

**Joint EU-ILO Government of Rwanda project: Strengthening
the impact on employment of sectoral and trade policies**

Infrastructure Development, the Construction Sector and Employment in Rwanda

September 2018



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Abbreviations

EICV	Integrated Household Living Conditions Survey (Enquête Intégrale sur les Conditions de vie des Ménages)
EmplA	Employment Impact Assessment
EU	European Union
FTE	Full-Time Equivalent (1 600 hours of work per year)
GDP	Gross Domestic Product
GIS	Geographic Information System
ILO	International Labour Organization
MIFOTRA	Ministry of Public Services and Labour
MINECOFIN	Ministry of Finance and Economic Planning
NEP	National Employment Programme
NFRPS	National Feeder Road Policy and Strategy
NISR	National Institute of Statistics of Rwanda
RWF	Rwandan Francs
SAM	Social Accounting Matrix
USD	United States Dollars

1. Background and context

Over the past two decades, Rwanda has been one of the fastest growing economies in Africa. Between 2000 and 2017 the Rwandan economy grew by 7.8 per cent annually and GDP per capita growth rate was 7 per cent per annum. The country has also made important strides in poverty reduction and economic transformation. The poverty headcount has been reduced from 78 per cent in 1995 to 39 per cent in 2014, and extreme poverty has been reduced from 24 per cent in 2011 to 16 per cent in 2014.

Rwanda's working-age population is growing rapidly. According to the *Rwanda Labour Force Survey of August 2017*, working age population (16 years and above) is estimated to 6.8 million while the unemployment rate stands at 16.7 per cent. At the same time, employment is still dominated by the agriculture sector, as it constitutes about 40 per cent of total employment. Agriculture is followed by services and the construction sector constituting 16.6 and 10.3 per cent of the total employment respectively. Furthermore, employment in the informal sector is 76.2 percent of total employment. In response to this, and as planned in the *Five Years Rwandan National Employment Programme (NEP) of 2014*, the Rwandan economy needs to create 200 000 off-farm jobs each year to meet the employment needs of its increasing labour force. Creating sufficient productive employment opportunities for this expanding labour force will be one of the defining challenges for Rwanda over the coming decade.

The construction sector plays an important role in Rwanda's economy both in its contribution to the national economy and employment creation. As one of the key sectors of the economy, data from the past five years shows that it contributes around 7 per cent to national GDP, and 8 percent to national employment. Furthermore, according to the *Business Monitor International* forecast, the construction sector is expected to grow by 9 per cent per annum until 2021, which is the second fastest growth rate in Sub-Saharan Africa.

Infrastructure is one of the key outputs of the construction sector. As one of the six pillars of the Rwanda vision 2020 is infrastructure development, the government plays an important role in creating demand for the construction sector. As such, the infrastructure and construction sectors are expected to continue their vital contribution to both the country's economic transformation, and employment creation.

The government of Rwanda's investment in the road sector is expected to continue as both road density and road standards are still low by global standards. The government plans to improve the road network to ensure that all farms are within 2 km distance of all-weather roads, and this will require rehabilitating or upgrading 30 000 km of road. It is also estimated

that 70 per cent of existing roads are in poor condition, requiring rehabilitation and upgrading.¹ In response to this, as shown in Table 1, from 2010-11 up to 2017-18 around 5 per cent of Rwanda's budget execution was spent on the construction, rehabilitation and maintenance of road infrastructure.²

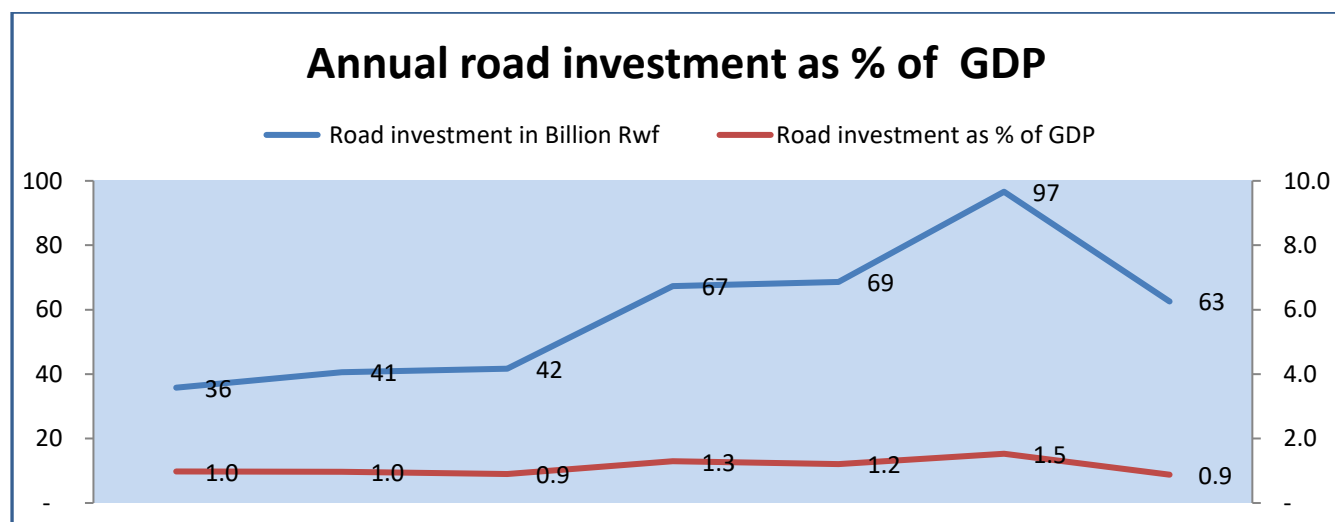
Table 1: Budget execution report for road transport

	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Spending on road in billion RWF	36	41	42	61	69	97	63	69
Spending on road in million USD	60	67	66	101	98	129	77	82
Total National Budget execution in billion RWA	813	933	1,177	1,195	1,331	1,492	1,644	1,850

Source: Elaborated by the authors using data from: MINECOFIN, Budget execution by Functional Classification and NISR, National Accounts

The annual share of road investment in percentage of nominal GDP does not show much fluctuation over the years. As Figure 1 shows, the government spent up to 1.3 per cent and 1.5 per cent of the total GDP in 2010-11 and 2017-18 respectively on roads infrastructure investment and has not spent below 0.9 percent in the past eight years.

Figure 1: Annual roads' investment in % of GDP



Source: Elaborated by the authors using data from: MINECOFIN, Budget execution by Functional Classification and NISR, National Accounts

¹The National Feeder Roads Policy and Strategy 201, pp.45

² Ministry of Finance And Economic Planning, Budget Execution Report 2017/18

One of the policies to enhance the road network and stabilize public investment in the sector is *The National Feeder Roads Policy and Strategy (NFRPS)* of 2017. The strategy estimates that on average US\$73 million will be required per annum between 2017 and 2027 to improve and maintain the feeder road network. The implementation of this policy and strategy could have important employment impacts, particularly for underemployed and poor rural workers.

2. The STRENGTHEN project

The joint EU-ILO and Government of Rwanda project entitled *Strengthening the Employment Impact of Sectoral and Trade Policies (STRENGTHEN)* is a global project implemented in nine countries with the aim of strengthening the capabilities of partner countries to analyse and design policies and programs that would enhance employment creation in terms of quality and quantity. The project has as one of its objectives to support Employment Impact Assessments (EmplA) in priority sectors such as agriculture, construction, infrastructure, and energy in order to assess the employment effects of policies and investments in these sectors.

Through the Local Project Team, chaired by the Ministry of Public Services and Labour (MIFOTRA) but composed of representatives from relevant ministries and agencies as well as social partners, the infrastructure and construction sectors were chosen as priority sectors.

As part of the project, three studies were conducted that are all relevant to the aim of understanding and quantifying the employment effects of infrastructure investments on employment. The studies looked at both the short-term employment effects during the construction phase, as well as the medium- to long-term effects of infrastructure on employment in general. They also used different methods and approaches and are thus complementary to each other. These studies are:

- The employment impact assessment of construction subsectors of Rwanda
- Sectoral employment multipliers in Rwanda: Comparing local multipliers and input-output analysis
- The impacts of improved access to roads on employment and poverty

The first study uses Input-Output and Social Accounting Matrix (SAM) based employment multipliers to analyse and assess the effects of infrastructure investments on employment within the construction sector, as well as on the economy as a whole. The second study measures the employment potential of different economic sectors including the construction sector by estimating local multipliers, a methodology based on census data that focuses on local labor markets. The third study assesses the impacts of improved access to roads on employment and poverty.

This report provides a summary of the key findings and policy implications of these studies.

3. Overview of methods used in the studies

EmplIA methods are used to improve our understanding of how policies and investments affect the quality and quantity of employment. There is no single methodology for conducting such assessments, but rather a group of methodologies and approaches are used depending on the sector of interest, the nature of the interventions and the type of impact to be assessed. A brief description of the methodologies used in the three studies is provided below.

3.1 Employment Impact Assessment Method in the construction sector

The analysis and assessment in “*the employment impact assessment of construction subsectors*” study used the latest SAM available for Rwanda – the 2011 SAM – to estimate output and employment multipliers. The SAM is based on the 2011 Rwanda input-output table and represents economic transactions and transfers taking place between different institutional sectors of the economy in the production of goods and services. It gives a measure of how the outputs from some sectors serve as inputs to the other sectors, as well as what factors of production provide inputs into the different sectors. Using the SAM, output multipliers for different sectors were calculated. Then, using these multipliers, the effects of increasing output of the construction sector through increased infrastructure investment on total output was calculated and analysed. Finally, to understand the different employment effects of spending on different kinds of infrastructure, the construction sector in the SAM was broken down and subsector accounts for national roads, labour-intensive feeder roads, capital-intensive feeder roads, and government buildings were created in the SAM.³

Employment data for 2011 is based on the Integrated Household Living Conditions Survey (EICV3) (2011), which measured hours worked. The data was then disaggregated to match the sectors in the SAM and used to estimate the output to employment ratios for each sector, which is essentially the number of hours worked to produce the output for each of the sectors. This measure was then used to estimate the additional labour input that would be required to produce the total output generated by the investment in infrastructure. The additional labour input required was then equated to the additional employment generated. The effects were estimated for increasing annual infrastructure investments by different amounts.⁴

³ The breakdown was done based on data collected on the inputs (including labour) required for these types of project and government expenditure on projects in these subsectors for 2011. In addition, an account “rest of construction” was created that contained all residual construction sector activity.

⁴ A spreadsheet and website have also been created to allow users to estimate the effects for different levels of infrastructure investment in different types of infrastructure based on the results. The (temporary) website address is <http://198.211.121.50:3838/Roads/>

3.2 Sectoral employment using local multipliers

The second study, *Sectoral employment multipliers in Rwanda: Comparing local multipliers and input-output analysis*, uses a recently developed methodology called local multipliers and compares these results with the findings obtained from the input-output multipliers described above. The objective of this approach is twofold. The first objective is to understand the employment potential of different sectors and to identify those sectors with the highest employment potential. The second objective is to reflect on methodologies for employment impact assessment and to explore new and innovative tools.

Local multipliers are estimated from census data and the methodology aims at computing a cross-sectoral correlation of employment variation measured at the level of a given and relatively small geographic subdivision (agglomeration, municipality or district). This methodology has been applied to only a small number of high-income countries such as the United States, Sweden and the United Kingdom. This project constitutes the first attempt to apply this approach to Sub-Saharan African countries. In Rwanda the data sources are the 2002 and 2012 census. Given the scarcity of data in low- and middle-income countries, an advantage of this methodology is its reliance on census data, the primary set of data collected in Sub-Saharan African countries. A second advantage is its use of the spatial dimension of the census data in countries experiencing rapid economic changes such as population growth, internal migration and urbanization. Like input-output analysis, local multipliers estimate employment multipliers. However, these multipliers need to be interpreted differently from input-output multipliers as a geographical dimension is involved. Of interest for the construction sector is to be able to estimate how many additional jobs are created in a local area, if one additional job is created in the construction sector through the construction of roads.

3.3 The impacts of improved access to roads on employment and poverty

The third study, *The impacts of improved access to roads on employment and poverty* looks beyond the effects during the construction phase, and rather at the medium- to long-term effects that the improved access to roads has on employment and poverty. This approach also uses spatial statistics (geographic information system - GIS) data for different years to measure how households' levels of access to the road network changes over time. The change in access is then regressed against changes in different employment and socioeconomic characteristics. We have combined the GIS information about roads' construction with economic database along two dimensions: i) census data measuring employment at the level of administrative entity between 2002 and 2012 ii) households' data and poverty using data between 2011 and 2014.

4. Key findings

4.1 Short-term employment potential of roads' construction

The three studies provided different measures for understanding the role and importance of infrastructure and construction sector development for employment in Rwanda. First the IO output multipliers for the indirect effect (backward linkages) of the construction sector was estimated at 1.8, which indicates that if 1 % of GDP were spent in the construction sector the total output of construction sector and its related sectors would increase by 1.8 % of GDP. Linked to this the IO based employment multiplier was found to be 0.74 meaning that for the 1% of GDP spent on construction, total employment in the economy (measured in hours worked) would increase by 0.74%. The output multiplier shows that the sector has good links to the rest of the economy and stimulates production in the other sectors by purchasing inputs from these sectors. The reason the employment multiplier is lower, is because of the higher average productivity of workers in the construction sector as shown below.

Another important finding from the study is the large differences found in the output /employment ratios of the different sectors and subsectors. These ratios based on dividing total output of a sector by total hours worked in the sector, give a measure of labour productivity in each of the sectors, indicating that the amount of RWF produced for each hour worked in the sector. As indicated in Table 2, the agriculture sector has by far the lowest employment/ output ratio, and the ratio in the construction sector is eight times higher than in the agriculture sector.

Table 2: Output/employment ratios for selected sectors

Sectors	Output RWF/hour worked
Agriculture	0.02
Forestry	0.33
Mining and quarrying	0.08
Chemical industries	0.47
Gas, water and electricity	0.08
Construction	0.16
Wholesale and retail trade	0.21
Hotel and restaurants	0.19
Financial services	0.55

Source: Authors computation based on SAM 2011 and EICV 3

This partially explains why the employment multiplier is lower than the output multiplier, as it takes fewer people in the construction sector to increase output. This strongly supports the policy objective of creating off-farm jobs to shift workers out of the agriculture sector into other

sectors where they are more productive. (At the same time, it is equally important that investments are made in the agriculture sector to increase the productivity of the workers who remain in this sector). Using the SAM, the output multiplier that includes both the indirect and induced (forward linkages from consumption effects) was also estimated and this was found to be 2.8. This indicates that the sector also has good forward linkages⁵.

Using these multipliers and the output/employment ratios for the different sectors and subsectors, the short-term employment effects were then estimated using the number of full-time equivalents (FTEs) created per USD million invested as an indicator.

The first general finding was that additional spending equivalent to USD 1 million in the construction sector would create up to 550 FTE off-farm jobs in the economy. Of these 50 percent (275 FTEs) would be direct jobs in the sector, meaning *that for every job created in the construction sector, one additional job is created in the rest of the economy*. The study also shows of the jobs outside construction, around 28 per cent (134 FTEs) would be indirect jobs created in sectors providing inputs into the construction sector such as wood, minerals and financial services, and 22 per cent (121 FTEs) would be induced jobs in sectors that are likely to benefit from increased consumption effects such as increased consumption of, for example, transport, food and restaurants. Furthermore, of the 550 FTE of employment created by USD 1 million investment in the construction sector, around 120 would be for female workers, this constitutes almost up to 22 percent of the total employment created. In addition, the study estimates that between 7 percent and 10 per cent of the newly created jobs would be for young employees aged between 16 and 29 years.

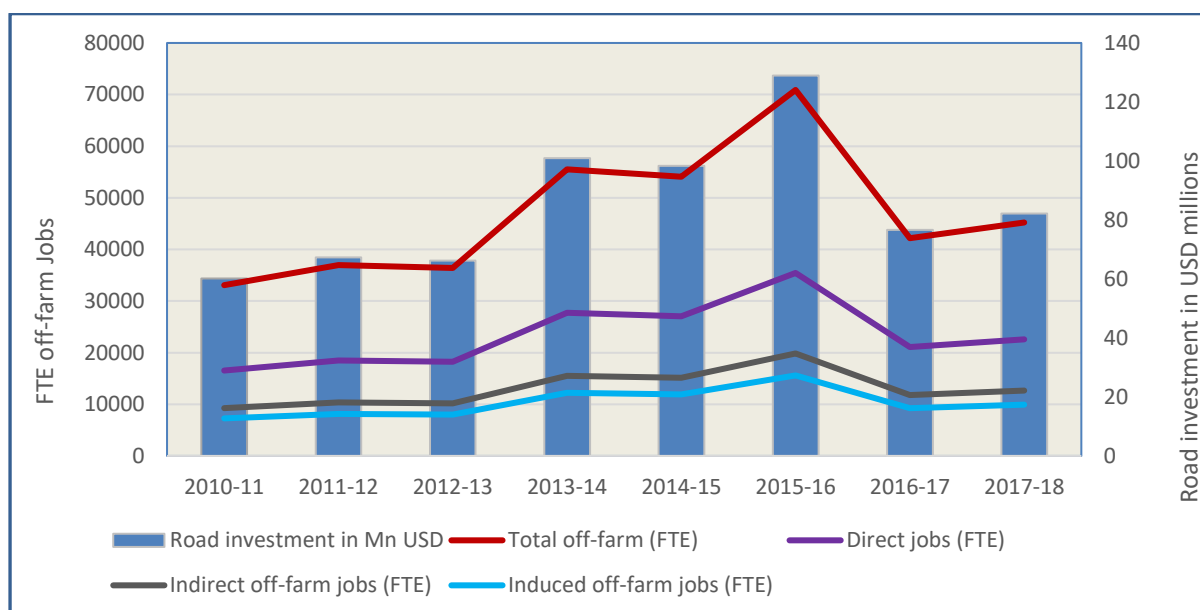
To analyse the skills composition of the newly generated jobs, three skills categories were created: skilled, semi-skilled and unskilled using the level of education as a parameter. The study found that, out of 550 person-years of employment created in the construction sector, up to 450 would be for unskilled workers, and around 50 jobs would be created in each skilled and semi-skilled category. It is important to mention that of 850 newly generated person-years of employment through USD 1 million investments in labour-intensive feeder roads, more than 85 per cent of the newly created jobs will be for unskilled workers with skilled and semi-skilled employment contributing up to 8 and 7 per cent, respectively. The sector therefore provides an important avenue for unskilled workers, particularly in agriculture, to shift to the construction sector, develop sector specific skills, increase their productivity and find sustained

⁵ The induced multipliers on agriculture sector was excluded, as the study also excluded the employment effects on the agriculture sector. This was done for several reasons. The first is that the key policy priority in Rwanda is structural transformation and the creation of off-farm jobs. The second is because it is generally acknowledged that because of the assumptions made when estimating the induced effects, the consumption effects tend to be overestimated, so this presents more conservative results. The third reason is that the low productivity in agriculture tends to lead to very high job estimates (low productivity means that a small increase in output leads to a lot of additional hours worked) which can distort the overall results.

employment in the sector. This shift to a sector with higher productivity thus supports the structural transformation of Rwanda's economy.

Using these figures and the expenditure data in Table 1, the number of off-farm jobs created from road construction were estimated and these are presented in Figure 2. These estimates show that for 2010-11 and in 2017-18, public investment in road construction created 33 084 FTE and 45 196 FTE off-farm jobs respectively.

Figure 2: Investment on road and off-farm job creation



Source: Author computation using data on budget execution and model on multipliers effects

With the breakdown of the construction sector into subsectors, it was also possible to make a similar analysis for the subsectors. The study found that, investing USD 1 million in labour-intensive feeder roads could create up to 850 person-years of employment. Of this, 540 or 63 percent will be direct person-years of employment, 150 indirect and 160 induced person-years of employment. Foreseeably, the employment impact of capital-intensive feeder roads is lower, particularly its direct employment effects. It should be noted that the main reason for these differences lies for jobs created in the construction sector, and not due to major differences in the number of indirect and induced jobs.

The study shows that the employment effects of this USD 1 million spending in capital intensive-feeder roads would be around 350 person-years of employment, of which only 25 per cent of employment would be directly created. The rest will be indirect and induced person-years of employment. This much higher number of FTEs created provides evidence to support a more labour-intensive technological approach in the road sector in Rwanda.

Employment effects of the *National Feeder Road Policy and Strategy*

These findings were then applied to do a simple simulation of the employment effects of the implementation of the *National Feeder Road Policy and Strategy (NFRPS)*. As mentioned, the strategy intends to increase spending on the construction and maintenance of feeder roads to USD 73 million each year, as this is the amount required to get the feeder road network into the desired state. It was estimated that this would represent an increase in annual expenditure of USD 41 million a year.

The employment effect of this investment is estimated to be between **10 000 and 24 000 additional FTE off-farm jobs per annum**, depending on the extent to which labour-based methods of construction will be used. This means that the number of jobs created per year could go up to 24 000 jobs if labour-intensive approaches were used more widely and consistently. This is significant as it would have been equivalent to 3.8 per cent of all off-farm employment in Rwanda in 2011. It is also important because most of this additional employment would be taken up by rural workers who are either underemployed or employed at very low levels of productivity in the agriculture sector. As such, this approach would contribute to structural transformation by attracting underemployed workers with low productivity in the agriculture sector into construction sector where their productivity is higher.

4.2 Comparing the medium-term employment potential of different sectors using Local Multipliers

In the second report, *Sectoral employment multipliers in Rwanda: Comparing local multipliers and input-output analysis*, local multipliers for two levels of aggregation at sectoral level were estimated and compared to the IO multipliers. Looking at employment multipliers across three aggregated sectors (agriculture, manufacturing and services), a clear hierarchy between sectors was found. The sector with the highest local multiplier is the manufacturing sector with a multiplier comprised between 6 and 7. For every job created in the manufacturing sector 6 to 7 jobs are created locally in the rest of the economy. On the contrary, jobs created in the service sector as an aggregate have a negligible impact on the local labour market. Certain service subsectors display positive and moderate multipliers as sectoral disaggregation makes it possible to capture the impact of service jobs creation on other service subsectors. In addition, the multiplier associated with agriculture is negative as workers are moving away from subsistence agriculture into manufacturing and service jobs.

Table 3: Local multipliers for aggregated sectors

	Services	Manufacturing	Agriculture
Manufacturing	7.73***		−2.12***
Services		0.08***	−0.10***
Agriculture	−2.02***	−0.33***	

Note: This table presents the results of the estimation of local multipliers excluding the constant term for the different combinations between manufacturing, services and agriculture. The table includes the instrumental variable estimation.

Comparing local multipliers with input-output multipliers for the manufacturing sector, the former far exceed the latter. Two possible transmission channels could account for these differences: i) the demand for locally produced goods as wages in the manufacturing sector are likely to be higher than the average wage in the economy; and ii) the quality of the jobs created – many informal jobs rather than fewer formal jobs. The results show that the multiplier increases with the employment status and with the skills of the jobs created and this was interpreted as indirect evidence of the importance of the first transmission channel, the increased demand for locally produced goods. These findings also contrast with employment multipliers based on input-output tables or SAMs that typically give high employment multipliers for the agriculture sector. It is important to emphasize that these are high because of the low productivity of this sector, and should therefore not be interpreted as a finding to encourage more employment in this sector. For this reason, the multiplier effect related to the agriculture sector was also excluded in the input-output analysis presented earlier.

In order to be able to consider the local multipliers for the construction sector, the three main sectors had to be disaggregated. The results for this are presented in Table 4. The estimation at the subsector level confirms the hierarchy discussed in the previous section between manufacturing, service and agriculture sectors. Multipliers associated with manufacturing jobs are above 10 and by far exceed any other multipliers. Some service subsectors have a non-negligible multiplier but they do not exceed 10. This is in contrast with the aggregate multiplier associated with service jobs presented previously that was close to zero. The main reason is that the multiplier associated with service jobs at the aggregate level could not capture the impact of job creation in a service subsector on other service jobs. Lastly, multipliers

associated with agriculture remain negative meaning that job creation in the other sectors tends to reduce employment in agriculture as workers shift to other more productive sectors.

Table 4: Local multipliers for disaggregated sectors

	Services	Manufacturing	Agriculture
Metalic, mineral	20.98***	2.32***	− 10.43***
Wood, paper	31.75***	4.29***	− 11.43***
Food, beverage	10.39***	1.08***	− 2.63***
Construction	3.41***	0.38***	− 0.60***
Transport	4.15***	0.58***	− 0.64***
Hotel, restaurant	9.92***	0.97***	− 1.15***
Crops	− 3.5***	− 0.65***	0.71***

Note: This table presents the results of the estimation of local multipliers excluding the constant term for the different combinations between manufacturing, services and agriculture. The table includes the instrumental variable estimation.

Concerning the construction sector, local multipliers showed an even bigger effect of the construction sector on employment than IO multipliers. The overall value of the local multiplier for the construction sector was found to be above 3, meaning that for every job created in the construction sector, three jobs would be created, mostly in the service sector (3.4) but with some positive effect in the manufacturing sector (0.4) and a negative effect on agriculture (-0.6). With the IO multipliers it was found that one job in construction would typically lead to one additional job in the rest of the economy.

While these differences are large, there are also differences in how the two results should be interpreted and applied. An important difference is that local multipliers are based on observing employment effects over a 10-year interval, while the SAM considers economic activity in a single year only. The local multiplier therefore also implicitly captures shifts and changes to the economy over the 10-year interval and this provides a medium-term perspective. However, it makes an even stronger case for considering the construction sector as an important sector for employment. By ensuring that employment in the construction sector is increased through, among others, increasing levels of infrastructure investment jobs over the long term, approximately three jobs outside the sector are created.

This implies that if the government were to *annually* invest USD 1 USD million in construction and thus sustain 275 FTE in the construction sector, it would generate an additional 825 FTE in other sectors over the medium term.

4.3 Assessing the long-term effect on employment of access to roads

The first part of the study looks at the impact of access to roads and employment growth in the long term. The novelty of the approach is to combine GIS data on roads (in 1999) and **employment data measured at municipality level based on census data 2002 and 2012.**

Figure 3: National roads and districts boundaries 1999-2009



Source: Charpe 2017

A first result is that in the late 1990s most roads were not passable with the exception of a few concrete roads. The main reasons have to do with the lack of investment due to the political crisis of the early 1990s, the genocide of 1994, and the floods of 1997/98. The following map of roads in 1999 shows a poor accessibility of most municipalities to the road network.⁶

We then measure whether having access to the road network in 1999 explains the difference in employment outcomes in the long run (in the year 2012 corresponding to the second census). We first show that administrative entity closer to the road network in 1999 displays relatively:

⁶ We measure road access by taking the distance from the administrative entity centroids to the main road. The administrative entity level is the 416 sectors.

- Higher employment level in 2012.
- A faster rate of structural transformation measured as the relative size of the services and manufacturing sectors in the economy.
- An increasing prevalence of salaried employment rather than self-employment.

Using the households' GIS coordinate from EICV 3 as well as a map of “good condition” roads in 2011, we produce an index of roads accessibility measured by the kilometers of roads comprised within a 2.5 km radius from the households as shown in Figure 4.

Figure 4: Good roads in 2011 and households GIS coordinates



Source: Charpe 2017

The study shows that having good access to the road network correlates well with different measures for quality of employment and reduction of poverty. The variables considered included: the likelihood of being extremely poor, likelihood of being poor, likelihood of working on a small farm/being a subsistence farmer, and likelihood of having salaried work. The study found a statistically significant negative correlation between the first three variables and access to roads. For instance, the regression coefficients for the likelihood of being extremely poor and poor are -3.48 and -2.56 respectively, meaning that the better the access to roads, the smaller the probability of being extremely poor or poor. Similarly, coefficients for the likelihood of being a subsistence farmer is -3.68, which indicates that the better the access to roads, the smaller the probability of being a subsistence farmer. The analysis also shows that there is a positive correlation between access to road and the likelihood of having salaried work. This indicates that the better the access to roads the larger the probability of having a

paid job. These findings indicate that improved access to roads correlates well with positive long-term effects on employment and poverty.

These correlations must be interpreted with caution, as they do not necessarily mean causation. Further analysis using the “double difference method” showed that, over the period analyzed, poverty declined faster among the households with improved road access as compared to those whose road access do not improve over years. This then gives a good indication that improved access is a cause of reducing poverty and that the efforts to ensure a minimum level of access to roads for the poor can be an important component of poverty reduction strategies including improving access to the labour market for the poor.

5 Policy implications

The picture that emerges for the three studies shows that the construction sector has good links to the rest of the economy. Using different methods, it was estimated that creating one job in construction stimulates between one and three jobs in rest of the economy. This is an important policy finding as the government plays a large and direct role in this sector through its public investments in infrastructure, in particular in road construction. It is therefore crucial to at least sustain, but potentially increase investments in this sector to optimize its potential for job creation.

5.1 Portfolio and technology choice of road investments matters for employment

The short-term employment impacts of the construction sector and infrastructure investment differ significantly depending on the approach and technologies chosen to implement the investment. As the findings have shown, labour-intensive feeder roads can create up to five times as many direct jobs and 2.5 times as many total jobs. Given the structure and nature of the Rwandan rural labour market (high underemployment, and low productivity), an attractive policy option is that, in all rural areas, approaches and technologies that require higher labour inputs are used as often as possible to maximize the employment outcomes of construction sector and infrastructure investments. Therefore, the policy goal in the *National Feeder Roads Strategy* to use labour intensive methods is important and should be supported. Since the government is the main investor in this area, and thus procures contractors, it can design these roads and structure the contracts in such a way that ensures the more use of labour-intensive methods.

5.2 Opportunity to create employment and reduce underemployment through employment in the construction sector

Investment in infrastructure provides a good opportunity to boost employment in both the short and medium term as the different multiplier analyses have shown that it creates employment both in the construction sector as well as related sectors in both the short and medium term. With regards to creating employment in the short-term, the implementation of the *National Feeder Roads Strategy* provides an important opportunity to create employment for both underemployed and unemployed rural workers. According to EICV 3 data, around 48 percent of people aged 15 to 64 were underemployed and were seeking additional work in 2010/11. These workers usually have few options for wage employment outside the agriculture sector where both wages and productivity tend to be very low. Shifting these workers to the construction sector, even if only on a temporary basis, would increase their productivity. Such employment will also provide these workers with an opportunity to develop a specific set of skills in the construction sector. This can be further maximized through establishing a specific skills training framework. In this context, both the construction sector and labour-intensive feeder road investment programmes can play an important role in reducing underemployment through increasing the total number hours worked in the overall economy in the short-term. Furthermore, the findings from the local multiplier analysis, show that in the medium-term a growing construction sector has an even greater multiplier effect, with an additional three jobs created for every sustained job in the construction sector.

5.3 Promotion of investments in roads to reduce poverty and support structural transformation

Road investments also provide a foundation for future employment growth and poverty reduction. This is especially important in countries like Rwanda, where the infrastructure gap is the greatest, and employment needs are growing. As findings in the study on *the impacts of access to road on employment and poverty* have shown, better access to roads entails a smaller probability to be extremely poor or poor. This also correlates to a smaller probability to be in subsistence farming and a higher probability to be in wage employment. In this regards, road investment seems to support structural transformation of the Rwandan economy. The study also showed that over the period analysed, poverty declines faster among the households with improved road access as compared to those whose road access did not improve over the years. Therefore, it is important to design road infrastructure investments as integral elements of poverty reduction strategies especially in rural areas. Emphasis should be given to both increasing the current road density and upgrading the road standard.

5.4 Prioritization of roads construction to improve labour market access and rural workers income

Another finding relates to the importance of roads in enhancing access to the labour market. It was found that even rural roads appear to support better access to salaried work and to the overall labour market, and this means that even in non-urban areas, roads play an important labour market function. This is an important finding as traditionally the economic value of non-urban roads is mainly evaluated based on their role in facilitating access to (agricultural) commodity markets. By neglecting the improved access to labour markets, the importance of rural roads is generally underestimated, which may in turn lead to the lower levels of financing allocated to rural roads. This finding supports the National Feeder Roads Strategy, which commits to a higher level of financing to rural roads.

Furthermore the extra income provided to the farmers employed on these feeder roads for construction and maintenance will make it easier for them to purchase improved seeds and fertilizers and increase the production of their farms. The findings from *the employment impact assessment of construction subsectors* study showed that between 80 to 85 percent of jobs created investments in labour-intensive feeder roads would be for unskilled rural workers who are generally also active in agriculture.

5.5 Policy option to improve women and youth employment

Rural women represent a significant proportion of active population in Rwanda and greatly contribute to subsistence agricultural production. However, they have less access to productive employment opportunities and resources than men. As it was indicated in the construction subsectors study, up to 25 per cent of the newly created employment opportunities in the construction sector would be for women workers. Thus, promoting public investment in this sector could be a policy option to generate more employment opportunities for women workers. The increasing number of young people joining the labour force with limited employment opportunities has also heightened the need to focus on youth employment in Rwanda. In this regard, the study found that, for new jobs triggered by investments in the construction sector, between 7 percent and 10 percent of the jobs would be for young people who are either unemployed or underemployed in the labour market. However measures to increase this percentage should be considered so that the sector can attract even more youth.

6 Recommendations

Taking into consideration the policy objectives of improving the wellbeing of the Rwandan population by reducing unemployment, underemployment and poverty, shifting employment

from farm to more productive non-farm jobs, improving the country's international connectivity, and improving access to commodity and labour markets it is recommended that:

- ❖ The government sustains and if possible gradually increases its investments in transport infrastructure in the national budget process for the coming years to not only improve access, but also support and sustain job creation in the construction and related sectors.
- ❖ The government continues to play its important role in developing the construction sector, as it is a sector that is directly influenced by government through its public investments in infrastructure. Ensuring a steady stream of work and boosting investment in periods when private investment declines will have positive effects for the construction sector, and the related sectors by encouraging private construction enterprises to invest in increasing productivity, individuals to develop relevant skills, and entrepreneurs to start construction companies. As this is a sector with a relatively low barrier to entry, it has the potential to nurture small enterprises.
- ❖ The government further increases the use of labour-intensive methods in implementing the National Feeder Road Policy and Strategy, as this would provide an opportunity for reducing unemployment and unskilled underemployment in rural areas and creating off-farm jobs
- ❖ Improved access to the labour market and the apparent effect of roads to support a shift out of subsistence agriculture into wage employment are included as criteria for making decisions on investments in road and transport infrastructure.
- ❖ Given the potential for the spatial based analysis to understand more thoroughly the long-term effects of road infrastructure on employment and economic and social wellbeing, it is recommended that the government as well as the ILO continue to develop the GIS based analysis of the effects of road investments further.

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