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Service Sector Development and its Determinants in Rwanda

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ABSTRACT

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The service sector is an avenue for economic transformation as not all countries have a competitive edge in manufacturing. The growing literature on service sector primarily focuses on its development in the US and Europe and on Asian emerging service economies like India. Not as much attention has been paid to the role that services can play in the economic growth of African countries primarily due to the high prevalence of agriculture in these countries. But with avenues of structural adjustments and globalization, some African countries have become service-based economies. Services are considered as an alternative to manufacturing-led development in Rwanda since its aims is to become a service-based hub to serve countries in the East African Community (EAC). Recently, the growth rate of the service sector has been impressive in the Rwandan economy. The present study is an attempt to study in detail the development of the service sector over the years in Rwanda's economy and empirically estimate its determinants by using an econometric methodology. The empirical results are based on micro-data collected during the Rwanda Enterprise Survey 2011 and the 2014 Establishment Census. The survey has data on 241 firms and establishments. Linear and limited dependent variable techniques are employed to investigate the factors behind the development of the service sector. Models are specified and estimated to assess the factors contributing to sales growth, innovation and turnovers of service firms. The results show the factors that have contributed to the development of the service sector. These factors can be used in forming public policy with the aim of using the service sector as a vehicle for speeding up the shift from a low income to a middle income state.

JEL Classification: C35, F13, G29, O47, O55

Keywords: limited dependent variables, services, openness, growth, East Africa, Rwanda

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1. Introduction

As per the 2014 Rwanda services policy review, the service sector was the largest and most dynamic sector in the Rwandan economy. Though there is competition among EAC countries, Rwanda is committed to becoming a service-based hub to serve the region in order to break its landlocked nature. The pace of globalization of services is much more rapid (Mann, 2004) and the service sector is conceived as an avenue for economic transformation, as not all countries have a competitive edge in manufacturing (UNECA, 2015). The Rwandan service sector is sub-divided into two broad categories of trade and transport services. Trade and transport services include maintenance and repair of motor vehicles, wholesale and retail trade and transport services and other services like hotels and restaurants; information and communication; financial services; real estate activities; professional, scientific and technical activities; administrative and support services; public administration and defense; compulsory social security; education services; human health; social work services; and cultural, domestic and other services.

Many researchers in economics have argued that the growth of the service sector has great implications for the growth of a country's economy. Among others, Wu (2007), Shingal (2013, 2014) and Singh and Kaur (2014) have claimed that India and China have recorded attractive economic growth that is closely associated with the dramatic development of the service sector.

Within the competitive global village, the Rwandan economy has annually recorded 8 per cent average GDP growth since 2001 and GDP per capita increased more than three-fold from about US$211 per capita in 2001 to about US$718 in 2014. The service sector spearheaded this strong economic growth journey as it accounted for a bigger share of GDP -- by 2015, 47 per cent of GDP compared to 33 per cent of the primary sector (agriculture, forestry and fishery) while the growth of services was impressive at around 9 per cent by 2014 against 7 per cent for industry and 4 per cent for agriculture. The main sub-sectors in the service sector are wholesale and trade, transportation, storage and communication services. Trade and transport services contributed to the share of services in gross domestic product at 159 billion Rwf[1] in 1999 which increased to 784 billion Rwf in 2014 of which wholesale and retail trade had 615 billion Rwf in 2014 against 133 billion Rwf in 1999. Other services including hotels and restaurants, information and communication, financial services and so forth increasingly contributed to GDP from 430 billion Rwf in 1999 to 1,505 billion Rwf in 2014. The service sector's contribution grew to 2,290 billion Rwf in 2014 as compared to 563 billion Rwf in 1999. Authorized loans by the central bank to the service sector increased from 1.5 billion Rwf in 2010 to 12 billion Rwf in 2014. All these statistics are at fixed 2011 prices and suggest increased attention and public support for the service sector's development.

As Rwanda was ranked second after Mauritius in Doing Business in sub-Saharan Africa in 2013-14, the service sector received a big share of foreign private investments. As a result 41.4 per cent of foreign private investments were allocated to ICT and tourism (12.8 per cent), while others like mining received 13.8 per cent, manufacturing (10.8 per cent) and other sectors received a significant (21.7 per cent) share of private investments. Meanwhile, as is documented in the Rwandan Vision 2020, the service sector is believed to be the engine

[1] USD 1 = 746 Rwf on 9 March 2016.

for Rwanda's economy with a growth rate of 13.5 per cent and a contribution of 42 per cent to GDP.

Empirically, the present study aims at analyzing the development of the service sector and its determinants in Rwanda. Thus, the prime purpose of the study is doing an analysis of trends in the expansion of services in Rwanda and pointing out the contributing factors driving its development using survey data covering various parts of the service sector. The findings can be used to initiate additional academic research; they also contribute to the body of knowledge about the role of the service sector in economic growth in developing countries of which Rwanda is classified as one. Further, it sheds light on Rwanda's ambitious target as listed in its Vision 2020 as contributing to holistically understanding what to concentrate on in the service sector for the economic growth of a country.

This paper is structured as follows: The next two sections review literature on the service sector's development in the world and in Rwanda in particular. The next section details the conceptual framework and specifies and estimates the models. The section that follows describes the data and the method for empirically analyzing the service sector in Rwanda. The next section presents the empirical model, specifications, estimations and testing. The section that follows focuses on understanding the empirical results and an analysis of trends. The next section points out the usefulness of the results and provides policy recommendations. The last section gives a summary of the findings and a conclusion and provides suggestions for future data collection and research.

2. Literature Review

A literature review shows that a number of researchers and international organizations have supported the role of the service sector as a key driver in the growth of an economy in both developing and developed countries. Recently, the United Nations Economic Commission for Africa (UNECA) affirmed that the service sector is an avenue for economic transformation as not all countries have a competitive edge in the manufacturing sector (UNECA, 2015). The service sector's development is also providing infrastructure that promotes productivity in manufacturing and agriculture.

2.1 Growth and development of the service sector

The service sector's economic development is the only way of promoting economic structural adjustment and accelerating the transformation of economic growth (Zhou, 2015). A declining share of agricultural employment is a key feature in economic development (Alverez-Cuadrado and Poschke, 2011); structural transformation usually coincides with a growing role of industry and services in the economy (UNECA, 2015). The growing size of the service sector and its impact on the other parts of the economy makes it all the more important to promote efficiency in the provision of services and thereby boosting economy-wide labor productivity as witnessed in OECD member countries. The slowdown in the service sector has brought down labor productivity in the entire economy from more than 4 per cent in 1976-89 to less than 2 per cent in 1999-2004 (Jones and Yoon, 2008).

Acharya and Patel (2015) confirm that the service sector is the fastest growing sector in India, contributing significantly to GDP, economic growth, trade and foreign direct investment (FDI) inflows as the total share of this sector to India's GDP is around 65 per cent.

Singh and Kaur (2014**)** state that the main reasons for the growth in services are rapid urbanization, expansion of the public sector and increased demand for intermediate and final consumer services. Domestic investments and openness also positively affect the share of the service sector in GDP, and the main service sectors attracting FDI in India are telecommunications, construction and hotels and restaurants. Malin (2013) says that the service sector has become the main contributor to GDP not only in developed economies like the US, Japan and UK but also in developing economies like China, Indonesia, Pakistan and India. Concluding his study on the determinants of innovation capacity with empirical evidence from service firms, Madeira, Jorge, Sousa, Moreira and Mainardes (2014), affirms that the greater the financial investments in the acquisition of machinery, equipment and software, in internal research and development, in acquisition of external knowledge, in marketing activities and other procedures, the greater the propensity for firms to innovate in terms of services.

According to Park and Shin (2012), general wisdom is that when a country industrializes, the shares of industry and service sectors in both GDP and employment rise whereas the share of agriculture falls and when a country de-industrializes and moves into the post-industrial phase, the share of services rises while the shares of both industry and agriculture fall. They found that when computing the contribution of agriculture, industry and services to GDP growth, in general the service sector made the biggest contribution. Further, the lower the per capita GDP, the greater the scope for labor productivity growth in the service sector, which implies that there is still a lot of room for the growth in the productivity of services. Thus, Buera and Kaboski (2009) argue that as productivity grows, individuals consume new services. Eventually, labor productivity increases enough which makes the absolute cost advantage of market-production smaller and leads individuals to home produce customized versions of services which yield higher utility.

In the early 1980s, Fuchs (1980) argued that the decline in agriculture was attributable primarily to differences in income elasticity of demand but the shift from industry to services was attributable primarily to differential rates of growth of output per worker. Economic growth also contributes to an increase in service employment through an increase in female labor force participation because families with working wives tend to spend a higher proportion of their incomes on consuming services.

2.2 The service sector's contributions to the economy

The rapid expansion of the service sector is principal to contemporary global economic restructuring; this is proven by the fact that the increase in the service sector's share in the global workforce from 24 per cent to 35 per cent between 1965 and 1990 led to its share in the world's domestic products increasing from 50.6 per cent to 62.4 per cent between 1960 and 1990 (Willian, 1996).

Olofin, Olufolaham and Jooda, (2015) have argued that in West Africa 60-65 per cent of the population is still engaged in farming and many are still food insecure. Research confirms a positive relationship between income growth and food security and researchers recommend

putting in place policies and programs to ensure quality civil services. However, despite this in sub-Saharan Africa the service sector makes up nearly 60 per cent of GDP and is expected to grow as historical data shows that each 15 per cent increase in services' contribution to GDP is associated with a doubling of incomes per capita. The top ten African countries by services as percentage as reported by UNECA (2015) are Seychelles (81.1 per cent), Djibouti (77.0 per cent), Mauritius (71.5 per cent), Cabo Verde (70.3 per cent), South Africa (69.1 per cent), Botswana (61.8 per cent), Senegal (60.1 per cent), Eritrea (60.0 per cent), Lesotho (60.0 per cent) and Gambia also having a 60.0 per cent share of the service sector in its GDP. In the European region, Maroto-Sanchez and Cuadra-Ruara (2011) confirm that several service industries have shown dynamic productivity growth rates, contributing more than expected to productivity growth.

Ghani, Goswami and H. Kharas (2011) say that services accounted for more than 75 per cent of the global economy, of which 45 per cent belonged to developing countries where they claim services contributed more to GDP growth, job creation and poverty reduction as compared to industry. In fact services are the fastest growing sector in global trade and the share of developing countries in world service exports increased from 14 per cent in 1990 to 21 per cent in 2008. Moreover, Nayyar (2012) has argued that the rapid increases in international trade services draw attention to the fact there are some countries which are in a position to specialize and export products in which they have a comparative advantage. For instance, the size of the service sector in India was bigger than the average lower-middle income countries in 2009. The Indian service sector consists of wholesale and retail trade, hotels and restaurants, transport, storage and communication services, financial services, real estate, electric and water utilities, media, communication, education, health, ownership of dwellings and renting services.

Notably, 60 per cent of all the employment created in the OECD area came from rapid employment growth in the service sector due to: the strong performance in certain markets for services such as wholesale and retail services, telecommunications, transport, finance, insurance and business services and secondly the growing use of productivity enhancing technologies like ICT, (OECD, 2005). The household-serving sector has other services such as civic and social organizations and childcare (Kay et al., 2007).

UNECA (2015) has documented the performance of Rwanda in the service sector which shows that service exports grew from $59 million in 2000 to $395 million in 2011. A growth of more than 10 per cent occurred in wholesale and retail trade, education, finance and insurance, and transport, storage and communications since 2007. Over 2000 and 2011, the ICT sub-sector received investments amounting to $552 million, exports of travel were equivalent to 63 per cent of total services' exports and 29 per cent of merchandise and services exports in 2011. By 2012, FDI stocks in services were the largest at $640.2 million followed by $391 million in ICT, $124.1 million in finance and $125.1 million in insurance, against just $90.8 million in manufacturing. In the seven year government program, tourism is expected to grow at a compound annual rate of 25 per cent and by 2014 Rwanda had received 1,137,000 visitors mostly attracted by the Rwanda mountain gorilla, generating $294 million (up from $62 million in 2000). In addition, the government is committed to increasing investments in services up to $350 million by 2016 from $46 million in 2015.

According to Sethi and Gott (2016) India and China continued to occupy the top two spots in the Global Service Location Index (GSLI). Their positions were thanks to major gains in

educational skills, cultural adaptability and financial attractiveness because of increased values of the renminbi over the US dollar and improved governance and financial liberalization in China while India has the first overseas research and development center and the 4th largest smartphone vendor in the world. Surprisingly, eight of the top 20 and six of the top 10 countries on the list are Asia Pacific countries due to their financial attractiveness and the availability of skilled people. Latin America and Western Europe both have five countries in the top 20 as Latin America shows a spike in the availability of skilled people and Western Europe has a conducive a business environment. In Africa, the only country that appears among the top 20 is Egypt which ranks 16th due to its strong performance in financial attractiveness. Ghana is ranked 29th and Mauritius 30th. Tunisia is ranked 38th, Kenya 39th, Senegal 45th and South Africa 48th. Among the East African countries, only Kenya comes first at a rank of 39 as a high-ranking newcomer to GSLI due to a top 10 score in financial attractiveness. It is argued that many Kenyan companies have based their growth on serving customers first in Kenya and neighboring countries like Uganda and Tanzania.

2.3 Determinant factors of the growth of the service sector

Increasingly, contemporary literature on economic growth in economies across countries underlines factors that contribute to the remarkable growth in the service sector. These factors include but are not limited to increasing foreign direct investments, openness of a country's economy, expansion of skill development, quality health services, applying information technology and increasing consumption expenditure.

Iashmi and Kumar (2012) and Das and Raut (2014) conclude that the growth of output in the service sector came from the rapid development of skill intensive services in the information technology and service segments. This is mostly oriented to the external market. In addition there is also the implementation of new economic policies such as reduction in government expenditure, opening of the economy to trade and foreign investments, adjusting the exchange rate from a fixed rate system to a flexible exchange rate system, deregulation in most markets and removal of restrictions on entry, exit, capacity and pricing. Earlier, Ramakrishna (2010) summarized the sources of growth of the Indian service sector as income elastic demand, open policies and growth in services like communications, business, banking and insurance and trade.

Latha and Shanmugam (2014) claim that the advancement of the service sector in India was a result of the expansion of both the health and education sectors where health is defined as a state of complete physical, mental and social well-being and not just the non-existence of diseases and aliments. This approach in literature is called Salutogenic healthcare.

Mujahid and Alam (2014) show that the growth of the service sector in Pakistan can be attributed to its population, foreign direct investments, consumption and investments. Talking of key industries driving service sector growth in India, Harini and Indira (2014), say that India's tourism and hospitality industries contribute the most because of strong growth in per capita incomes, an increasing young population coupled with changing lifestyles which have led to greater expenditure on leisure services.

Heshmati and Kim (2012) conclude about the Korean economy that the competitiveness in its service industry can be driven by the incentive system for skilled workers and investing

more in research and development in order to increase labor productivity. In addition, the Korean government should implement an open market policy to liberalize labor movement and induce low paid labor to a large extent to move to the production process.

2.4 Employment and productivity growth in services

Arnold et al., (2016) demonstrate the presence of a link between India's policy reforms in the service and productivity of manufacturing firms. They find that banking, telecommunications, insurance and transport reforms have all had significant effects on productivity in manufacturing firms; these effects tend to be stronger on foreign owned firms.

El-Said and Kattara (2013) researched the application of information technology versus human interaction services in an Egyptian hotel. They found that customers preferred to contact an employee rather than depending on technology based self-service in a majority of service encounters. In Uganda, more than 80 per cent of the households were employed in tourism services. Tourism employment can provide initial capital for supplementary activities (see also Adyia et al., 2014).

3. The Rwandan service sector's development and growth

The service sector is now the largest and most dynamic sector in the Rwandan economy. The main service sub-sectors and contributors to the growth of the service sector were wholesale and retail trade and transport, storage and communication services from 2006 to 2010 (Mashayekhi, 2014). Several other service sub-sectors are also rapidly developing.

According to the Rwandan Integrated Household Living Condition Survey or Enquête Intégrale sur les condition de Vie des ménages (EICV4), the indicator of an increase in private and business oriented mixed establishments by industry in 2011-14 increased up to 24 per cent in which the contribution of each service sub-sector reveals a rise and fall in percentage change. An increase was found in wholesale and retail trade, and repair of motor vehicles and motorcycles (21 per cent), accommodation and food service activities (34 per cent), transport and storage (7 per cent), professional, scientific and technical activities (3.9 per cent), administrative and support services (23.1 per cent), health and social work activities (33.1), art, entertainment and recreation (31.0 per cent), financial and insurance activities (18.4 per cent), private form of education (0.6 per cent) and other service activities (32.0 per cent), whereas a fall was recorded in information and communication (-28.3 per cent) and real estate activities (-76.5 per cent).

Employment change in private and business oriented establishments by industry in 2011-14 grew up to 34.5 per cent within which in the service sub-sector a large increase was recorded in administrative and support activities (268.3 per cent), financial and insurance activities (81.2 per cent), transport and storage (54.9 per cent), arts, entertainment and recreation (67.7 per cent), health and social work activities (50.2 per cent), accommodation and food service activities (37.7 per cent), wholesale and retail trade and repair of motor vehicles and motorcycles (28.7 per cent)

By 2020, the contribution of services is projected to be 57 per cent to GDP as compared to 24 per cent by agriculture followed by 19 per cent by industry. As per EICV4, the service

sector was the biggest contributor to GDP growth with 2,536 billion Rwf in 2013 compared to 774 billion Rwf for industry and 1,785 billion Rwf for agriculture in the same year. This reflects the transition of the Rwandan economy towards a service-based economy. This is also evidenced by a change in the share of economic sectors in GDP from 1970 to 2010. In 1970 agriculture led other sectors as it had a 55.9 per cent share in GDP compared to a 19 per cent share of industry and 25.0 per cent of services. Since 2000, the service sector is leading with a contribution of 45.6 per cent to GDP in 2000, 49.7 per cent in 2010 and 53.3 per cent in 2013.

3.1 Development of services by economic activity

The distribution of businesses by economic activity shows that the service sector achieved positive growth in both rural and urban areas. The main sub-sectors in the service sector that showed more than 30 per cent growth include accommodation and food services, human health and social work activities and art, entertainment and recreation activities. According to Singh and Kaur (2014) rapid urbanization is a key factor which contributes to the growth of services and leads us to analyze this growth of the service sector in urban and rural area in 2011-14. Accommodation and food service activities showed the greater growth; they had 26,190 registered establishments in 2011 and 36,545 registered establishments in 2014 in rural areas showing a 40 per cent increase whereas in urban areas 7,095 establishments were registered in 2011 and 8,076 in 2014 corresponding to a 13.8 per cent increase. The average growth of the accommodation and food services sub-sector was 34 per cent between 2011 and 2014 in private establishments and the business oriented mixed sector by economic activity where 33,285 accommodation and food establishments were registered out of 119,270 in 2011 and 44,621 establishments out of 148,376 were registered in 2014. It is obvious that the accommodation and food services sub-sectors are growing faster in rural areas than in urban areas and the growth of this sub-sector contributed to the overall growth of the service sector (NISR, 2014).

As stated by Latha and Shanmugam (2014), advancement of the service sector is correlated with the expansion of quality health services indicated by complete physical, mental and social well-being and not just the non-existence of diseases and aliments. While analyzing the service sector's development in Rwanda, it was found that human health and social work activities demonstrated an interesting growth of 33.1 per cent. In rural areas, 83 human health and social work establishments were registered in 2011compared to 167 registered in 2014 showing a 101 per cent increase over the period. In urban areas, 261 establishments in human health and social work activities were registered in 2011 as compared to 291 registered in 2014 or a 11.5 per cent increase in human health and social work establishments in urban areas. The growth of establishments in human health and social work activities was eight times higher in rural areas as compared to urban areas from 2011 to 2014. Therefore, there is a great conviction that the growth of the service sector is linked to high growth in its sub-sectors, particularly in rural areas.

Though wholesale and retail trade and repair of motor vehicles and motorcycles are not mentioned among the fastest growing service sub-sectors, it is worth analyzing them since they had a lion share in the service sector. In wholesale and retail trade, there was an average increase of 7 per cent by 2014 while the motor vehicles and motorcycles repair sub-sector had a 37 per cent increase in rural areas as compared to a 7 per cent increase in urban areas.

This was a result of 30,708 establishments registered in 2011 and 42,101 establishments registered in 2014 in rural areas as compared to urban areas where 33,968 establishments were registered in 2011 and 36,352 in 2014. Generally the rural areas spearhead economic activity in the service sector. Figure 1 shows the remarkable growth of the service sub-sectors accommodation and food activities and wholesale trade, repair of motor vehicles and motorcycles.

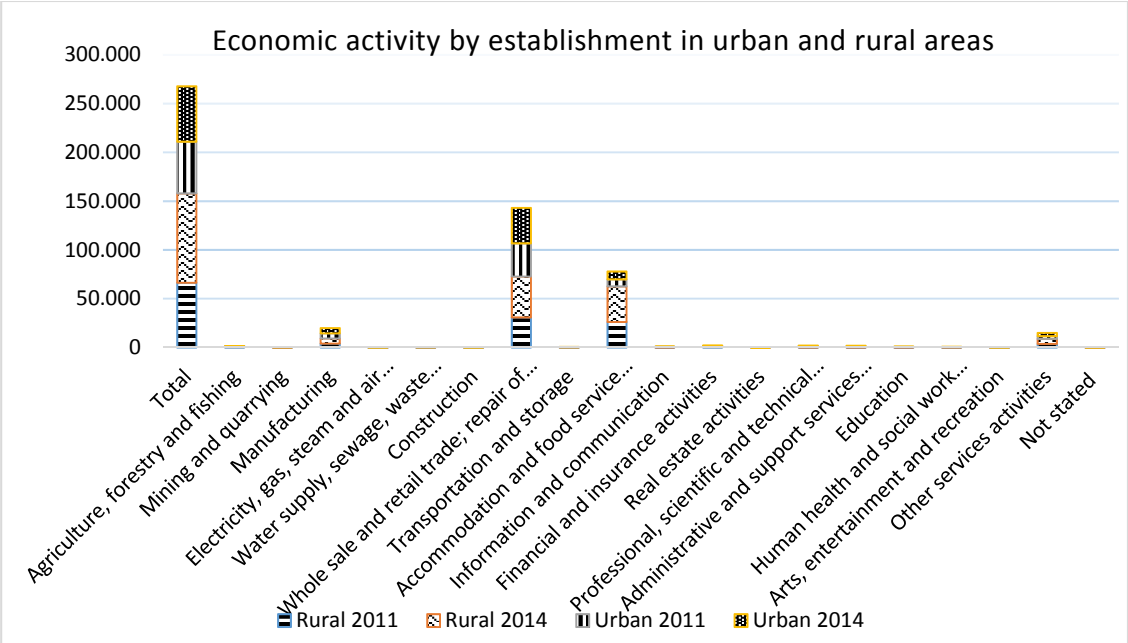

Figure 1. Economic activity of private and business oriented mixed establishments according to urban/rural areas (2011 and 2014)

Source: NISR's Establishment Census (2014).

3.2 Employment growth in the service sector

A growing body of literature supports employment to measure growth in a sector by looking at female labor participation in services (Fechs and Victor, 1981) and measuring the growth of firms since they reflect both short-term and long-term changes Isaga (2015). In keeping with this thinking, this section gives a descriptive analysis of employment in the service sector in Rwanda.

According to the Establishment Census (2014), the service sector employed 401,173 workers or 81.3 per cent of the total workers. The biggest service sub-sectors in terms of the people employed included wholesale and retail trade, repair of motorcycles and motor vehicles (with 120,482 employees equivalent to 24.4 per cent of the total employment), followed by education employing 83,569 (16.9 per cent of the total employment) and accommodation and food service activities having 82,213 employed people (16.7 per cent of the total employment). These sub-sectors supported the growth of the service sector since they provided more jobs as compared to other economic sectors.

Men were still predominant in almost all the service sub-sectors except human health and social work activities where they represented 47.7 per cent of the total employed while female workers reached 52.3 per cent. A general picture of the share of employment within the service sector shows that gender inequalities persist. Only 36.8 per cent of the total employment in the service sector was with females as compared to male workers who had the lion's share of the service sector employment at 63.2 per cent of services employment. Considering the share of women in the total population in Rwanda -- 53 per cent as compared to 47 per cent for men -- there is hope that the service sector will continue to grow if there is full participation of women in the service sector's employment. Figure 2 illustrates the way employment is divided across economic activities.

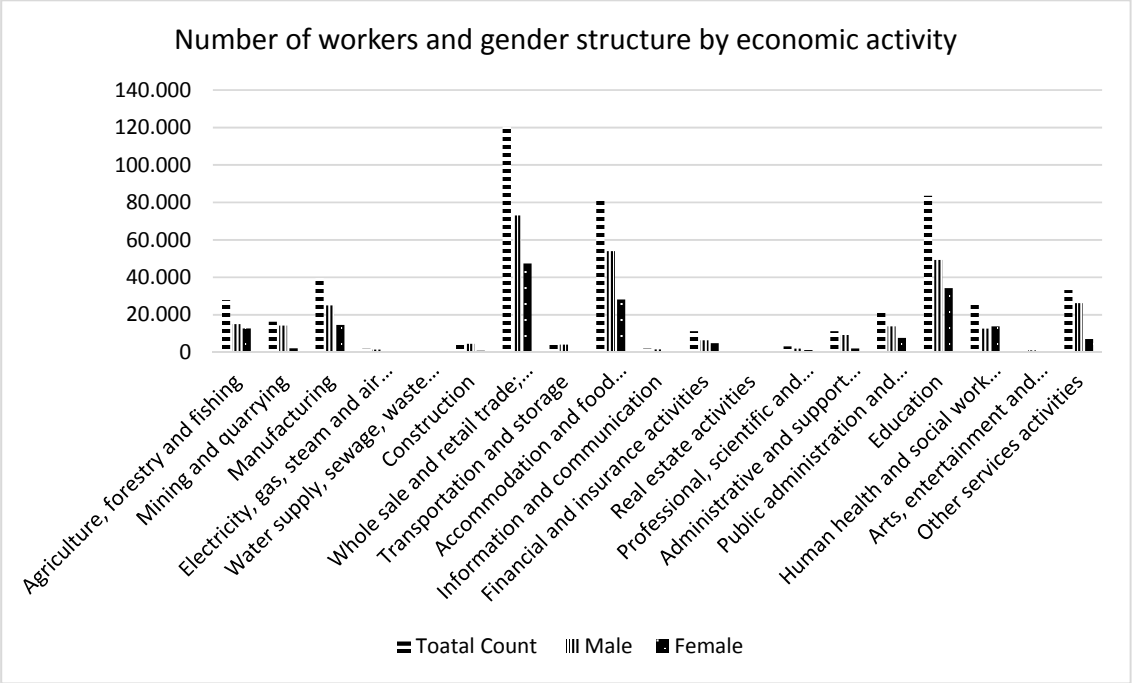

Figure 2. Distribution of number of workers and gender structure by economic activity, (2014)

Source: NISR's Establishment Census (2014).

3.3 GDP share of service sector growth

According to the National Institute of Statistics of Rwanda (2014), the service sector was the biggest contributor to GDP. The shift from an agriculture based economy to a service-led economy has been effective since 2004 when the annual output in agriculture was 879 billion Rwf compared to output in the service sector at 882 billion Rwf. Till 2016 the service sector spearheaded the contribution of economic sector to the growth of GDP in Rwanda.

The impressive growth of the service sector is documented around 9 per cent by 2014 against 7 per cent for industry and 4 per cent for agriculture while the annual average GDP was 8 per cent by 2014. The total output in the service sector increased up to four times from 1999

to 2014. The total output of the service sector in 1999 was 563 billion Rwf which grew to 2,290 billion Rwf in 2014 (Figure 3).

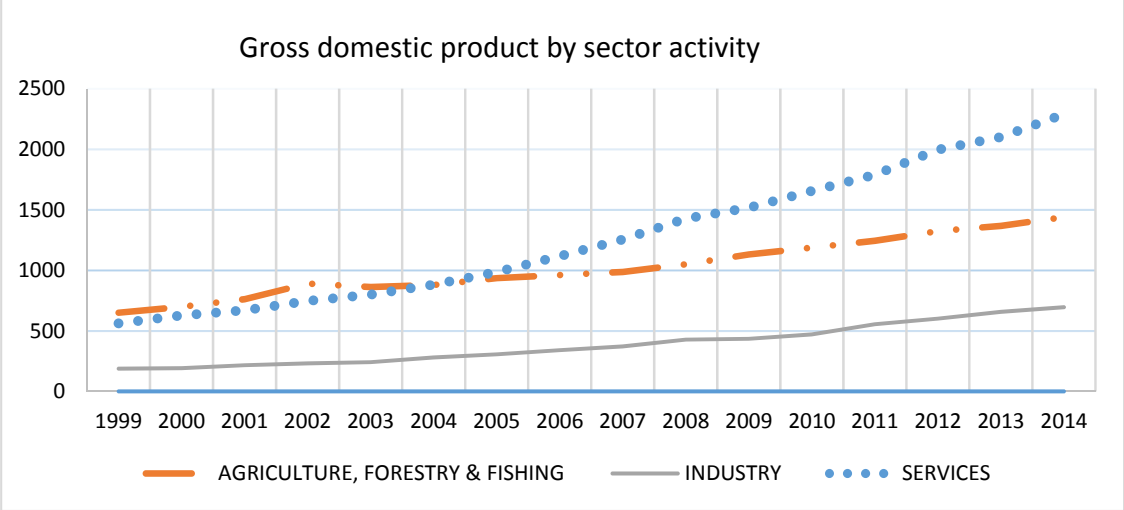

Figure 3. GDP by sector activity at constant 2011 prices (in billion Rwf)

Source: National Institute of Statistics of Rwanda (2014).

The service sub-sectors that contribute more include wholesale and retail trade with a contribution of 130 billion Rwf in 1999 and 615 billion Rwf in 2014. Though they do not show growth, real estate activities contributed more to the share of the service sector in GDP. In 1999, the total output in real estate activities was 283 billion Rwf which did not grow much and amounted to 311 billion Rwf by 2014. Tremendous growth in hotels and restaurants (accommodation and food activities) is witnessed by the contribution of this sector to GDP. In 1999, hotels and restaurants contributed 19 billion Rwf which grew to 113 billion Rwf in 2014.

In general, the contribution of the service sector to GDP shows that the sector has been growing since 1999. The effective transition of the economy happened in 2004, at a time when the service sector became the top sector.

3.4 Summary of the literature review on the service sector

A literature review on the service sector provides an interesting perspective of the role that the service sector plays in economic growth in both developing and developed countries (Ghani et al., 2011). The service sector accelerates the transformation of economic growth by contributing to GDP growth (William, 1996; Zhou, 2015), increasing employment due to increased female labor participation in services (Fechs and Victor, 1981) and boosts economy-wide labor productivity (OECD, 2008) since it adds to cost advantages of market production (Buera and Kaboski, 2009).

Factors which have contributed to the development of the service sector include but are not limited to rapid urbanization, expansion of the public sector, increased demand for

intermediate and final consumer services (Singh and Kaur, 2014), innovation capacity (Madeira, Jorge, Sousa, Moreira and Mainardes., 2014), domestic investments and openness (Fang, Hong, Li and Song., 2013), education skills, cultural adaptability, financial attractiveness and business environment (Sethi and Gott, 2016) and expansion of quality health services, application of information and technology and increase in consumption expenditures (Iashmi and Kumar, 2012). In addition, expansion of the health and education sectors (Latha and Shanmugan, 2014), population size (Majahid and Alam, 2014), incentive systems and investing more in research and development (Kim et al., 2012) also contribute to the advancement and growth of the service sector.

It is found that the transition of the Rwandan economy to a service-based economy has a good record. Services are leading the economy since 2004 and contributed up to 53.3 per cent of the 2013 national account data. Innovations in the service sector are a more interesting factor because innovation is one of the six principles of the economic development and poverty reduction strategy (EDPRS II). Knowing that Rwanda is a landlocked country, openness and foreign direct investments are seen as a breakthrough in the service sector's development. As found in literature, a conducive business environment and promotion of gender equality, education skills through 12 years of education for a knowledge based economy are transformative means in the Rwandan economy. However, except documenting the strategy to promote services in the national development agenda and some other statistics, literature does not reveal the factors behind the growth of the service sector in Rwanda.

A descriptive analysis of the service sector is based on the Establishment Census (2014) which sheds light on the structure of the service sector. It is found that the service sector was the top employer in the economy with 81 per cent of the total employed people, the growing service sub-sectors are accommodation and food service activities and human health and social work activities. Sub-sectors like wholesale and retail trade, repair of motor vehicles and motorcycles, hotels and restaurants and real estate activities were top contributors to the share of the service sector in GDP.

4. The Conceptual Framework and Model

4.1 Understanding the key concepts

Services, in this study are conceptualized as non-agricultural and non-manufacturing economic activities in firms operating in the Rwandan economy. National accounting of GDP complies with the International Standards Industrial Classification (ISIC) of all economic activities.[2]

[2] ISIC classified services into sections from G to U as per individual categories in such a way to (U) include wholesale and retail trade, repair of motor vehicles and motorcycles, transport and storage, accommodation and food service activities, information and communication, financial and insurance activities, real estate activities, professional, scientific and technical activities, administrative and support service activities, public administration and defense, compulsory social security, education, human health and social work activities, arts, entertainment and recreation, other services' activities, activities of households as employers, undifferentiated goods and services producing activities for households for own use and activities of extra-territorial organizations and bodies (UN, 2008).

Openness is conceived as an interaction with activities outside the Rwandan service sector in terms of import and export of services, foreign direct investment firms and acquisition of working capital externally. Yeboah, Naawaab, Saleem and Akuffo (2012) have argued that the trade effect on productivity is much greater in an outwardly-oriented economy than in an inwardly-oriented nation. The relationship between trade openness and economic growth is significantly positive in developing countries (Tahir and Azid, 2015). The openness of a firm's founders and early preparations for growth determine both the extent of organizational learning and the speed at which it is developed and used (Hagen and Zucchella, 2014).

Growth is conceptualized as the increase in the service sector measured as GDP. King and Levine (1993) claim that financial development is robustly correlated to the future rate of economic growth, accumulation of physical capital and improvements in economic efficiency. Growth in foreign sales contributes to a firm's growth if there is greater interaction among the management team's members and a higher degree of joint decision making among the owners and managers of small firms (Reuber and Fischer, 2002). Sustaining economic growth and improving living standards requires shifting labor into both the manufacturing and service sectors (Eichengreen and Gupta, 2011).

A firm's growth is conceived as an increase in the product or service as the main business, increase in sales, increase in the number of new employed persons and the size of the establishment in the service sector. Smith and Verner (2006) found that the proportion of women in top management jobs had a positive effect on a firm's performance and that the effect depended on the qualifications of female top managers in Denmark. Dawkins, Feeny, and Harris (2007) have argued that both large firms and those which are highly specialized, enjoy higher profit margins, whereas the more capital intensive the firm the lower its profitability.

4.2 Empirical findings in service sector research

Mujahad and Alam (2014) claim that an increase in the share of services in Pakistan's GDP is linked to population size and both internal and external factors. They conceptualize domestic factors as household and government consumption, gross fixed consumption, labor participation, growth rate and literacy, while external factors are conceived as external total debt, foreign direct investments and trade liberalization measured by imports plus exports divided by GDP. Their results show that total debt, population, investments and GDP growth had a negative effect on services. In contrast trade liberalization, labor participation, aggregate consumption and government spending had a positive effect on services.

Sahu (2015) analyzed micro-data on service sector companies to test high growth in total factor productivity (TFP) assessing if better factor allocation led to TFP growth. He found that a reduction in the misallocation of resources in the service sector resulted in an accelerated pace of TFP growth. Therefore, the communication and community service industries registered the fastest growth in terms of moving towards efficient TFP levels. Acharya (2016) affirms what accounts for exceptional TFP growth performance in some ICT industries using industries where productivity gains in the production of ICT are given as an answer in the US and in the Organization of Economic Cooperation for Development (OECD). Van der Marel and Shepherd (2013) confirm that ICT capital and legal institutions are particularly important determinants of a country's ability to successfully export services.

Further, the tradability indices are strongly correlated with important factors like country productivity and size, factor endowment, trade costs and regulatory measures.

Geishecker and Görg (2008) claim that measuring both service and material offshoring is not straightforward and is greatly limited in available data on coherent and comparable information on such activities. Thus, trade economists usually revert to measuring trade in intermediaries as proxy. In addition, they assessed the impact of offshoring activities in an industry on individual wages which are conceptualized as average hourly gross labor earning including bonus, premium and other extra payments. The explanatory variables are demographic and human capital variables including age, age squared, dummies for the presence of children and being married, job tenure, tenure squared, a high education indicator, dummies for occupation and dummies for firm size and regional dummies. Their results show that workers in industries with increasing levels of offshoring services were likely to experience reduction in their wages. They conclude what would have been considered as a perfect case of spillovers from ICT using conventional methods -- the impact of research and development and other intangible capital.

Madeira, Jorge, Sousa, Moreira and Mainardes (2014) investigated the main determinants of innovation in the service sector in the area of innovation activities. They found the use of the logit model to be appropriate for measuring direct and indirect effects of a selected set of explanatory variables of the innovation capacity of Portuguese service firms. They point out the existence of several factors that stimulate and limit the innovation capacities of firms such as investments in innovation activities, firm size and the sub-sector service in the sector of the activity.

Many research findings show that the contribution of research and development activities in the growth of the economic sector in any country is fundamental. Jafaridehkord et al., (2015) have argued that firms benefit immensely from spending on their human capital because this investment adds value to their companies. Heshmati and Kim (2012) discuss the fact that a decrease in research and development investment results in decreasing productivity growth. Schoonjans et al., (2013) claim that the effect of knowledge networking on firm growth is significantly larger for service firms than for manufacturing firms since it positively affects net asset and value added growth of service firms.

According to Du and Temouri (2015), firms in both manufacturing and service sectors are likely to become high-growth firms (HGF) when they exhibit higher TFP. The TFP growth model shows that openness to foreign companies and the world economy, restructuring the economy through a shift of resources between sectors and the presence of foreign companies in Malaysia are major contributors to TFP growth (Jajri, 2008).

4.3 Determinants of productivity growth in service firms

Capital, labor and knowledge-based capital are key inputs in the production of goods and services. Salehi-Isfahani (2006) claim that urban households are a source of growth in human capital in the Middle East and North of Africa (MENA) countries. But households in that region face a large role of the state in the economy, which distorts the incentive to invest in education and the labor market and in social norms regarding gender. As result, households invest in an inefficient portfolio of human capital with dire consequence for long-run growth.

Literature argues the relevance of knowledge-based capital in a firm. Yli-Renko, Autio and Sapienza (2001) found that knowledge acquisition is positively associated with knowledge exploitation for competitive advantages through new product development, technological distinctiveness and sale cost efficiency. Corporate entrepreneurship is positively associated with knowledge based-capital (Simsek and Heavy, 2011) and business services can have an effect comparable to the traditional production factor only when it applies to the service sector (Drejer, 2002).

A review of contemporary literature suggests that regulatory, policy and institutional environments, competition in the product market, spillovers and externalities, internalization and globalization are constituents of a business environment affecting a firm's performance.

Bouazza et al. (2015) confirm that the key factors of the business environment affecting Algerian firms are unfair competition from the informal sector; cumbersome and costly bureaucratic procedures; burdensome laws, policies and regulations; an inefficient tax system; lack of access to external financing; and low human resources capacity. The main internal factors responsible for unstable and limited growth include entrepreneurial characteristics, low managerial capacity, lack of market skills and low technological skills. Gale, Krupkin, Reuben (2015) confirm the existence of a negative relationship with the rate of firm formation and the top income tax rate by finding that a cut in top income tax automatically generates or necessitates growth.

The economic growth of a country in terms of GDP growth is determined by the real value added growth of underlying firms. According to Pop, Stümpel, and Bordean, (2014), in an economic crisis it becomes clear that the smaller firms are often capable of responding faster, they are more targeted and flexible to fluctuations in the global economy and to withstanding the recessionary phase.

Khan (2011) tested the important determinants of a firm's growth. He highlights that a firm's age, the education of the owner, the boss' attitude, family business, networks, new process, major improvements, market share, on job training and knowhow significantly and positively increase the probability of a firm's growth. The age of the owner, foreign trade regulations, taxes, other regulations, political instability, inflation and lack of skilled labor adversely reduce the probability of a firm's growth in terms of employment opportunities. Olivera and Fortunato (2008), and Lenaerts and Merlevede (2016) claim that a firm's growth is mainly explained by the firm's age and size.

Existing literature supports that expenditure on ICT has a positive impact on exports of producer services (Guerrieri and Meliciani, 2004) and ICT to be a bedrock in improving business processes, customer relations and efficient delivery of goods and services to satisfy the needs of customers (Atom, 2013). According to Bethapudi (2013), ICT integration provides a powerful tool that brings advantages to promoting and strengthening the tourism industry. Mihalic et al., (2015) mention that ICT is also becoming an important factor in business and competitiveness because of as is discussed by Borghoff (2011), its influence on the three sub-processes of globalization: internationalization, global network building and global evolutionary dynamics.

As for ICT applicability in the service sector, its role is crucial in facilitating trade (Guta, 2012). According to Liu and Nath (2013), the trade-enhancing effect of ICT is on its use. Internet subscriptions and internet hosts have a significant positive effect on both exports

and imports. ICT in transport services plays a decisive role in reducing energy consumption and CO_2 emissions in the road transport sector (Guta, 2012).

According to Agwu and Carter (2014), the use of mobile banking and automatic teller machines (ATMs) has made financial services easily accessible and have reduced costs to both customers and financial service providers in Nigeria. Information technology has enabled banks to understand and serve customers better than their competitors, developed and improved new products for customers and further improved processes and relationships with customers and business partners (Muro, Maguta and Katembe, 2013).

4.4 Performance Models

In order to investigate the determinants of service sector development, we focus on the role of total annual sales and innovation and turnover in service firms as dependent variables. These are commonly used measures of performance throughout literature and are endogenous to firms in their decision making.

A number of hypotheses were formulated and tested. The first hypothesis was that the service sector's development can be investigated through total annual sales of a firm. In the Rwanda Enterprise Survey (2011), firms were asked what their establishment's total sales were in 2010 and what the establishment's total annual sales were in the three previous fiscal years since fiscal year 2008. Thus, total sales growth up to 2010 was used as the dependent variable. Variables that have an effect on total sale growth are employment cost, loan size, ICT and a firm's innovation characteristics. The null hypothesis is that these factors have no effect on total sales and growth rate, while the alternative hypothesis is that they have positive effects on total sales and growth rate.

Total annual sales were measured in terms of the amount of money a firm acquired by selling services domestically and through direct or indirect exports over three years from 2008. Labor utility was included in the costs incurred for employment by a service firm. Working capital was estimated using the loan size approved to track the role of financial institutions as channels of access to financial service activities. ICT application was tracked by using emails to communicate with clients or suppliers and the use of cell phones for the operations of an establishment. A firm's innovation characteristics were defined as employee development, research and development activities, internal or external training, new methods, new practices, new marketing strategies and new logistics.

The model for investigating the determinants of total sales growth in service firms is constructed as follows:

(1) Total sales growth = f (employment cost, working capital, ICT, firm innovation criteria, acquisition of fixed asset)

The second hypothesis is that the service sector's development is reflected in its innovation that is expressed in the introduction of new products or services. In the Rwanda Enterprise Survey (2011), firms were asked whether they had introduced new products or services in the last three year. The variable of the introduction of new products or services which is conceived as innovation is taken as the dependent variable. Independent variables include internal research and development (R&D) activities, external or internal acquisition of research and development (ext. R&D) as time given to employees in a service firm to

develop or try out a new approach or new idea about products or services, business process, firm management marketing, training, access to finance illustrated by the acquisition of fixed assets and a firm's characteristics in term of size. The null hypothesis suggests that these factors do not influence service innovation, while the alternative hypothesis suggests that they have a positive effect on service innovation of new products and services. The model to investigate the factors affecting service sales is structured as:

(2) Service innovation = f (R&D, ext. acquisition of R&D, acquisition of training, acquisition of fixed assets, other firms' criteria)

The third hypothesis is that the turnover of a service firm is affected by a number of factors like the capital used, openness conceived as buying and selling outside the country, the manager's gender, paying value added tax, paying income tax and the service sub-sector. The turnover of a service firm is defined as the amount of money that is received in sales. In the Establishment Census (2014), the information collected on this variable is classified in categories where the first category includes all firms with turnovers less than 300,000 Rwf, the second category includes all firms with turnovers ranging from 300,000 Rwf to 12 million Rwf, the third category has all firms with turnovers ranging from 12 million to 50 million Rwf and the last category includes all firms with turnovers more than 50 million Rwf. This is a category dependent variable. Categorization of the turnover leads to information of losses within the category; it also sheds light on category differences in performance and the variations in their determinants.

The first dummy variable on openness contains information on whether a firm sells or buys goods or services abroad. The second dummy variable 'gender' defines whether the manager of a firm is female or male. The third dummy variable on value added tax (VAT) contains information on whether or not the firm pays VAT. The fourth dummy variable has information on whether or not the firm pays income tax. There is also a factor variable on the service sub-sector where 7 stands for wholesale and retail trade and repair of motor vehicles and motorcycles, 8 stands for transportation and storage, 9 stands for accommodation and food service activities, 10 stands for information and communication, 11 stands for financial and insurance activities and 12 stands for real estate activities. The other factor variable 'capital' contains information classified in categories in such a way that the first category considers firms using less than 500,000 Rwf, the second using 500,000 to 15 million Rwf, the third using 15 million to 75 million Rwf and the last category using capital more than 75 million Rwf. Thus this is a categorical variable. Factors affecting change in turnover are constructed with the variables mentioned earlier and is expressed as:

(3) Turnover = f (capital used, openness, gender, taxes, service sub-sector)

5. Data and Method

5.1 Description of the data

Data about the performance of Rwanda's service sector used in this study was provided by the National Institute of Statistic of Rwanda. The data came from two important data collection channels -- the 2010-12 Enterprise Survey in Rwanda and the 2014 Establishment Census.

The Enterprise Survey focuses on the many factors which shape the business environment and is useful for both policymakers and researchers. The Enterprise Survey is conducted by the World Bank and its partners across all geographic regions and covers small, medium and large companies. The sample is consistently defined in all countries and includes the entire manufacturing sector, the service sector and the transport and construction sector. The 2011 Rwanda Enterprise Survey covered 241 firms including 159 service firms and 82 manufacturing firms. The cleaned raw database contains 148 firm observations each with 247 variables describing various aspects of the firms and their activities (WB, 2014).

The Rwanda Establishment Census (2014) consists of a complete count of all establishments practicing specific economic activities in Rwanda except not-for-sale government services. It covered themes like economic activity, legal status, registration of establishment, taxation, capital employed, regular operation accounts, socioeconomic characteristics of an establishment's staff, payment status and sex of employees. The dataset contains 154,236 cases with 91 variables (NISR, 2014).

The dependent variable is service firm growth which is measured by several attributes such as turnover/sales, employment, assets, market shares and profits. The Rwanda Enterprise Survey (2011) provides data on total sales for three years and the 2010 fiscal year and data on the introduction of new products or services which are a measure of innovation output in the previous three years. Factors affecting total sales, growth of employment and service innovation determine the development of the service sector. Literature highlights key measures of firm's growth as sales, employment and innovation. Zhou and Wit (2009) and Isaga (2015) used sales and employment to measure the growth of a firm since they reflect both short-term and long-term changes in a firm.

In the model on service innovation, the dependent variable is a binary variable on the introduction of new products or services in three years from 2010. According to Neely and Hii (1998), innovation has a direct impact on the competitiveness of a firm. The values created by innovations are often manifested in new ways of doing things or new products and processes that contribute to wealth. In their studies, Arvanistis and Stucki (2012) and Madeira, Jorge, Sousa, Moreira and Mainardes (2014) used a firm's innovations for measuring growth because it is argued that innovation start-ups are important drivers of economic growth.

The model on turnover uses a categorical dependent variable where the turnover of a firm is classified into four categories as described earlier. An ordinary scale with many categories (5 or more), interval and ratio are usually analyzed using the traditional approaches of statistical tests (Newsom, 2013).

Independent variables in new service development are classified into four categories -- firm characteristics, innovation characteristics, managerial characteristics and business environment. In this study, a firm's characteristics consider the firm's size, gender composition and legal status. Considering firm size, Madeira, Jorge, Moreira and Mainardes (2014) found the positive and increasing effect of firm size on firm innovation. Medium-sized firms showed greater propensity to innovate than small sized firms.

Innovation characteristics include market conditions, new management practices, new market methods, spending on research and development activities, service firm's employees' development, a firm's access to finance expressed in the acquisition of fixed assets and

degree of competition. Acs and Audretch (1988), and Prajogo and Sohal (2006) claim that there is a positive relationship between innovation and research and development activities of firms.

Managerial characteristics are pointed out with the top managers' levels of education and the years of working experience of the top manager in the service sector. Education is measured by level of education attained classified as: no education, primary school, secondary school, vocational training, some university training and graduate degree. Queiro (2016) found that firms which switch to more educated managers' experience sharp increases in growth relative to comparable firms managed by less experienced managers. More educated managers increase the use of incentive pay and are likely to report new products and services and incorporate new technologies. The correlation matrix of the dependent and independent variables is given in Appendix 1.

5.2 Estimation methods: linear and logistic regression models

Madeira, Jorge, Sousa, Moreira and Mainardes (2014) has argued that a firm's capacity to innovate is a complex phenomenon influenced by a wide range of factors. Thus, the logistic regression (logit model) helps to study the statistical relationship of the dependent variable in relation to more than one determinant variable. Stock and Watson (2011) discuss a regression with a binary dependent variable and conclude that when dependent variable Y is binary, the population regression function is the probability that Y=1, conditional on the regressors. The resulting predicted values are predicted probabilities and the estimated effect of a change in regressor X is the estimated change in the probability that Y=1 arising from the change in X. The standard estimation in the maximum likelihood method and its estimates proceeds in the same way as it does in linear multiple regressions.

In this study, dependent variables for service innovation conceived as the introduction of new products or services are binary variables where value of 0 translates into the fact that a firm did not introduce a new product or service and 1 for firms that introduced new products or services. The same applies to independent variables.

According to Verbeek (2004), who discusses the models with limited dependent variables, when the dependent variable is zero for a substantial part of the population but positive for the rest of the population with many different outcomes, the logistic regression model is particularly suited for these types of variables. Since a violation of distribution leads to inconsistent maximum likelihood estimators, testing for misspecifications is to be conducted and necessary measures undertaken.

To estimate the total sales growth in service firms, we used the multivariate regression analysis since growth is expected to be analyzed in the three years' total annual sales of a service firm. We need to track the factors that contributed to the change in total annual sales in service firms. In this case, using the linear regression model is helpful.

6. The Empirical Model's Specifications, Estimation and Testing

In this section, we present the model used to empirically assess the factors determining service sector development through three models on sales, innovation and turnover. First, the model's dependent and independent variables are presented after which the model

estimation is done, the outputs presented and tests for significance of coefficients are conducted and explained.

6.1 The empirical model and its specifications

The empirical models for an analysis of the service sector's development and its determinants in Rwanda are expressed on the basis of total annual sales, service sector innovativeness and service sector turnovers to track the factors influencing the dependent variables. Starting with the factors affecting sales in service firms (Model 1), we can construct the multivariate regression model as:

$$(4) \quad \text{Sales}i = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_{8+} \beta_9\, x_9 + \beta_{10}\, x_{10} + \beta_{11}\, x_{11} + \beta_{12}\, x_{12} + \varepsilon_i .$$

In this model, the dependent variable 'Sales' stands for the level of total sales given the values of X's that are independent or determinant variables. X_1 stands for the total annual cost of labor including wages, salaries, bonus and social security payments as the performance expression in service firms, X_2 stands for the size of the most recent loan or line of credit approved as a source of finance, X_3 stands for a dummy variable on the use of internet expressed by emails to communicate with clients or suppliers as an ICT application, X_4 stands for a dummy variable of employees' development activities through new ideas or approaches about products or services, X_5 stands for a dummy variable on the spending on formal research and development activities to create new products or to find more efficient methods of production, X_6 stands for a dummy variable on innovation expressed as the introduction of products or services, X_7 stands for a dummy variable on engaging in internal or external training of personnel, X_8 stands for a dummy variable on the acquisition of fixed assets such as machinery, vehicles, equipment, land or buildings, X_9 stands for a dummy variable on the new or significantly improved methods of offering services, X_{10} stands for a dummy variable on the new or significantly logistical or business support processes, X_{12} stands for a dummy variable on introduced new or significant improved marketing methods, X_{12} stands for a dummy variable on the new or significantly improved organizational structure or management practices.

The coefficients are represented with symbol β with subscripts from 0 to 12 according to the dependent variables. On the one hand is the null hypothesis, $H_0: \beta_i = 0$, that is, $\beta_1, \beta_2, \ldots, \beta_n = 0$. In this case, no independent variable has any effect on the total annual sales of service firms, and on the other hand, is the alternative hypothesis, H_1:$H_1 : \beta_i \neq 0$ meaning that in the independent variables results change in total annual sales of service firms. A positive coefficient is interpreted as having a positive effect and a negative effect on sales. Thus, the main focus is on the properties of the effects namely the signs of the effects and their consistency with our expectations, the size of the effects and their statistical significance. The model can also be specified in the form of changes in sales between two years or labor productivity that is sales per employee.

The innovation model was also used to assess the determinants of service sector innovativeness which can influence growth of firms. The model for service innovation (Model 2) is specified as:

$$(5)\quad \Pr.(Y=1|z) = \varphi_0 + \varphi_1 z_1 + \varphi_2 z_2 + \varphi_3 z_3 + \varphi_4 z_4 + \varphi_5 z_5 + \varphi_6 z_6 + \varphi_7 z_7 + \varphi_8 z_8 + \varphi_9 z_9 + \varphi_{10} z_{10} + \mu_t .$$

The probability that the service firms introduce new products or services is portrayed with Y as the binary dependent variable. The symbol z with subscripts ranging from 0 to 10 stands for different independent variables or determinants of innovativeness that are thought to have an effect on the extent to which a firm innovates.

As conceived in eqn. 5, z_1 stands for new or significantly improved methods of offering services, z_2 stands for a dummy variable on the new or significantly logistical or business support processes, z_3 stands for a dummy variable on introduced new or significant improved marketing methods, z_5 stands for a dummy variable on spending on formal research and development activities to create new products or to find more efficient methods of production, z_6 stands for a dummy variable on employees' development activities through new ideas or approaches about products or services, z_7 stands for a dummy variable on engaging in internal or external training of personnel, z_8 stands for a dummy variable on the acquisition of fixed assets such as machinery, vehicles, equipment, land or buildings, z_9 stands for a dummy variable on having a line or a loan from a financial institution, z_{10} stands for a factor variable on the firm size defined as small (5-19 employees), medium (20-99 employees) and large firms (100 employees and above) and μ_t stands for the random error term.

For this model, the null hypothesis, H_0: $\varphi_i = 0$, implies that all the independent variables do not affect or generate the introduction of new products or services and the alternative hypothesis, H_1: $\varphi_i \neq 0$, suggests that the independent variables have an effect on the introduction of new products or services. Although maximum likelihood estimators have the property of being consistent, the likelihood function has to be correctly specified for this to hold. The most convenient framework for such a test is the Lagrange Multiplier Framework (Verbeek, 2004).

Turnover as a measure of growth is used to assess the factor that influences it in the service sub-sectors. The model on the service firm turnover (Model 3) is constructed as:

$$(6)\quad Turnover = \theta_0 + \theta_1 X_1 + \theta_2 X_2 + \theta_3 X_3 + \theta_4 X_4 + \theta_5 X_5 + \theta_6 X_6 + \epsilon_i$$

The level of the turnover of service firms given the predictor X_i in this model is represented by G and the coefficients are symbolized by θ with subscripts 1 to 6. The independent variable X_1 stands for the gender of the manager, X_2 stands for openness in the service firm as selling and buying goods or services abroad, X_3 stands for tax on added value, X_4 stands for tax on income, X_5 stands for a categorical variable on the main service sub-sector, X_6 stands for a categorical variable on the capital used by the service firm and ϵ_i represents the error term. The null hypothesis, H_0: $\theta = 0$ implies that the independent variables have no effect on the level of turnovers in service firms. The alternative hypothesis, H_1: $\theta \neq 0$ implies that independent variables effect the levels of turnover in service firms. The sign of the coefficient is checked to be consistent with expectations.

6.2 Relationship between sales, innovation and turnover

As discussed earlier, sales are used as an indicator to measure a firm's growth and this growth as the turnover. In this study, sales and turnover are both used with different model

specifications because the datasets used are different. Otherwise, they should have the same model specifications since they can be used interchangeably.

The model on the sales of service sector firms is constructed with the variables used in the collection of data during the 2011 Rwanda Enterprise Survey by the National Institute of Statistics of Rwanda in partnership with the World Bank. Because this database contained missing values, we constructed a model on turnover with the variable used to collect information in the Establishment Census (2014) by National Institute of Statistic of Rwanda. This was done to track the main factors affecting sales or turnover.

For the innovation model, we used the same database as the sales model because the 2011 Enterprise Survey attached more interest to the innovation factor in the performance of firms. Only the predictors of the innovation model can appear in the sales model in order to prove the contribution of innovation in the growth of sales of service firms.

6.3 Estimation and testing

6.3.1 Linear regression of service sales model

The results of the multivariate linear regression of the service sales model (Model 1) are presented in Table 1. At a 5 per cent confidence interval, the variable on employment coefficient, loan size, employees' development and internet use are statistically significant with a positive effect on the growth in sales except employees' development. Therefore, we reject the null hypothesis. Other coefficients are statistically insignificant, thus we fail to reject the null hypothesis. Innovation, training, acquisition of fixed assets, new methods, new practices, new marketing and new logistics do not have any effect on total annual sales. The R^2 is 0.84, meaning that the independent variables explain variations in sales of service firms at 84 per cent.

Table 1. Linear regression of service sales model (Model 1) and its determinants

Source	SS	df	MS	Number of obs =	48
				F(12, 35) =	15.80
Model	152.521668	12	12.710139	Prob > F =	0.0000
Residual	28.1634417	35	.804669764	R-squared =	0.8441
				Adj R-squared =	0.7907
Total	180.68511	47	3.84436403	Root MSE =	.89703

Logtotalsales	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Logemplycost	0.7220	0.1079	6.689	0.0000	0.5029	0.9412
Logloansize	0.2361	0.0852	2.771	0.0089	0.0631	0.4090
1.Internetuse	1.2684	0.5292	2.397	0.0220	0.1940	2.3428
1.Employeedvt	-1.0810	0.4163	-2.596	0.0137	-1.9262	-0.2358
1.Researchdevpt	-0.9456	0.3223	-2.934	0.0059	-1.5999	-0.2914
1.innovation	0.1124	0.4208	0.267	0.7910	-0.7419	0.9668
1.Trainings	-0.1875	0.4509	-0.416	0.6801	-1.1028	0.7278
1.Fixasset	-0.2912	0.3970	-0.733	0.4681	-1.0970	0.5147
1.Newmethods	-0.6576	0.4593	-1.432	0.1611	-1.5901	0.2749
1.Newpractices	0.1796	0.4846	0.371	0.7132	-0.8043	1.1634
2.Newmarketing	-0.6149	0.3739	-1.645	0.1090	-1.3740	0.1442
1.Newlogistics	0.7042	0.5023	1.402	0.1697	-0.3155	1.7239
_cons	3.4132	1.5283	2.233	0.0320	0.3105	6.5159

6.3.2 Logistic regression of the service innovation model

The results of the logistic regression of the service innovation model (Model 2) in output are given in Table 2. The results for the innovation model show that the independent variables on new or improved methods of offering services, engaging in internal or external training and acquisition of fixed assets are statistically significant at 5 per cent, that is, they effect the service firms' innovation. Thus, we reject the null hypothesis. The other variables in the model are statistically insignificant as they have no effect on the innovativeness of the service sector.

Testing the fit of the model, we find that AIC is lower than BIC which implies that our model is well fit (see Table 3). The logistic model of innovation is correctly classified at 76.58 per cent. The log likelihood ratio test is recommended with inference at -80.4422 with chi2 (1) = 1.63 and Prob>chi2=0.2015 at 5 per cent, implying that the model is fully fitted (Appendix 2). According to Scott (1997), the LR test assesses constraints by comparing the likelihood of the unconstrained model to the log likelihood of the constrained model. If the constraint significantly reduces the likelihood, then the null hypothesis is rejected. The results of an alternative skewed logistic regression of innovation are presented in Appendix 3.

Table 2. Logistic regression model of innovation performance (Model 2) and its determinants.

```
Logistic regression                                     Number of obs   =        158
                                                        LR chi2(12)     =      46.28
                                                        Prob > chi2     =     0.0000
Log likelihood = -81.257932                             Pseudo R2       =     0.2217
```

Innovation	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Newmethods	1.0971	0.4907	2.236	0.0254	0.1354	2.0587
Newlogistics	0.2143	0.5451	0.393	0.6943	-0.8542	1.2827
Newpractices	-0.1162	0.5654	-0.205	0.8372	-1.2243	0.9920
Newmarketing	-0.2969	0.4911	-0.605	0.5454	-1.2595	0.6656
Researchdvpt	0.2238	0.4919	0.455	0.6491	-0.7402	1.1878
Employeedvpt	0.8771	0.4861	1.804	0.0712	-0.0757	1.8299
Training	0.9657	0.4720	2.046	0.0408	0.0406	1.8909
Fixasset	-1.1771	0.4449	-2.646	0.0082	-2.0491	-0.3051
Loan	0.6215	0.4092	1.519	0.1288	-0.1805	1.4234
Firmsize						
1	-0.4398	1.0077	-0.436	0.6625	-2.4148	1.5352
2	0.0959	1.0425	0.092	0.9267	-1.9473	2.1391
3	1.0922	1.2691	0.861	0.3895	-1.3952	3.5797
_cons	-0.8578	1.0347	-0.829	0.4071	-2.8858	1.1702

Table 3. Summary of post estimation of Akaike's and Baysian information criteria (AIC, BIC)

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Akaike's information criterion and Bayesian information criterion
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Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	158	.	-80.44222	14	188.8844	231.7608

6.3.3 Ordered Logistic regression of the service turnover model

In order to estimate the service turnover model, we used ordered logistic regression because turnover is a dependent variable defined as a categorical variable. If the primary interest is understanding how the explanatory variable affects the conceptual dimension represented by an ordinal variable, an ordinal variable is appropriate. The results of an ordinal logistic model are the same as those for a traditional logistic model with the exception that there is a cut point instead of a constant (Powers and Xie, 1999)

The results presented in Table 4 indicate that the coefficients of gender, openness, value added tax, income tax, capital used and service sub-sectors 8, 9 and 11 are statistically significant. Meaning that, they influence the level of turnover of a service firm. The others are statistically insignificant which implies that they have no effect on the change in the level of turnover.

Table 4. Ordered Logistic regression of service turnover model (Model 3) and its determinants.

Ordered logistic regression — Number of obs = 35575; LR chi2(12) = 17932.95; Prob > chi2 = 0.0000; Log likelihood = -21409.823; Pseudo R2 = 0.2952

Turnover	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
1.Gendermenager	-0.0624	0.0280	-2.224	0.0262	-0.1174	-0.0074
1.Openess	0.7192	0.0891	8.075	0.0000	0.5447	0.8938
1.Valueaddedtax	1.8273	0.0816	22.380	0.0000	1.6672	1.9873
1.Incometax	0.2105	0.0479	4.394	0.0000	0.1166	0.3043
Ssubsectors						
8	0.7318	0.2213	3.306	0.0009	0.2980	1.1656
9	-0.3654	0.0277	-13.193	0.0000	-0.4197	-0.3111
10	-0.0246	0.2351	-0.105	0.9166	-0.4854	0.4361
11	1.9284	0.1207	15.983	0.0000	1.6920	2.1649
12	-0.4586	1.1115	-0.413	0.6799	-2.6371	1.7200
Capital						
2	2.7719	0.0334	82.892	0.0000	2.7063	2.8374
3	5.3948	0.1121	48.128	0.0000	5.1751	5.6145
4	6.4496	0.1464	44.058	0.0000	6.1626	6.7365

7. Analysis of Empirical Results

This section gives an interpretation and analysis of the results for the three models specified and estimated earlier. From this we can gain advanced knowledge about the constituents of the service sector and the determinants contributing to the development of this sector. Service sector development is measured by considering key measures of a firm's performance and growth like innovation, sales and turnover and these are taken to be dependent variables for forming and estimating the models. The growth in sales of service firms contributes to the growth of the service sector's share in Rwanda's GDP. Innovations bring in new products or services which in turn push the growth of the sector. The factors influencing growth in sales, service innovativeness and turnover are used to find the drivers of service sector development. These determinants are taken into consideration in shaping and sustaining the service-led economy path as it is a national strategy for economic growth.

7.1 Factors affecting total sales growth

Estimation results of the linear regression of the sales model indicate that employment costs, size of the approved loan and use of internet positively affect the change in sales of service firms for the period 2008 to 2010. Growth in employment is a good indicator of a firm's performance whereby the cost of employment for three years is positively reflected in total sales. A 1 per cent change in costs attributed to employment results in a 0.72 per cent change in sales in service firms, other things holding constant.

UNECA (2015) reported that financial services are the oil of transactions and provide access to credit for investments for most other businesses. This is proven by the fact that in our model on sales, the size of the most recent loan or line of credit approved is positively correlated to the change in total sales of service firms. Other things holding constant, a 1 per cent change in the size of the loan results in a 0.236 per cent change in the total annual sales of a service firm.

Liu and Nath (2013) argue that the trade enhancing effect of ICT infrastructure or ICT capability depends on its use. Internet subscriptions and internet hosts have significant positive effects on both exports and imports. In our model on sales, the use of emails to communicate with clients or suppliers expressed as internet use had a positive relationship to total sales as has also been found in previous studies. Holding other things constant, a 1 per cent change in the use of internet brings in a 1.268 per cent change in the sales of a service firm.

Both employees' development and research and development activities are negatively correlated with a change in the sales generated in service firms. Holding other things constant, a 1 per cent decrease in employees' development results in a 0.108 per cent decrease in total service sales. A 1 per cent decrease in spending on research and development activities induces a 0.94 per cent decrease in total sales, other things holding constant.

The change in total sales of service firms in Rwanda is attributed to financial services through access to credit, ICT applications in service provision principally via email operationalization, employment growth expressed by the costs incurred by a service firm for employment, employees' development as a trial of a new approach or new idea about products or services, business process, firm management or marketing. Last but not the least is the expenditure incurred on research and development activities. These variables are explained in the model at 84 per cent as measured by R^2 and all are statistically significant as their t-statistic is greater than 1.96 and p-values with less than 0.05.

7.2 Factors contributing to innovativeness

The logistic regression of the service innovation model (Model 2) finds the factors contributing to innovations in Rwanda's service firms. In the summary of results for Table 2, the number of observations shows that 158 firms were included in the estimation. The significance test of the likelihood ratio indicating whether the predictors in the model together account for significant variations in the dependent variable is 46.28 where the probability chi-square test is 0.000. This implies that the independent variables influence the

dependent variable. Variables like new methods, training and acquisition of fixed assets are statistically significant at the 95 per cent confidence interval since their p-values are less than 0.05 and their z values in absolute terms are greater than 1.96. The approximate amount of variance is accounted for by independent variables in this model as expressed by Pseudo R^2 which is 0.22. The log likelihood is -81.2579.

A 1 per cent increase in the use of new methods like new or significantly improved technology, equipment and software for production, finishing, packaging or quality control result in a 1.097 per cent increase in the innovativeness of a service firm, holding other things constant.

A 1 per cent increase in the level of acquisition of internal or external training results in a 0.965 per cent increase in the level of introducing new products or services in the firm, holding other things constant. This result is consistent with prior literature on the importance of training in the performance of a firm. In his study on the effect of training on employee performance with evidence from Uganda, Naasazi 2013) reported that training and development have an impact on employees' performance with regard to their jobs. Training develops skills, competencies and abilities and ultimately improves employee performance and organizational productivity (Amir and Amen, 2013).

A 1 per cent decrease in the acquisition of fixed assets such as machinery, vehicles, land and buildings results in a 1.17 per cent decrease in the introduction of new products or services, holding other things constant. This indicates that the acquisition of fixed assets is a key factor for the innovation process in service firms. It is clear that a lack of fixed assets not only hampers service innovation but also affects existing service provision which is bad for the country's economy. Silva (2015) found that the greater the financial investment in acquisition of machinery, equipment and software, the greater the propensity for firms to innovate in their services.

In conclusion, service firms' innovations in Rwanda are attributed to the new methods applied, acquisition of internal or external training and acquisition of fixed assets. These factors affect the service sector's performance and growth by enabling the introduction of new products or services.

7.3 Factor determining the levels and variations in turnover

Turnovers of service firms are conceived as the amount of money taken by a business in a particular period. The estimation of the ordered logistic regression model on turnover in the service sector revealed that the gender of the manager, openness and taxes are statistically significant and influence the turnover of service firms at a 95 per cent confidence interval. This implies that the p-value of the independent variable is less than 0.05. The control variable on the level of capital used is positive and statistically significant at the 95 per cent confidence interval due to the fact that the p-values are less than 0.05. The service sub-sectors of transport and storage (8), accommodation and food service activities represented (9) and financial and insurance activities (11) are statistically significant because their p-values are less than 0.05 at the 95 per cent confidence interval. In accordance with our estimated model on turnover, these three service sub-sectors influence variations in turnovers of service firms in Rwanda which impact the service sector as a whole. The estimation results are presented in Table 3.

Table 3 shows that the gender of the manager is statistically significant and negatively correlated to the turnover of a service firm. In this study, being a male manager negatively influenced the turnover in the service firm at the 6 per cent level. Meanwhile, Johnson and MacMahon (2005), report that consistent statistically significant differences in financial performance and business growth do not exist between female and male owned-managed concerns once appropriate demographic and other relevant controlling influences are taken into account. According to Watson (2003), female managers are just as effective (as males) in using resources. However, females (on average) invest fewer resources in their ventures and also seem to get involved in less risky enterprises. Their overall performance is likely to be the same as that of males provided appropriate measures of performance are used such as sales or profits. Considering prior research findings, the negative relationship found in this study does not imply differences in female and male managers in terms of performance, rather it is possible to view this in terms of the risk associated with a business and this is a subject for subsequent studies for more clarifications.

Openness is conceived as an interaction outside the Rwandan service sector in terms of imports and exports of services. In this study, interaction is assessed through buying and selling services abroad and estimation results show that there is a statistically significant and positive relationship between turnover and openness in service firms. A 1 per cent change in the level of openness, increases the level of turnover by 0.71 per cent. Singh and Kaur (2014) claim that openness positively affects the share of the service sector in gross domestic product. According to Halpern et al., (2015) importing all inputs will increase a firm's revenue productivity by 0.22 per cent, about one-half of which is due to imperfect substitution between foreign and domestic inputs. They argue that productivity gains from a tariff cut are larger when the economy has many importers and many foreign firms.

An assessment of the determinants of service sector development looked at the role of Rwanda's taxation system to boost the service sector. The estimation of ordered logistic regression of turnover to value added tax and income tax showed that there is a statistically significant positive relationship at the 95 per cent confidence level. This means that the tax system in Rwanda positively affects the development of the service sector. A 1 per cent change in payment of the value added tax results in a 1.82 per cent change in the growth of turnover in services and a 1 per cent change in the payment of income tax increases the turnover of the service sector up to 0.21 per cent holding other things constant. Stoilova and Patonov (2013) claim the existence of a clear and strongly expressed impact of direct taxes on economic growth. In addition, they argue that a tax structure based on direct taxes is more efficient in terms of supporting economic growth. Wu, Wu, Zhou and Wu (2012) argue that in China private firms with politically connected managers enjoy tax benefits. Chude et al., (2015) have concluded that the positive and significant relation between profitability and taxation explanatory variables indicate that if policymakers expand tax revenue through more effective tax administration it will positively impact a company's profitability.

Capital is used as a control variable since the capital used by a service firm is categorized as its capability. Estimation results showed that the capital used at all levels is significantly positive. Holding other things constant, for a service firm using capital ranging between 500,000 to 15 million Rwf, a 1 per cent change in the level of capital used results in an increase in turnover of up to 2.77 per cent. For firms using capital between 15 million and 75 million Rwf, a 1 per cent increase in capital results in a 5.40 per cent increase in turnover, holding other thing constant. For firms using more than 75 million Rwf the estimation results

indicated that a 1 per cent change in the capital used resulted in a 6.44 per cent increase in turnover, holding other things constant. Briefly the more the capital used, the more the turnover of a service firm. Thus, capital is another factor contributing to the service sector's development since any increase in the capital used results in an increase in the turnover of a service firm.

An ordered regression of the service sector's turnover as per different sub-sectors indicates that the transport and storage, accommodation and food service activities and financial and insurance activities sub-sectors have a significant positive effect on the turnover of a service firm. Holding other things constant, a 1 per cent increase in transport and storage for a service firm resulted in a 0.76 per cent increase in its turnover. A 1 per cent decrease in the level in the accommodation and food service activities sub-sector resulted in a 0.36 per cent decrease in turnover, holding other things constant. Lastly, a 1 per cent increase in financial and insurance activities brought in a 1.94 per cent increase in turnover, holding other things constant.

8. Usefulness of Results and Policy Recommendations

The ultimate goal of this study was to carry out an analysis of trends in the development of the service sector in Rwanda and identifying contributing factors driving its performance and growth using survey data covering various aspects of the service sector. Literature was reviewed to assess the similarities and dissimilarities in findings all over the world, a descriptive analysis of existing data and an empirical analysis of micro-data on the service sector were used to understand the functioning of the service sector in Rwanda and in other parts of the world. The results were interesting and are useful for academics and both in the public and private sectors.

8.1 Adoption and scaling-up of innovation activities

The results of factors influencing innovation in the service sector are very useful for the government because innovation is a key to economic growth and development. In public sector management, innovation is a priority for all nations because the current wealthy nations have got a wide range of innovations in various disciplines. In our study, innovation as a standalone variable did not influence any change in total sales; though some of the variables characterizing innovation were statistically significant namely new methods and training. Therefore, the government could use these findings to scale-up innovation activities in the service sector and shape capacity building strategies and policy with these empirical facts. Innovation is a prime contributor to sales growth and needs to be geared up to sustain the service sector's development as a way for economic growth.

This study is an asset for academicians and for future studies by researchers and graduate students. The findings on service innovation can form the basis for expanding research in economic growth since it is Rwanda's national policy in Vision 2020 of becoming a middle income country. Thus, it is the responsibility of academia to support the government by providing facts to monitor the implementation of government policies for evidence based interventions and decision making.

8.2 Diversification of sources of development

The results of the linear regression of the sales model are very useful in assessing the role of economic integration. One of the objectives of economic integration is to operate in a large market where nationals buy and sell their products and services. Having openness as a significant variable to change turnovers indicates that economic agents in the service sector should take advantage of this information to increase the returns to their businesses. The private sector can use this information to exploit unused channels and do a study of regional markets to expand their businesses since it has been a while when the government signed the agreement to be a member of East African Countries (EAC) and other regional economic integration cooperation efforts.

Focus on ICT is found to be another source of better performance in the service sector. Daily use of internet as a communication channel must be looked at as a strategy to be widely adopted by competitive managers of service firms. This fits well with the national commitment of becoming an ICT regional hub and an ICT connected country.

For academic research purposes, this information is crucial since it opens up the ground for the further empirical studies to assess how the government is benefiting from regional economic integration in terms of economic growth and development. Further, it will be interesting to conduct an empirical study on ICT applicability and economic performance in Rwanda.

8.3 Providing insights on turnovers of firms and their access to finance

All firms aim to increase their turnovers as they are profit based entities. The results from the model on service firms' turnovers give information on interacting with the foreign market by either buying or selling products or services. The more the capital used the more the turnover increases which could inform investors attracted by service related economic activities like transport and storage, accommodation and food services. These service sub-sectors are found to be more profitable in the overall service sector. The spillover effects of taxes are marked in the turnovers of service companies. This could be used to back the importance of paying taxes by service sector tax payers. Looking at the value added tax, which is paid by consumers, helps us conclude that the service sector's development is demand elastic because the more the consumers pay VAT, the more the turnovers are generated. Income tax is normally paid depending on the income earned by a firm through the year. The correlation of income tax and growth in turnover implies good performance in the service sector. Generally, taxes support the economy at large and it is important to know how taxes affect the service sector in particular.

Access to finance is one of the most needed inputs for the good performance of a service firm; this is provided by financial institutions like banks. Our investigation of determinants of service sector development qualifies it to be more appropriate for service firms' performance as indicated by acquisition of fixed assets, loan size and capital used. The government should take note of this in steering monetary policy and encourage financial institutions to facilitate service sector operators in accessing funds.

8.4 Policy recommendations

As the Government of Rwanda opted for driving its economic growth through the service sector and it aims to become a middle income country, this study gives recommendations that can help in speeding up the shift form a low income to a middle income economy through the development of the service sector and its expansion.

The Government of Rwanda should emphasize on its employment policy by targeting entrepreneurs operating in the service sector. With regard to the role of employee development and training in promoting innovations in service firms, it is very important for the government to put in place mechanisms that facilitate both managers and employees in promoting innovations. This could be incentives given to service firms' managers who want to send their employees for training abroad or hiring international consultants to train them locally on unique services related skills. An awarding mechanism for employees with impactful innovations and firms with strategic plans promoting innovation can also act as motivation. Considering the correlation between employment costs and turnovers and a descriptive analysis revealing that the service sector provides employment to only 36.8 per cent females workers as compared to 63.2 per cent male workers, the government through the ministry of gender and family promotion should review its gender equality policy in a way that provides room for women to participate equitably in the service sector. The female population represents 53 per cent of the total population in the country.

Due to the fact that the acquisition of fixed assets like machinery, vehicles, equipment, land and buildings has multiple effects on innovation, the government should facilitate the import of necessary fixed assets to be used by service firms. This could be tax exemption and incentives depending on the value of the imported fixed assets. Further, since the acquisition of fixed assets is a proxy indicator for accessing finance for firms, the government should regulate finance in a way that facilitates firms to have easy access to finance from financial institutions like working out the interest rate charged from a firm when it wants to purchase fixed assets.

Since the size of the loan approved influences the turnover of a service firm the government should put in place a mechanism encouraging financial institutions to provide impactful loans. This can be done by setting a reasonable collateral value and extending the time for paying back the loan approved by giving a sufficient grace period.

The key recommendations from the analysis of service sector development and its determinants in Rwanda can be summarized as:

- Put in place a services innovation policy complementing existing employment with emphasis on employees' development and enhanced training strategies;
- Develop a gender sensitive employment policy to ensure full participation of women in the economic sector, especially in the service sector;
- Facilitate private sector operators in purchasing fixed assets by tax exemptions or subsidizing some strategic assets for the service sector's expansion;
- Expand ICT applications for service firms to become mobile based by targeting the country-side population;
- Regulate the monetary policy in a way that financial institutions can provide loans to the service sector's operators; and

- Put in place a foreign trade policy with emphasis on service exports in forms that benefit from existing economic integration.

9. Summary and Conclusions

This analysis of the service sector's development and the determinants of its performance and growth provides useful details about the service sector's growth over recent years and empirically estimates the determinants of service sector development by using the econometric methodology. The measures of firm growth used include innovation, sales and turnovers. The estimation is enabled by using micro-data collected by the National Institute of Statistics of Rwanda namely the 2011 Rwanda Enterprise Survey and the 2014 Establishment Census.

The literature review on the service sector supports that services contribute more to economic growth. Ghani et al., (2011), Zhou (2015), and William (1997) claim that the service sector accelerates the transformation of economic growth, raises employment and boosts economy-wide labor productivity. The key factors that contribute to the growth of the service sector include rapid urbanization, expansion of the public sector, increased demand for intermediate and final consumer services, domestic investments and openness, education skills, cultural adaptability, financial attractiveness, business environment, expansion of quality health services, application of information and technology, increase in consumption expenditure, incentive system and investing more in research and development. In Rwanda, the service sector is dominated by wholesale and retail trade, motorcycle and motor vehicle repairs, accommodation and food services activities and human health and social work activities sub-sectors.

After estimating models on sales, innovation and turnovers in service firms, the results show that service sector development in Rwanda is driven by access to finance, increased labor force, training personnel, ICT applications, embryonic innovations and the tax system. Access to finance has enabled the service sector to grow over the past few years in Rwanda. The size of the loans approved by financial institutions like banks and cooperatives has had a positive effect on the three years total annual sales, capital used by the service firms which also positively impacted turnovers of service firms and the acquisition of fixed assets which positively influenced service innovativeness. FinScope Rwanda (2016) has revealed the 89 per cent of the adult population has access to finance.

Increased labor participation in services, employee development and training of personnel have boosted the service sector in Rwanda. As it has been explored through literature, service sector development can be attributed to employment. Our study shows that the cost allocated to employment in services is positively correlated with total sales generated over three years and a descriptive analysis confirms that the service sector is at the top in employment, even though there is gender inequality in the sector. Despite lack of innovation influencing changes in sales, some variables characterizing innovation are inducing service innovativeness like internal and external training. Further, research and development and employee development were found to influence sales over the three studied years. This draws attention to future research to assess the innovation propensity in the service sector.

Openness and ICT applications have definitely contributed to the growth of the service sector in Rwanda. Benefiting from accessing a wider market was a national aspiration when

Rwanda signed the regional economic integration agreement. Our study indicates that we are on track whereby openness has had a positive effect on turnovers in the service sector. In addition we have seen the Government of Rwanda putting more effort in extending optic fiber across the country that has influenced service firms. Our study finds that communication via emails influenced the sales generated over the three years studied.

Tax collection, typically VAT and income tax, impacted the service sector's development in Rwanda. As previous findings have illustrated there is a positive relationship between taxes and economic growth. Our study also reaffirmed this as it found that value added tax and income tax had a positive effect on turnovers of service firms. It is suggested that data should be collected on the sub-sectors in the service sector to better understand why some service firms are growing faster than others in the same sector. The study opens up a number of research avenues for the future on the contribution of regional economic integration to service sector development, an analysis of ICT applicability and contribution to service sector development and an empirical analysis of gender inequalities in the service sector's growth in Rwanda.

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Appendix 1. Correlation matrix of diferent covariates, n=158.

	Newmethods	Newlogis~s	Newpract~s	Newmarke~g	Research~t	Employee~t	Training	Fixasset
Newmethods	0.2407							
Newlogistics	-0.0909	0.2972						
Newpractices	-0.0117	-0.0840	0.3197					
Newmarketing	-0.0513	-0.0224	-0.0104	0.2412				
Researchdvpt	-0.0092	-0.0172	-0.0262	-0.0136	0.2419			
Employeedvpt	-0.0128	0.0054	-0.0699	-0.0381	0.0028	0.2363		
Training	-0.0039	-0.0356	-0.0186	-0.0480	-0.0563	-0.0295	0.2228	
Fixasset	0.0138	-0.0328	-0.0245	-0.0226	-0.0131	-0.0298	-0.0101	0.1980
Loan	-0.0066	-0.0255	-0.0073	0.0047	-0.0119	0.0210	0.0332	-0.0172
1.Firmsize	0.0115	-0.0644	0.0660	-0.0040	0.0435	-0.0713	0.0018	-0.0214
2.Firmsize	-0.0148	-0.0355	0.0630	0.0282	0.0304	-0.0624	-0.0236	-0.0742
3.Firmsize	0.0049	-0.0589	0.0078	0.0174	0.0028	-0.0327	0.0099	-0.0623
_cons	-0.0485	0.0358	-0.1518	-0.0462	-0.0102	0.0072	-0.0161	0.0229

	Loan	1. Firmsize	2. Firmsize	3. Firmsize	_cons
Loan	0.1674				
1.Firmsize	-0.0165	1.0154			
2.Firmsize	-0.0221	0.9493	1.0868		
3.Firmsize	-0.0684	0.9390	0.9593	1.6107	
_cons	-0.0518	-0.9038	-0.8926	-0.8474	1.0707

Appendix 2. Logistic model for innovation

+	87	25	112
-	12	34	46
Total	99	59	158

```
Classified + if predicted Pr(D) >= .5
True D defined as Innovation != 0
```

Sensitivity	Pr(+| D)	87.88%
Specificity	Pr(-|~D)	57.63%
Positive predictive value	Pr(D| +)	77.68%
Negative predictive value	Pr(~D| -)	73.91%
False + rate for true ~D	Pr(+|~D)	42.37%
False - rate for true D	Pr(-| D)	12.12%
False + rate for classified +	Pr(~D| +)	22.32%
False - rate for classified -	Pr(D| -)	26.09%
Correctly classified		76.58%

Appendix 3. Skewed logistic regression of innovation.

Skewed logistic regression — Number of obs = 158
Zero outcomes = 59
Log likelihood = -80.44222 — Nonzero outcomes = 99

Innovation	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Newmethods	0.7162	0.3399	2.107	0.0351	0.0499	1.3824
Newlogistics	0.1210	0.3527	0.343	0.7316	-0.5703	0.8123
Newpractices	-0.0990	0.3551	-0.279	0.7804	-0.7950	0.5970
Newmarketing	-0.1649	0.3152	-0.523	0.6009	-0.7827	0.4529
Researchdvpt	0.2385	0.2765	0.862	0.3885	-0.3035	0.7804
Employeedvpt	0.6093	0.3223	1.891	0.0587	-0.0224	1.2410
Training	0.5703	0.2875	1.984	0.0473	0.0068	1.1339
Fixasset	-0.6896	0.2680	-2.573	0.0101	-1.2149	-0.1643
Loan	0.4360	0.2527	1.725	0.0845	-0.0593	0.9313
Firmsize						
1	-0.3431	0.6728	-0.510	0.6101	-1.6617	0.9756
2	0.0838	0.6807	0.123	0.9021	-1.2504	1.4180
3	0.5803	0.7563	0.767	0.4429	-0.9020	2.0626
_cons	-15.5998	1523.5291	-0.010	0.9918	-3.00e+03	2970.4623
/lnalpha	14.5702	1523.5288	0.010	0.9924	-2.97e+03	3000.6318
alpha	2.13e+06	3.24e+09			0.0000	.