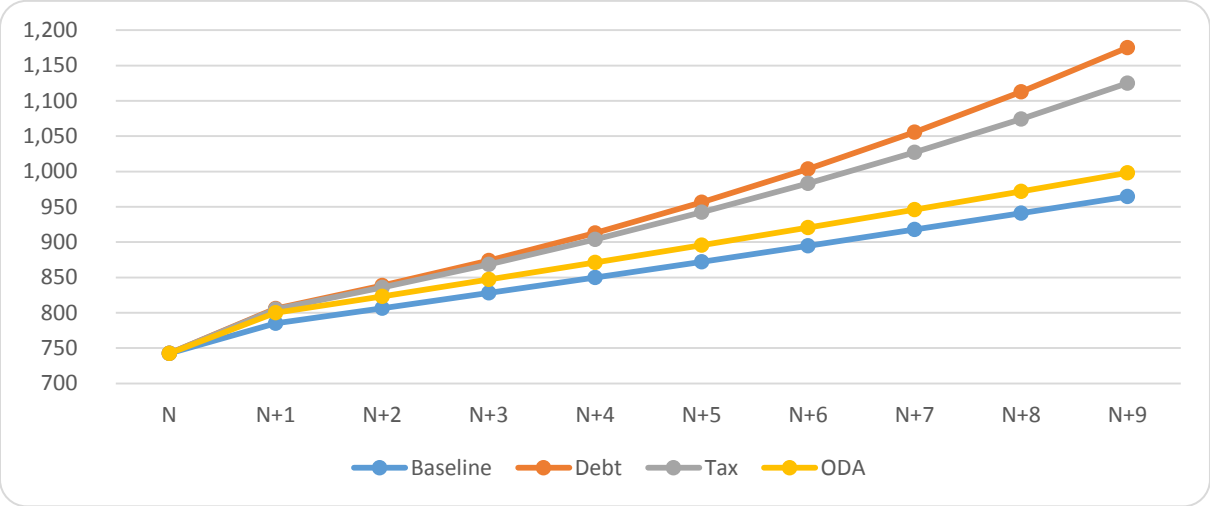

Figure 6.10: Trends in real GDP per capita following increased investment in the telecommunications infrastructure

CPI increased marginally by 0.1% following increased investment in the telecommunications infrastructure financed through debt. The increase in CPI meant a decline in purchasing power

for consumers in Burkina Faso. Financing increased investment in the telecommunications infrastructure via tax or ODA had no impact on CPI. Consumer purchasing power remained stable as the inflation rate did not change. Despite the slight depreciation of consumer purchasing power, consumption levels (see Table 6.3) increased due to increased household income.

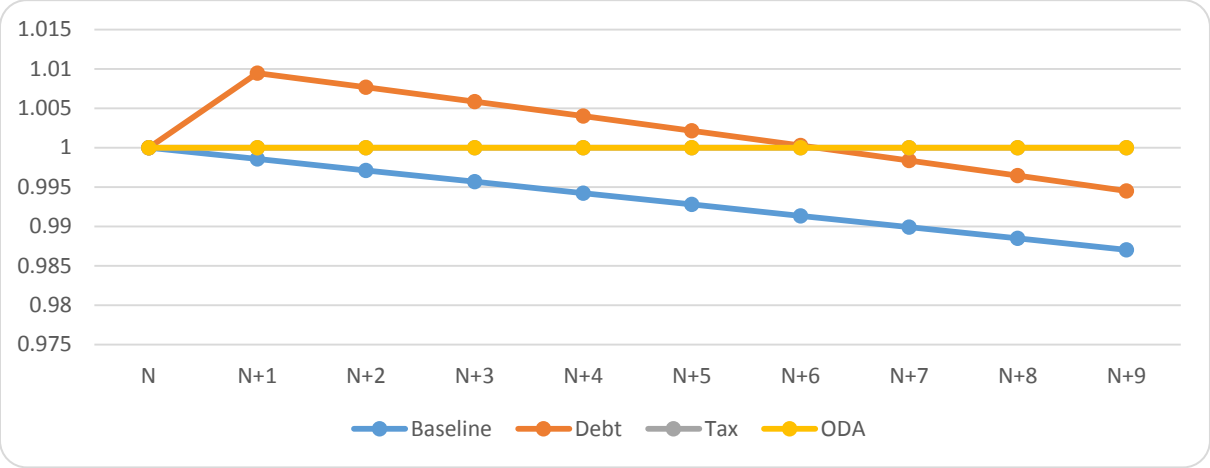

Figure 6.11: Trends in CPI following increased investment in the telecommunications infrastructure

Imports, similar to real GDP per capita, also rose, regardless of the funding source. Imports increased by 3.9%, 2.9%, and 0.2%, respectively, for debt, tax, and ODA financing, following increased investment in the telecommunications infrastructure.

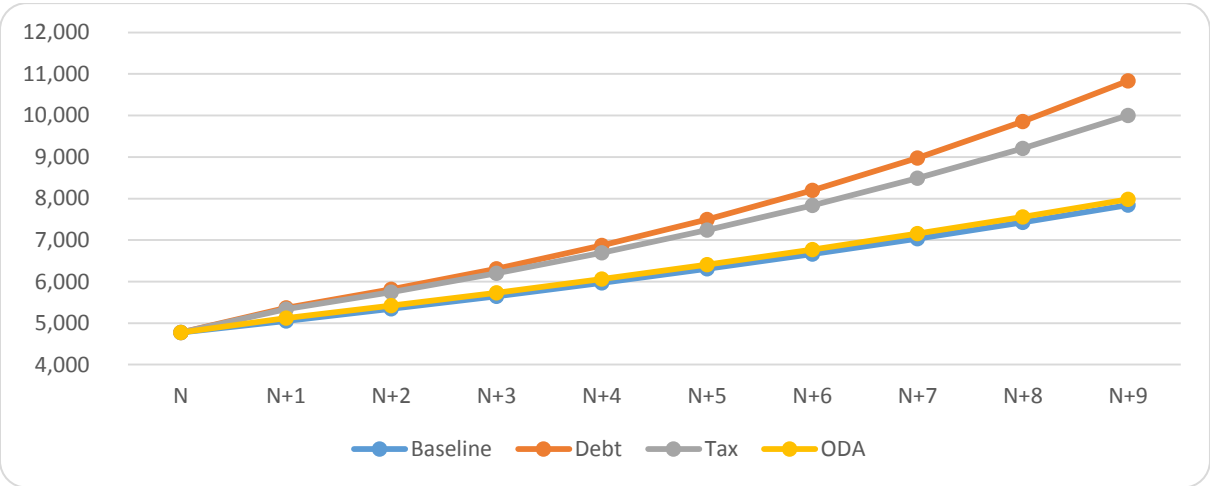

Figure 6.12: Trends in imports following an increase in investment in telecommunication infrastructure

The increase in imports after increased investment in telecommunications reflects a growing openness of the Burkinabè economy to international markets facilitated by improved

communication technology. The increase in imports, with the rise of real GDP per capita after increased investment in the telecommunications infrastructure, suggests growing imports of productive assets such as machinery and equipment that would improve the Burkinabè economy in the long run.

Exports, with the exception of tax financing, increased following increased investment in telecommunications. Exports rose by 0.20% and 0.30%, respectively, due to increased investment in telecommunication financed by debt and ODA. It fell by 0.5% against the baseline for telecommunication infrastructure financed through tax.

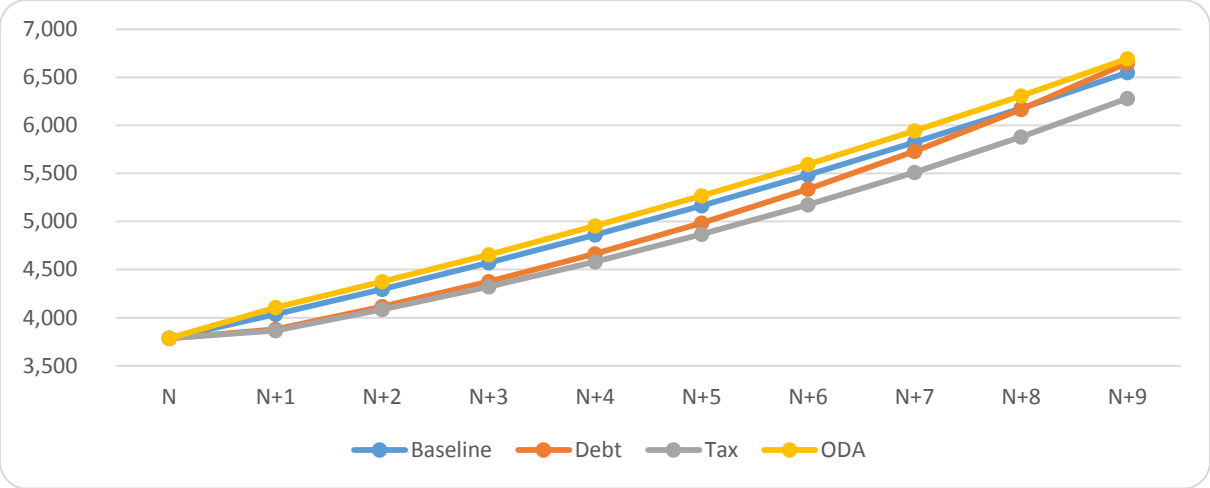

Figure 6.13: Trends in exports following an increase in investment in telecommunication infrastructure

Like the transport sector, increased investment in the telecommunications infrastructure via debt also negatively impacted Burkina Faso's budget balance, which increased by 13.89%. This trend grew over time (see Figure 6.14). However, it did not have any impact on the budget balance if investment was channelled through tax and ODA.

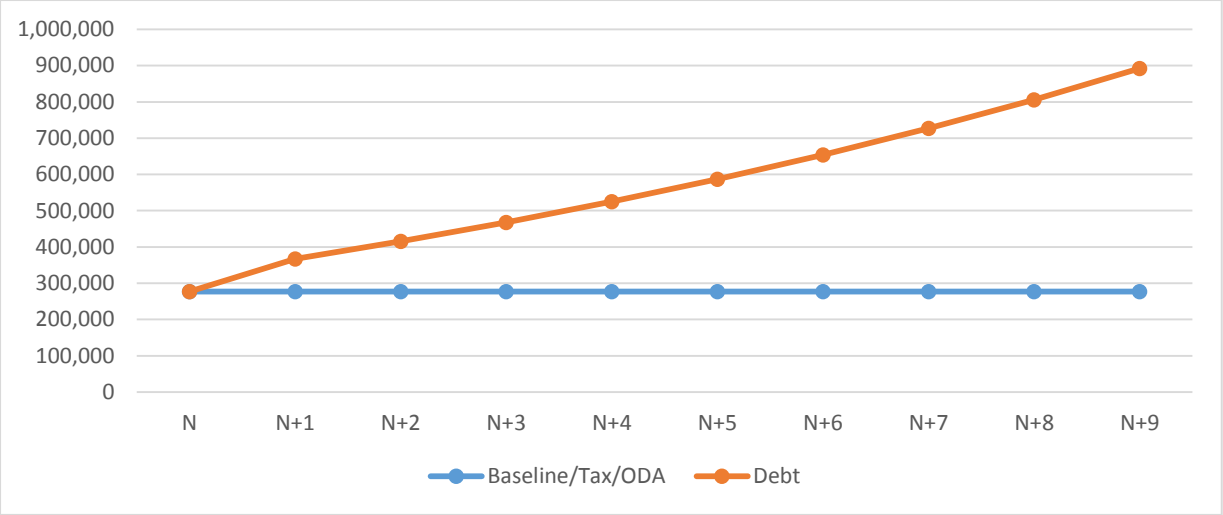

Figure 6.14: Evolution of budget balance in the baseline scenario and per financing source following increased investment in the telecommunications infrastructure

Similarly to the transport and telecommunication sectors, the negative trend in Burkina Faso's budget balance following a debt-financed increase in electricity, water, and gas infrastructure indicates that the country may experience, in the long term, the burden of debt repayment. In this regard, deficit infrastructure financing in Burkina Faso is likely to result in an economic crisis if not properly addressed.

Burkina Faso's current account decreased sharply by 14.4% following increased investment in telecommunications financed through debt and 12.9% for tax-financed telecommunications investments. The current account remained slightly close to the baseline in the scenario of increased investment financed via ODA (see Figure 6.15)

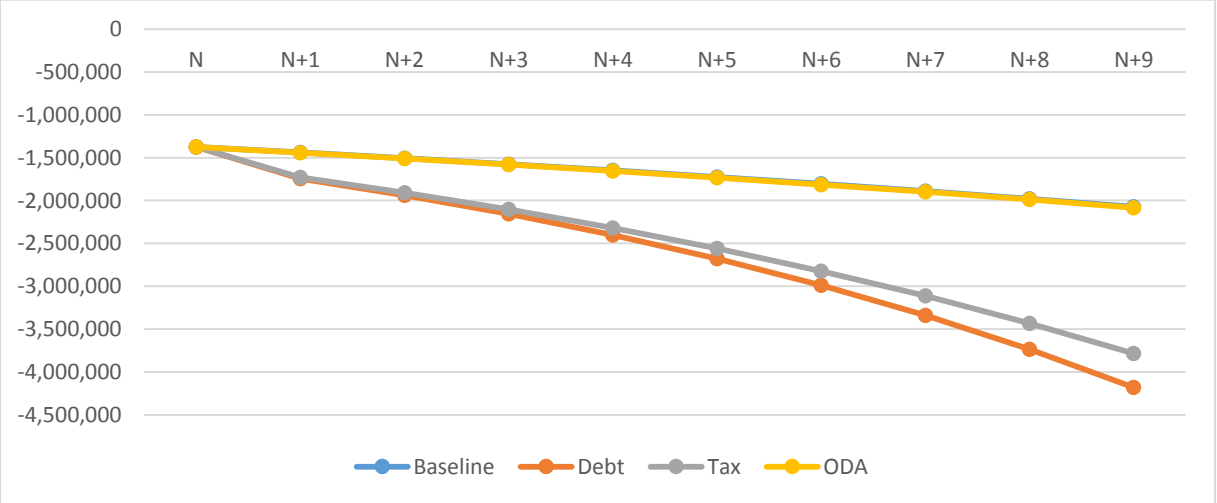

Figure 6.15: Evolution of the current account in the baseline scenario and per financing source following an increase in investment in the telecommunications infrastructure

Like transport infrastructure, the findings of this study indicate that irrespective of the funding source, increased investment in the telecommunications infrastructure further decreased the Burkinabè current account. This negative impact grows over time. The current account declined by 8.49% in the scenario of a debt-financed increase in the telecommunications infrastructure. It fell by 7.25% for a tax-financed increase and by just 0.07% in the ODA-financed scenario of an increase in the telecommunications infrastructure.

As the balance of trade is a key determinant of the current account, its deficit negatively impacted the current account. The results indicate that Burkina Faso's exports grew at a lower rate than imports over the period under study, meaning that the current account deficit widened. In addition, financing the telecommunications infrastructure, particularly by tax, resulted in an increase in the costs of private enterprises in terms of tax and an increase in the prices of local products on the domestic market. As a result, foreign product imports were privileged at the expense of exports. Moreover, the economic gains, including a balanced current account, derived from increased investment in the telecommunications infrastructure may be offset by an infrastructure deficit in other infrastructure sectors such as transport and power. It may also imply that a 5% increase in investment in the telecommunication infrastructure in Burkina Faso is below the threshold required to positively affect the country's current account.

The findings of this study corroborate earlier empirical studies (Olalekan, 2013; Donou-Adonsou et al., 2016; Cronin et al., 1991; Alleman et al., 2004; Nadiri & Nandi, 1997; Wang, 1999; Norton, 1992; Canning, Fay & Perotti, 1994; Canning, 1997; Posu, 2006; Osotimehin et al., 2010; Cohen, 1992; Greenstein and Spiller, 1995; Yilmaz et al., 2002; Bezmen et al., 2003; Perkins et al., 2005; Sridhar et al., 2007) that found that investment in the telecommunications infrastructure may have a positive effect on economic growth.

6.3.2 Microeconomic effects of an increase in investment in telecommunications

Increased investment in the telecommunications infrastructure in Burkina Faso would result in microeconomic benefits, as recorded in Table 6.5 below. These microeconomic gains are relative to sectoral output production and factor production income.

Table 6.5: Microeconomic effects of increased investment in the telecommunications infrastructure

	Percentage change		
Microeconomic variables	**Debt**	**Tax**	**ODA**
Sectoral output production			
Primary	2.5%	0.1%	0.1%
Secondary	2.5%	0.1%	0.1%
Tertiary	2.5%	0.4%	0.4%
Factor production price			
Agri-labour	0.2%	0.2%	0.6%
Non-agri-labour	0.3%	0.3%	0.0%
Family labour	0.2%	0.2%	0.6%
Capital	0.2%	0.2%	0.3%
Factor production income			
Agri-labour	0.1%	0.2%	0.6%
Non-agri-labour	0.3%	0.3%	0.0%
Family labour	0.1%	0.2%	0.6%
Capital	0.2%	0.2%	0.3%

Production of sectoral output grows. Primary sector production increases regardless of the funding source. A 5% increase in investment in telecommunications infrastructure would increase the primary sector's production by 2.5% for debt financing and 0.1% for tax and ODA financing. Similar to the primary industry, production of the secondary sector also rose nearly by the same levels. It grew by 2.5% for debt financing and 0.1% for tax and ODA financing. The output of the tertiary sector also increased. It rose by 2.5% for debt financing and 0.40% for tax and ODA financing after increased investment in the telecommunications infrastructure.

Growth in consumption levels recorded in Table 6.6 drove sectoral output production. As economic output increased, it positively impacted GDP formation.

Factor production prices collectively went up. Cost rose marginally for labour in the agricultural sector. Agricultural labour costs rose as wages rose by 0.2% following increased infrastructure investment through debt and tax. In comparison, ODA financing resulted in a 0.6% increase in the cost of labour in the agricultural sector. Labour costs outside the agricultural sector marginally increased. It rose by 0.3% if an increase in investment in telecommunication was financed through debt and tax. Prices here remained stable in the case of increased investment financed through ODA. Family labour costs also rose marginally by 0.2% for debt and a tax-financed increase in the telecommunications infrastructure. Costs rose by 0.6% for ODA financing. Capital costs rose by 0.2% in the case of an increase in the telecommunications infrastructure financed via debt and tax. Costs rose by 0.3% if the increase in telecommunications investment was financed via ODA.

Income from factor production increased regardless of the funding source. In the increased investment financed through debt, tax, and ODA scenario, revenue from agricultural labour increased by 0.19%, 0.21% and 0.57%, respectively. For debt and tax financing, labour income outside the agricultural sector rose by 0.3%. It did not change in the increased investment in telecommunications financed through the ODA scenario. Family labour income also rose by 0.19% if the increase in investment was debt-financed. It rose by 0.21% in the case of debt and 0.57% in the ODA financing scenario. Similarly, capital income increased by 0.33% for debt and tax-financed scenarios. It rose by 0.40% if the increased telecommunications investment was financed through ODA.

On the microeconomic side, the study's findings corroborate several empirical studies' results. These studies found that sectoral output production generally increased due to telecommunications investment. For example, Perrault, Savard and Estache (2010) developed a standard CGE model to investigate the impact of an increase in investment in infrastructure in six African countries (Benin, Cameroon, Mali, Senegal, Tanzania, and Uganda). They performed simulations on non-productive investments, roads, electricity, and telecommunication infrastructure, taking into consideration five financing scenarios, namely (i) reduced public expenditure, (ii) increased value-added taxes, (iii) increased import duties, (iv) funding foreign aid, and (v) increased income taxes. The findings of this study showed a similar positive impact on economic growth for macroeconomic indicators, especially GDP, while sectoral outputs differed among countries and investment types.

According to Jha and Khaleja (2008), investment in telecommunications positively affects many sectors of the economy, such as business services, industry, and agriculture. Abler (1970), and Stough and Paelinck (1998) posited that increased supply of telecommunications infrastructure contributes to trade flow and openness by reducing the geographical isolation of remote locations. Alleman et al. (2002) found that investment in telecommunications increases the demand for the goods and services used in their production, thereby raising sectoral output production, which has positive direct and indirect impacts on employment. Agenor et al. (2006) found that infrastructure may impact economic growth through its complementary effects on private investment, especially private capital formation. Several authors studied ICT's impact, especially improved phone connectivity's effects on the market. Jensen (2007) and Aker and Mbiti (2010) studied the role of the communications infrastructure in lowering search costs and reducing information friction. They found a reduced price dispersion from mobile phones, more so if markets were connected by road (Collier et al., 2015). Other authors (Norton, 1992; Röller & Waverman, 2001) found that telecommunication infrastructure reduces the fixed costs of information acquisition and the variable costs of

participating in markets. Furthermore, investment in telecommunication and its services generates significant economic gains.

6.3.3 Socioeconomic effects of increased investment in telecommunications

A 5% investment increase in the telecommunications infrastructure positively affects household income and consumption levels for poor and non-poor households in Burkina Faso, regardless of the funding source, as recorded below in Table 6.6.

Table 6.6: Socioeconomic effects of increased investment in the telecommunications infrastructure

	Percentage change		
Socioeconomic variables	**Debt**	**Tax**	**ODA**
Household income - poor	2.2%	1.7%	0.4%
Household income - non-poor	1.9%	1.6%	0.4%
Consumption levels - poor	1.9%	2.0%	0.4%
Consumption levels - non-poor	1.8%	1.8%	0.4%
Unemployment rate*	0.28	0.28	0.02

* The unemployment rate is expressed as percentage point changes

Household income and consumption levels for the poor and non-poor rose irrespective of the funding source. Income for poor households rose by 2.2%, 1.7%, and 0.4% for the debt-financed, tax-financed and ODA-financed scenarios, respectively. Non-poor household income also increased by 1.9%, 2.0%, and 0.4%, respectively, for debt, tax and ODA financing.

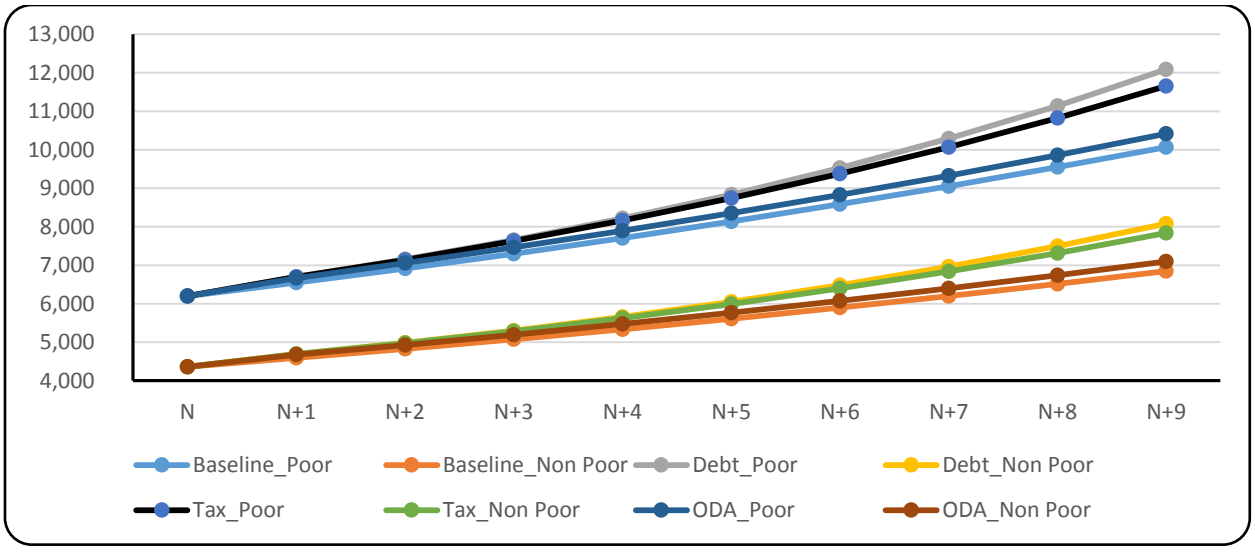

Figure 6.16: Trends in household income following an increase in investment in telecommunication infrastructure

Poor households' consumption levels rose by 1.9% in the scenario of increased investment in telecommunication financed through debt. It increases by 2% and 0.4% for tax and ODA financing, respectively. Consumption levels for non-poor households rose by 1.8% for debt and tax financing, while it increased by 0.4% for ODA financing.

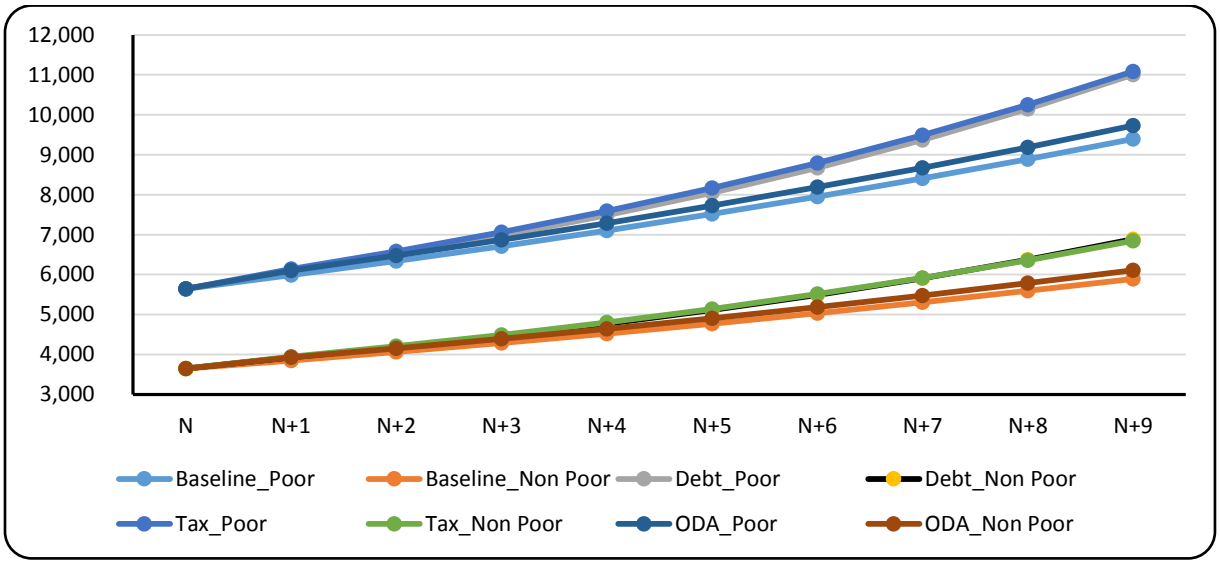

Figure 6.17: Trends in household consumption levels following increased investment in the telecommunication infrastructure

Following increased investment in telecommunications, the unemployment rate marginally increased by 0.28% for ODA and tax financing. It rose by just 0.02% in the scenario of ODA financing.

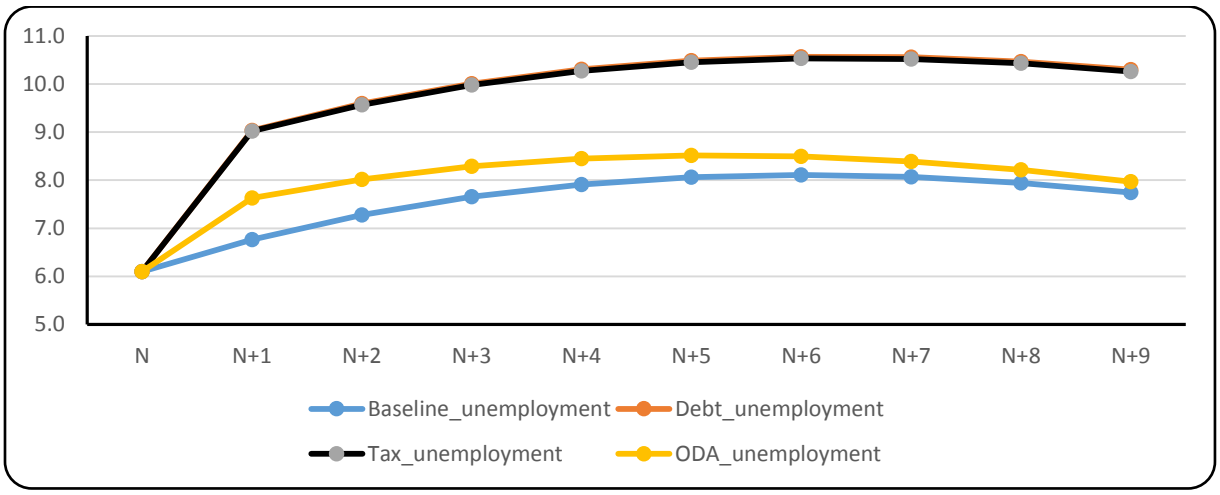

Figure 6.18: Trends in unemployment level following increased investment in the telecommunications infrastructure

The findings of the study corroborated earlier empirical studies (Olalekan, 2013; Donou-Adonsou et al., 2016; Cronin et al., 1991; Alleman et al., 2004; Nadiri & Nandi, 1997; Wang, 1999l Norton, 1992; Canning, Fay & Perotti, 1994; Canning, 1997; Posu, 2006; Osotimehin et al., 2010; Cohen, 1992; Greenstein & Spiller, 1995; Yilmaz et al., 2002; Bezmen et al., 2003; Perkins et al. 2005; Sridhar et al., 2007) which found that investment in telecommunications infrastructure may have a positive effect on economic growth.

6.4 ECONOMY-WIDE IMPACT OF AN INCREASE IN INVESTMENT IN ELECTRICITY, WATER, AND GAS INFRASTRUCTURE

The research findings showed that investment in the electricity, water, and gas infrastructure promoted growth in Burkina Faso. For example, a 5% increase in investment in the electricity, water, and gas infrastructure positively affected Burkina Faso's economy. Tables 6.7, 6.8 and 6.9 below summarise the macroeconomic, microeconomic and socioeconomic effects of an increase in the electricity, water, and gas infrastructure in Burkina Faso.

6.4.1 Macroeconomic effects of an increase in investment in electricity, water, and gas

As reported in Table 6.7 below, Burkina Faso's economy would register several macroeconomic gains should the country increase investment in the electricity, water, and gas infrastructure.

Table 6.7: Macroeconomic effects of an increase in investment in electricity-water-gas infrastructure

	Percentage change		
Macroeconomic variables	**Debt**	**Tax**	**ODA**
Real GDP per capita	1.94%	1.42%	0.32%
CPI	0.01%	0.01%	0.01%
Imports	3.43%	2.44%	0.21%
Exports	0.16%	-0.51%	0.26%
Budget balance	18.81%	0.00%	0.00%
Current account	7.68%	6.37%	0.12%

Real GDP per capita increased, regardless of the funding source. It rose by 1.94%, 1.42%, and 0.32% for debt, tax and ODA financing for increased investment in the electricity, water, and gas infrastructure.

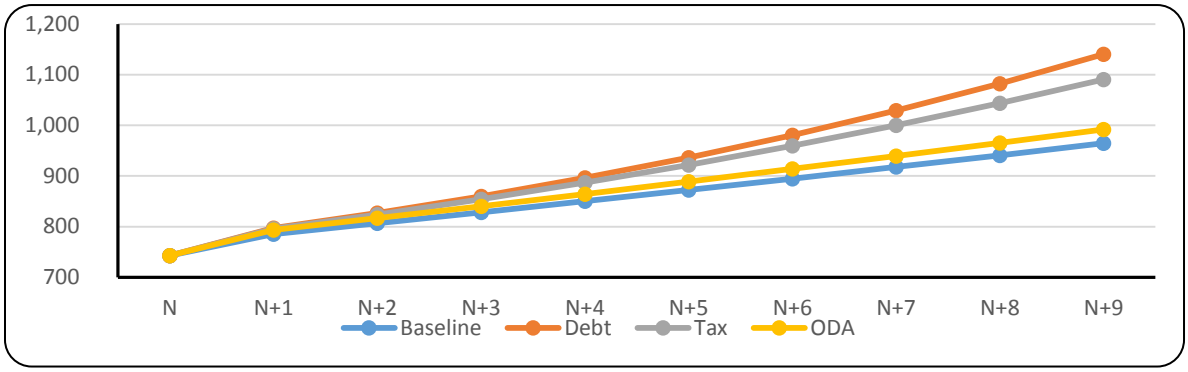

Figure 6.19: Trends in real GDP per capita following an increase in investment in water, electricity, and gas infrastructure

Real GDP per capita increased plus imports (see Table 6.7 above), sectoral output production and factor income (see Table 6.8), and household income and consumption levels (see Table 6.9) all rose.

CPI increased marginally by 0.01% for all funding sources following increased investment in the electricity, water, and gas infrastructure. The slight increase in CPI reflected a rise in the inflation rate, meaning declining consumer purchasing power in Burkina Faso. However, despite the slight depreciation of consumer purchasing power, consumption levels increased due to increased household income.

Imports rose following increased investment in the electricity, water, and gas infrastructure, regardless of the funding source. As a result, imports increased above the baseline by 3.43%, 2.44%, and 0.21% for debt, tax, and ODA financing, respectively.

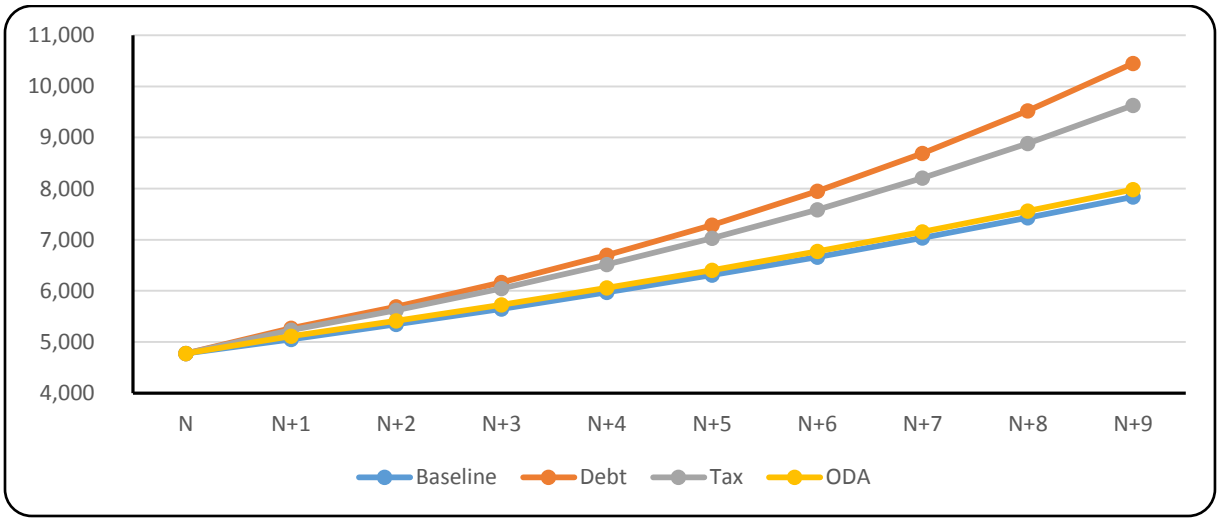

Figure 6.20: Trends in imports following increased investment in the water, electricity, and gas infrastructure

Exports also increased following increased investment in electricity, water, and gas, except for tax financing. Exports rose by 0.16% and 0.26% after an increase in investment in electricity, water, and gas financed by debt and ODA, respectively. However, it fell by 0.51% against the baseline for an electricity, water, and gas infrastructure financed through tax.

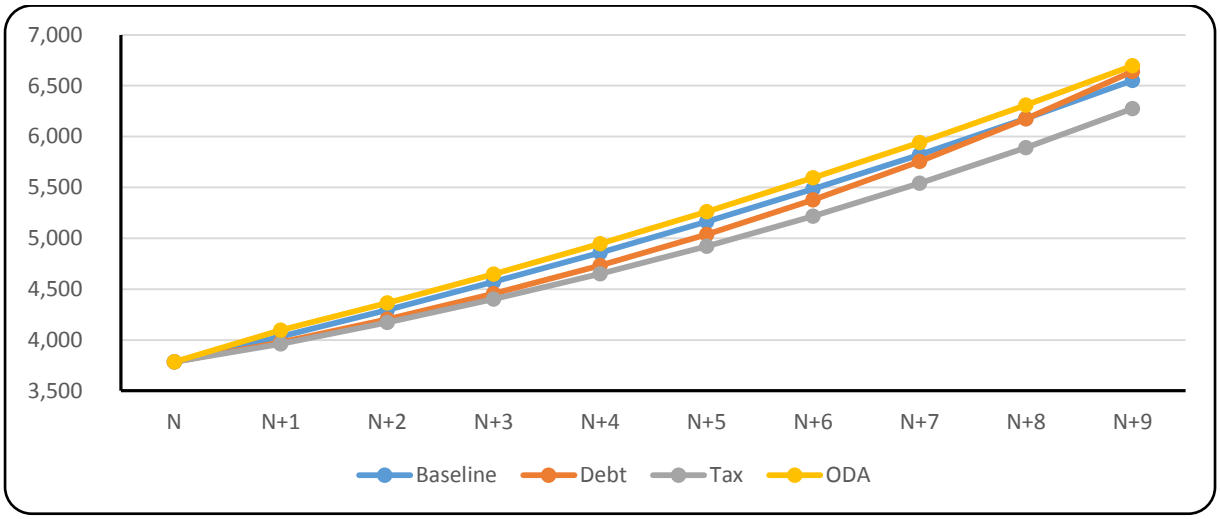

Figure 6.21: Trends in exports following increased investment in the water, electricity, and gas infrastructure

Like in the transport and telecommunications infrastructure sectors, the budget balance increased sharply in the scenario of an increase in investment in the electricity, water, and gas infrastructure via debt. It increased by 18.81%, meaning a significant negative impact on Burkina Faso's budget balance. However, it does not have any impact on the budget balance if investment is channelled through tax and ODA (see Figure 6.22)

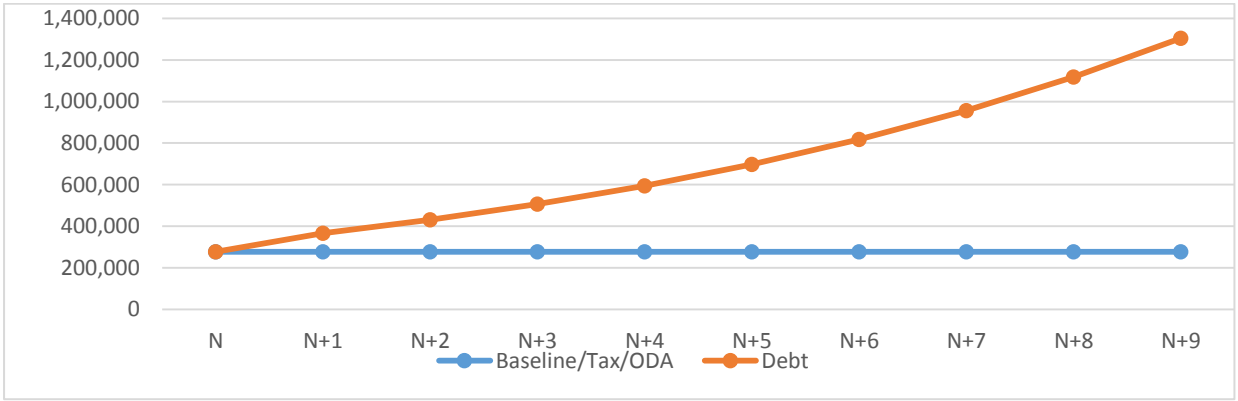

Figure 6.22: Evolution of budget balance in the baseline scenario and per financing source following increased investment in water, electricity, and gas infrastructure

Similarly to the transport sector, the negative trend in Burkina Faso's budget balance in the scenario of a debt-financed increase in investment in telecommunication infrastructure may

be an indication that deficit financing of infrastructure in Burkina Faso may result, in the long term, in debt unsustainability.

The current account declined by 7.68%, 6.37%, and 0.12%, respectively, for debt, tax and ODA-financed electricity, water, and gas infrastructure increase. Similar to the results for transport and telecommunications infrastructure, the findings of this study showed that irrespective of the funding source, financing the electricity, water, and gas infrastructure further decreased the Burkinabè current account (see Figure 6.23).

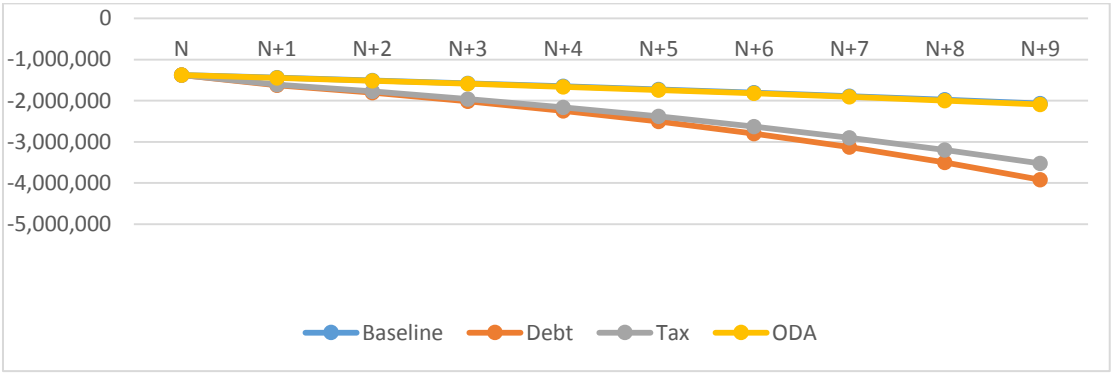

Figure 6.23: Evolution of current account in the baseline scenario and per financing source following an increase in investment in water, electricity, and gas infrastructure

As the balance of trade is a key determinant of the current account, its deficit negatively impacts it. The results of this study indicate that Burkina Faso's exports grew at a lower rate than imports over the period under study, meaning that the current account deficit widened. In addition, financing the electricity, water, and gas infrastructure, particularly by tax, resulted in an increase in the costs of private enterprises in terms of tax and an increase in the prices of local products on the domestic market. As a result, foreign product imports were privileged at the expense of exports. Moreover, the economic gains, including a balanced current account, derived from an increase in investment in power infrastructure may be offset by an infrastructure deficit in other infrastructure sectors such as transport and telecommunications. It may also imply that a 5% increase in investment in the electricity, water, and gas infrastructure in Burkina Faso is below the threshold needed to affect the country's current account positively.

The findings of this study support early empirical studies (Borojo, 2015; Égert et al., 2009; Perrault et al., 2010; Federreke et al., 2008; Mbanda et al., 2011; Agenor et al., 2006; Dinkelman, 2011; Galinis & Leeuwen, 2000; Dissou & Didic, 2011; Aydin, 2010) that drew on CGE modelling to assess the impact of investment in energy on economic growth. These studies found that investment in energy, which is a key input in the production process,

positively impacted economic growth, most notably real GDP, sectoral output production, trade balance, private investment, household income and employment. Borojo (2015) found that in Ethiopia, investment in electricity positively impacted real GDP and output of the industrial and service sectors in all simulations. These findings are very much in line with the results of this study, in which investment in electricity positively impacted real GDP per capita and sectoral output production, irrespective of the funding source. Investment in infrastructure, including electricity infrastructure, positively affected domestic private and foreign direct investment by reducing production costs (Borojo, 2015). Furthermore, it positively affected total factor productivity, thereby enhancing enterprises' contribution to economic growth. The findings of this study also corroborate, in part, the study of Perrault et al. (2010), who found that for electricity, investment funded by tax income was more favourable for some countries. This study found that debt-financed investment in electricity followed by tax tended to be more beneficial to Burkina Faso. Furthermore, the findings of the study supported Aydin (2010), who found that in Turkey, increased investment in hydropower would result in significant macroeconomic gains for the Turkish economy. The impact included job creation, investment and overall aggregate output production, with substantial effects on sectoral output, trade balance, private investment and overall economic growth. In addition, the results of this study corroborated the findings of several other studies (Barro, 1998; Kosec, 2014; Sharma, 2010; Fourie, 2006; Galiani et al., 2005; Duflo & Pande, 2007; World Bank, 2003; Sambo, 2005; Stern, 2004; Morimoto & Hope, 2004; Enang, 2010), which found that electricity had a positive impact on aggregate output. Overall, these findings supported the view of ecological economists (Stern & Cleveland, 2004; Stern, 2010), who posited that energy has a significant role in economic growth. They established that energy is a key factor of production spurred by capital and labour.

6.4.2 Microeconomic effects of increased investment in the electricity, water, and gas infrastructure

Increased investment in the electricity, water, and gas infrastructure in Burkina Faso would result in microeconomic benefits, as recorded in Table 6.8 below. These microeconomic gains are relative to sectoral output production, factor production costs, and factor production income.

Table 6.8: Microeconomic effects of increased investment in the electricity, water, and gas infrastructure

	Percentage change		
Microeconomic variables	**Debt**	**Tax**	**ODA**
Sectoral output production			
Primary	2.14%	1.75%	0.12%
Secondary	2.17%	1.70%	0.17%
Tertiary	2.14%	1.60%	0.23%
Factor production price			
Agri-labour	2.14%	1.75%	0.12%
Non-agri-labour	-0.02%	-1.04%	0.28%
Family labour	2.17%	1.70%	0.17%
Capital	2.14%	1.60%	0.23%
Factor production income			
Agri-labour	0.09%	0.11%	0.47%
Non-agri-labour	0.08%	0.07%	-0.21%
Family labour	0.09%	0.11%	0.47%
Capital	0.16%	0.16%	0.23%

Primary sector production increased regardless of the funding source. For example, a 5% increase in the electricity, water, and gas infrastructure would raise the production of the primary sector by 2.14%, 1.60% and 0.23% for debt, tax and ODA financing, respectively, with the former recording the highest percentage change.

Production of the secondary sector also rose. It grew by 2.17% for debt-financed electricity, water, and gas infrastructure, 1.70% for tax-financed electricity, water, and gas infrastructure and 0.17% for ODA financing. Similarly, the output of the tertiary sector also increased. It rose by 2.14%, 1.60%, and 0.23% for debt, tax and ODA financing, respectively, for increased investment in the electricity, water, and gas infrastructure. Growth in consumption levels recorded in Table 6.9 drove sectoral output production. As economic output rose, it positively impacted GDP formation.

Costs rose for labour in the agricultural sector. Agricultural labour costs rose by 2.14% for increased infrastructure investment through debt. It also increased by 1.75% in the tax-financed scenario. ODA financing resulted in an increase of 0.12% in the agricultural sector's labour cost. The cost of labour outside the agricultural sector marginally fell. It went down by 0.02% if an increase in electricity, water, and gas investment was financed through debt. The cost fell by 1.04% in the scenario of tax financing and by 0.28% if the increase was financed through ODA. Family labour costs also increased marginally by 2.17%, 1.70%, and 0.17%, respectively, for debt, tax, and ODA-financed increases in the electricity, water, and gas infrastructure. Capital costs rose by 2.14% in the case of an increase in the electricity, water, and gas infrastructure financed via debt. It also increased by 0.60% and 0.23%, respectively,

for tax and ODA-financed increased investment in the electricity, water, and gas infrastructure. Income from factor production increased irrespective of the funding source, except for labour outside the agricultural sector, which fell by 0.21 in the scenario of ODA financing. Income from agricultural labour increased by 0.09%, 0.11% and 0.47%, respectively, in increased investment financed through debt, tax and ODA scenarios. Family labour income also increased by 0.09% if the increase in investment was debt-financed. It rose by 0.11% in the case of debt and 0.47% in the ODA financing scenario. Similarly, capital income increased by 0.16% for debt- and tax-financed scenarios. It rose by 0.23% if the increase in electricity, water, and gas investment was financed through ODA.

As highlighted by the Word Bank (2014), an unreliable and poor power infrastructure affect firm productivity and infrastructure, especially power shortages and costs, and transport bottlenecks are perceived as the main bottlenecks for about 60% of enterprises operating in Africa (World Bank, 2014). In this regard, increased investment in electricity supply is expected to result in positive gains in firm productivity, sectoral output production and private capital formation. The results of our study support the earlier empirical studies that found that investment in power infrastructure positively impacts economic growth. It does so by improving productivity and as a direct input and complement to other production process inputs. The findings of this study also support Agenor et al. (2006), who found that by raising the marginal productivity of all factor inputs, infrastructure lowered marginal production costs and increased the level of private production. This, in turn, may lead to higher private investment, raising production capacity over time and making the growth effect more lasting. Fourie (2006) also found that infrastructure may positively affect input factors' productivity indirectly. Using electrical equipment, one unit of labour per hour would be more productive than one hour's manual labour. The results of this study also corroborate the findings of several other studies (Stern & Cleveland, 2004; Stern, 2010; Borojo, 2015; Dissou & Didic; 2011; Aydin, 2010; Sambo, 2005; Girma, 2000; Parasuraman & Sengupta, 2001), which found that investment in electricity had substantial positive effects on sectoral output production, factor production and income.

6.4.3 Socioeconomic effects of an increase in investment in the electricity, water, and gas infrastructure

A 5% increase in investment in the electricity, water, and gas infrastructure positively affected household income and consumption levels for poor and non-poor households in Burkina Faso, irrespective of the funding source (see Table 6.9).

Table 6.9: Socioeconomic effects of increased investment in the electricity, water, and gas infrastructure

	Percentage change		
Socioeconomic variables	**Debt**	**Tax**	**ODA**
Household income - poor	1.81%	1.36%	0.32%
Household income - non-poor	1.57%	1.20%	0.28%
Consumption levels - poor	1.53%	1.59%	0.36%
Consumption levels – non-poor	1.45%	1.36%	0.31%
Unemployment rate	0.07	0.07	-0.17

* The unemployment rate is expressed as percentage point changes

Household income increased for poor households by 1.81%, 1.36%, and 0.32% for the debt-financed, tax-financed and ODA-financed scenarios, respectively. Non-poor household income rose by 1.57% in the scenario of increased investment in the electricity, water, and gas infrastructure financed through debt. Their income increased by 1.20% and 0.28% for the tax and ODA-financed scenarios, respectively.

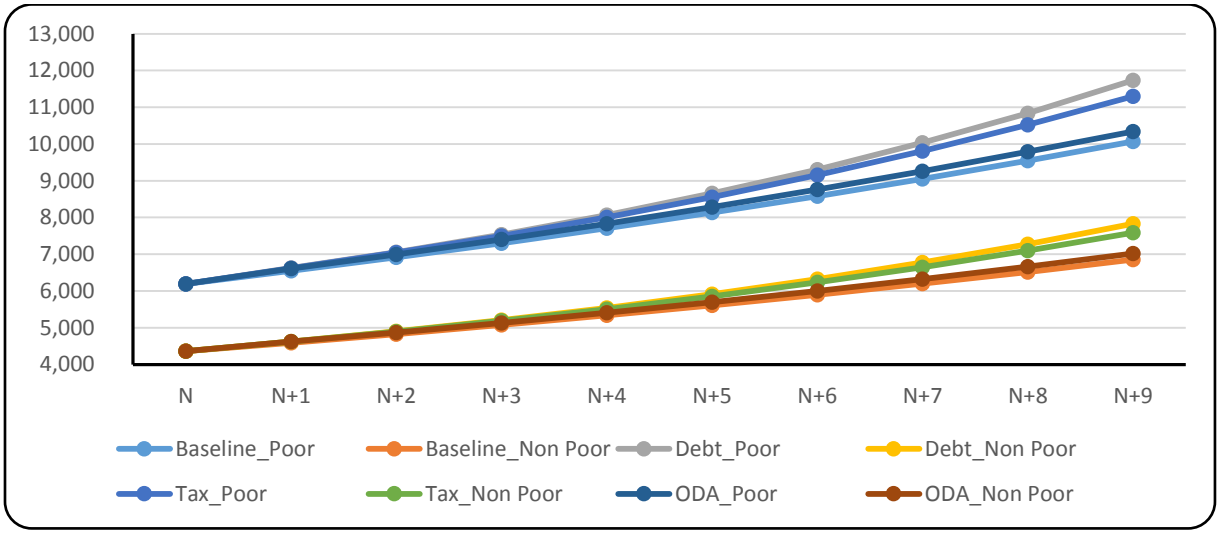

Figure 6.24: Trends in household income following an increase in investment in electricity, water, and gas infrastructure

Poor households' consumption levels would increase by 1.33% if an increase in the electricity, water, and gas infrastructure were financed by debt. It increased by 1.59% in the tax financing scenario and by 0.36% in the ODA financing scenario. Consumption levels for non-poor households rose by 1.45%, 1.36%, and 0.31% in the debt financing, tax, and ODA financing scenarios, respectively.

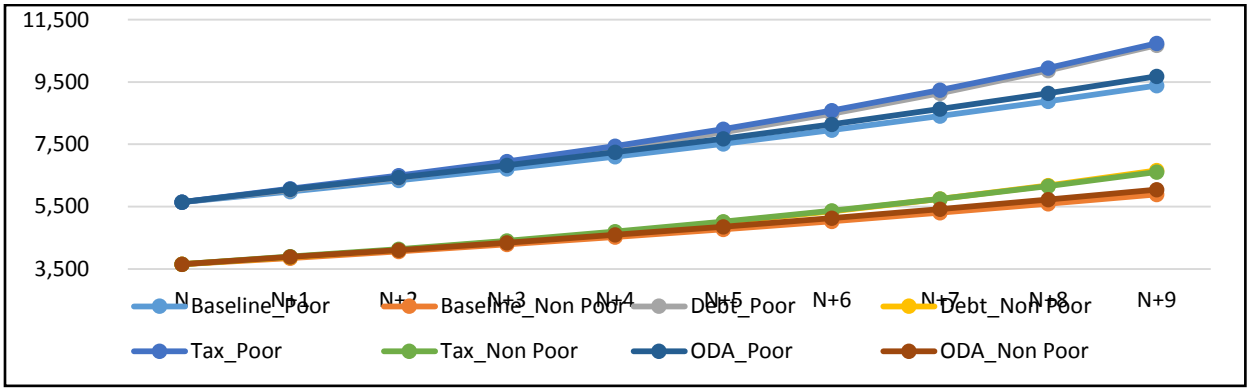

Figure 6.25: Trends in household consumption levels following an increase in investment in the water, electricity, and gas infrastructure

The unemployment rate was reduced marginally by 0.17 percentage points in the case of an ODA-financed increase in electricity, water, and gas investment, while it grew by 0.07 percentage points in the debt or tax financing scenarios.

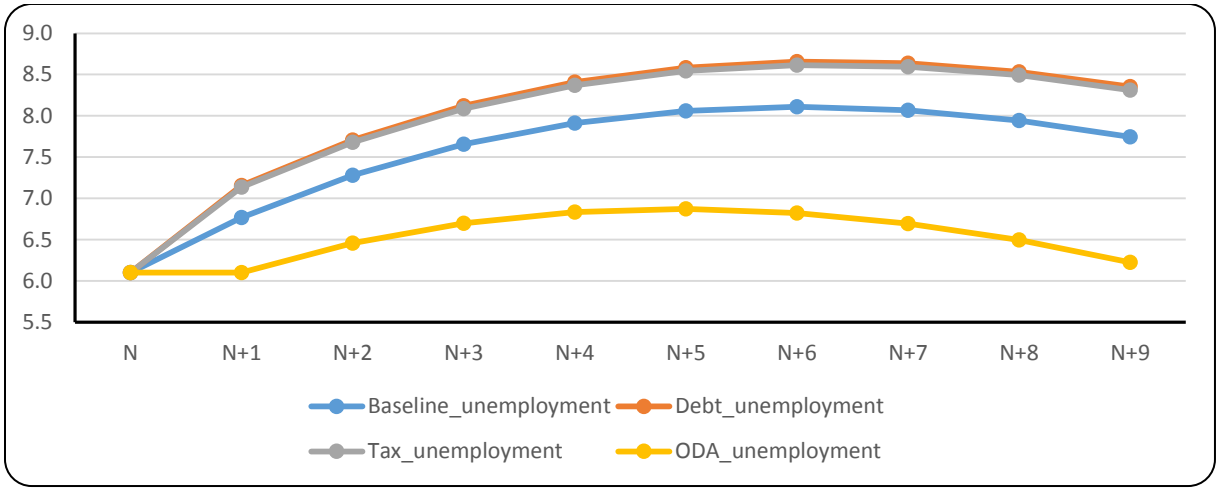

Figure 6.26: Trends in unemployment rate following an increase in investment in the water, electricity, and gas infrastructure

The above results supported some of the past empirical studies (Borojo, 2015; Aydin, 2010), which found that investment in power positively impacted household income and consumption levels. In addition, it also corroborated the findings of some empirical studies (Sambo, 2005; Aydin, 2010; Girma, 2000; Parasuraman & Sengupta, 2001, Borojo, 2015; Aydin, 2010), which also found that energy provision, irrigation and water supply generate employment.

6.5 THE NEXUS OF INVESTMENT IN INFRASTRUCTURE AND ECONOMIC GROWTH IN BURKINA FASO

Overall, the results of this study showed that an increase in investment in infrastructure in Burkina Faso has far-reaching positive effects on the whole economic system. Since most of

the macroeconomic, microeconomic and socioeconomic variables exhibited positive growth following an increase in investment in infrastructure, regardless of the infrastructure sector, These findings suggest that investment in infrastructure is key to economic growth in Burkina Faso.

Theoretically, the point of this research corroborates the economic theory, which posits that infrastructure may positively impact economic growth.

The results specifically corroborate endogenous growth theories (Solow, 1956; Arrow & Kurz, 1970; Barro & Sala-i-Martin, 1990; Futagami et al., 1993; Sánchez-Róbles, 1998; Calderón & Servén, 2004; Agenor, 2005) that hold that public capital, especially productive infrastructure, affects growth positively. In contrast to exogenous models in which external forces drive the economy, endogenous growth models posit that economic growth results from the effect of endogenous variables such as investment. The conceptual model was introduced in section 2.4 of Chapter 2 and drew on growth theories to quantify the impact of investment in infrastructure in Burkina Faso.

Empirically, the results of this study provided evidence in support of the various empirical studies that found a positive relationship between investment in infrastructure and economic growth. In this regard, the results support the findings of Ahmed et al. (2013), Aschauer (1989), Barro (1990), Bayoudh (2012), Bekele and Ferede (2015), Boopen (2006), Borojo (2015), Servén and Calderón (2006), Calderón and Servén (2010), Canning and Pedroni (2008), Canning (1999), Chipaumire et al. (2014), Dynkelman (2008), Égert et al. (2009), Estache et al. (2005), Kumo (2012), Perkins et al. (2005), Mbanda and Chitiga (2017), Mbanda et al. (2010), Ogun (2010), Raihan (2011), Savard (2010), Zhang et al. (2013), Federreke et al. (2008), Fourie (2006), Agenor et al. (2006), Collier et al. (2015), AfDB (2018), and McKinsey (2021).

However, this study does not provide evidence of a short or long-run causality between investment in infrastructure and economic growth, nor does it specify the direction of the causality, which may be unidirectional or bidirectional. In this regard, econometric models utilising stationary time-series infrastructure investment data to perform Granger causality tests may be more appropriate to determine the causality between infrastructure investment and economic growth.

Notwithstanding the above uncertainties, the results of this study confirmed that, overall, an increase in infrastructure investment is likely to drive economic growth in Burkina Faso. The economic benefits generated by increased investment in infrastructure range from the national

level to the sectoral level through to the household level, thereby contributing to improving the overall performance of the Burkinabè economy and, ultimately, the well-being of its people through economic and financial inclusivity.

6.6 COMPARATIVE ANALYSIS OF FUNDING SOURCES

In this section, the study proceeded with a comparative analysis of the three funding sources, namely (i) debt, (ii) tax, and (iii) ODA, that was utilised to assess the impact of increased investment in infrastructure in Burkina Faso. However, it is important to note that, in practice, a country may decide to finance investment in its infrastructure through a combination of the three funding sources.

Funding sources were compared regarding their respective contribution to real GDP per capita growth following a 5% increase in investment in transport, telecommunications, and the electricity, water, and gas infrastructures. Because GDP, which includes the aggregate output of all sectors of the economy, is the most comprehensive measure of overall economic performance, the analysis in this study does not account for the other macro-, micro- and socioeconomic variables whose effects are reflected through real GDP per capita.

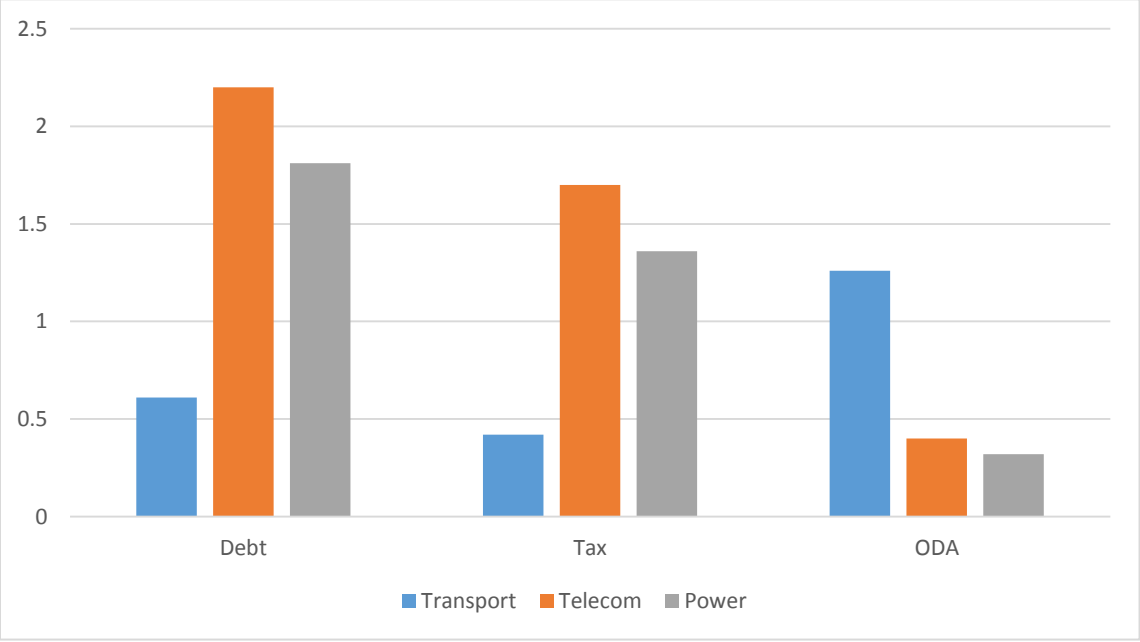

Figure 6.27: Real GDP per capita percentage growth per funding source and infrastructure sector

The findings of this study showed that ODA financing of the transport sector tends to be more beneficial to the economy of Burkina Faso as it would generate the highest increase in real GDP per capita (1.29%) compared to debt(0.64%) and tax (0.41%).

The results of this study also showed that in Burkina Faso, debt financing of an increase in investment in telecommunication infrastructure tends to be more beneficial to Burkina Faso's economy as it would generate the highest growth in real GDP per capita (2.28%) compared to tax (1.78%) and ODA (0.39%).

Similarly to the telecommunication sector, the study's findings showed that for energy infrastructure, debt financing of an increase in investment in electricity, water and gas infrastructure tends to be more beneficial to the economy of Burkina Faso as it would generate the highest growth in real GDP per capita (1.94%) compared to tax (1.42%) and ODA (0.32%).

Overall, the results of this study showed that increased investment in infrastructure through any of the three finding sources results in economic gains in Burkina Faso, especially in aggregate output. In addition, no negative impact was registered for any of the three funding sources, irrespective of the infrastructure sector. The study's findings did not, however, suggest that all funding sources provide equal benefits to the economy.

The findings of this study support several earlier empirical studies. Ahmed et al. (2013) found that in Pakistan, an increase in public investment for infrastructure through tax versus international debt resulted in macroeconomic gains and improved poverty levels in the long run. Savard (2010) found that external aid was the most equitable funding mechanism in the Philippines, while poverty reduction was best addressed by value-added tax. In Quebec, Boccanfuso et al. (2014) found that income tax had the most positive effects while business tax had the most negative effects.

Estache et al. (2010) developed a CGE model based on the EXTER model and Cobb-Douglas function for six African countries. They found little difference between the effects of different funding sources on a given type of infrastructure. Similarly, Habiba (2014) found that funding sources had little impact on economic growth in Mali. Comparing various infrastructure investment scenarios in Mali, Estache et al. (2010) found a negative impact linked to investment types, therefore resulting in foreign aid producing Dutch disease in the country. The findings of Estache et al. (2010) did not support the results of this study, which rather found that in Burkina Faso, all funding sources, irrespective of the infrastructure sector, record real GDP per capita growth.

Financing infrastructure through debt may increase interest rates on the domestic market. The cost of capital will rise, thereby crowding out private investments (Friendman, 1978; Ahmed et al., 2000; Atukeren, 2005; Agenor, 2006). However, while financing infrastructure through borrowing on the domestic market may crowd out private investment, Pradham et al. (1990)

have found that in India, debt-financed infrastructure may result in macroeconomic gains and better income distribution.

Financing infrastructure through tax may also negatively affect economic agents' savings, thus reducing private investment. Barro (1990) has, however, found that the negative impact of tax-financed infrastructure, especially taxation on capital and labour, may be contained by gains in economic growth, as infrastructure is a source of endogenous growth. Capital accumulation may be improved, thus enabling private investment. Induced externalities from investment in infrastructure maintain the marginal productivity of private capital at a high level, thus improving private sector investments. The impact of tax-financed investment in infrastructure may be influenced by the type of tax used. Baxter and King (1993) found that financing infrastructure through income tax would result in a 1.1% reduction in production, while using a lump sum tax would increase output by 1.16%. Demetriades and Mamuneas (2000) also found similar results. Conversely, Rioja (1999) has found that financing infrastructure by increasing taxation on production would increase GDP and private investment.

While ODA has been a major infrastructure investment source in developing countries, theoretical and empirical work on the impact of ODA-financed investment in infrastructure on economic growth remains contentious. ODA-financed investment in infrastructure may increase productivity through complementarity effects between public and private investments. In developing countries, however, issues related to the absorptive capacity of aid and Dutch disease may negatively affect the real exchange rate and lead to its appreciation. As a result, domestic exporting companies' production will be reduced. In addition, these companies will be more vulnerable to international competition, thus resulting in a loss of their market share with a potentially significant downturn in the country's economy. Reliance on ODA to finance infrastructure may also increase a country's dependency and ability to mobilise much-needed domestic resources that would help reduce its infrastructure deficit. ODA-financed investment in infrastructure may improve private factor productivity and the supply of non-tradable goods. Significant economic gains may be derived from ODA-financed investment in infrastructure despite the possibility of Dutch Disease (Adam, 2006; Adam and Bevan, 2006).

Moreover, the impact of ODA-financed infrastructure may be seen as a quick win (Clemens, Radelet, and Bhavnani, 2004). In this regard, Yang, Powell and Gupta (2006) pointed out that ODA's funding source is particularly relevant to the economic infrastructure sector. For ODA funding to significantly impact economic growth, the authors suggest that increased

investment in infrastructure through ODA should be channelled gradually to address the issue of absorptive capacity.

On the theoretical side, Kellermann (2004) asserted that public borrowing is not an efficient instrument to finance public investment. The paper examined the effect of public investment debt financing on social welfare and public and private capital stock. The findings of this study suggested that governments should use taxes to finance public investment because debt financing increased the opportunity costs of public investments and decreased public investment and public capital stock (Kellermann, 2004).

Conversely, studying different approaches to financing transport infrastructure in Australia and the implications for public finance, Abelson (2005) found that taxation is not an effective, efficient or equitable method of raising infrastructure finance. First, taxation can only raise a limited amount of funds. Second, it may incur a high household tax rate, resulting in economic distortions. Third, taxation involves social equity issues as the current taxpayers bear the brunt of its imposition. Instead, the author suggested that public borrowing is generally a low-cost method of borrowing as it allows for an equitable spreading of the burden of payment.

This research indicates that ODA financing of the transport sector would tend to be more beneficial to Burkina Faso's economy, followed by debt and tax financing. In this regard, the results of this research do not corroborate the findings of Kellermann (2004), who rather posited that tax financing is more efficient than public borrowing. On the other hand, the results of this study support Abelson (2005), who asserted that debt financing of transport infrastructure is more efficient than taxation. Furthermore, for the telecommunication and power sectors, the findings of my research support Abelson (2005) in that deft financing of these sectors would tend to be more beneficial to the Burkinabe economy than tax and ODA.

Few past studies were carried out regarding the empirics on infrastructure funding sources. In addition, there are some caveats when trying to compare the findings of past empirical studies with the results of this research. First, these are methodological issues when comparing the results of the mentioned studies with the findings of this research. Several studies used aggregate infrastructure investment instead of infrastructure sector investment, which this study considers. Second, previous studies did not specifically cover the three infrastructure sectors considered in this research. In the best scenario, they had studied only two of the infrastructure sectors under investigation in this research.

Considering methodological similarities, some previous studies drew on a computable general equilibrium model to assess the best-performing funding sources for investment in infrastructure.

Mbanda et al. (2017) in South Africa used a recursive dynamic CGE model to assess the impact of investment in public economic infrastructure on growth and employment. They considered three funding sources: adjustment in government deficit, taxation, and a combination of government deficit and tax. While all three funding sources exhibited positive macroeconomic gains, the combination of government deficit and tax, which is not considered in the case of Burkina Faso, contributes more to GDP growth. Similar to the findings in Burkina Faso, debt financing would tend to give better macroeconomic gains in the short term. However, the authors noted that financing infrastructure investment through budget deficit and taxation may be the least favourable outcomes in the medium- and long run.

Giesecke et al. (2008) used a dynamic multi-regional CGE model to analyse the macroeconomic impact of regional public infrastructure in Australia. They considered four funding sources: developer charges, debt, payroll tax, and residential rates. The authors have found, as in the case of Burkina Faso, that funding source matters.

Using a dynamic CGE model to compare different funding schemes (debt; a combination of debt and increased taxes) for public infrastructure investment in Quebec, Boccanfuso, Joanis, Richard and Savard (2014) found no major differences between the funding sources. However, our study found that household income tax had the best results on growth. Household income tax was not specifically analysed in the case of Burkina Faso.

Ahmed et al. (2013) found that in Pakistan, an increase in public investment for infrastructure through tax versus international debt resulted in macroeconomic gains and improved poverty levels in the long run. In the case of Burkina Faso, the findings of Ahmed et al. (2013) did not corroborate the results of this study. The research has found that debt-financed investment in the three infrastructure sectors under investigation for all funding source scenarios tends to be more beneficial to the Burkinabè economy than tax-financed investment.

Comparing various infrastructure investment scenarios in Mali, Estache et al. (2010) found a negative impact linked to investment types, therefore resulting in foreign aid producing Dutch disease in the country. The findings of Estache et al. (2010) did not support the results of this study, which rather found that in Burkina Faso, all funding sources, irrespective of the infrastructure sector, record real GDP per capita growth.

Perrault et al. (2010) developed a standard CGE to investigate the impact of scaling-up infrastructure in six African countries. They considered different financing scenarios to assess the most efficient funding source. The study found that investment funded by tax income is more favourable for some countries regarding electricity. The research results in Burkina Faso showed that for the energy sector, debt financing tends to deliver a higher increase in real GDP per capita than tax.

Estache et al. (2010) developed a CGE model based on the EXTER model and Cobb-Douglas function for six African countries. They found little difference between the effects of different funding sources on a given type of infrastructure.

Similarly, Habiba (2014) found that funding sources had little impact on economic growth in Mali. In the same vein, Savard (2010) has found little differences between the funding sources when comparing infrastructure investment financing through tax and ODA.

Bayoudh (2012) analysed the impact of public investment in infrastructure in Tunisia using a dynamic computable general equilibrium model. The author found that ODA-financed investment in transport and telecommunication infrastructure would be more beneficial to Tunisia's economy. The research results in Burkina Faso corroborated the author's findings in the transport sector. However, it does not support the author's findings for the telecommunication sector since, in Burkina Faso, debt financing in this sector would generate higher GDP growth

6.7 SUMMARY OF CHAPTER

Chapter 6 discussed the study's findings in the context of the literature review undertaken earlier in Chapter 2. This chapter discussed the economic-wide impact of a 5% investment increase in transport, telecommunications, and electricity, water, and gas infrastructures in Burkina Faso. In this regard, the chapter first introduced the macroeconomic, microeconomic and socioeconomic effects of increased investment for the three infrastructure sectors and per funding source: debt, tax and ODA.

Macroeconomic variables under consideration were real GDP per capita, CPI, imports, exports, budget balance and current account. Microeconomic variables under study were sectoral output, factor production costs and factor production income. The socioeconomic variables under consideration were household income, consumption levels and the unemployment rate. Quantitative values expressed in percentage change above the baseline or percentage points for employment were recorded in tables, reflecting the effects of increased investment in infrastructure.

Chapter 6 provided evidence that most macro-, micro- and socioeconomic variables recorded positive percentage growth above the baseline. The chapter highlighted that increased investment in infrastructure positively affected Burkina Faso's economy, as evidenced by earlier empirical studies.

Moreover, based on these findings and theoretical studies and earlier empirical reviews, the chapter discussed the relationships between investment in infrastructure and economic growth in Burkina Faso. The chapter stressed that the study's findings suggest that increased investment in infrastructure promotes growth in Burkina Faso.

Finally, the chapter proceeded with a comparative analysis of the funding sources using real GDP per capita as a variable. This comparative analysis indicated that funding source matters to economic growth as it affects real GDP per capita differently and at varying levels, although all financing sources positively aggregate output, regardless of the infrastructure sector considered.

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

7.1 INTRODUCTION

This chapter concludes this study and formulates several recommendations for policymakers in Burkina Faso, development professionals and academics. Before discussing the limitation of this study and proposals for future research, this chapter also states the study's contribution in terms of the theory and empirical impacts of investment in infrastructure on economic growth, the methodology as well as the policy implications.

Overall, the research findings showed that investment in infrastructure would spur economic growth in Burkina Faso. As economic theory predicts and is evidenced by a wide range of empirical studies, infrastructure is a key determinant of economic growth in developing countries such as Burkina Faso.

At the macroeconomic level, real GDP per capita for the transport infrastructure increased regardless of the funding source. Imports increased irrespective of the funding source while exports also rose, except for transport infrastructure financed through ODA. Burkina Faso's consumer purchasing power fell as CPI increased, irrespective of the funding source. Regardless of the infrastructure sector, the balance of budget deficit further increased in the scenario of debt financing. As a result, the deficit grew for transport infrastructure. However, it remained at the baseline level in the tax and ODA financing of increased investment in the transport infrastructure scenarios. Burkina Faso's current account fell, irrespective of the infrastructure sector. On the microeconomic side, primary sector production, secondary sector, and tertiary sector production all rose, regardless of the funding source. However, factor production prices generally rose except for non-agricultural labour. Income from factor production increased regardless of the funding source, except for labour outside the agricultural sector. Capital income increased irrespective of the funding source.

Regarding socioeconomic variables, household income and consumption levels for poor and non-poor households increased regardless of the funding source. The unemployment rate was marginally reduced in the case of an ODA-financed increase in transport infrastructure, while it grew at the same level in the scenario of debt or tax financing. The findings of this study showed that ODA financing of the transport sector tends to be more beneficial to the economy of Burkina Faso as it would generate the highest increase in real GDP per capita.

At the macroeconomic level, regardless of the funding source, real GDP per capita for the telecommunications infrastructure rose above the baseline. Real GDP per capita rose as imports, sectoral output production, capital income, household income, and consumption levels increased. CPI increased marginally following increased investment in the telecommunications infrastructure financed through debt. Financing an increase in investment in telecommunication infrastructure via tax or ODA has no impact on CPI. Similar to real GDP per capita, imports rose regardless of the funding source. Exports, with the exception of tax financing, increased. The budget balance deficit increased sharply in the scenario of debt financing. The current account depressed with increased investment in telecommunications, regardless of the funding source.

On the microeconomic side, the production of sectoral output grew. Primary sector production increased regardless of the funding source. Similar to the primary sector, production in the secondary sector also rose to nearly the same level, regardless of the funding source. The output of the tertiary sector also increased, irrespective of the funding source. Factor production prices collectively went up. The cost rose marginally for labour in the agricultural sector. Agricultural labour costs rose regardless of the funding source as wages increased following an increase in infrastructure investment. Labour costs outside the agricultural sector marginally increased. It went up if an increase in investment in telecommunication is financed through debt and tax. Prices here remain stable in the case of increased investment financed through ODA. Family labour and capital costs also rose regardless of the funding source. Although all factor production costs rose, income from all factor production increased regardless of the funding source. Concerning socioeconomic variables, household income and consumption levels for the poor and non-poor rose irrespective of the funding source. The unemployment rate marginally increased for all funding sources after increased investment in telecommunications. The results of this study also showed that in Burkina Faso, debt financing of increased investment in telecommunication infrastructure tends to be more beneficial to Burkina Faso's economy as it would generate the highest increase in real GDP per capita

On the macroeconomic side, real GDP per capita for the electricity, water, and gas infrastructure increased, regardless of the funding source. CPI increased marginally for all funding sources following increased investment in the electricity, water, and gas infrastructure. Imports rose following increased investment in the electricity, water, and gas infrastructure regardless of the funding source. Exports also increased following increased investment in electricity, water, and gas, except for tax financing. It fell against the baseline for the electricity, water, and gas infrastructure financed through tax. The budget balance further increased for debt financing of increased investment while not changing in the tax and ODA financing

scenarios. The current account fell for debt and tax financing while it slightly decreased for ODA financing. At the microeconomic level, primary sector production increased regardless of the funding source. Production of the secondary sector also rose, irrespective of the funding source.

Similarly, the output of the tertiary sector also increased regardless of the funding source. The cost rose for labour in the agricultural sector. Agricultural labour costs rose for an increase in infrastructure investment through debt. It also increased in the scenario of the tax-financed model. ODA financing resulted in a rise in the cost of labour in the agricultural sector. The cost of labour outside the agricultural sector marginally fell. It decreased when increased electricity, water, and gas investment was financed through debt. The cost fell in the scenario of tax financing and if the increase was financed through ODA. Family labour costs also increased marginally, irrespective of the funding source. Capital costs also rose, regardless of the funding source. Income from factor production increased irrespective of the funding source, except for labour outside the agricultural sector.

Concerning socioeconomic indicators, household income increased for poor and non-poor households, regardless of the funding source. Consumption levels for the poor and non-poor households also rose in all funding scenarios. The unemployment rate reduced marginally in the case of an ODA-financed increase in electricity, water, and gas investment while it grew at the same level in the debt or tax financing scenarios. This study also showed that debt financing of increased investment in the electricity, water, and gas infrastructure in Burkina Faso tended to be more beneficial to the Burkinabè economy.

At the microeconomic level, primary sector production increased regardless of the funding source. Production of the secondary sector also rose, irrespective of the funding source. Similarly, the output of the tertiary sector also increased regardless of the funding source. The cost of labour in the agricultural sector rose. Agricultural labour costs rose for an increase in infrastructure investment through debt. It also increased in the scenario of the tax-financed model. ODA financing resulted in increased labour costs in the agricultural sector. The cost of labour outside the agricultural sector marginally fell. It decreased when increased electricity, water, and gas investment was financed through debt. The cost fell in the scenario of tax financing and if the increase was financed through ODA. Family labour costs also increased marginally, irrespective of the funding source. Capital costs also rose, regardless of the funding source.

Income from factor production increased, irrespective of the funding source, except for labour outside the agricultural sector. Regarding socioeconomic indicators, household income

increased for poor and non-poor households regardless of the funding source. Consumption levels for the poor and non-poor households also rose in all funding scenarios. Furthermore, the unemployment rate reduced marginally in the case of an ODA-financed increase in electricity, water, and gas investment while it grew at the same level in the debt or tax financing scenarios. This study's findings showed that for energy infrastructure, debt financing of an increase in investment in electricity, water and gas infrastructure tends to be more beneficial to Burkina Faso's economy as it would generate the highest growth in real GDP per capita

7.2 CONTRIBUTION OF THE STUDY

Firstly, the study makes some important contributions to the theory and empirical aspects of the impact of infrastructure on economic growth. Second, this study, through its methodology, contributes to CGE modelling assumptions and application in the context of developing countries. Third, the findings of this study contribute to informing public policymaking in the infrastructure sector for low-income countries in Sub-Saharan Africa, especially Burkina Faso. Overall, this study provides evidence of the key role that infrastructure could play in spurring economic growth, people's financial inclusivity and well-being in developing African countries.

7.2.1 Theoretical contribution of the study

As theory predicted, the findings of this research confirmed that investment in infrastructure is key to economic growth in Burkina Faso. This study theoretically contributes to growth theories by providing evidence that investment in infrastructure may positively impact economic growth, especially in low-income countries with significant infrastructure deficits. Furthermore, because the GCE model is built on WALRAS general equilibrium, this study provides a practical application of this theory in the context of a developing country in Sub-Saharan Africa.

7.2.2 Contributions to the existing literature

This study enriched the limited existing literature by investigating the impact of investment in infrastructure on economic growth in Burkina Faso. Except for a few studies undertaken by Briceño and Dominguez (2011), Ouédraogo (2010), and the IMF, which was touched on earlier in section 2.2.7, very little research has been specifically dedicated to Burkina Faso. While some cross-country studies drew on existing data related to Burkina Faso, their findings provided limited detailed country-specific insights. This study, by investigating the effect of investment in infrastructure on twelve macroeconomic, microeconomic and socioeconomic variables, provides critical insights into the economy-wide impact of investment in infrastructure and economic growth in Burkina Faso. The study provides evidence covering a wide range of economic variables, including aggregate output and microeconomic and socioeconomic variables, that very few studies on infrastructure in Burkina Faso provide.

Moreover, this study also expands the literature on the subject in Sub-Saharan Africa. It is worth noting that in Africa, most studies utilised macroeconomic and econometric models to assess the impact of infrastructure on growth. In this regard, this study draws on CGE modelling and makes an important contribution to the subject through the various simulations performed. Furthermore, the comparative analysis of funding sources this study carried out brings an important point of view to the debate about the best-performing source of finance**.**

7.2.3 Methodological contribution of the study

This study brings three major methodological contributions. First, this study develops a CGE model that mimics the structure of the Burkinabè economy and analyses the impact of infrastructure investment in the country. Second, this study incorporates unemployment into the IFPRI model since Burkina Faso's economy is not at full employment, as assumed in the IFPRI model. Third, the study brings important contributions to CGE modelling in the context of infrastructure investment, particularly for developing countries.

7.2.4 Policy contribution of the study

This study provides evidence to policymakers that infrastructure and infrastructure investment contribute significantly to Burkina Faso's economic growth. Furthermore, this study's findings support Burkina Faso's current public policy strategy, especially the *Plan National de Developpement Economique et Social,* in which infrastructure is a key strategic pillar expected to significantly contribute to the structural transformation of the Burkinabè economy.

While this research provides evidence of the positive economy-wide effects of increased infrastructure investment in Burkina Faso, it also points out its negative impact on the economy, depending on the infrastructure sector and the financing source under consideration. In recent years, national public opinion and Parliament have been making repeated calls on the Government to justify the massive investment in infrastructure envisioned under the *Plan National de Developpement Economique et Social.* The findings of this study provide evidence to the Government, the policy proponents, and opponents to back up their claims on the key role that infrastructure could play in shaping Burkina Faso's economy. At the same time, as the findings of this study showed, investment in infrastructure may negatively impact the economy, a reminder to Government that their narrative and views about infrastructure investments only generating positive economic benefits for the country may not hold true in certain circumstances. In this respect, depending on the desired policy outcome, policymakers should consider a mix of funding sources to mitigate any potential negative impact of a particular funding source for infrastructure projects.

7.3 RECOMMENDATIONS

The study findings showed that financing sources matter as economic benefits derived from investment in infrastructure may vary by funding source and type of infrastructure sector. In this regard, should Burkina Faso focus its investment in infrastructure in a particular infrastructure sector and target a specific funding source? The results of this research indicate that while funding sources matter, they all exhibit a positive effect on real GDP in Burkina Faso, regardless of the infrastructure sector, suggesting that at this stage of development of the Burkinabè economy, the infrastructure sectors under study, as well as all types of funding sources, play an important role. In this respect, it would seem reasonable for Burkina Faso to target a mix of funding sources combining debt, tax and ODA with a strategic view of debt sustainability. However, As Ewuosho put it, “Attracting investment is one thing but channelling the investment in the most useful context that maximises the outcomes for a given population is a separate challenge” (Ewuosho, 2020).

In Burkina Faso, while infrastructure strategic and operational plans exist, they fail to account for the wider value and benefits that infrastructure investment is expected to provide to the country. As Flyvbjerg (2007) notes , a key feature of failed infrastructure projects is the lack of clearly articulated value and benefits. Moreover, developing disjointed pieces of infrastructure would unlikely deliver an economic impact at scale since the underlying foundation for cross-cutting infrastructure strategic planning involving various stakeholders is not in place. Therefore, this study recommends that policymakers in Burkina Faso clearly articulate and quantify the value and benefits that could be derived from infrastructure outside its core function in their strategic planning.

7.4 LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

While this research brings some important contributions to the theory and empirics of infrastructure and economic growth, as well as methodological and policy contributions, there are limitations in the study.

The first limitation of the study largely emanates from the limitations of CGE modelling. There is often uncertainty over parameters, specifications, and experimental design. In CGE modelling, the benchmark equilibrium implies functional forms requiring a choice of elasticities and other parameter values based on empirical work. In addition, CGE models focus on the relationship between relative price changes and the flow of goods and services, not levels of prices. Moreover, data requirements of CGE models are substantial as CGE models are data-demanding and do not tolerate inconsistencies in data. Therefore, CGE models are not ideally suited to handling some macroeconomic questions. It is worth noting that CGE models do not

answer all the questions. Hence, it should be ideally used together with other tools and models. The second limitation of our study is that the model of this study does not capture the induced social benefits of increased investment in infrastructure. In addition, the study's model, which is mainly quantitative, does not account for the infrastructure's quality and access dimensions.

Finally, the study also formulates four potential areas of interest for future research direction. First, researching infrastructure requires a multidimensional approach. Scholars increasingly embrace a more holistic approach to studying infrastructure as a system. In this respect, infrastructure type or right amount, infrastructure best geographical area or optimum level, and integrating all dimensions of quantity, quality and access should be duly considered. This study recommends researching infrastructure as a system in the context of Burkina Faso.

Second, empirical reviews suggest that transport infrastructure has large externalities and spillovers, especially in the health and education sector in low-income countries in Sub-Saharan Africa, such as Burkina Faso. Given the crucial role that health and education play in the country, future studies on the economy-wide impact of investment in transport infrastructure in Burkina Faso should attempt to capture and quantify these externalities. Agenor (2006) stipulates that rather than increasing direct spending on health or education, "the best way to increase production of health services, raise output growth, and improve welfare may be to invest more in transport infrastructure" (Agenor, 2006, p.33). In this regard, and given the limited financial resources at play in Burkina Faso, this study recommends that due consideration be given in future research to testing Agenor's assertion in the context of Burkina Faso.

Third, amid climate change impact in developing countries and given that adaptation finance to date compared to mitigation still receive a small portion of climate finance, building resilient transport infrastructure systems upfront in Burkina Faso would be key in the long-term economic growth of the country. According to the Global Commission on Adaptation, every $1 invested in making new transport infrastructure resilient to climate change could yield almost $5 in benefits (GCA, 2022). Investing in a resilient transport infrastructure, therefore, makes sound economic sense. The study recommends that future studies in Burkina Faso consider options to draw on CGE modelling to investigate the wide economic impact of climate-resilient transport infrastructure in Burkina Faso.

Finally, given the severe impact of Covid-19 on developing countries' economies, a future study delineating its impact on the transport, energy and telecommunication sectors in Burkina Faso would be welcomed as it would provide additional recommendations for policy measures.

7.5 SUMMARY OF THE CHAPTER

Chapter 7 of the study highlighted, in the first instance, the main contribution of this research in terms of theory, empirical research, methodology and policy. It does so with particular consideration of the Burkinabè context.

This study contributes mainly to growth theories. Therefore, it extends the existing literature on the impact of infrastructure on economic growth in Sub-Saharan Africa in general and in Burkina Faso in particular. This chapter also briefly provided the methodological contribution of this study based on CGE modelling. Furthermore, Chapter 7 stated the policy contribution of this research and formulated some recommendations for policymakers in Burkina Faso. In addition, this chapter discussed the limitations of this study, which were mainly related to CGE modelling. It then concluded by formulating recommendations concerning further studies in Burkina Faso.

Overall, these research findings showed that increased investment in infrastructure would promote growth in Burkina Faso. This research provided evidence in support of the PNDES, in which investment in infrastructure is a key strategic pillar. At the same time, this study calls on policymakers to carefully consider the funding source as it may negatively impact some economic variables. Moreover, this research urges policymakers to consider accounting for the wider value and benefits of infrastructure in Burkina Faso’s infrastructure investment strategic planning.

REFERENCES

Abelson, P. (2005). Financing transport infrastructure: Public finance issues. In K.J. Button & D.A. Hensher (Eds.), *Handbook of transport strategy, policy and institutions* (Vol. 6), 359-373. Emerald Group Publishing Limited.

Acaravci, A., & Ozturk, I. (2010). Electricity consumption-growth nexus: Evidence from panel data for transition countries. *Energy Economics, 32*(3), 604–608. https://www.sciencedirect.com/science/article/pii/S0140988309001996

Acaravci, A., & Ozturk, I. (2012). Electricity consumption and economic growth nexus: A multivariate analysis for Turkey. *Economic Amphitheatre, 14*(31), 246–257. https://www.amfiteatrueconomic.ro/temp/Article_1114.pdf

Adam, C. (2006) "Exogenous inflows and real exchange rates: Theoretical quirk or empirical reality? " in P. Isard, L. Lipschitz, A. Mourmouras, and B. Yontcheva, The macroeconomic management of foreign aid: Opportunities and Pitfalls, Washington: International Monetary Fund.

Adam, C. and D. Bevan (2006). Aid and the supply side: public investment, export performance and Dutch Disease in low income countries. World Bank Economic Review, 20(2), 261-290 https://doi.org/10.1093/wber/lhj011

Adams, S., & Ford, J. (2009). Telecommunications infrastructure and economic development in Sub- Saharan Africa, GIMPA. *Journal of Management, Leadership and Administration, 5*(2), 122-140.

African Development Bank. (2018). Africa Infrastructure Development Index (AIDI). https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/Economic_Brief_-_The_Africa_Infrastructure_Development_Index.pdf. August 17, 2021

African Development Bank (2018). Africa's infrastructure: great potential but little impact on inclusive growth. African Economic Outlook (AEO) 2018. Retrieved from https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/2018AEO/African_Economic_Outlook_2018_-_EN_Chapter3.pdf September 23, 2021

African Development Bank. (2021). African Economic Outlook (AEO) 2021. https://www.afdb.org/en/documents/african-economic-outlook-2021. August 26, 2021

Agénor, P. R., & Moreno-Dodson, B. (2006). Public infrastructure and growth: New channels and policy implications (Vol. 4064). World Bank Publications. https://openknowledge.worldbank.org/handle/10986/8880. April 24, 2021

Ahmed, H., & Miller, S. M. (2000). Crowding-out and crowding-in effects of the components of government expenditure. *Contemporary Economic Policy, 18*(1), 124-133 https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1465-7287.2000.tb00011.x

Ahmed, R., & Donovan, C. (1992). *Issues of infrastructural development: A synthesis of the literature*. International Food Policy Research Institute .9-31

Ahmed, V., Abbas, A., & Ahmed, S. (2013). Public infrastructure and economic growth in Pakistan: A dynamic CGE-microsimulation analysis. In J. Cockburn, Y. Dissou, J.-Y. Duclos, & L. Tiberti, *Infrastructure and economic growth in Asia*. 117-143. Springer, Cham.

Aker, J. C., & Mbiti, I. M. (2010). Mobile phones and economic development in Africa. *Journal of economic Perspectives, 24*(3), 207-32. https://pubs.aeaweb.org/doi/pdfplus/10.1257/jep.24.3.207

Akkoyunlu, Ş. (2018). An empirical analysis of diaspora bonds. *Journal of Economic and Political Economy, 5*(1). http://dx.doi.org/10.1453/jepe.v5i1.1566

Alleman, J. (2002). A new view of telecommunications economics. *Telecommunications Policy, 26*(1-2), 87-92. https://d1wqtxts1xzle7.cloudfront.net/44034711

Alleman, J., Hunt, C., Michaels, D., Mueller, M., Rappoport, P., & Taylor, L. (1994). Telecommunications and economic development: Empirical evidence from Southern Africa. In 10th biennial international telecommunications society meeting, Sydney.

Alliance for Affordable Internet. (2017). *Affordability Report*. https://a4ai.org/research/affordability- report/affordability-report-2017/

Altinay, G., & Karagol, E. (2005). Electricity consumption and economic growth: Evidence from Turkey. *Energy Economics, 27*(6), 849–856. https://doi.org/10.1016/j.eneco.2005.07.002

Aqeel, A., & Butt, M. S. (2001). The relationship between energy consumption and economic growth in Pakistan. *Asian Pacific Development Journal, 8*(2), 101-110. https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=d9708bcc8350a12f0c93f18c52507d9b5c9946d2

Arbouch, M., Canuto, O., & Vazquez, M. (2020). *Africa infrastructure finance*. https://www.policycenter.ma/publications/africa%E2%80%99s-infrastructure-finance. August 10, 2021

Arezki, R., Bolton, P., Peters, S., Samama, F., & Stiglitz, J. (2017). From global savings glut to financing infrastructure. *Economic Policy, 32*(90), 221-261. https://doi.org/10.1093/epolic/eix005

Aschauer, D. A. (1989). Is public expenditure productive? *Journal of Monetary Economics, 23*(2), 177-200. https://www.policycenter.ma/publications/africa%E2%80%99s-infrastructure- finance

Atsu, F., Agyei, C., Darbi, W. P., & Adjei-Mensah, S. (2014). The impact of telecommunication revenue on economic growth: Evidence from Ghana. *African Journal of Economic and Management Studies*, 5(2), 195-208. https://doi.org/10.1108/AJEMS-10-2011-0076

Atukeren, E. (2005). Interaction between Public and Private Investment: Evidences from Developing Countries", Kyklos, 58(3), 307-330. https://doi.org/10.1111/j.0023-5962.2005.00290.x

Aydin, L. (2010). The economic and environmental impacts of constructing hydro power plants in Turkey: a dynamic CGE analysis (2004-2020). *Natural Resources, 1*(2), 69. https://www.scirp.org/pdf/nr20100200008_45903192.pdf

Badran, M. F. (2012). The impact of broadband infrastructure on economic growth in some Arab and emerging countries. Topics in Middle Eastern and North African Economies, 14. https://ecommons.luc.edu/cgi/viewcontent.cgi?article=1161&context=meea

Bahan, D., Montelpare A., & Savard L. (2011). An analysis of the impact of public infrastructure spending in Quebec. GREDI Working Paper 11-07. https://econpapers.repec.org/paper/shrwpaper/11-07.htm.

Barro, R., & Sala-i-Martin, X. (2004). Economic growth second edition. The MIT Press.

Barro, R. J. (1990). Government spending in a simple model of endogenous growth. *Journal* of Political Economy, 98(S5), 103-125. https://www.jstor.org/stable/2937633

Bayoudh, M. (2012). Investissement en infrastructure publique et croissance en Tunisie: une analyse en équilibre général calculable [doctoral dissertation]. Université Laval.

Baxter, M. And R.G. King (1993) "Fiscal policy in general equilibrium", American Economic Review, 83, 315–334.

Behrman, J. R., & Wolfe, B. L. (1987). How does mother's schooling affect family health, nutrition, medical care usage, and household sanitation? *Journal of Econometrics, 36*(1-2), 185-204. https://doi.org/10.1016/0304-4076(87)90049-2

Bekele, S., & Ferede, T. (2015). Economy-wide impact of investment in road infrastructure in Ethiopia: A recursive dynamic CGE approach. *Ethiopian Journal of Business and Economics (The), 5*(2), 187-213. htpp://dx.doi.org/10.4314/ejbe.v5i2.2

Berndt, E. R., & Hansson, B. (1991). Measuring the contribution of public infrastructure capital in Sweden. *The Scandinavian Journal of Economics, 94*(Suppl), S151-S168. https://doi.org/10.2307/3440255.

Boccanfuso, D., & Savard, L. (2010). Analyse d'impacts de la construction de l'autoroute Dakar- Thiés: Un modéle d'équilibre général calculable multiménages intégré.

Canadian Journal of Development Studies/Revue canadienne d'études du développement, *29*(3-4), 435-464. https://www.tandfonline.com/doi/abs/10.1080/02255189.2010.9669267

Boccanfuso, D., Joanis, M., Richard, P., & Savard, L. (2014). A comparative analysis of funding schemes for public infrastructure spending in Quebec. Applied Economics, 46(22), 2653-2664. https://www.tandfonline.com/doi/abs/10.1080/00036846.2014.909576

Bogetic, Z. & Fedderke, J. (2005). Infrastructure and growth in South Africa: Benchmarking, productivity and investment needs. In ESSA conference.

Boopen, S. (2006). Transport infrastructure and economic growth: Evidence from Africa using dynamic panel estimates. *The Empirical Economic Letters,* *5*(1). https://www.researchgate.net/profile/Boopen-Seetanah/publication/228622395_Transport_Infrastructure_and_Economic_Growth_Evidence_from_Africa_Using_Dynamic_Panel_Estimates/links/5e81eaffa6fdcc139c144220/Transport-Infrastructure-and-Economic-Growth-Evidence-from-Africa-Using-Dynamic-Panel-Estimates.pdf

Borojo, D. G. (2015). The economy-wide impact of investment on infrastructure for electricity in Ethiopia: A recursive dynamic computable general equilibrium approach. *International Journal of Energy Economics and Policy,* *5*(4), 986-997. https://dergipark.org.tr/en/download/article-file/361563

Bouoiyour, J., & Selmi, R. (2013). The nexus between electricity consumption and economic growth in MENA countries. *Energy Studies Review,* *20*(2), 25–41. https://dergipark.org.tr/en/download/article-file/361348

Brenneman, A., & Kerf, M. (2002). Infrastructure and poverty linkages: A literature review [Unpublished what?]. The World Bank.

Briceño-Garmendia, C., & Domínguez-Torres, C. (2011). Burkina Faso's infrastructure: A continental perspective. Africa Infrastructure Country Diagnostic. World Bank. https://openknowledge.worldbank.org/handle/10986/27261 License: CC BY 3.0 IGO.

Burfisher, M. E. (2017). *Introduction to computable general equilibrium models*. Cambridge University Press.

Calderón, C., & Chong, A. (2004). Volume and quality of infrastructure and the distribution of income: An empirical investigation. Review of Income and Wealth 50(1), 87-105. https://doi.org/10.1111/j.0034-6586.2004.00113.x

Calderón, C., & Servén, L. (2004). *The effects of infrastructure development on growth and income distribution*. The World Bank. 13-26

Calderón, C., & Servén, L. (2008). Infrastructure and economic development in Sub-Saharan Africa. World Bank policy research working paper 4712. https://openknowledge.worldbank.org/handle/10986/6988#:~:text=Sub%2DSaharan%20Afri ca%20ranks%20consistently,poverty%20reduction%20across%20the%20region.

Calderón, C., & Servén, L. (2010). Infrastructure and economic development in Sub-Saharan Africa. *Journal of African Economies, 19*(suppl_1), i13-i87. https://doi.org/10.1093/jae/ejp022

Calderón, C., Moral-Benito, E., & Servén, L. (2011). Is infrastructure capital productive? A dynamic heterogeneous approach. *Policy Research Working Papers.* https://doi.org/10.1596/1813- 9450-5682

Canning, D., & Fay, M. (1993). *The effect of transportation networks on economic growth*. Columbia University.16-29

Canning, D., & Pedroni, P. (2008). Infrastructure, long-run economic growth and causality sets for cointegrated panels. *The Manchester School, 76*(5): 504–527. https://doi.org/10.1111/j.1467- 9957.2008.01073.x

Canning, D. (1999). The contribution of infrastructure to aggregate output. The World Bank Policy Research Working Paper. https://documents1.worldbank.org/curated/en/563251468739159840/118518322_2004 111 7163541/additional/multi-page.pdf

Canova, F., & Ortega, E. (2000). 15 Testing calibrated general equilibrium models. Simulation-based Inference in Econometrics: Methods and Applications.https://doi.org/10.1017/CBO9780511751981

Cantú, C. (2017). Defining infrastructure and its effect on economic growth. *Equilibrio Económico, Revista de Economía, Política y Sociedad, 13*(1), pp.77-104.

Casaburi, L., Glennerster, R., & Suri, T. (2013). *Rural roads and intermediated trade: Regression discontinuity evidence from Siërra Leone*. https://scholar.harvard.edu/files/lorenzocasaburi/files/casaburi_glennester_suri_roads. pdf

Çelik, S., & Isaksson, M. (2013). Institutional investors as owners: who are they and what do they do? *OECD Corporate Governance Working Papers No. 11*. https://doi.org/10.1787/22230939

Chander, A. (2001). Diaspora bonds. *NYUL Review, 76*, 1005.

Chandran, V. G. R., Sharma, S., & Madhavan, K. (2010). Electricity consumption-growth nexus: The case of Malaysia. *Energy Policy, 38*(1), 606–612. https://doi.org/10.1016/j.enpol.2009.10.013

Chen, Y., Inglesi-Lotz, R., & Chang, T. (2017). Revisiting the asymmetric causal link between energy consumption and output in China: Focus on coal and oil consumption. *Energy Sources, Part B: Economics, Planning and Policy, 12*(11), 992–1000. https://doi.org/10.1080/15567249.2017.1344745

Chipaumire, G., Ngirande, H., & Ruswa, Y. (2014). The impact of government spending on economic growth: Case South Africa. *Mediterranean Journal of Social Sciences, 5*(1), 109. https://doi.org/10.5901/mjss.2014.v5n1p109

Chude, N. P., & Chude, D. I. (2013). Impact of government expenditure on economic growth in Nigeria. *International Journal of Business and Management Review, 1*(4), 64-71.

Collier, P., & Cust, J. (2015). Investing in Africa's infrastructure: Financing and policy options. *Annual Review of Resource Economics, 7*(1), 473-493. https://doi.org/10.1146/annurev-resource- 100814-124926

Collier, P., & Mayer, C. (2013). Unlocking private finance for African infrastructure. *Columns in Social Europe Journal*. https://www.urosario.edu.co/Servicios-Legales-Y-Construccion-de-Paz- Colombia/Dialogo-Guiado-3/materialDeApoyo/Unlocking-Private-Finance-for-African- Infrastructu.pdf

Correa, L. (2006). The economic impact of telecommunications diffusion on UK productivity growth. *Information Economics and Policy, 18*(4), 385–404. https://doi.org/10.1016/j.infoecopol.2006.04.001

Dakpogan, A. G. (2019). *Modelling the effect of disruption to electricity supply on economic growth in Benin* [Doctoral dissertation]. Stellenbosch University. 106-179. https://core.ac.uk/download/pdf/268882993.pdf

Datta, A., & Agarwal, S. (2004). Telecommunications and economic growth: a panel data approach. Applied Economics, 36(15), 1649–1655. https://doi.org/10.1080/0003684042000218552

David, O. O. (2019). Nexus between telecommunication infrastructures, economic growth and development in Africa: Panel vector autoregression (P-VAR) analysis. *Telecommunications Policy, 43*(8), 101816. https://doi.org/10.1016/j.telpol.2019.03.005

Della Croce, R., & Gatti, S. (2014). Financing infrastructure–International trends. *OECD Journal: Financial Market Trends, 2014*(1), 123-138. https://doi.org/10.1787/19952872

Demetriades P.O, T.P. Mamuneas, (2000) "Intertemporal output and employment effects of public infrastructure capital: evidence from 12 OECD economies", Economic Journal, 110, 687–712. https://doi.org/10.1111/1468-0297.00561

Dethier, J. J. (2015). Infrastructure in Africa. *The Oxford handbook of Africa and economics*, volume 2. Oxford University Press. 2-13

Development Bank of Southern Africa. (1998). Infrastructure: A foundation for development. Development Report 1998.

Diao, X., & Thurlow, J. (2012). A recursive dynamic computable general equilibrium model. In X. Diao, J. Thurlow, S. Benin, & S. Fan (eds.). Strategies and priorities for African agriculture: Economywide perspectives from country studies, pp.17-50. [https://www.ifpri.org/publication/strategies-and-priorities-african-agriculture-0]

Diewert, W. E. (1986). The measurement of the economic benefits of infrastructure services. Springer-Verlag.

Dinkelman, T. (2011). The effects of rural electrification on employment: New evidence from South Africa. *American Economic Review, 101*(7), 3078-3108. https://doi.org/10.1257/aer.101.7.3078

Dissou, Y., & Didic, S. (2011). Public infrastructure and economic growth a dynamic computable general equilibrium analysis with heterogeneous agents. Working Paper, University of Ottawa. https://ideas.repec.org/p/ekd/002625/3368.html

Dixon, P. B., & Jorgenson, D. W. (eds.). (2013). *Handbook of computable general equilibrium*. https://www.sciencedirect.com/handbook/handbook-of-computable-general-equilibrium- modeling. April 15, 2018

Dixon, P. B., Koopman, R. B., & Rimmer, M. T. (2013). The MONASH style of computable general equilibrium modeling: A framework for practical policy analysis. In P.B. Dixon, & D.W. Jorgenson, *Handbook of computable general equilibrium modeling* (Vol. 1). 23-103). Elsevier.

Donou-Adonsou, F., Lim, S., & Mathey, S. A. (2016). Technological progress and economic growth in Sub-Saharan Africa: Evidence from telecommunications infrastructure. *International Advances in Economic Research, 22*(1), 65-75. https://doi.org/10.1007/s11294-015-9559-3

Duflo, E. & Pande, R. (2007). Dams. *The Quarterly Journal of Economics, 122*(2), 601-646.
Duggal, V. G., Saltzman, C., & Klein, L. R. (1999). Infrastructure and productivity: a nonlinear approach. *Journal of Econometrics, 92*(1), 47-74. https://doi.org/10.1162/qjec.122.2.601

Dumont, J. C., & Mesplé-Somps, S. (2000). *The impact of public infrastructure on competitiveness and growth: A CGE analysis applied to Senegal*. https://www.semanticscholar.org/paper/The-Impact-of-Public-Infrastructure-on-and-Growth-%3A-Dumont/4dd3134a34172bccfe22cf39c0c8286d51858ffb

Eberhard, A., Foster, V., Briceño-Garmendia, C., Ouedraogo, F., Camos, D., & Shkaratan, M. (2008). Africa infrastructure country diagnostic (AICD). Underpowered: The state of the power sector in Sub-Saharan Africa. World Bank.2-50

Égert, B., Kozluk, T., & Sutherland, D. (2009). *Infrastructure and growth: Empirical evidence working paper 685.* Organisation for Economic Cooperation and Development. 14-19

EIB Papers. (2010). Public and private financing of infrastructure: Evolution and economics of private infrastructure finance. *EIB Papers, 15*(1). https://www.eib.org/attachments/efs/eibpapers/eibpapers_2010_v15_n01_en.pdf

Enang, B. U. (2010). Industrial development, electricity crises and economic performance in Nigeria. European *Journal of Economics, Finance and Administration Sciences*, 105-121. https://www.researchgate.net/publication/286003483_Industrial_development_electri city_cri sis_and_economic_performance_in_Nigeria

Estache, A. & Garsous, G. (2012). The impact of infrastructure on growth in developing countries. IFC Economics Notes, 1.

Estache, A., Speciale, B., & Veredas, D. (2005). How much does infrastructure matter to growth in Sub-Saharan Africa. unpublished, World Bank (June 2005).5-18

Estache, A., Perrault, J. F., & Savard, L. (2009). Impact of infrastructure spending in Mali: A CGE modeling approach [Unpublished manuscript].11-27

Estache, A., Perrault, J. F., & Savard, L. (2010). *The impact of infrastructure spending in Sub-Saharan Africa: A CGE modeling approach*. The World Bank. https://doi.org/10.1596/1813- 9450-5386

Estache, A. (2010). Infrastructure finance in developing countries: An overview. *EIB Papers, 15*(2), 60-88. http://hdl.handle.net/10419/45371

Ewuosho, S. (2020). *Infrastructure in Africa: Turning investment to impact*. Future Africa Forum. https://futureafricaforum.org/2129/. January 30, 2022

Fay, M., Martimort, D., & Straub, S. (2021). Funding and financing infrastructure: the joint-use of public and private finance. Journal of Development Economics, 150, 102629. 2-4 https://doi.org/10.1016/j.jdeveco.2021.102629

Fedderke, J., & Garlick, R. (2008). Infrastructure development and economic growth in South Africa: A review of the accumulated evidence. Policy paper, 12. https://www.ecsecc.org/datarepository/documents/pp12_55323.pdf. August 7, 2021

Fedderke, J. W., & Bogetić, Ž. (2009). Infrastructure and growth in South Africa: Direct and indirect productivity impacts of 19 infrastructure measures. *World Development, 37*(9), 1522-1539. https://doi.org/10.1016/j.worlddev.2009.01.008

Fedderke, J. W., Perkins, P., & Luiz, J. M. (2006). Infrastructure investment in long-run economic growth: South Africa 1875–2001. *World Development, 34*(6), 1037-1059. https://doi.org/10.1016/j.worlddev.2005.11.004

Federal Geographic Data Committee (2009). Economic Justification: Measuring Return on

Investment (ROI) and Cost Benefit Analysis (CBA). Retrieved from https://www.fgdc.gov/initiatives/50states/newspbp/EconomicJustification_ROI-CBA-Tutorial_v2_052809_FinalVersa.pdf, August 17, 2021. August 17, 2021

Flyvbjerg, B. (2007). Policy and planning for large-infrastructure projects: Problems, causes, cures. Environment and Planning B: Planning and Design, 34(4), 578-597.

Fofana, I., Diallo, M. Y., Sarr, O., & Diouf, A. (2015). *2011 social accounting matrix for Senegal*. https://www.ifpri.org/publication/2011-social-accounting-matrix-senegal

Fofana, I., Lemelin, A., & Cockburn, J. (2002). Balancing a social accounting matrix. CREFA-Université Laval.1-11

Foster, V., & Briceño-Garmendia, C. (2010). Africa's infrastructure: A time for transformation. World Bank. 43-83

Fourie, J. (2006). Economic infrastructure: A review of definitions, theory and empirics. *South African Journal of Economics, 74*(3), 530-556. https://doi.org/10.1111/j.1813-6982.2006.00086.x

Friedman, B. M. (1978). Crowding out or crowding in? The economic consequences of financing government deficits (No. w0284). National Bureau of Economic Research.

Galiani, S., Gertler, P., & Schargrodsky, E. (2005). Water for life: The impact of the privatization of water services on child mortality. *Journal of political economy, 113*(1), 83-120. https://bibliotecadigital.fgv.br/dspace/bitstream/handle/10438/12617/1144.pdf

Galinis, A., & Van Leeuwen, M. J. (2000). A CGE model for Lithuania: The future of nuclear energy. Journal of Policy Modeling, 22(6), 691-718. https://doi.org/10.1016/S0161-8938(98)00028-3

German-Soto, V., & Bustillos, H. A. B. (2014). The nexus between infrastructure investment and economic growth in the Mexican urban areas. *Modern Economy, 5*(13), 1208. http://dx.doi.org/10.4236/me.2014.513112

Ghosh, S. (2002). Electricity consumption and economic growth in India. Energy Policy, 30(2), 125–129. https://doi.org/10.1016/S0301-4215(01)00078-7

Giesecke, J. (2006). The national and regional economic consequences of rapid growth in Australia's telecommunications sector. *Economic Analysis and Policy, 36*(1-2), 61-97. https://doi.org/10.1016/S0313-5926(06)50005-0

Girma, H. (2000). Energy law: Ethiopia. International Encyclopeadia of Laws. Kluwer Law International.

Global Center on Adaptation. (2022). *Adaptation dialogues for Africa: Strengthening climate resilience of infrastructure in Africa*. https://gca.org/events/adaptation-dialogues-for-africa- strengthening-climate-resilience-of-infrastructure-in-africa/

Gómez-Barroso, J. L., & Marbán-Flores, R. (2020). Telecommunications and economic development–The 21st century: Making the evidence stronger. *Telecommunications Policy, 44*(2), 101905. https://doi.org/10.1016/j.telpol.2019.101905

Gómez-Ibáñez, J. A. (2003). Regulating infrastructure: Monopoly, contracts, and discretion. Harvard University Press.

Gramlich, E. M. (1994). Infrastructure investment: A review essay. *Journal of Economic Literature, 32*(3), 1176-1196.

Griffiths, A., & Meinicke, C. (2014). Introduction to social impact bonds and early intervention – Initial report. Early Intervention Foundation.

Gumede, W., Monyae, D., & Motshidi, K. (2012). An African diaspora bond for infrastructure development: Lessons learnt from India, Israel and Islamic bonds. Development Bank of Southern Africa Policy Brief. 1-6

Habiba, A. W. (2014). Accroissement des depenses publiques en infrastructures: Un MEGC Dynamique Sequentiel Applique au Mali. Université de Sherbrooke. 36-57

Hansen, N. M. (1965). Unbalanced growth and regional development. *Economic Inquiry, 4*(1), 3-14.

Hardy, A. P. (1980). The role of the telephone in economic development. *Telecommunications Policy, 4*(4), 278-286. https://doi.org/10.1016/0308-5961(80)90044-0

Hirschman, A. O. (1958). The strategy of economic development. Yale University Press.

Ho, C. Y., & Siu, K. W. (2007). A dynamic equilibrium of electricity consumption and GDP in Hong Kong: An empirical investigation. *Energy Policy, 35*(4), 2507–2513. https://doi.org/10.1016/j.enpol.2006.09.018

Holtz-Eakin, D., & Lovely, M. E. (1996). Scale economies, returns to variety, and the productivity of public infrastructure. *Regional Science and Urban Economics, 26*(2), 105-123. https://doi.org/10.1016/0166-0462(95)02126-4

Hossine Sharif, S. (2017). Telecommunication and its impact over the economic development of SAARC countries. In S. Sharif. (2016). Telecommunication and its impact over the economic development of SAARC countries. http://dx.doi.org/10.2139/ssrn.2810057

Hulten, C. R. & Schwab, R. M. (1984). Regional productivity growth in US manufacturing: 1951-78. *The American Economic Review, 74*(1), 152-162.

Humphrey, C. (2018). *Channelling private investment to infrastructure: What can multilateral development banks realistically do?* ODI working paper. https://odi.org/en/publications/channelling-private-investment-to-infrastructure-what-can- multilateral-development-banks-realistically-do/

ICGN. (2013). *Guidance on institutional investor responsibilities*. International Corporate Governance Network. 5-20

IMF. (2016). *Impact of public investment scaling-up in Burkina Faso: Principles and underlying determinants.* International Monetary Fund. 5-10

Jamil, F., & Ahmad, E. (2010). The relationship between electricity consumption, electricity prices and GDP in Pakistan. *Energy Policy, 38*(10), 6016–6025. https://doi.org/10.1016/j.enpol.2010.05.057

Jedwab, R., Kerby, E., & Moradi, A. (2014). *History, path dependence and development: Evidence from colonial railroads, settlers and cities in Kenya*. Working Paper 2014-02. George Washington University.3-28

Jedwab, R., & Moradi, A. (2012). *Colonial investments and long-term development in Africa: Evidence from Ghanaian railroads*. Working Paper. George Washington University. 2-20

Jensen, R.T. (2007). The digital provide: information (technology), market performance and welfare in the south Indian fisheries sector. *Quarterly Journal of Economics, 122*(3), 879–924. https://doi.org/10.1162/qjec.122.3.879

Jerome, A. (1999). Infrastructure in Africa: The record, African Development Bank. *Economic Research Papers (International), No. 46:1-28*. African Development Bank.

Jha, P., & Kaleja, M. (2008). Telecommunication and economic growth in India.115-208

Jumbe, C. B. L. (2004). Cointegration and causality between electricity consumption and GDP: Empirical evidence from Malawi. *Energy Economics, 26*(1), 61–68. https://www.jstor.org/stable/25098864

Kabedi-Mbuyi, M. M., Diouf, M. A., & Ngouana, M. C. A. L. (2016). *Walking a fine line: Public investment scaling-up and debt sustainability in Burkina Faso*. International Monetary Fund. 3-31 https://econpapers.repec.org/scripts/redir.pf?u=http%3A%2F%2Fwww.imf.org%2Fexternal%2Fpubs%2Fcat%2Flongres.aspx%3Fsk%3D43761;h=repec:imf:imfdps:2016/006

Kahsay, T. N., Kuik, O., Brouwer, R., & Van Der Zaag, P. (2015). Estimation of the transboundary economic impacts of the Grand Ethiopia Renaissance Dam: A computable general equilibrium analysis. *Water Resources and Economics, 10*(April), 14-30. https://doi.org/10.1016/j.wre.2015.02.003

Kay, J. (1990). Efficiency and private capital in the provision of infrastructure. *Infrastructure Policies for the 1990s*. OECD.55-71

Kellenberg, D. K. (2009). US affiliates, infrastructure and growth: A simultaneous investigation of critical mass. *The Journal of International Trade & Economic Development, 18*(3), 311-345. https://doi.org/10.1080/09638190902986488

Kellermann, K. (2004). *Allocative Inefficiency of Debt Financing of Public Investment: An Ignored Aspect of" The Golden Rule of Public Sector Borrowing"*. Faculty of Economic and Social Sciences-University of Fribourg.

Ketkar, S. L., & Ratha, D. (2007). Development finance via diaspora bonds track record and potential. *World Bank Policy Research Working Papers*. https://doi.org/10.1596/1813-9450- 4311. June 24, 2022

Khandker, S., Lavy, V., & Filmer, D. (1994). Schooling and cognitive achievements of children in Morocco. *Discussion Paper No. 264.* World Bank.6-24

Kim, Y. G., Kim, H. W., Yoon, J. W., & Ryu, H. S. (1997). Building an organizational decision support system for Korea Telecom: A process redesign approach. *Decision Support Systems, 19*(4), 255-269. https://doi.org/10.1016/S0167-9236(96)00066-8

Kodongo, O., & Ojah, K. (2016). Does infrastructure really explain economic growth in Sub-Saharan Africa? *Review of Development Finance, 6*(2), 105-125. https://doi.org/10.1016/j.rdf.2016.12.001

Kosec, K. (2014). The child health implications of privatizing Africa's urban water supply. Journal of Health Economics, 35(May), 1–19. https://doi.org/10.1016/j.jhealeco.2014.01.006

Kularatne, C. (2005). Social and economic infrastructure impacts on economic growth in South 4-24. Africa.https://www.researchgate.net/profile/Chandana-Kularatne/publication/254423251_Social_and_Economic_Infrastructure_Impacts_on_Economic_Growth_in_South_Africa/links/543a75910cf204cab1da98f5/Social-and-Economic-Infrastructure-Impacts-on-Economic-Growth-in-South-Africa.pdf

Kumo, W. L. (2012). *Infrastructure investment and economic growth in South Africa: A granger causality analysis.* African Development Bank Group Working Paper Series. African Development Bank.

Kuofie, M., Boateng, O., Yellen, R., & Garsombke, P. (2011). Mobile phone providers and economic development in Ghana. *Journal of Information Technology and Economic Development, 2*(2), 17–18.

Lahirushan, K. P. K. S., & Gunasekara, W. G. V. (2015). The impact of government expenditure on economic growth: A study of Asian countries. *International Journal of Social, Behavioural, Educational, Economic, Business and Industrial Engineering, 9*(9), 2995-300. https://doi.org/10.5281/zenodo.1338436

Lam, P. L., & Shiu, A. (2010). Economic growth, telecommunications development and productivity growth of the telecommunications sector: Evidence around the world. *Telecommunications Policy, 34*(4), 185-199. https://doi.org/10.1016/j.telpol.2009.12.001

Lavy, V., Strauss, J., Thomas, D., & Vreyer, P. (1996). Quality of health care, survival and health outcomes in Ghana. *Journal of Health Economics, 15*(June 1996), 333-57. https://doi.org/10.1016/0167-6296(95)00021-6

Lavy, V., Strauss, J., Thomas, D., & De Vreyer, P. (1996). Quality of health care, survival and health outcomes in Ghana. *Journal of Health Economics,* 15(3), 333-57. https://doi.org/10.1016/0167- 6296(95)00021-6.

Lee, C.-C., & Chang, C.-P. (2005). Structural breaks, energy consumption, and economic growth revisited: Evidence from Taiwan. *Energy Economics, 27*(6), 857–872. https://doi.org/10.1016/j.eneco.2005.08.003

Lee, L., Rosenzweig, M. R., & Pitt, M. M. (1997). The effects of improved nutrition, sanitation, and water quality on child health in high-mortality populations. *Journal of Econometrics, 77*(1), 209-35. https://doi.org/10.1016/S0304-4076(96)01813-1

Lee, S. H., Levendis, J., & Gutierrez, L. (2012). Telecommunications and economic growth: An empirical analysis of sub-Saharan Africa. *Applied Economics, 44*(4), 461-469. https://doi.org/10.1080/00036846.2010.508730

Leff, N. H. (1984). Social benefit-cost analysis and telecommunications investment in developing countries. *Information Economics and Policy, 1*(3), 217-227. https://doi.org/10.1016/0167-6245(84)90003-9

Leipziger, D., Fay, M., Wodon, Q., & Yepes, T. (2003). Achieving the millennium development goals: The role of infrastructure. *Working Paper No.3163*. World Bank. https://deliverypdf.ssrn.com/delivery.php

Levy, H. (2004). Rural roads and poverty alleviation in Morocco. World Bank.

Limao, N., Venables, A. J. (2001). Infrastructure, geographical disadvantage, transport costs, and trade. *World Bank Economic Review, 15*(3), 451–79. https://doi.org/10.1093/wber/15.3.451

Loayza, N., & Odawara, R. (2010). Infrastructure and economic growth in Egypt. *World Bank Policy Research Working Paper 5177*. World Bank.5-15

Lofgren, H., Harris, R. L., & Robinson, S. (2002). *A standard computable general equilibrium (CGE) model in GAMS* (Vol. 5). International Food Policy Research Institute.3-42

Looney, R. E. (1990). Infrastructure investment and inflation in Saudi Arabia. *The Journal of Energy and Development, 14*(1 Autumn), 103-11. https://www.jstor.org/stable/24807839. October 9, 2021

Lowe, M. (2014, January). Rail revival in Africa? The impact of privatisation. In Joint RES-SPR Conference on Macroeconomic Challenges Facing Low-Income Countries: New Perspectives.

Mabuga, R., Chitiga, M., Rakabe, E. (2008). Public infrastructure investment in South Africa. Macroeconomic challenges facing low-income countries. 13-23

Madden, G., & Savage, S. J. (1998). CEE telecommunications investment and economic growth. *Information Economics and Policy, 10*(2), 173-195. https://doi.org/10.1016/S0167-6245(97)00020-6

Maniar, H. (2013). Scenario of viability gap funding (VGF) concept in Indian infrastructure projects. Journal of Infrastructure Development, 5(1), 33-65

Mbanda, V., & Chitiga-Mabugu, M. (2017). Growth and employment impacts of public economic infrastructure investment in South Africa: A dynamic CGE analysis. *Journal of Economic and Financial Sciences, 10*(2), 235-252. https://repository.up.ac.za/bitstream/handle/2263/63604/Mbanda_Growth_2017.pdf?sequence=1&isAllowed=y

Mbanda, V., Chumi, S., Kanda, P., & Mabugu, M. R. (2010). Impact of public infrastructure investment in South Africa: A dynamic micro-simulation CGE analysis. In Preliminary results from a static CGE model, poverty and Economic Policy Research Network. 8th PEP general meeting, Dakar, Senegal. https://www.pep-net.org/sites/pep-net.org/files/typo3doc/pdf/files_events/8th-PEPmeeting2010-Dakar/papers/Vandudzai_Mbanda.pdf. April 16, 2018

McCarthy, D., Wolf, H., & Wu, Y. (1999). The growth costs of malaria [Unpublished what]. Georgetown University.4-25

McKinsey. (2021). *Meeting the sustainable infrastructure challenges*. Global Infrastructure Initiative.https://www.mckinsey.com/~/media/mckinsey/business%20functions/operations/our%20insights/voices%20on%20infrastructure%20meeting%20the%20sustainable%20infrastructure%20challenge/gii-sept-2021-voices.pdf

McKitrick, R. R. (1998). The econometric critique of computable general equilibrium modeling: The role of functional forms. *Economic Modelling, 15*(4), 543-573. https://doi.org/10.1016/S0264-9993(98)00028-5

Michaels, G, & Rauch, F. (2013). Resetting the urban network: 117-2012. *Discussion Paper 9760.* CEPR.

Mihalyi, D., Hwang, J., Rivetti, D., & Cust, J. (2022). Resource-backed loans in Sub-Saharan Africa. *Policy Research Working Paper No. 9923*. World Bank. https://openknowledge.worldbank.org/handle/10986/36924 License: CC BY 3.0 IGO.

Ministere de l'Economie, des Finances et du Développement du Burkina Faso. (2016). Plan National de Développement Economique et Social (PNDES).1-63 Retrieved from http://cns.bf/IMG/pdf/pndes_2016-2020-4.pdf. February 15, 2018

Ministère de l'Economie, des Finances et du Développement. Les matrices de comptabilité sociale (MCS) 2015-2017 du Burkina Faso (2021), Institut national de la statistique et de la Démographie (INSD). Retrieved from http://www.insd.bf/contenu/pub_periodiques/comptes_eco/Les%20Matrices%20de%20Com ptabilite%20Sociale%202015%202017.pdf. June 30, 2022

Mirabile, M., Sangaré, C., & Schmerler, C. (2014). Using financial instruments to mobilise private investment for development. In OECD, *Development Cooperation Report 2014: Mobilising Resources for Sustainable Development, (part 2),* pp.135-144. OECD. https://doi.org/10.1787/dcr-2014-15-en

Mohammed, N. I., & Adeniji, S. O. (2015). Telecommunication infrastructure and economic growth in Nigeria: new evidence from ARDL bound testing approach to cointegration. *Journal of Economics and Sustainable Development, 6*(24), 151-162. https://www.researchgate.net/profile/Sesan-Adeniji/publication/328410125_Telecommunication_Infrastructure_and_Economic_Growth_in_Nigeria_New_Evidence_From_ARDL_Bound_Testing_Approach_to_Cointegration/links/5bcb650aa6fdcc03c797640e/Telecommunication-Infrastructure-and-Economic-Growth-in-Nigeria-New-Evidence-From-ARDL-Bound-Testing-Approach-to-Cointegration.pdf

Morimoto, R., & Hope, C. (2004). The impact of electricity supply on economic growth in Sri Lanka. *Energy Economics, 26*(1), 77-85. https://doi.org/10.1016/S0140-9883(03)00034-3

Mozumder, P., & Marathe, A. (2007). Causality relationship between electricity consumption and GDP in Bangladesh. *Energy Policy, 35*(1), 395–402. https://doi.org/10.1016/j.enpol.2005.11.033

Mu, R., & Van de Walle, D. (2007). Rural roads and local market development in Vietnam. *Policy Research Working Paper 4 340*. World Bank. 8-45. https://doi.org/10.1596/1813-9450-4340

Myovella, G., Karacuka, M., & Haucap, J. (2020). Digitalization and economic growth: A comparative analysis of Sub-Saharan Africa and OECD economies. *Telecommunications Policy, 44*(2), 3-11. 101856. https://doi.org/10.1016/j.telpol.2019.101856

Narayan, P. K., & Smyth, R. (2005). Electricity consumption, employment and real income in Australia evidence from multivariate Granger causality tests. *Energy Policy, 33*(9), 1109– 1116. https://doi.org/10.1016/j.enpol.2003.11.010. March 7, 2022

Narayan, P. K., Smyth, R., & Prasad, A. (2007). Electricity consumption in G7 countries: A panel cointegration analysis of residential demand elasticities. *Energy Policy, 35*(9), 4485–4494. https://doi.org/10.1016/j.enpol.2007.03.018. March 7, 2022

Nasab, E. H. & Aghaei, M. (2009). The effect of ICT on economic growth: Further evidence. *International Bulletin of Business Administration, 5*(2), 46-56. https://www.researchgate.net/profile/Majid-Aghaei/publication/237227348_The_Effect_of_ICT_on_Economic_Growth_Further_Evidence/links/59292aa2458515e3d4676c87/The-Effect-of-ICT-on-Economic-Growth-Further-Evidence.pdf

Newman, J., Pradhan, M., Rawlings, L. B., Ridder, G., Coa, R., & Evia, J. L. (2002). An impact evaluation of education, health, and water supply investments by the Bolivian Social Investment Fund. *World Bank Economic Review*, pp. 241-74. World Bank. https://doi.org/10.1093/wber/16.2.241

Niu, S., Ding, Y., Niu, Y., Li, Y., & Luo, G. (2011). Economic growth, energy conservation and emissions reduction: A comparative analysis based on panel data for 8 Asian-Pacific countries. Energy Policy, 39(4), 2121–2131. https://doi.org/10.1016/j.enpol.2011.02.003

Norton, S. W. (1992). Transaction costs, telecommunications, and the microeconomics of macroeconomic growth. *Economic Development and Cultural Change, 41*(1), 175-196.

Odhiambo, N. M. (2009a). Electricity consumption and economic growth in South Africa: A trivariate causality test. *Energy Economics, 31*(5), 635–640. https://doi.org/10.1016/j.eneco.2009.01.005

Odhiambo, N. M. (2009b). Energy consumption and economic growth nexus in Tanzania: An ARDL bounds testing approach. *Energy Policy, 37*(2), 617–622. https://doi.org/10.1016/j.enpol.2008.09.077

OECD. (2005). Private pensions: OECD Classification and Glossary. OECD Publishing. https://doi.org/10.1787/9789264017009-en-fr

OECD. (2021). *Mobilising institutional investors for financing sustainable development in developing countries: Emerging evidence of opportunities and challenges.* OECD. https://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DCD(2021)11&do cLanguage=En. October 4, 2021

Ogun, T. P. (2010). August. Infrastructure and poverty reduction: Implications for urban development in Nigeria. *Urban Forum, 21*(3), 249-266. https://doi.org/10.1007/s12132-010-9091-8. August 16, 2021

Olalekan, D. O. (2013). The effect of investment in telecommunication on economic growth: Evidence from Nigeria. *International Journal of Advancements in Research and Technology, 2*(1), 1-23.

Oliner, S. D., & Sichel, D. E. (2000). The resurgence of growth in the late 1990s: Is information technology the story? *Journal of economic perspectives, 14*(4), 3-22. https://doi.org/10.1257/jep.14.4.3

Otto, G. D., & Voss, G. M. (1996). Public capital and private production in Australia. *Southern Economic Journal*, 62(3), 723-738. https://doi.org/10.2307/1060890

Ouédraogo, I. M. (2010). Electricity consumption and economic growth in Burkina Faso: A cointegration analysis. *Energy Economics, 32*(3), 524–531. https://doi.org/10.1016/j.eneco.2009.08.011

Ouédraogo, N. S. (2013). Energy consumption and economic growth: Evidence from the economic community of West African States (ECOWAS). *Energy Economics, 36*, 637–637. https://doi.org/10.1016/j.eneco.2012.11.011

Oughton, E., & Tyler, P. (2013). Infrastructure as a complex adaptive system. Working paper of the Infrastructure Transitions Research Consortium (ITRC).2-9

Ozturk, I., & Acaravci, A. (2011). Electricity consumption and real GDP causality nexus: Evidence from ARDL bounds testing approach for 11 MENA countries. *Applied Energy, 88*(8), 2885– 2892. https://doi.org/10.1016/j.apenergy.2011.01.065

Parasuraman, S., Sengupta, S. (2001). World commission on dams: Democratic means for sustainable ends. *Economic and Political Weekly, 36*(21), 1881-1891. https://www.jstor.org/stable/4410669

PEP. (2020). Recommended readings. https://www.pep-net.org/recommended-readings-1#sm. February 7, 2020

Perrault, J. F., Savard, L., & Estache, A. (2010). The impact of infrastructure spending in Sub-Saharan Africa: A CGE modeling approach. *World Bank Policy Research Working Paper 5386*. World Bank. 9-51

Posu, S. M. A. (2006). Information and communication technologies in the Nigerian economy. In International conference on human and economic resources. Izmir. 329-334

Pradhan, R. P., Arvin, M. B., Mittal, J., & Bahmani, S. (2016). Relationships between telecommunications infrastructure, capital formation, and economic growth. *International Journal of Technology Management, 70*(2-3), 157-176. https://doi.org/10.1504/IJTM.2016.075158

Pradhan, R. P., Arvin, M. B., Norman, N. R., & Bele, S. K. (2014). Economic growth and the development of telecommunications infrastructure in the G-20 countries: A panel-VAR

approach. *Telecommunications Policy, 38*(7), 634-649. https://doi.org/10.1016/j.telpol.2014.03.001

Pradhan, B. K., Ratha, D. K., & Sarma, A. (1990). Complementarity between public and private investment in India. Journal of Development Economics, 33(1), 101-116. https://doi.org/10.1016/0304-3878(90)90008-Y

Prud'Homme, R. (2004, May 3-5). *Infrastructure and development*. [Paper]. Annual Bank Conference on Development Economics), Washington, DC, United States.3-42

Pyatt, G. & Round, J. I. (1985). Social accounting matrices: A basis for planning. The World Bank.

Radelet, S., Clemens, M., & Bhavnani, R. (2004). Aid and growth: The current debate and some new evidence. *Center for Global Development*.

Rahman, M. M., & Velayutham, E. (2020). Renewable and non-renewable energy consumption- economic growth nexus: new evidence from South Asia. *Renewable Energy, 147*(1), 399-408. https://doi.org/10.1016/j.renene.2019.09.007

Raihan, S. (2011). Infrastructure and growth and poverty in Bangladesh. 21-27. https://mpra.ub.uni-muenchen.de/37882/3/MPRA_paper_37882.pdf

Reinikka, R., & Svensson, J. (2002). Coping with poor public capital. *Journal of development economics, 69*(1), 51-69. https://doi.org/10.1016/S0304-3878(02)00052-4

Rietveld, P., & Bruinsma, F. (2012). *Is transport infrastructure effective? Transport infrastructure and accessibility: Impacts on the space economy*. Springer Science & Business Media.

Rioja, F. (1999). Productiveness and welfare implications of public infrastructure: a dynamic two-sector general equilibrium analysis, *Journal of Development Economics*, 58, 387–404.

Roberts, B. M. (1994). Calibration procedure and the robustness of CGE models: Simulations with a model for Poland. *Economics of Planning, 27*(3), 189-210.

Roller, L. H., & Waverman, L. (2001). Telecommunications infrastructure and economic development: a simultaneous approach. *American Economic Review, 91*(4), 909–923. https://doi.org/10.1257/aer.91.4.909

Round, J. (2003). Social accounting matrices and SAM-based multiplier analysis. The impact of economic policies on poverty and income distribution: Evaluation techniques and tools, 14, 261-276. https://www.pep-net.org/sites/pep-net.org/files/typo3doc/pdf/chapter14.pdf

Saghir, J. (2005). Energy and poverty: Myths, links, and policy issues, Energy Working Paper No. 4, World Bank.

Savard L. (2010). Scaling Up Infrastructure Spending in the Philippines: A CGE Top-Down Bottom-Up Microsimulation Approach. *International Journal of Microsimulation, 3*(1), 43-45.

Sambo, A. S. (2005). Renewable energy for rural development: The Nigerian perspective. *ISESCO Science and Technology Vision, 1*, 12-22.

Saunders, R. J., Warford, J. J., & Wellenius, B. (1994). *Telecommunications and economic development.* The Johns Hopkins University Press.

Schwab, K., & Sala-i-Martín, X. (2016). *The global competitiveness report 2013–2014: Full data edition*. World Economic Forum. 8-116

Serven, L., & Calderon, C. (2006). *Is infrastructure capital productive?* World Bank. 9-20

Shahbaz, M., & Feridun, M. (2012). Electricity consumption and economic growth empirical evidence from Pakistan. *Quality & Quantity International Journal of Methodology, 46*(5), 1583–1599. https://doi.org/10.1007/s11135-011-9468-3

Shahbaz, M., Tang, C. F., & Shahbaz Shabbir, M. (2011). Electricity consumption and economic growth nexus in Portugal using cointegration and causality approaches. *Energy Policy, 39*(6), 3529–3536. https://doi.org/10.1016/j.enpol.2011.03.052

Sharma, S. S. (2010). The relationship between energy and economic growth: Empirical evidence from 66 countries. *Applied energy, 87*(11), 3565-3574. https://doi.org/10.1016/j.apenergy.2010.06.015

Shiu, A., & Lam, P.-L. (2004). Electricity consumption and economic growth in China. *Energy Policy, 32*(1), 47–54. https://doi.org/10.1016/S0301-4215(02)00250-1

Shoven, J. B. & Whalley, J. (1992). *Applying general equilibrium*. Cambridge University Press.
Snieska, V., & Simkunaite, I. (2009). Socio-economic impact of infrastructure investments. *Engineering Economics, 3*(63).

Solarin, S. A., & Shahbaz, M. (2013). Trivariate causality between economic growth, urbanization and electricity consumption in Angola: Cointegration and causality analysis. *Energy Policy, 60*, 876–884. https://doi.org/10.1016/j.enpol.2013.05.058

Squalli, J. (2007). Electricity consumption and economic growth: Bounds and causality analyses of OPEC members. *Energy Economics, 29*(6), 1192-1205. https://doi.org/10.1016/j.eneco.2006.10.001

Stern, D. I. (2004). Economic growth and energy. *Encyclopaedia of Energy, 2*, 35-50. http://www.sterndavidi.com/Publications/Growth.pdf

Storeygard, A. (2013). Farther on down the road: Transport costs, trade and urban growth in Sub- Saharan Africa. *Policy Research Working Paper 6 444*. World Bank. 1263-1295

Sturm, J. E., Jacobs, J., & Groote, P. (1999). Output effects of infrastructure investment in the Netherlands, 1853–1913. *Journal of Macroeconomics*, 21(2), 355-380. https://doi.org/10.1016/S0164-0704(99)00107-X

Tang, C. F. (2008). A re-examination of the relationship between electricity consumption and economic growth in Malaysia. *Energy Policy, 36*, 3077–85. https://doi.org/10.1016/j.enpol.2008.04.026

Tang, C. F. (2009). Electricity consumption, income, foreign direct investment, and population in Malaysia: New evidence from multivariate framework analysis. *Journal of Economic Studies, 36*(4), 371–382. https://doi.org/10.1108/01443580910973583. March 8, 2022

Thacker, S., Adshead, D., Morgan, G., Crosskey, S., Bajpai, A., Ceppi, P., Hall, J.W., & O'Regan, N (2018). Infrastructure: Underpinning sustainable development. UNOPS. 2-41

Thacker, S., Adshead, D., Fantini, C., Palmer, R., Ghosal, R., Adeoti, T., Morgan, G., Stratton-Short, S. 2021. Infrastructure for climate action. UNOPS, Copenhagen, Denmark. Retrieved from https://www.unops.org/news-and-stories/news/infrastructure-for-climate-action. October 21, 2021

Thurlow, J. (2004). A dynamic computable general equilibrium (CGE) model for South Africa: Extending the static IFPRI model. Trade and Industrial Policy Strategies.3-42

Traoré, F. (2012). A comparison between the PEP 1-1 model and the IFPRI standard model. AGRODEP Technical Note TN-01.3-8

Tyson, J. E. (2018). *Private infrastructure financing in developing countries*. Overseas Development Institute.8-36

Uddin, M., & Aziz, S. (2014). Effect of public investment on economic growth in Bangladesh: An econometric analysis. *Journal of Economics and Sustainable Development, 5*(22), 37-50. https://core.ac.uk/download/pdf/234646634.pdf

United Nations. (2022). Financing for sustainable development report 2022: Great finance divide amid COVID-19 poses major setback for sustainable development. Retrieved from https://www.un.org/ohrlls/news/ffd2022. June 24, 2022

Vu, K., Hanafizadeh, P., & Bohlin, E. (2020). ICT as a driver of economic growth: A survey of the literature and directions for future research. *Telecommunications Policy, 44*(2), 101922.

Wagstaff, A., & Claeson, M. (2004). *The Millennium Development Goals for Heath: Rising to the Challenges*. World Bank. 8-162

Warwick, H., & Smoke, A. D. (2004). The killer in the kitchen. ITDG Publishing. 5-222 https://www.esmap.org/sites/default/files/resources-

document/Smoke_The%20Killer%20in%20the%20Kitchen_Indoor%20Air%20Pollution%20in%20Developing%20Countries.pdf

WEF, Bain and Co and World Bank. (2013). Enabling trade valuing growth opportunities. https://www3.weforum.org/docs/WEF_SCT_EnablingTrade_Report_2013.pdf. June 26, 2021

WHO. (2015). Global status report on road safety 2015. https://www.afro.who.int/publications/global- status-report-road-safety-2015. June 21, 2021

Williams, I. (2011). Telecom policy innovation: The role of free spectrum and telecommunication development in rural Ghana. *Journal of Technology Management & Innovation, 6*(3), 93-105.

World Bank. (2014). *Expanding the possible in Sub- Saharan Africa: How tertiary institutions can increase growth and competitiveness.* World Bank.

World Bank. (2020). *The African continental free trade area*. https://www.worldbank.org/en/topic/trade/publication/the-african-continental-free-trade-area#:~:text=The%20African%20Continental%20Free%20Trade%20Area%20(AfCFTA)%2 0agreement%20will%20create,valued%20at%20US%243.4%20trillion. July 17, 2021

World Bank Database. (2021)

World Bank. (1994). *World development report: Infrastructure for development*. https://openknowledge.worldbank.org/handle/10986/5977. May 16, 2021

World Bank. (2005). *Meeting the challenge of Africa's development: A World Bank Group Action Plan, Africa Region*. https://web.worldbank.org/archive/website01259/WEB/IMAGES/AAP_FINA.PDF. May 3, 2021

World Bank. (2017). *Africa's pulse (English).* World Bank Group.3-85

Yang, H. Y. (2000). A note on the causal relationship between energy and GDP in Taiwan. *Energy Economics, 22*(3), 309–317. https://doi.org/10.1016/S0140-9883(99)00044-4

Yang, Y., Powell, M. R., & Gupta, M. S. (2006). *Macroeconomic challenges of scaling up aid to Africa: A checklist for practitioners*. International Monetary Fund. https://policycommons.net/artifacts/452096/macroeconomic-challenges-of-scaling-up-aid-to-africa/1424935/

Yoo, S. H. (2005). Electricity consumption and economic growth: Evidence from Korea. *Energy Policy, 33*(12), 1627–1632

Yoo, S. H. (2006). The causal relationship between electricity consumption and economic growth in the ASEAN countries. Energy Policy, 34(18), 3573–3582. https://doi.org/10.1016/j.enpol.2005.07.011

Yuan, J., Zhao, C., Yu, S., & Hu, Z. (2007). Electricity consumption and economic growth in China: Cointegration and co-feature analysis. Energy Economics, 29(6), 1179–1191. https://doi.org/10.1016/j.eneco.2006.09.005

Zahra, K., Azim, P., & Mahmood, A. (2008). Telecommunications infrastructure development and economic growth: a panel data approach. Pakistan Development Review, 47(4), 711–726. https://www.jstor.org/stable/41261249

Zhang, Y., Wang, X., & Chen, K. (2013). Growth and distributive effects of public infrastructure investments in China. In Infrastructure and economic growth in Asia (pp. 87-116). Springer, Cha. https://doi.org/10.1007/978-3-319-03137-8_4