The Effectiveness of Work-Linked Vocational Training Programmes in Senegal

Mafang Lioniel
Tsambou André Dumas
Malou Jonas Bertin
Diouf Marie Ndeye Gnilane

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By

Mafang Lioniel
University of Yaoundé II, Cameroon

Tsambou André Dumas
University of Yaoundé II, Cameroon

Malou Jonas Bertin
University Amadou Mahtar Mbow (UAM), Senegal

Diouf Marie Ndeye Gnilane
University of Cheikh Anta Diop, Senegal

African Economic Research Consortium, Nairobi
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Abstract

The main objective of this study was to evaluate the effectiveness of work-linked vocational training in Senegal. In order to do so, we focussed on four specific objectives. First, we identified the main factors that promote or limit access to work-linked vocational training by the youth. Second, we evaluated the impact of work-linked vocational training on the income of youth in the labour market. Third, we evaluated the impact of vocational training on access to regular and stable employment. Fourth, we evaluated the impact of vocational training on labour productivity. To achieve these objectives, we used an endogenous switching regression (ESR) model and an endogenous switching probit model. We examined the robustness of the results using propensity score matching. These methodologies take into account observed and unobserved factors, thus enabling us to handle selection and endogeneity problems that may be related to vocational training. They were used to evaluate data derived from the Employment Policy Improvement Survey (EAPE) that was carried out in 2018 in Senegal. The results suggest that the sampled groups of youth that participated in vocational training display characteristics that differ from those of the sampled groups of youth that did not participate in vocational training. The sampled groups of youths who benefitted from training had a probability 19.27 percentage points higher, on average, of accessing a permanent job, and 24.18 percentage points higher of accessing temporary employment. These youth also had a probability 57.8 percentage points higher of accessing stable employment than youth that did not benefit from vocational training.

Key words: Apprenticeship, Business, Effectiveness, Professional training, Senegal.

1. Introduction

In the context of a rapidly changing environment, workers in business firms owe it to each other to quickly adapt in order to remain efficient. The adaptation must begin right at the moment of basic training of human capital and be followed upon throughout an individual's professional life. In order to be effective, the training of human capital requires cooperation among all the actors and the willingness of all the actors to respond to the needs of both an individual and the enterprise. Such training relies on individual and collective dimensions in order to forge an identity and internalize a culture that is unique to the profession, in order to facilitate professional insertion and professional development (Devaud, 2001; Correa Molina and Gervais, 2011). The training could be of general, technical, professional, basic or continuous academic or post-academic nature, and be tailored to last a lifetime in order to develop and organize the basic knowledge on which the profession is based.

Professional training has emerged as a high priority in African countries ever since the economic recession of 1987, and socio-political conflicts, inter-ethnic wars and civil wars that led to the destruction of the continent's economic fabric. In addition, the continent has experienced a population boom, multiplying the number of people by 5 times between 1960 and 2020, against 2.7 for the whole of Asia and 3 times for Latin America and with a higher population of youth (35%) aged between 15 and 35 years (UNDP, 2019). With an unemployment rate that has reached double digits in some African countries, the insertion of youth into stable employment has become a major challenge in relation to economic policy (UNDP, 2015). In sub-Saharan Africa, the labour market is characterized by a pronounced mismatch between job opportunities and training, with 72% in vulnerable employment and between 34% and 72% in informal employment. However, although the youth employment rate is relatively low (almost 12%), most actively employed youth (38.1%) live in poverty and lack training (ILO, 2018). The youth often suffer from underemployment and a lack of decent job opportunities. Young women tend to work more within the informal sector and are less favoured than young men in regard to access to employment opportunities, and are often faced with worse working conditions than their male counterparts. Due to the high rate of population growth, the number of youths could increase by 283 million between now and 2030, which would translate to almost triple the size of the population of this age group in 1990 (ILO, 2020). This growth rate presents Africa with challenges related to training, decent job opportunities and the reduction of poverty.

Although Africa as a region is experiencing a high growth rate in its gross domestic product (GDP), per capita GDP remains by far the lowest in the world with 53.9% of the people living below the poverty threshold. Thus, the issue of training that is geared towards youth employment in Africa remains a major challenge in regard to public policy, just like in the rest of the world. To combat challenges related to youth insertion, several sub-Saharan African countries, such as Senegal, implemented active programmes for professional training intended to orient youth towards salaried jobs or self-employment. In this context, employment policies that focus on youth employment in the civil service as well as parastatals, started shifting towards professional training by public and private institutions. This shift, which allowed for the integration of new components (such as professional training, internships and support for entrepreneurship), was arrived at through public policies on employment. These policies are geared towards fighting against the socio-economic exclusion from the labour market of the most vulnerable members of society.

Professional training is a process of acquiring specific competencies through which the recipient receives the necessary competencies and experience required to undertake a professional activity or perform a work-related role. Such professional training allows one to be more active in the execution of their tasks and unleashes better production capacities for the beneficiary (Becker 1964; Spence 1973; Thurow, 1975). The literature distinguishes between four types of professional training according to a country and the place of training, the degree of training and the specificity of the training. These are academic training, professional training that is essentially academic, training on a specific task and vocational training in terms of internship in a business firm. Vocational training relates experience and training at the workplace to professional training for a career or a specific sphere of work. Such professional training which could be said to be a dual mode of teaching, provides its beneficiary with personnel development and a high level of transferability that allows for an improvement in the yields from human capital. When this occurs through internships in businesses, it promotes competencies that are immediately useful within the labour market. It thus leads to higher skill levels and and facilitates employment (Mckenzie and Robalinio, 2010; Caliendo and Schmidl, 2016). Internship in an enterprise also allows one to complement competencies that are generally transferable that had been acquired during training, with specific technical competencies acquired on the job (Zimmerman et al., 2013).

In Senegal, the government has over the past few years been committed to ambitious reforms in the higher education sector, with the aim of diversifying the supply of training and leading individuals to opt-in on a new type of higher education. The implementation of policies such as the creation of a ministry of employment, vocational training, internship and insertion, re-orienting professional and technical training (Law No 2015_01 of 26th December 2014), and the creation of higher vocational education institutions in Bignona (Decree n° 2016-812 of 14 June 2016) allows for the diversification of training and provides more opportunities for the youth to access education and in the labour market (Decree 2020–2222). Furthermore, the

government has created several accredited institutions that offer short vocational courses (1 to 3 years) that are organized by the ministry of employment. These accredited institutions fall under the National Agency for the Employment of Youth (ANPEJ) in order to rationalize and coordinate actions geared towards vocational training and youth employment. We have noted a proliferation of actors with several structures that have a direct or indirect impact upon vocational training policy, such as the National Agency for the Development of Small and Medium Enterprises (ADEPME), the Investments and Major Projects Agency (APIX), National Insertion Agency for Agricultural Development (ANIDA), General Delegation for Rapid Entrepreneurship (DER), and the Agency for the Promotion and Development of Handicrafts (APDA).

Although these structures are attached to various units of administration, they have similar objectives as those prescribed in the National State-Employer Agreement (CNEE), signed in 1987, and renewed in 2000 and 2009 (PSE, 2014). This convention that exists in the framework of an effective partnership between the State and employers ensures the active and regular promotion of youth employment by prescribing objectives that would facilitate youth employment in the labour market through in-service training, incubation and spin-off programmes. Such vocational training endows young graduates with knowledge, know-how and the soft skills necessary for their insertion into the labour market. Whether this work-based vocational training is through adaptation or on-the-job, through internship or capacity building, it provides an opportunity to youth for their professional development, increases their levels of qualification and improves their chances for insertion into the labour market.

Despite such interventions, the problem of youth unemployment persists. Although theoretical and empirical studies have demonstrated the significance of vocational training for youth, the question of the effectiveness of this training remains a topical issue. Such studies, as important as they are, give divergent views in regard to the effectiveness of vocational training (Attanasio et al., 2011; Chakravarty et al., 2019), and give little attention to work-linked vocational training in enterprises in regard to internships, and the provision of stable, regular and well-paying jobs (Crépon and Van Den Berg, 2016; Kane et al., 2020a; Kane et al., 2020b). Thus, the objective of this study was to examine the effectiveness of work-linked professional training in enterprises by focusing on apprenticeship programmes in Senegal. More specifically, we aimed to identify the main factors that promote or limit access by youth to work-linked vocational training. We also evaluated the impact of work-linked vocational training on the income of youth in the labour market and on their access to a regular and stable job. Finally, we evaluated the impact of work-linked vocational training on labour productivity.

The study aimed to fill a gap in the literature by expanding the existing findings on the effectiveness of work-linked professional training so as to verify whether the theoretical mechanisms that underlie the phenomenon in developed countries are identical to those in developing countries such as Senegal. To achieve these objectives, the study used an endogenous switching regression (ESR) model and an endogenous switching probit model. Further, to examine the robustness of the results

we used propensity scores. This empirical approach allows for more robust results through a comparison of the differences in results in regard to the groups of youth that benefitted from work-linked vocational training and the groups of youth that did not benefit from this training. We used the National State-Employer Agreement due to availability of data. The survey focused on this agreement since it is one of the rare policy instruments on employment that has been implemented over the past few decades in order to resolve the problem of matching training to employment. It was signed for the first time in 1987, and renewed in 2000 and thereafter in 2009. This agreement is a framework of effective partnership between the State and employers to ensure the active and continuous promotion of youth employment through work-linked vocational training through internships in enterprises. The main target group is youth of working age.

This paper is broken down into seven sections. Section 2 is a state-of-the art survey on the subject of training, and Section 3 presents a literature review. The fourth section focuses on the methodology and the statistical results are presented in the Section 5. The econometric results are presented in the Section 6. The last section, Section 7, presents the conclusion and suggests various leads that future studies may follow.

2. Work-Linked Vocational Training in Senegal

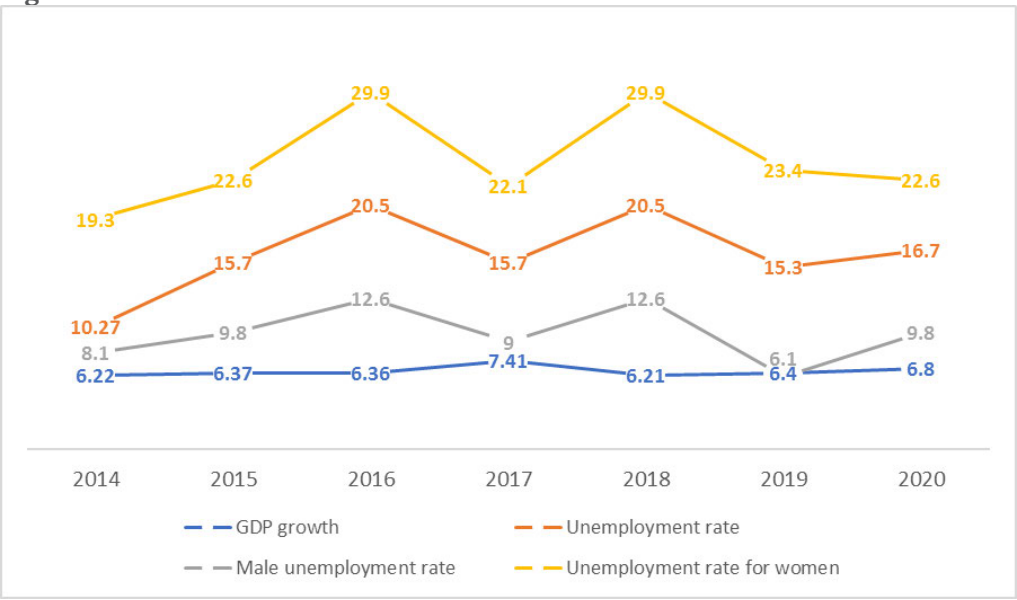
In the Plan for an Emergent Senegal, the Government of Senegal prioritized vocational training, the creation of employment and an improvement in the living conditions of its people in its policies (PES, 2014). Faced with an employment crisis that had a higher impact on young graduates than on the rest of the working population, the government put in place a wide-reaching framework of vocational training geared towards employment. This aspect of focusing on the employment market through formulating continuous trainings, practical training, on-the-job training, vocational training and workshop mastery training aimed to be ambitious and target improvement the quality, equitability and the transparency of the education and training sectors. Although this reform liberalized professional training, there is still a mismatch between training and the labour market (AFD, 2011). Therefore, the implementation of the policies of the strategic emergence plan has made it possible to classify Senegal among the sub-Saharan African countries experiencing rapid economic growth, with an average growth rate of 6.6% from 2014 (PES, 2014).

Despite this economic performance, the labour market is unable to absorb the increasing number of youths searching for employment. Close to 200,000 new youths join the labour market each year, whereas the supply of jobs is estimated at close to only 30,000 new jobs (ILO, 2020). This is because more than half (63%) of the population comprises youth aged less than 20 years (at least 1 out of 2 is aged 18 years) and employment creation does not follow the same rhythm as population growth (UNDESA, 2019). Indeed, Senegal recorded a real GDP growth that was above 6% per year between 2014 and 2019 (Figure 1), but job creation remains inadequate (PAP, 2019). The employment rate decreased slightly from 43.8% in 2011 to 43% in 2020, with significant differences between women (31.1%) and men (56.2%) (ANSD, 2021). This decrease was accompanied by precarious jobs, informal jobs, and visible underemployment which affects more than a quarter of the actively employed, especially women (40.3%) and the youth (28%). Informal employment and in-work poverty increased and 67.6% of the jobs created are vulnerable jobs (World Bank, 2018). The quasi-totality of youth (90%) who join Senegal's labour market each year operate in the informal sector where a high level of job insecurity is generally observed both in regard to working conditions and in wages. The unemployment rate was 16.7% in 2020 (26.3% among women and 9.3% among men), at 19.5% among the

youth aged between 20 and 24 years of age, and 17.5% among youth aged between 25 and 29 years against 10% among adults (ENES, 2021). Thus, unemployment and job insecurity remain unresolved and threaten the livelihoods of Senegalese youth, hampering their progress and seriously compromising their futures. According to the World Bank (2018), one of the major reasons for youth unemployment is the lack of professional experience.

ANPEJ (2021) justified this difficulty through the lack of specific training or qualifications and the lack of experience and recommended vocational training in the dual apprenticeship system between the education centre and the business. Lack of experience among Senegalese youth remains a major preoccupation for the authorities because of the prevalent high rates of unemployment and job insecurity (underemployment, informality and vulnerable employment) particularly among the youth. Most recruiters require experience for their candidates since, according to them, recruiting a youth without experience would be costly to their firm because of the need to train them, which could impact have an impact on the profitability of the company in the short term. This is why most job vacancy announcements from Senegalese firms demand that those applying for the job have experience of varying numbers of years, depending on the needs of the vacancy. In order to resolve this problem, the Government of the Republic of Senegal, through the National State-Employer Agreement (CNEE), is providing jobs to youth through vocational training through apprenticeship and adaptation in formal businesses. (World Bank, 2018). Thus, vocational training is an apprenticeship programme which aims to provide young interns with training that is methodological and comprehensive and that is sandwiched between a business firm and an educational centre. The apprenticeship is in complemented by adaptation internship or requalification training aimed at giving youth the chance to acquire practical experience over a period of 1 to 4 years and increasing their chances of accessing salaried employment. The programme is complemented by incubation programmes that provide appropriate training through programmes that last from 6 months to 2 years in business firms. These firms provide the trainee with a base, support and sponsorship so the youth may prepare themselves to be future entrepreneurs. The main objective of this type of programme is to ensure the insertion of young jobseekers into the employment market after a period of practical training within a business enterprise. These programmes which are implemented by CNEE are an effective public private partnership that ensures an active and regular promotion of youth employment and distributes the costs of running the programme between the State and the private sector. The partnership aims to generate a higher quantity of employment opportunities that are of good quality through a type of training that allows for the development of competencies and offers possibilities for workers to acquire professional experience. This could then lead to access to a regular and stable job and thus reduce poverty (Ayenew et al., 2017; Van Hoyweghen et al., 2021, Behrendt et al., 2021, Fabry et al., 2022).

Figure 1: Trends in the indicators



Source: Data derived from the National Demographic and Statistics Agency

Youth who are beneficiaries of this vocational training programme receive a monthly allowance paid by the firm that is undertaking the training. In return, the firm provides a recapitulative statement for the training of the youth in the programme and all the money that was paid to them, and the government then reimburses 50% of the money spent on the trainees. The programme that promotes human resource development aims to facilitate access by qualified manpower to business firms in the short, medium and long term, in the least expensive manner. The programme operates on both the supply and the demand side of employment. It targets improving the employability of youth through professional training and the acquisition of their initial professional experience, which then increases their productivity and facilitates their integration into the labour market. In addition, the programme increases the demand for manpower by business firms through employment subsidies. Such programmes contribute to maintaining the supply of jobs in a country and avoid the possibility that some youth may remain long-term jobseekers while trying to avoid the loss of human capital (Mckenzie, 2017). The subsidization of this programme that supports employment reduces hiring costs for business firms and contributes to an increase in quality employment through the experience acquired through practical apprenticeship (Kane et al., 2020).

3. Literature review

Studies undertaken using Becker's (1964) Human Capital Theory have demonstrated that the formulation of human capital allows for the acquisition of competencies in order to increase the labourer's productivity. Changes were suggested as from 1975 in regard to the generalization of this type of human capital. Indeed, the acquisition of human capital is an investment decision that arises from choosing between continuing with one's education/training, the aggregate of diverse costs (training fees, materials, transportation costs, accommodation costs etc.) and the end of those studies, leading to one's entry into the labour market for income arising from business activities (Ben-Porath, 1967; Heckman, 1976). It is in this context that a distinction was made between general and specific human capital, assuming perfect information (Becker, 1975). General human capital in this context is that which is accumulated through training centres/schools and is of benefit only to an individual. Specific human capital is, however, specific to a business firm, since the firm invests in its acquisition. It is useful for a specific job.

Given the diverse theoretical debates on the subject of the formation of human capital, it becomes evident that the main concern highlighted is the notion of the time taken in regard to the transition period from the ending of training to the optimization of the skills obtained within business firms. When this transition is not immediate, it would lead to perspectives for the future that are less certain in regard to insertion and to the impact of the training on the labour market. However, when the training is done only within a business enterprise (on-the-job training), the individual only receives certain skills and although a change is undertaken, it is not sustainable. In other words, once the training is completed, difficulties are perceptible in regard to obtaining jobs in the future.

Whereas the transition is immediate when, during training in a training center, individuals obtain a job directly, general and specific human capital are acquired simultaneously when training is provided in a school or training center. This would provide several advantages both at the individual level (micro) and at the enterprise level (meso).

This simultaneous accumulation of human and specific capital is a result of the combinations of work and training and the mobility between the training centre and the business firm. The skills acquired through work-based professional training result from a combination of theoretical competencies acquired from the training

centre/school, complemented by their being put into practise at this business firm. These skills that are simultaneously acquired are likely to have both direct and indirect consequences on the labour market. The economic advantages are similar to the most rapid speed of insertion of individuals into the labour market and the best results in that particular market. Regardless of whether the situation is one of pure and perfect competition or not, several theories related to the notion of human capital (general and specific) have been formulated, such as the job search theory, the job competition theory, efficiency wage model, economic segmentation theory, and signal extraction filters.

Using these theories, various channels are available through which work-based professional training is likely to have an impact on results in the labour market. First, assuming that there is perfect circulation of information, because of the behaviours it promotes (theoretical training, technical skills), professional training increases the stock of human capital through the observable and unobserved skills of the beneficiaries, which increases employment and people's potential productivity (Card, 1999). Indeed, professional training enables the acquisition of practical skills, that could improve human capital and the productivity of interns. Also, training in a vocational training school provides theoretical skills on specific subjects and is likely to provide technical competencies, thus increasing productivity. Thus, through training individuals are endowed with general skills in terms of the creation and use of business firms, which ignites an entrepreneurial spirit (Cho et al., 2013). Mixing work with training provides the worker with the advantage of being in connection not only with one employer, but eventually with a network of employers through their recommendations. Finally, combinations of work and training and the mobility between the training centre and the business firm provide beneficiaries with the opportunity to demonstrate their potential assets (effort, skills and talents) to employers. Second, imperfect information and the significant level of conflict that exists in the labour market are said to be one of the mechanisms through which work-based training has an impact on performance in the labour market. Through lack of training, individuals in general and young people in particular face difficulties entering the job market, particularly because of their low productivity potential. (Farber and Gibbons,1996; Pallais, 2014).

The choice of professional training is related to individual characteristics, socio-economic characteristics of the household, the area of residence and the characteristics of the area of residence (Wang and Guo, 2018; Kumar et al., 2019; Vincent and Rajasekhar, 2021). Although there is no consensus among the researchers, some have found that people from more deprived socio-economic backgrounds are likely to choose professional training while those from a wealthier socio-economic background would be oriented toward academic training (Tilak, 2003; Altinok, 2012). The parent's level of education is also a significant determinant in regard to participation in work-based professional training (Wang and Guo, 2018). This demonstrates that individuals whose parents did not receive a university education have a very low likelihood of choosing work-linked professional training. Further,

Kumar et al. (2019) have demonstrated that the gender of an individual and the urban area are the main factors that influence the choice of work-linked professional training in India. In addition to these factors, Vincent and Rajashekar (2021) demonstrated that the household characteristics (socio-economic status of the parents and the size of the family) are important in explaining the choice of work-linked professional training since the parents' level of education and the size of the family affect the choice of work-linked professional training.

Evidently, some researchers established the negative impact of such factors (Moenjak and Worswick, 2003; Altinok, 2012), but the choice of training could be a source of benefit for both the individual and for the business firm. An evaluation of the effectiveness of training programmes through identifying the channel by which professional training has an impact on the labour market has been the subject of several empirical studies (Ashenfelter, 1978; Heckman et al., 1999; Burghardt and Scochet, 2001; Attanasio et al., 2011; Card et al., 2011; Cho et al., 2013; Honorati, 2015; Ibarrarán et al., 2015; Alzúa et al., 2016; Diaz and Rosas, 2016; Hirshleifer et al., 2016; Acevedo et al., 2017; Attanasio et al., 2017; Maitra and Mani, 2017; McKenzie, 2017; Das, 2021). The study of the effectiveness of vocational training experienced a resurgence following various studies undertaken by American and European scholars (GAO, 1996; Bloom et al., 1997; Friedlander et al., 1997; Heckman et al., 1999; Burghart et al., 2001). Two vast fields in the area were enriched due to the resurgence, including research that focuses on vocational training at secondary school level and those studies that focus on post-secondary vocational training, yet are associated with vocational training programmes aimed at endowing individuals with skills that can be used immediately in the production sector.

In this context, the level of education of a participant in the programme is not taken into account. Thus, several types of programmes were evaluated separately, especially on-the-job training, resulting in various conclusions. One of the lessons that emerges from those studies is that vocational training on the job has a generally modest impact on results in the labour market. The comparison between various types of programmes provided a second major finding according to which on-the-job training is more effective in regard to results on the labour market than training that taked place within the confines of training centres (Heckman et al., 2000; Burghardt et al., 2001). These different results allowed for an extension of studies according to gender and according to specific age groups within a population. This resulted in some studies demonstrating that the benefits of the programme are higher among women than among their male counterparts (Friedlander et al.,1997). GAO (1996) demonstrated that the two programmes implemented in the United States of America had different effects. The researcher found that among women the Job Partner Training Act effect was null, but positive in the long term. The impact was negative in the short term among men. However, the Job Corps had a positive and significant effect among both sexes. Lee (2005), for example, demonstrated that the Job Corp has an impact of close to 12% on income 3 years after the training programme.

In the Dominican Republic Card et al. (2007), using a randomized experiment,

evaluated the economic yields of the combination of work and training programme in terms of employment, medical cover and income of young people living in urban areas. The researchers demonstrated that the training programme, which covers training within the school and within a business firm, has no impact on youth employment. Also, the impact was significantly marginal on the wages and on medical cover. However, this impact varies depending on the type of employment. indicator varies according to the type of job. However, Attanasio et al. (2011) had a different type of result. They found that women have more benefits than men in terms of yields from work and training programmes (employment, income and formal jobs).

In developing countries, proof of effectiveness is limited. Betcherman et al. (2004), conducted a meta-analysis of the impact of training programmes on youth training in 69 countries, of which 19 were developing countries. The researchers demonstrated that training programmes in South America were more effective than those in the United States and in Europe. In addition, Ñopo and Saavedra (2003) focussed on sampled training programmes in South America and concluded that the impact on employment and income is higher and tends to surpass the impact in developed countries. McKenzie (2017) examined the results of 12 studies focusing on the vocational training programme in 8 developing countries. He observed that only three studies demonstrated a positive impact on employment and two on income. In regard to specific countries, Attanasio (2017) in Colombia demonstrated the existence of a sort of complementarity between training and the experience acquired in the two training sites, leading to conclusions according to which in the short and in the long-term, work-based vocational training combined with training in an educational centre has a positive impact on employment, contributions to social security and the formality of business firms. In examining the heterogeneity of this impact according to gender, the researchers found that it is identical for men and for women. More recently, within the same framework, Das (2021) focused on the relationship between indicators in the labour market (employment and income) and work-based vocational training by using a follow-up survey on disadvantaged youth (unemployed or underemployed) who had benefitted from the programme. The researcher demonstrated that disadvantaged youth see their performance in the labour market in terms of employment and income improving 6 months after their programme only if they benefitted from on-the-job training. The employment impact diminishes with time (22 months after the programme), but the impact on income is lasting as long as the programme leads to finding occasional employment or a paid job. However, the addition of the element of work-based vocational training to a training school during the course of one's employment only has a short-term impact on employment and wages, but the impact is somehow long lasting.

In regard to Africa, Hardy et al. (2019), in a study focusing on Ghana, demonstrated that classroom training makes youth graduate from salaried jobs to self-employment. The loss of income as a result of that transition, however, is not compensated by an increase in benefits drawn from working in self-employment. In Uganda, Alfonsi et al. (2020) sought to verify the differences between employment and income for youth

on the basis of their choice to undergo vocational training through an examination of school-based training and training undertaken in a work-based setting. Their results also demonstrated that there is a bonus for two distinct types of training in terms of employment, but the bonus in income is only observed in relation to school-based vocational training.

In regard to business firms, studies undertaken on the impact of work-linked training on productivity are not unanimous in relation to the depth and intensity of the impact (Barron et al., 1989; Bartel,1994; Black and Lynch, 1996; Barron et al., 1997; Barrett and O'Connell, 2001; Ng and Siu, 2004; Garcia, 2005; Ballot et al., 2006; Zwick, 2006; Colombo and Stanca, 2008; Bernier, 2014). Whereas some of the empirical studies found for a positive relationship, others found either a negative or null relationship. Several factors could justify this lack of consensus of which the most common are the nature of the indicators of productivity used, the measurement of training and the type of data used in the studies.

Bartel (1994), using data from Spain's manufacturing industry, demonstrated that work-linked training had a positive impact on the net sales in that industry. He also found that only training that offers new programmes has benefits in terms of sales for the firms and not formal training. Similar results were also arrived at by Bishop and Kang (1996) and Loewenstein and Spletzer (1999). Barret and O'Connell (2001) found a positive impact between training in management, marketing, sales and finance/ accounting, and production in a business firm. Furthermore, the authors noted no impact in production in business firms due to training in technology and systems of product development and in the development of production techniques (Black and Lynch, 1996).

It is evident from the foregoing that when cross-sectional data are used, the impact of training which is in the short term, is not always immediately observed. To fill this gap, several researchers demonstrated that in using longitudinal data the impact of work-linked vocational training is only observed after a certain duration. D'Arcimoles (1997) demonstrated that the yields from work-linked professional training are observable after 1 or 2 years. In other words, there is a minimum duration after which the impact of training would be observable in terms of productivity in the business firm. Similar results were arrived at by other authors (Black and Lynch, 2001; Zwick, 2006; Colombo and Stanca, 2008). Bernier (2014) demonstrated that returns from work-linked professional training take into account the dynamic nature of the impact (short and medium term). At best, the impact of expenditure on training improves productivity in business firms in the short term, but this impact is even higher after a period of 4 years.

Despite the existence of empirical studies on the benefits of vocational training in developed countries, the literature on specific training, notably that which is split between the training school and the business firm, is rarely addressed in studies in developing countries, and notably in studies that focus on Senegal.

4. Methodology of the study

4.1 Theoretical framework for work-based professional training

Human capital is a network of production capacities (skills and experience) that an individual acquires throughout their lives by the accumulation of general and specific skills, and know-how (Becker, 1962). This indicates that each individual seeking employment has their own capital, either innate or derived from the various training they have received, which has been accumulated over time with investing in human capital (expenditure on education, training, school fees, equipment etc.). By investing in human capital, each individual could accept to delay their entry into the labour market if they considered that their future income would be much higher. Such investment which leads to the accumulation of human capital has interesting economic implications in terms of an increase in production potential, labour productivity, returns (wages) for the remainder of one's active life and the profitability of business firms. Lucas (1988) indicated that besides an increase in production factors, economic growth is related to an endogenous accumulation of human capital. Human capital thus seems to be a determinant in regard to access to the labour market, productivity and gains in competitiveness.

According to Becker (1962), investment in human capital is done through general training and specific training. General training acquired from the education system remains in the possession of individuals and could be useful when applied across the entire spectrum of the labour market. In this market, business firms buy the "labour force" (agreement between the worker and the business firm) and very few among them contribute to the costs of training of individual workers due to the fear that the beneficiaries would use their new status as leverage to bargain with a different firm in order to be hired at higher wages. Being already in the market, specific training could increase the labour productivity of an individual within the firm who trained him or her, but the value of investing in specific training could be lost when that worker's labour contract is interrupted. The distinction between general training, which enhances the skill levels of individuals, and specific training which increases the productivity of an individual in the business firms in which they work forms the basis of analysis on the transaction costs in the labour market.

With education being a collective good, general training is provided by the government or paid for directly by an individual (Becker, 1962). Thus, since the insertion of youth into stable, regular and well-paying jobs is a major challenge in Senegal, numerous programmes have been initiated and implemented by public authorities implemented to help vulnerable youth.

Althiugh, professional training is at the heart of human capital theories (see for example Becker, 1962; Stigler, 1962; Mortensen and Pissarides, 1994), but the problem of training oriented towards employment remains little explored in empirical studies. The match between training and employment leads to frictions on the labor market linked to the heterogeneity of the characteristics of their agents, to problems of imperfections and to the geographical location of the actors. In order to adjust supply of labour to demand for labour, public policy has been geared towards various aspects of the labour market through the creation of public sector employment bureaus whose role is to offer training oriented towards employment and to help the youth who are in the process of seeking employment.

Using the Human Capital Theory, the Action Theory, the Theory of Change and public policy effectiveness, this study evaluated the effectiveness of work-based professional training, focussing on the objectives of the Government of Republic of Senegal in regard to the insertion of the youth, into the labour market. The relevance of such training which is related to the rationale and the openness in the objectives of public policy on employment allowed us to examine its impact on the well-being of potential beneficiaries of the training. to the study also evaluated how the government is achieving its objectives in regard to youth employment through work-based professional training programmes. The impact of these programmes on perspectives of regular, stable and well-paying jobs allowed the study to identify factors that directly or indirectly influence participation in various vocational trainings. To avoid reverse causality effects, and frequency effect, we examined the determinants of training, the employment situation in terms of stability, regularity and the remuneration of youthful beneficiaries of work-linked training in business firms compared to non-beneficiaries.

4.2 Data Sources

This study used two distinct databases to achieve fixed objectives. First, we used primary data derived from a survey on the improvement of employment policies in Senegal (EAPE) undertaken in 2018 in Senegal by the Centre for Research and Training for Economic and Social Development (CREFDES) with technical and financial support from the International Development Research Centre (IDRC). The objective of the survey was to evaluate the effectiveness of the programmes implemented by the CNEE in order to improve youth insertion into the labour market. This allowed for an examination of job creation schemes, and the views of those targeted in regard to public policies that help them in job seeking. The survey allowed us to access information on characteristics of the population (sex, age and level of education), characteristics of the socio-economic environment, contacts of the jobseekers, the socio-economic category, and the income or wages of the individuals who benefit from the CNEE services.

The strategy of this survey comprised visiting the department of employment to collect data from information sheets on all job applicants. With this information we constituted a sample frame that enabled us to identify individuals who had applied to participate in the CNEE programme between 2010 and 2015. The information allowed us to follow-up on 2,000 individuals who either benefitted from the programme or were not picked. These individuals were from four departments of the Dakar region (Dakar, Guédiawaye, Pikine and Rufisque). Using this sample frame, two groups of individuals were constituted (beneficiaries and non-beneficiaries) with the aim of sampling 1,000 beneficiaries and 1,000 non-beneficiaries. The individuals were selected randomly and contacted by telephone for a face-to-face interview. If the correspondent was unavailable, a new number was selected randomly from the sample. Furthermore, when the person initially contacted was no longer available for the meeting, a new person was randomly selected and contacted. Finally, a survey that focused on 1,838 individuals of whom 842 had benefitted from at least one programme (intermediation, work-based professional training or support in entrepreneurship) from CNEE and 996 unsuccessful applicants.

The information collected from the two categories of individuals was linked to trends in their socio-demographic characteristics during the period between their application to the department of employment and the year in which the survey was undertaken. This is information related to their vocational path, their professional experience, their job status before and after participating in the programme, their place of residence, their level of education etc. Identical questionnaires were addressed to the two groups of individuals with some questions reserved for the individuals who had benefitted from a programme and retrospective questions related to indicators of the labour market (unemployment, duration of unemployment, wages, regular employment, social security, nature of contract etc.). By the end of the survey, 1,838 individuals had been questioned, 45.8% beneficiaries and 54.2% unsuccessful applicants. Among the beneficiaries, 86.2% had been involved in work-linked training in terms of apprenticeship in a business firm, 12.6% had benefitted from a solidarity contract and 1.2% had benefited from a spin-off contract. We were interested only in beneficiaries of work-linked training related to training in business firms with the aim of providing the young apprentices with a professional and methodological training and practice in entrepreneurship. Evidently, vocational training was carried out in conjunction with a business firm, but the employers were not questioned to determine whether their employees had become more productive at their jobs after the end of the training. The study only focused on an age group of youths that were in greater need of training and insertion (15 to 35 years old) in the labour market. This age group corresponds to the definition of youth adopted by the African Union's African Youth Charter in The Gambia in 2006. A comparative analysis of the situation of young men as compared to that of young women was also undertaken to reveal any possible differences in results between the two groups of youths, to determine whether young women are more disadvantaged than young men in regard to access to regular and stable employment.

Second, we used data from the survey termed Determinants of the performance of enterprises in francophone sub-Saharan Africa: A case study of Senegal, focusing on 639 firms and undertaken in 2014 by the Economic Research Laboratory of the University of Cheik Anta Diop, with technical and financial support from IDRC. The objective of the survey was to identify the determinants of performance in Senegal's business firms. The survey was carried out in three cities (Dakar, Thiès and Saint Louis) which host more than 50% of the business firms in Senegal. According to the ANSD sample frame, these three regions are the top locations for the country's enterprises with 5% located in Saint Louis, 11.5% in Thiès and 39.5% in Dakar (ANSD, 2017).

Questions related to training of employees and the adoption of innovative activities were collected using questions that retrospectively addressed the 5 years preceding the survey so as to evaluate changes that may have occurred in the running of the business firms. On the whole, the questions were related to the enterprise, its manager and its employees. The data gathered focused on information and communication technology (ICT) and technological innovation, environmental policies, production, the value of sales and the net benefits at the end of the exercise, the business environment, access to markets, social security etc. Of 723 enterprises, 64% operated within the service sector and 34% within the manufacturing sector. Among the sampled firms, 17% offered vocational training and capacity building for their employees.

4.3 Empirical Framework

4.3.1 *Endogenous switching regression model*

In order to evaluate the relationship between work-based professional training and insertion to the labour market, the literature provides us with several evaluation techniques such as experimental and quasi experimental methodologies (Darnall et al., 2008), the combination of matching techniques and the simple regression method (Jiang et al., 2016; Lundgren and Zhou, 2017). Although these methods allow us to arrive at conclusive results, they do not take into account the unobserved effects. For our study, we used endogenous switching regression models (endogenous switching regression and endogenous switching probit model) which consider the observed and unobserved factors, allowing us to address problems of self-selection and endogeneity for the vocational training. We used the matching method to analyse the robustness of the results.

4.3.1 *Endogenous Switching regression models*

We first used a decision model related to vocational training to analyse the main factors that promote or limit access by youth to vocational training in terms of work-based apprenticeship. Individuals who are aware of the impact of the quality of training on insertion into the labour market are willing to be trained. The training (F) is a visible manifestation of the latent variable (F_i^*) which is unobservable in an individual.

$$F_i = \begin{cases} 1 \text{ si } F_i^* > 0 \\ 0 \text{ sinon} \end{cases} \text{ avec } F_i^* = Z_i\alpha + \varepsilon_i \quad (1)$$

Where $Z_i = (1, z_{i1}, z_{i2}, z_{i3}, \ldots z_{ik})$ is the vector of explanatory α is the vector of parameters to be estimated; ε_i is the undertaking of random events distributed following normal distribution; and F_i is a variable translating the situation of individual *i,* which is equal to the unit if the individual *i* received work-based professional training ($F_i = 1 \text{ ou } F_i^* > 0$) and 0 if not. The training is linearly dependent to the vector of explanatory variables (Z) such as the socio-demographic characteristics of the individual, knowledge of the training centre, the characteristics of the parents, the socio-economic environment and the residual (ε).

Second, we examined the effectiveness of work-based professional training in terms of regularity and stability in employment, and an improvement in the income obtained in the labour market. After this examination of several functional forms, the most robust was a specification whose simple approach to examining the effectiveness of work-linked training was included in Equation 2 on employment income, a dummy variable (F) that is equal to 1 if the individual benefitted from work-linked training then apply the ordinary least squares (OLS). Nevertheless, this approach could furnish biased estimations because it assumes that work-based professional training is determined in an exogenous manner whereas it is potentially endogenous. It therefore becomes evident that self-selection in terms of work-based professional training, which is a source of endogeneity, is generally at the individual level. One of the best methods to explicitly account for this endogeneity is to use the ESR method, which specifically corrects all selection biases and any endogeneity possible within a sample (Freeman et al., 1998). Indeed, the decision on whether to undergo vocational training or not is voluntary and could be based on the individual self-selection of individuals. Individuals who received training may have characteristics that are systematically different from those that did not benefit from the training. Furthermore, the individuals may have decided to be trained as a function of the expected labour productivity or perspectives in the labour market. The unobserved characteristics of individuals could have an impact on both the decision to be trained and indicators in the labour market. Also, by taking into account the endogeneity of the decision to be trained, we estimated a simultaneous equation model of the decision to be trained and the indicators of the labour market with endogenous switching by full information maximum-likelihood method. Contrary to studies that use values generated automatically by the non-linearity of the selection model to control for endogeneity, we used a restriction of exclusion so that the model may be identified (Maddala, 1983). Such a restriction is necessary when there are various variables that have a direct impact on the selection variable (work-based professional training), but not the outcome variable calculated through regularity of pay, job stability and the income from labour. We used the instrumental variables method, whose variables were: the level of education of the parents and the percentage number of participants in training per region. The admissibility of the instruments was determined after a falsification test (Di Falco et al., 2011).

In order to take the selection bias into account, we adopted an endogenous switching regression model for indicators of the labour market in which individuals are confronted by two regimes: [1] work-based professional training and [2] no training. The regression model was defined as that of Di Falco et al. (2011).

$$\begin{cases} \text{Régime 1 : Formation professionnelle} & Y_{1i} = X_{1i}\beta_1 + \theta Z_{1i} + \mu_{1i} \quad \text{si } F_i = 1 \quad \text{(a)} \\ \text{Régime 2 : Pas de formation} & Y_{2i} = X_{2i}\beta_2 + \theta Z_{2i} + \mu_{2i} \quad \text{si } F_i = 0 \quad \text{(b)} \end{cases} \tag{2}$$

Where F is the probability of participating in work-based professional training; Y_i represents effectiveness in vocational training calculated through a stable, regular and well-paying job in regimes 1 and 2; X_i represents the vector of explanatory variables; and β_1 and β_2 are the vectors of parameters to be estimated, μ_{1i} *et* μ_{2i} are the error terms. Z_{1i} et Z_{2i} are the vectors of the instrument which, by definition, do not have any direct impact on the effectiveness of the training except through participation in the training programme. The error terms are assumed to have a normal distribution with a mean of zero and a covariance matrix ($\sum$) which is not singular. In other words, the error term ε_i, μ_{1i} *et* μ_{2i} in Equation 1 and Equation 2 are assumed to have a trivariate normal distribution ($(\varepsilon, \mu_1 \mu_2)$: $N(0, \Sigma)$).

With $$\sum = \begin{pmatrix} \sigma^2_{\varepsilon} & \sigma_{\varepsilon\mu_1} & \sigma_{\varepsilon\mu_2} \\ \sigma_{\mu_1\varepsilon} & \sigma^2_{\mu_1} & . \\ \sigma_{\mu_2\varepsilon} & . & \sigma^2_{\mu_2} \end{pmatrix} \tag{3}$$

Where σ^2_{ε} is the error variance in Equation 1, which is assumed to be equal to 1 because the coefficients can only be estimates until a scaling factor (Maddala, 1983); $\sigma_{\mu_1}{}^2, \sigma_{\mu_2}{}^2$ are the variances in error terms in the functions of (2a) and (2b); and $\sigma_{\mu\varepsilon}$ *et* $\sigma_{\mu_2\varepsilon}$ represent the covariance of ε_i, μ_{1i} *et* μ_{2i}. Since Y_{1i} et Y_{2i} is not observed simultaneously, the covariance between μ_{1i} et μ_{2i} is not defined. Taking into account the error term in Equation 1, a significant implication of the structure of the error is that ε_i is correlated to the error terms of the functions of result of (a) and (b) in Equation 2 (μ_{1i} et μ_{2i}). The expected values of μ_{1i} et μ_{2i} conditional to the sample selection are zero:

$$\begin{cases} E\left[\mu_{1i} \middle| F_i = 1\right] = \sigma_{\mu_1\varepsilon} \dfrac{\phi(Z_i\alpha)}{\Phi(Z_i\alpha)} = \sigma_{\mu_1\varepsilon}\lambda_{1i} \\ E\left[\mu_{2i} \middle| F_i = 0\right] = \sigma_{\mu_2\varepsilon} \dfrac{\phi(Z_i\alpha)}{1-\Phi(Z_i\alpha)} = \sigma_{\mu_2\varepsilon}\lambda_{2i} \end{cases} \tag{4}$$

Where $\phi(.)$ is the function of the density of the standard normal probability; and $\Phi(.)$ the normal cumulative density function. If the estimated covariances $\hat{\sigma}_{\mu_1\varepsilon}$ et $\hat{\sigma}_{\mu_2\varepsilon}$ are statistically significant, then participation in work-based professional training and the indicators of the labour market are correlated. Thus, we have:

$$\ln L_i = \sum_{i=1}^{N} F_i \left[\ln \Phi\left(\frac{\mu_{1i}}{\sigma_{\mu_1}}\right) - \ln \sigma_{\mu_1} + \ln \Phi(\theta_{1i}) \right] + (1-F_i) \left[\ln \Phi\left(\frac{\mu_{2i}}{\sigma_{\mu_2}}\right) - \ln \sigma_{\mu_2} + \ln\left(1-\Phi(\theta_{2i})\right) \right] \quad (5)$$

Whery $\theta_{ji} = \frac{\left(Z_i\alpha + \rho_j \mu_{ji} / \sigma_j\right)}{\sqrt{1-\rho_j^2}}$ J=1,2 with ρ_j signifying the coefficient of the correlation between the error term ε_i of Equation 1; and the error terms μ_{ji} of (a) and (b) in Equation 2 . This model allowed comparison, using a post estimation analysis, of an expected situation concerning individuals that undertook work-based professional training (a) and those who did not benefit from the training (b).

Furthermore, one could examine the effectiveness expected from work-based professional training in cases of assumed counterfactuals (c) for individuals who received training in case they may have not received it, and also for those who did not receive it (d) in case they may have received it. These conditional expectations on the effectiveness of vocational training in the four cases are defined as follows:

$$\begin{cases} E(Y_{1i} / F_i = 1) = X_{1i}\beta_1 + \sigma_{\mu_1\varepsilon}\lambda_{1i}, & \text{(a)} \\ E(Y_{2i} / F_i = 0) = X_{2i}\beta_2 + \sigma_{\mu_2\varepsilon}\lambda_{2i}, & \text{(b)} \\ E(Y_{2i} / F_i = 1) = X_{1i}\beta_2 + \sigma_{\mu_1\varepsilon}\lambda_{1i}, & \text{(c)} \\ E(Y_{1i} / F_i = 0) = X_{2i}\beta_1 + \sigma_{\mu_1\varepsilon}\lambda_{2i}, & \text{(d)} \end{cases} \quad (6)$$

Cases (a) and (b) of Equation 6, represent the real expected results for individuals who participated in the work-based professional training programme observed from the sample. Cases (c) and (d) represent the expected results of the counterfactuals (the individuals that did not benefit from work-based professional training). Furthermore, building on the studies by Heckman et al. (2001) just as done by Di Falco et al. (2011), we calculated the impact of the treatment effect of work-based professional training on the treated (ATT) as the difference between (a) and (c), which represents the effectiveness of work-based professional training for individuals who have not in the real sense undergone work-based professional training.

$$ATT = E(Y_{1i} | F_i = 1) - E(Y_{2i} | F_i = 1) = X_{1i}(\beta_1 - \beta_2) + (\sigma_{\mu_1\varepsilon} - \sigma_{\mu_2\varepsilon})\lambda_{2i} \quad (7)$$

Equally, it is necessary to calculate the treatment effect (ATU) for individuals who did not undergo work-based professional training as being the difference (d) and (b).

$$ATU = E(Y_{1i}|F_i = 0) - E(Y_{2i}|F_i = 0) = X_{1i}(\beta_1 - \beta_2) + (\sigma_{\mu\varepsilon} - \sigma_{\mu_2\varepsilon})\lambda_{2i} \quad (8)$$

As demonstrated in the literature, an estimation of the ESR model is undertaken in a single step using the maximum likelihood method (Freeman et al., 1988). After estimation, the average impact of treatment could be calculated as the difference between the result expected from individuals who benefitted from work-based professional training and the result expected from individuals who did not benefit from work-based professional training (Di Falco et al., 2011).

4.3.2 Endogenous switching probit model

In order to examine the impact of work-linked training in business firms on non-wage and non-monetary indicators of employment quality, we used the endogenous switching probit model. It assumes that the binary probit model contains a random unobserved term which is correlated to the random unobserved terms in the resulting model. Contrary to the wages and monetary indicator of quality of employment which is continuous (wage variable), taking into account the sample selection and endogenous change for binary results when the data are adjusted using non-linear models is a challenge (Heckman, 1978). An estimation that uses a two-step procedure according to Heckman's (1978) model would lead to erroneous conclusions and produce incoherent results. We used an endogenous switching probit model which is similar to a regression model with endogenous switching, for continuous results (Lokshin and Sajaia, 2011).

Either the decision to participate in the work-linked vocational training programme (F_i) represented through the following latent response model (F_i^*)

$$F_i = \begin{cases} 1 \text{ si } F_i^* > 0 \\ 0 \text{ sinon} \end{cases} \text{ with } F_i^* = Z_i\alpha + \varepsilon_i \quad (9)$$

Where Z_i is the vector of explanatory variables; α the vector of variables to be estimated; and ε_i the occurrence of random events distributed following normal distribution. The variable of the binary result is also defined as follows:

$$Y_i = \begin{cases} 1 \text{ si } Y_i^* > 0 \\ 0 \text{ sinon} \end{cases} \text{ with } Y_i^* = X_i\beta + \tau S_i + \mu_i \quad (10)$$

Where Y_i is the variable of the binary result; Y_i^* represents the latent variable; β

represents the vector of parameters to be estimated; τ is the coefficient of the dummy endogenous treatment variable; and μ_i is the residual term.

The problem of endogenous switching in this study is that access to employment (Y_i) for an individual *i* is not directly observable. We assumed that access to a job (Y_i) depends on participation in work-linked training which is endogenous (F_i) and on a vector of explanatory variables (X_i). The variable of participation in the endogenous programme (F_i)also depends on a vector of explanatory variables (Z_i). It is also possible that the vectors Z_i and X_i share elements. An estimation of Equation 10 and its interpretation as an intermittent effect would lead to biased estimations due to unobserved endogeneity. A probit endogenous switching regression would correct this bias by simultaneously estimating the selection equation and the result with an appropriate instrument for the decision to participate in the work-linked vocational training programme (Lokshin and Sajaia, 2011; Kane et al., 2020). The framework of the endogenous switching probit model maps the decision to participate in the work-linked training programme and its impact of the various binary indicators of employment within a two-step framework. First, the decision by individuals to participate in the work-linked vocational training programme is modelled using a probit model. Second, the relationship between binary indicators for the labour market and participation in the work-linked training vocational training programme, and the entire set of explanatory variables is determined through the use of a probit model with selectivity correction As was done by Lokshin and Sajaja (2011), the binary results in a labour market conditioned by participation in the work-linked vocational training programme were specified through an endogenous regime switching model:

$$\begin{aligned} &\textit{Régime 1: } Y_{1i}^{*} = \beta_1 X_{1i} + \varepsilon_{1i} \quad \text{si} \quad Y_{1i} = 1 \ (Y_{1i}^{*} > 0) \qquad \text{a} \\ &\textit{Régime 2: } Y_{2i}^{*} = \beta_2 X_{2i} + \varepsilon_{2i} \quad \text{si} \quad Y_{2i} = 1 \ (Y_{2i}^{*} > 0) \qquad \text{b} \end{aligned} \tag{11}$$

Where Y_{1i}^{*} and Y_{2i}^{*} are latent variables that determine the binary results Y_{1i} and observed Y_{2i} for participants and non-participants in the work-linked vocational training programme respectively. X_{1i} and X_{2i} are the vectors of exogenous variables; Z*i* is the vector of variables that determine the movement from one regime to the other; β_1 and β_2 are the vectors of parameters to be estimated; and ε_{1i} and ε_{2i} are the error terms in the equations of the result. Y_i when observed is an occurrence of dichotomous latent variables and they themselves are defined as followed:

$$Y_i = \begin{cases} Y_{1i} & \text{si} \quad F_i = 1 \\ Y_{2i} & \text{si} \quad F_i = 0 \end{cases} \tag{12}$$

We estimated an endogenous switching probit model with maximum likelihood in order to estimate the parameters of interest. The impact of the work-linked vocational training programmes on employment was estimated using a methodological framework developed by Lokshin and Sajaia (2011). Just like the regime switching regression model, the switch probit model also allows for the estimation of the treatment effect on the treated (ATT) and the treatment effect on the untreated (ATU). The impact of the work-linked vocational training programme on employment could vary not only in relation to characteristics observed for individuals (X) but also in function of unobserved characteristics (ε). The impacts of unobserved heterogeneity are taken into account through an estimation of the marginal treatment effects so as to identify the impact of the work-linked vocational training on access to regular employment on a temporary or permanent employment.

4.3.3 Propensity score matching (PSM)

In view of the sensitive nature of the instrumental variables related to the endogenous switching regression model, we used propensity score matching to evaluate the robustness of the treatment effects. We thus assumed that the variable of the result (Y_i), which measures the effectiveness of the work-linked vocational training, has a value that varies with ($F=1$) or without training ($F=0$). It is possible to observe the variable resulting from individuals who benefitted from work-linked vocational training ($E(Y_1 \mid F=1)$), but not the variable resulting from individuals that did not benefit from work-linked vocational training. Thus, the estimation of the average treatment effect (ATT) through the application of Equation 7 may be biased. An estimation by PSM linked to three assumptions (conditional independence, existence of common support and the stable unit treatment value) provided a clear picture of the effects of the treatment using the target population (Rosenbaum and Rubin, 1983; Khandker et al, 2009). The benefits for individual *i*, following their participation in the work-based vocational training programme is given through the difference in the result between the treated group and the control group. The assumption of conditional independence assumed that the conditional probability between the variable result in the absence of work-linked training (Y_2) and the training status (F) were statistically independent and defined the propensity score for participation in the said work-linked training programme in the following manner:

$$P(Z) = \Pr(F=1) \mid X \tag{13}$$

Furthermore, the application of the matching method is possible when individuals are presence who have not benefited from work-based professional training and who have similar characteristics to those individuals who have benefited from work-based profesional training.

All sampled individuals have the same likelihood to participate or not to participate in the work-based professional training programme such as $0<F(X)<1$. On the basis of those assumptions, an ATT estimator is specified through PSM in the following manner:

$$\mathrm{ATT}=\mathrm{E}\left\{Y_1 \mid F=1, F(X)\right\}-E(Y_2 \mid F=1), F(X) \quad (14)$$

Estimating the equation was undertaken in several steps: We started by estimating the probability of participating in the work-based professional training programme using a probit model, which allowed the estimation of propensity scores for each individual. Subsequently, each individual that participated in the work-linked training programme was matched with several individuals who did not participate in the work-linked training programme, with similar propensity scores to estimate the value of the treatment effect (ATT). Using PSM allowed us to undertake a comparison of the treated individuals (having benefitted from training) with individuals from the control group (who did not benefit from training) with similar characteristics to determine the net impact of training. Although the result from the PSM method is sensitive to the fact that there could be a problem of endogeneity related to self-selection to training, the results of PSM were compared to those arising from using the ESR method which considers the self-selection of the variable of the treatment of endogeneity. Despite the existence of several methods of matching (the nearest neighbour method, kernel method, radius method etc.) in the literature, none is superior to the other, and no consensus has been arrived at in the literature as to which method is the best (Lecocq et al., 2014). Our study used the nearest neighbour method applied to several performance variables to verify the robustness of the results.

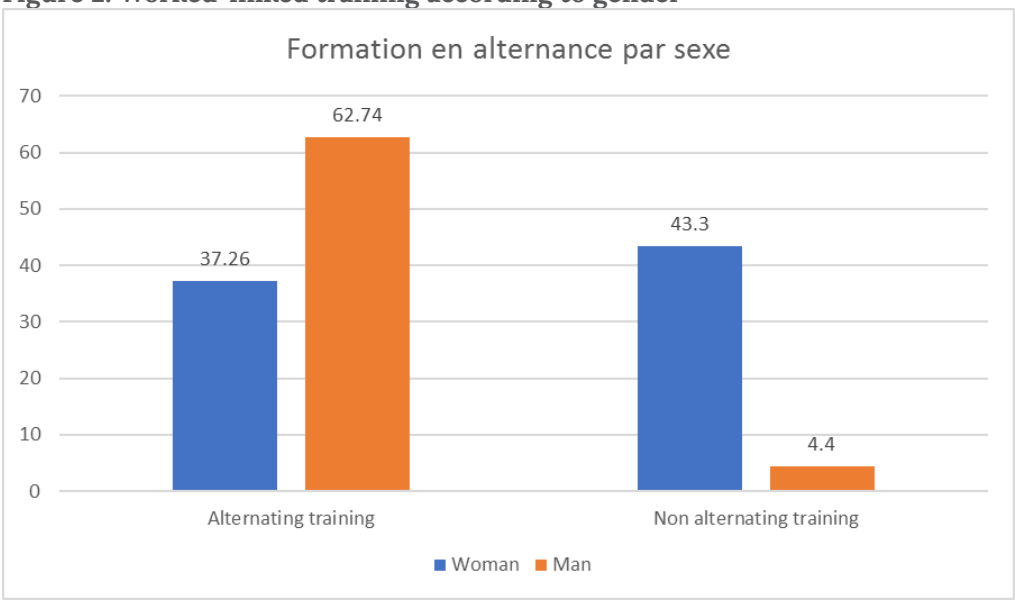
5. Results of the analysis

This section first presents the statistical results. It then presents the results of the impact of work-based professional training provided through the National State-Employer Agreement programme on the income of the beneficiaries using the endogenous switching regression method, and its impact on regular and stable employment through the endogenous switching probit model.

5.1 Statistical results of the study

Before presenting the results of the econometric estimations, we first used some descriptive statistics to observe the trends in various socio-economic and demographic characteristics related to work-based professional training. Figures 2 and 3 highlight the relationship between work-linked vocational training and some socio-demographic characteristics of the individual, some characteristics of the job held and given indicators. The results in Figure 2 show that the percentage of men (62.74%) who benefitted from work-linked training was higher than that of women (37.26%).

Figure 2: Worked-linked training according to gender



In relation to the level of education, Figure 3 shows that holders of a diploma certificate "Brevet des Techniciens Supérieurs" were the highest number of participants in work-linked training (11.2% against 4.94%) compared to beneficiaries of the work-linked training holding any other type of certificate. However, people with no certificate whatsoever were the least interested in this type of training, since only 2.96% of them applied to participate. An examination of the distribution of people who choose to participate in work-linked training, according to sector of activity, revealed that 48% of the employees in the service sector participated in a work-linked training programme against only 2% of those who work in the agriculture sector. These statistics also indicate the significant correlation between work-linked training and the results in the labour market we have previously mentioned.

Figure 3: Work-linked training according to education level

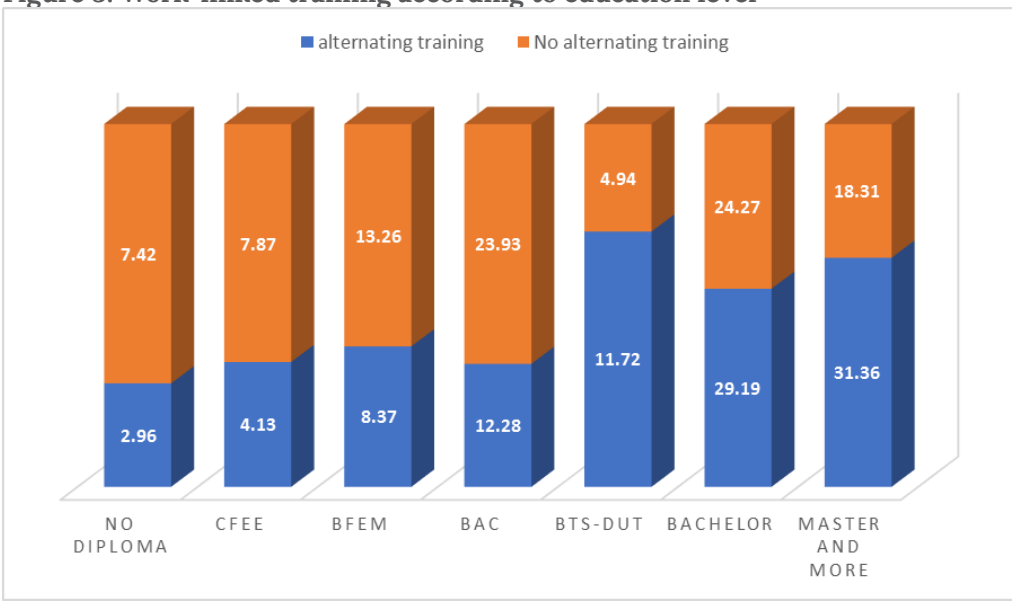


Table 1 highlights the role work-linked training plays over all the individual characteristics examined. A total of 41.8% of the individuals participated in the work-based professional training programme and, on average, the sampled individuals were 31 years old. However, this age average is lower for those individuals that benefitted from the work-linked training than for those who did not benefit. Furthermore, 41% of the sampled individuals were married. The proportion of married people was higher for individuals who benefitted from work-linked training than for those who did not benefit, or 33.84% against 47.37% respectively. We also observed that the average household size was eight people per household for those who benefitted from work-linked training, as compared to four people for those who did not benefit. This demonstrates *a priori*, that those individuals who come from large families tend seek vocational training to enable them to become self-reliant in terms of their careers. Furthermore, 35.29% of the people who benefitted from work-linked training were experiencing financial difficulties. In regard to the characteristics of the family of an

individual, there appears to be a difference in the socio-professional categories of the mother and the father among those who benefited from work-linked training and those who do not. Thus, the percentage share of individuals that benefitted from work-linked training and whose mothers are skilled employees or entrepreneurs as compared to those who do not benefit from the training was (7.10%), with the exception of those with mothers who worked in top management jobs (6.41%) or as housewives. However, when one focuses on the socio-professional category of the father, the percentage share was higher for those who opted for work-linked training than for those who did not benefit, except for those whose fathers were skilled workers. Also, the percentage share of parents (father or mother) of individuals who benefitted from work-linked training was higher than that of those who did not benefit. It reached 19.69% and 18.57% for mothers of individuals and to 29.42% and 30.77% for fathers of individuals Furthermore, individuals who benefitted from work-linked training would be more likely to be members of a political party than would those who do not benefit. Finally, the characteristics of the place of residence demonstrated a difference between the people who choose to participate in work-linked training and those who do not. Thus, for individuals who benefitted from work-linked training and those who did not, more than half lived in Dakar. However, the percentage share was higher for those who chose work-linked training. Also, fewer people who lived in Rufisque benefitted from the work-linked training (4.86%) than those who did not benefit but lived in the same city (5.88%).

Table 1: Descriptive statistics

Variables	Designation	Set		Work-linked training		No work-linked training	
		Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Work-linked training		0.4187	0.4935				
Labour contract	Permanent employment	0.1373	0.3442	0.1195	0.3247	0.1408	0.3479
	Short-term contract	0.1912	0.3934	0.1925	0.3947	0.1909	0.3931
	Verbal contract	0.1103	0.3134	0.1040	0.3056	0.1116	0.3149
	No contract	0.5612	0.4963	0.5840	0.4934	0.5567	0.4968
Job satisfaction	Happy with working conditions	0.3081	0.4618	0.2677	0.4432	0.3160	0.4650
Consistency of work	Regular job	0.5189	0.4997	0.4889	0.5004	0.5248	0.4995
Gender	Male	0.5874	0.4924	0.5641	0.4964	0.5919	0.4916
Age	Age	31.091	5.6150	30.323	5.0309	31.242	5.7119
	Handicap	0.0364	0.1874	0.0619	0.2413	0.0314	0.1744

Level of education according to highest certificate attained	No certificate	0.0666	0.2494	0.0155	0.1236	0.0767	0.2662
	CFEE	0.0524	0.2229	0.0199	0.1398	0.0588	0.2354
	BFEM	0.0976	0.2968	0.0509	0.2200	0.1068	0.3089
	BAC	0.1577	0.3645	0.1460	0.3535	0.1599	0.3667
	BTS/DUT	0.0925	0.2898	0.0841	0.2778	0.0941	0.2921
	Undergraduate degree	0.2691	0.4436	0.3473	0.4766	0.2537	0.4352
	Postgraduate degree	0.2640	0.4409	0.3363	0.4729	0.2497	0.4329
Marital status	Married	0.41005	0.4919	0.3385	0.4737	0.4241	0.4943
Household size	Number of children	70.763	40.943	70.407	40.5178	70.833	50.020
Financial status	Difficult	0.3875	0.4873	0.3539	0.4787	0.3940	0.4887
Sociocultural status of the mother	Senior executive	0.6991	0.2550	0.0641	0.2453	0.0710	0.2569
	Skilled worker	0.0681	0.2519	0.0686	0.2530	0.0680	0.2518
	Entrepreneur	0.1475	0.3546	0.1526	0.3600	0.1465	0.3536
	Housewife	0.0419	0.2003	0.0332	0.1793	0.0435	0.2042
	NSP	0.6726	0.4693	0.6814	0.4664	0.6709	0.4699
Sociocultural status of father	Senior executive	0.2989	0.4579	0.3141	0.4647	0.2959	0.4565
	Skilled worker	0.1948	0.3961	0.1769	0.3821	0.1983	0.3988
	Entrepreneur	0.1748	0.3798	0.1880	0.3912	0.1722	0.3776
	Stay at home father	0.0306	0.1722	0.0442	0.2059	0.0279	0.1647
	NSP	0.3008	0.4587	0.2765	0.4478	0.3056	0.4607
Political engagement	Member of a political party	0.1038	0.3050	0.1239	0.3298	0.0998	0.2998
Information channel	Via internet	0.3940	0.4887	0.4889	0.5004	0.3753	0.4843
	Advertisement campaign	0.1282	0.3343	0.1460	0.3535	0.1246	0.3304
	Word of mouth	0.2385	0.4263	0.2721	0.4455	0.2319	0.4221
	Other means	0.2392	0.4267	0.0929	0.2906	0.2680	0.4430
Sources of finance	Family	0.6689	0.4707	0.7256	0.4467	0.6578	0.4745
	Labour	0.2308	0.4215	0.1681	0.3744	0.2432	0.4291
	Other	0.1001	0.3002	0.1062	0.3084	0.0989	0.2986
Mother's education level	With a CFEE minimum	0.1875	0.3904	0.1969	0.3981	0.1857	0.3889
Father's education level	With a CFEE minimum	0.3055	0.4607	0.2942	0.4562	0.3077	0.4616
Sector of activity	Agriculture	0.0164	0.1269	0.0133	0.1146	0.0170	0.1293
	Industrial	0.0480	0.2139	0.0398	0.1957	0.0496	0.2173
	Commercial	0.1256	0.3315	0.0951	0.2937	0.1316	0.3381
	Service	0.4286	0.4949	0.4269	0.4952	0.4289	0.4950
	Other	0.3813	0.4858	0.4247	0.4948	0.3727	0.4836
Area of residence	Dakar	0.6315	0.4825	0.6548	0.4759	0.6268	0.4837
	Pikine	0.1938	0.3953	0.1769	0.3820	0.1970	0.3978
	Guediawaye	0.1176	0.3222	0.1194	0.3247	0.1172	0.3218
	Rufisque	0.0572	0.2322	0.0486	0.2154	0.0588	0.2354

5.2 Determinants for participation in work-linked vocational training

Table 2 presents results from a full information maximum likelihood estimation. Using this method, we examined the relationship between participating in the work-linked vocational training programme and the wages of individual beneficiaries to the programme. Each model (set, man, woman) respectively represents the estimated coefficients of the equation of selection (1) on benefitting or not benefitting from the work-linked vocational training programme and from functions of wage gain, Equation 2 (1) and(b), for individuals who either benefitted from work-linked training or did not benefit. In the various regressions, in for both men and women, the sociodemographic characteristics (age, gender, level of education, matrimonial status), the characteristics of the socio-economic environment such as the financial situation, the socio-professional category of the parents, the level of education of the parents, their salary expectations, the percentage share per region in terms of participation in the training programme, the expected new wages and political engagement had a significant impact on the probability of participating in work-linked training.

The level of education had the highest influence of the probability of participating in vocational training, more so for women than for men. Women holding a junior high school certificate participated more in vocational training than men who only engaged in the training once they had attained the baccalaureate level of education. Attaining a baccalaureate qualification increased the chances of participating in work-linked training for women more than for men. At the highest levels of education such as a master's degree, this probability increased for both men and women. This demonstrates that the higher the level of education, the more women there are participating in work-linked training so that they may be enter the labour market. The reality in Senegal is that at a certain time in life, regardless of a man's level of education, he has to participate in the activities of the informal sector in order to enter into the labour market. This agrees with the results arrived at by ANSD (2019) that demonstrated that most people in the labour market are self-employed workers regardless of type of training undertaken.

Furthermore, an examination of the results tables 2 reveals that the sign of the variable socio-professional category of the father is positive and significant. This indicates on the whole that individuals whose fathers are senior executives are more likely to participate in work-linked training. Although the probability was reduced for both men and women, it remained higher among women. Sons of fathers who are senior executives had a higher chance than daughters to participate in work-linked training. This demonstrates that in this category parents use their professional experience to transmit their skills and cultural values to their children in order to allow them to choose training that is geared towards employment that corresponds best with their values and which they believe are essential to the training of their children. Although the parents are obliged to choose the education, not all of them are able

ability to guide the youth about work-linked vocational training. This incapacity could probably be linked to the level of education which is a determinant in the education of children.

Some variables, such as an individual's financial situation, the expected salary and political engagement, had a negative and significant impact on participation in work-linked training. This demonstrates that the participation of youth in politics leads them to spend their time, energy, knowledge and skills at political meetings, hoping they may be rewarded with a job in their local administration or be able to leverage their political connections to obtain a position in the public service. Being a member of a political party motivates young Senegalese idealists in regard to political apprenticeship and opportunities for professional integration which are attained through socio-political capital.

Table 2: The impact of work-linked training on the income of youths

Variables	Designation	Set			Men			Women		
		Decision to participate in training	Non-beneficiaries	Beneficiary of training	Decision to participate in training	Non-beneficiaries	Beneficiary of training	Decision to participate in training	Non-beneficiaries	Beneficiary of training
		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
Gender	Male	0.0755	-1.39***	-2.05***						
		(0.0660)	(0.377)	(0.455)						
Age	Age	10.47	57.64*	47.52	24.86	5.900	-0.933	6.512	2.93	-6.86
		(6.681)	(31.51)	50.07	(17.15)	(11.00)	(12.42)	(9.016)	(4.23)	(6.86)
	Age squared	-1.520	-7,868*	-6.408	-3.660	-0.714	0.201	-0.988	-3.367	10.10
		(0.960)	(4.492)	(7.221)	(2.472)	(1.574)	(1.803)	(1.288)	(5.850)	(9.598)
Level of education	BFEM	0,672***	-0.997	-4,521*	0.102	0.237	-0.103	-0.274	0.426	-2,852*
		(0.210)	(0.741)	(2.447)	(0.465)	(0.295)	(0.348)	(0.180)	(0.793)	(1.580)
	BAC	1,005***	-1,708**	-3.519	0.267	0.244	0.0842	0.131	-0.955	-0.190
		(0.195)	(0.781)	(2.572)	(0.367)	(0.225)	(0.280)	(0.160)	(0.805)	(1.196)
	BTS/DUT	1,158***	-1.143	-2.965	0,455	0,494**	0.152	/	/	/
		(0.195)	(0.860)	(2.670)	(0.354)	(0.234)	(0.272)			
	Undergraduate degree	1.202***	-1,858**	-3.124	0.673**	0.265	0.00999	0.335***	-0.294	0.616
		(0.184)	(0.798)	(2.681)	(0.334)	(0.224)	(0.269)	(0.128)	(0.726)	(0.983)
	Master's	1.257***	-2.46***	-3.565	0.761**	0.535**	0.266	0.566***	-1.437*	0.423
		(0.185)	(0.842)	(2.741)	(0.346)	(0.242)	(0.270)	(0.122)	(0.796)	(1.036)
Marital status	Married	-0.0106	0.0143	-0.0429	-0.157	-0.0196	0.228**	-0.0251	0.910*	2.293***
		(0.0696)	(0.390)	(0.472)	(0.146)	(0.112)	(0.0895)	(0.0973)	(0.524)	(0.670)
Financial status	Difficult	-0.29***	-2.33***	-1.002	0.182	-0,46***	-0,37***	-0.41***	-2.51***	-2.19***
		(0.0700)	(0.403)	(0.621)	(0.166)	(0.126)	(0.0994)	(0.0918)	(0.542)	(0.766)

Socio-professional category of the mother	Senior executive	-0.00897	0.537	1.529**	0.404*	-0.410*	-0.0446	-0.0276	1.568	0.628
		(0.121)	(0.784)	(0.723)	(0.234)	(0.216)	0.131	(0.177)	(1.099)	(1.037)
	Employed	-0.00990	1.134	-0.502	-0,0681	-0.243	-0,0842	-0.0408	0,796	-1,985*
		(0.119)	(0.733)	(0.753)	(0.239)	(0.182)	(0.139)	(0.162)	(0.964)	(1.038)
	Employer/ Enrepreneur	0.0720	-0.174	0.887	0.151	0.00804	-0,232*	0.118	-0.413	0.762
		(0.0967)	(0.558)	(0.638)	(0.204)	(0.160)	(0.119)	(0.135)	(0.753)	(0.881)
	Housewife	-0.104	-1.088	-1.050	0,270	0.358	-0.0290	-0.0748	-0.699	-0.389
		(0.178)	(0.955)	(1.249)	(0.602)	(0.507)	(0.334)	(0.225)	(1.159)	(1.521)
Socio-professional category of the father	Senior executive	(0.295)	0.372	0.257	0,439**	0.168	-0.163	0.334***	0.934	0.541
		(0.0908)	(0.554)	(0.730)	(0.199)	(0.152)	(0.116)	(0.123)	(0.738)	(0.852)
	Employed	0.0890	0.749	-0.378	0.189	0.0427	-0.304**	0.0652	1.384**	-0.253
		(0.0965)	(0.520)	(0.691)	(0.219)	(0.162)	(0.140)	(0.128)	(0.679)	(0.871)
	Employer/ Enrepreneur	-0.153	0,753	0.188	0.169	-0.0609	-0.222	(0.272)	1.709**	1.029
		(0.105)	(0.528)	(0.787)	(0.262)	(0.186)	(0.166)	(0.135)	(0.668)	(1.019)
	Stay at home father	-0.187	-0.624	0.355	0.301	-0.401	0.356	-0.115	0.0850	-0.913
		(0.195)	(1.008)	(1.523)	(0.475)	(0.364)	(0.296)	(0.254)	(1.316)	(1.845)
Political engagement	Political party member	-0.226**	0.0583	-0.432	-0.305	-0.358*	0.0304	-0.247*	0.354	-0.321
		(0.110)	(0.552)	(0.899)	(0.308)	(0.205)	(0.202)	(0.133)	(0.671)	(1.042)
Salary expectations	Expected new wages	-1.22***	-2.220	-4.102*	-0.0424	-1.26***	-1.47***	-0.00331	-0.197	-0.137
		(0.240)	(1.646)	(2.184)	(0.572)	(0.406)	(0.389)	(0.0305)	(0.210)	(0.168)
	Expected salary squared	0,057***	0.105	0.194*	-0.00208	0.064***	0.075***	/	/	/
		(0.0114)	(0.0768)	(0.104)	(0.0274)	(0.0194)	(0.0188)			
Parents level of education	At least a secondary school level of education	0.131** (0.0744)			0.215** 0.151			0.126* (0.0992)		
Percentage participation in training	Percentage per region	0.592*** (0.139)			0.646** (0.310)			0.650*** (0.180)		

Constant	Constant	-13,32 (11.66)	-56.071 (86.04)	-86.89 55.26	-42.52 (29.91)	5.210 (19.43)	19.79 (21.36)	-11.42 (15.76)	-38.50 (72.54)	128.6 (116.6)
Sigma	σ		5.836*** (0.2536)	5.787** (0.2005)		0.696*** (0.0538)	0.583*** (0.0691)		5.847*** (0.3153)	5.545*** (0.2772)
Rho	ρ		-0.419 (0.1589)	0.110 (0.339)		-0.360 (0.285)	-0.834 (0.348)		-0.422 (0.1930)	0.213 (0.248)
Wald chi2 Prob > chi2 Obs		96.23 0.000 1.820			74.38 0.000 788			58.64 0.000 1,032		

Note: BAC = baccalaureate; BTS = Brevet de techniciens supérieurs (higher technical school certificate); DUT = Brevet de techniciens supérieurs (higher technical school certificate);; BFEM = brevet de fin d'études moyens (junior secondary school certificate); σ indicates the square root of the variance in error terms μ_{ii}, the results of Equation 2 (a) and (b); ρ_j indicates the coefficient of the error terms ε_i of Equation 1 and the error term μ_{ii} Equation 2 results of (a) and (b); standard deviations in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1.

In this study, although we used the endogenous switching regression model and the endogenous switching probit model, we used an exclusion restriction so that the model may be identified (Maddala, 1983). The instrumental variables method allowed us to improve the identification of the result variable. Thus, we used two instrumental variables for participation in work-based professional training. First, the level of education of the parents (have at least a secondary school level of education) was used as an instrument for work-linked training. The idea is that parents who have at least a secondary school level of education could influence the education of their children or their participation in work-linked training but can only influence the impact of their children to regular and stable jobs through their participation in work-linked vocational training. The more educated the parent, the more the parent will invest in the education and in guiding their children about their education. Such an academic orientation of the child would have a positive impact on their results in the labour market. The choice of using "the level education of the parents" as an instrument is widely used in the literature (Aakvik et al., 2000; Lokshin et Sajaia, 2011; Kuepie, 2016; Totouom et al., 2018).

Secondly, given the sensitive nature of this instrument, we used a second instrumental variable, "the percentage share of participants per region". Such a variable was used by Lokshin and Sajaia (2011) and Aavkik et al., (2000) to instrumentalize participation in training programs. The idea is that the number of participants in the work-linked training programme in a department has an impact on an individual living in that same region to seek out that same type of training but has neither an impact on access to a regular or stable job nor on income in the labour market. As demonstrated by Riddell and Song (2011), people from privileged backgrounds and with better and well-connected social networks would benefit from better training opportunities in order to acquire a higher level of education.

The percentage share of participants in work-linked training in a department has an influence on the probability that an individual that lives in that department would participate in work-linked training. The high positive significance of the threshold at 1% of the percentage number of participants per region suggests that the higher the number of individuals that have undergone work-linked training is in a region, the more the youth living in that region would tend towards participating in work-linked training. This percentage share increases the average number of participants in the said training whether girls or boys. This result is due to the networking effect, the sharing of information, and advice from elder siblings or participants in the trainings from the same region. Furthermore, youth that live in the same districts as the trainees are more likely to seek out work-linked training. With increasing Internet penetration rates (46%) and high-speed Internet connections (3G–4G) on smartphones (62.4%) in Senegal, information in terms of the availability of training programmes and internships rapidly circulates in certain districts within departments such as Dakar, Pikine, Guediawaye and Rufisque. Thanks to the high Internet penetration, the use of e-learning platforms allows access to participation in the training programme and offers greater flexibility in the context of movement between the training centre and the business firm.

The parents' education has a statistically significant positive impact on participation in the work-linked training programme. This average significance to a threshold of 5% demonstrates that the youth in Senegal with parents with at least a high school level of education, have a higher likelihood of participating in a work-linked training programme. This demonstrates that in Senegal, the level of education of the parents has an impact on the training of their children. This result agrees with that arrived at by Totouom et al. (2018) on the education of women in Cameroon.

The instruments selected are validated by the Fisher test and executed using an exogenous instrument. If the Fisher statistic is high and significant, the null hypothesis on the weakness of instruments will be rejected. Furthermore, the admissibility of the instruments was determined after a falsification test (Di Falco et al., 2011). If the selection instruments are valid, they will have an effect on the decision to participate in the work-based vocational training programme but not on income, and access to regular and stable employment for individuals that did not participate in the said training programme. Table A1 presents the results of the instrumental variables tests. These instrumental variables were validated through the Fisher test ($F = 17.56$ higher than a predefined threshold of 10) which demonstrates a significant threshold of 1% for the variables in the model for participation in work-linked training. This implies that we cannot ignore the presence of those instruments in the model. The impact of these instrumental variables on income in the labour market or on access to stable and regular employment should be arrived at through their impact on participation in work-linked training. This validity is confirmed through the falsification test that shows that there was no direct impact from the instrumental variables on the income in the labour market or on access to a regular and stable job (Table A1). These variables have an indirect impact on income in the labour market or access to regular and stable employment through their impact on the work-linked training. Income in the labour market or access to a regular and stable jobs for individuals who did not participate in the training programme was regressed using the instrumental variable with all the other variables in the model. The lack of significance of the coefficients of these instrumental variables suggests that there is no direct impact on income in the labour market or on access to a regular and stable job. This demonstrates that the model presents a predictive acceptable power and could be used to predict unobserved values.

The coefficient of correlation between the indicators of income and participation in the training programme was significant. This significance validates the use of the endogenous switching regression method whose estimation method is more effective than the full information maximum likelihood estimation model (Maddala, 1983). Finally, we examined whether the impact of work-linked training is more or less significant for the youth that benefitted from the said training or for the youth that did not benefit from the training in counterfactual, in making a difference between ATT and ATU.

5.3 The impact of work-linked training on the income of youths (salary)

The function of income for individuals that participated in the work-linked training is significantly different from the statistical threshold of 1% of the income function of individuals that did not undertake the work-linked training. In accordance with expectations of economic theories, the socio-demographic characteristics (level of education, sex, age, marital status) and the characteristics of the socio-economic environment (financial status, expected salary, political engagement, socio-professional category) are significantly associated with an increase in the income of individuals who benefitted from work-linked training. One's marital status has a significant impact on the income of men and women once they have undergone the work-linked training programme. This high and positive significance demonstrates that young married people in the labour market could benefit from social security, from labour laws and from tax issues that would adjust their income levels, given that these youth bear their familial responsibilities in return.

Financial difficulties for individuals with access to training has a negative and significant impact on the income of individuals after they have undergone the work-linked training programme. This demonstrates that individuals that have previously had a precarious existence have access to all types of jobs after their training even if they may be underemployed. This acceptance of underemployment on their part allows them to escape their previous precarious circumstances, even though their jobs are neither stable nor decent. The expected salary has a strong influence on the income of individuals after they have undergone the work-linked training programme. The salary expectations have a negative and significant impact, but when one squares them, the impact becomes strongly positive. This demonstrates that there is a U-shaped relationship between the salary expectations of men and women and the real income obtained in the labour market. The negative scenario is also noted when an individual fresh out of their internship accepts underemployment offers due to ignorance on what is going on in the labour market. With time and an understanding of the realities in the market, individuals revise their salary expectations upwards, according to the capacities that they have acquired through training, which leads them to choose regular and stable jobs with better salaries.

However, the level of education has a significant impact on the income function of youth in the two groups. This is in agreement with the point of view arrived at in the literature that demonstrates that education is an investment that transforms unqualified manpower, which increases yields in the labour market (Pande et al., 2005). However, we also observed that various variables such as education have different impacts on the income function of individual beneficiaries of training and those individuals that did not benefit. This difference in the coefficient of income functions of beneficiaries and non-beneficiaries indicates the presence of heterogeneity in the sample.

Table 3: The impact of work-linked training on income

Sub-sample	Choice of participating in work-based professional training	Beneficiary of vocational training	Beneficiary of training	Impact of training (treatment effect)
Set	Beneficiary of training	(a) 7.0867 (0.0564)	(c) 2.2908 (0.0655)	ATT = 4.796 (0.0864) ***
	Non-Beneficiary of training	(d) 6.1467 (0.0614)	(b) 5.5749 (0.0579)	ATU = 0.572 (0.0844) ***
Men	Beneficiary of training	(a) 12.045 (0.0145)	(c) 11.382 (0.0158)	ATT = 0.6631 (0.0215) ***
	Non-beneficiary of training	(d) 12.462 (0.0141)	(b) 11.468 (0.0149)	ATU = 0.9941 (0.0206) ***
Women	Beneficiary of training	(a) 8.2853 (0.0660)	(c) 2.9026 (0.0676)	ATT = 5.383 (0.0945) ***
	Non-beneficiary of training	(d) 6.009 (0.0640)	(b) 6.187 (0.0616)	ATU = 0.1779 (0.0888) ***

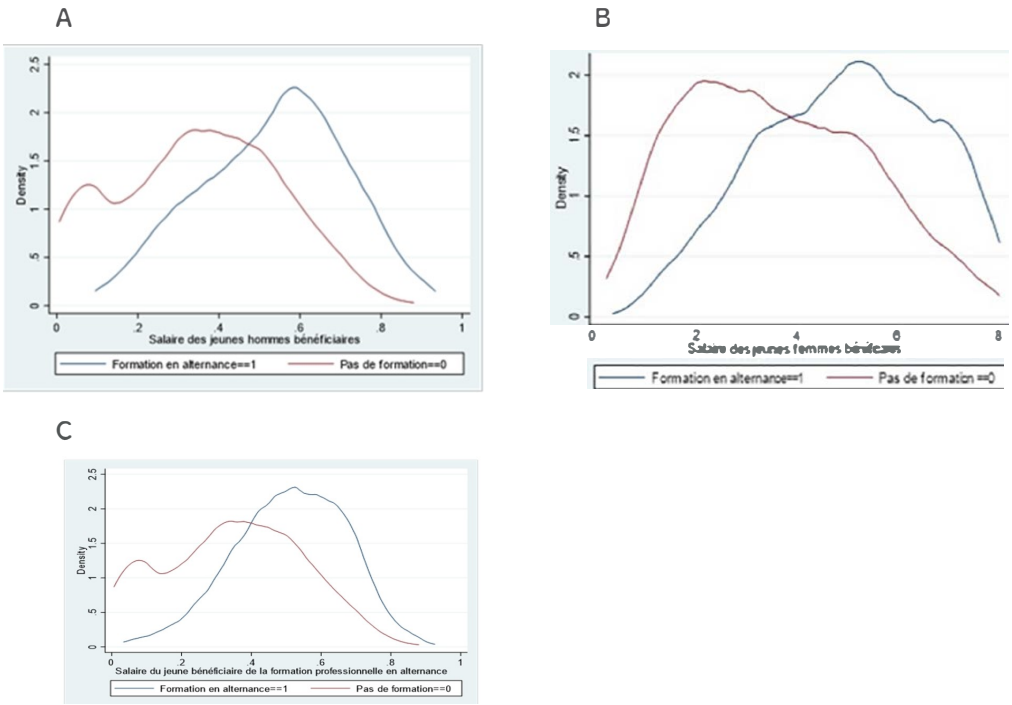
Note: ATT = the average treatment effect for beneficiaries of the training; ATU = average treatment effect for the non-beneficiaries if they had benefitted from the training; standard deviation in parentheses; ***p < 0.01, **p < 0.05, *p < 0.1.

Table 3 presents the expected impact in the real conditions and in counterfactual scenario for participation in the work-linked training programme. Columns (a) and (b) indicate the expected impact that could be observed from the sample. This expected impact on the income of Senegalese youth that have undergone work-linked training is close to 7.0867 (12.045 among men and 8.2853 among women respectively) for youth that participated in training whereas it is close to 5.5749 (11.468 among men and 6.187 among women respectively) for youth that did not undergo the training. This simple comparison could nonetheless be misleading and lead us to conclude that, on average, Senegalese youth that benefit from work-linked training would have an increase in income of 1.512 (0.577 among men and 2.093 among women respectively) or an increase in income by 21.33% (4.8% among men and 25.26% among women respectively) or higher, than is the case for youths that did not benefit from work-linked training (c) and (d) indicating the impact in counterfactual scenarios. In a counterfactual case (c), youth that effectively undertook a work-linked training programme had an impact on their income by around 4.796 (0.6631 for men and 5.383 for women respectively) or 86% (6% for men and 87% for women respectively) higher than if they would not have undertaken the training programme. In a counterfactual case (d) for youth that did not benefit from the training they could have undertaken; they had an increase of 0.572 (close to 0.99941 for the men and 0.1779 for the women respectively) higher than if they would have undertaken the work-based professional training programme. The impact in the observed and counterfactual cases could be compared to that for the youth in each regime.

The treatment effects for participation by Senegalese youth in the work-linked training programme on the wages received in the labour market (ATT) corresponds to the difference between (a) and (c). The difference was 4.796 percentage points, which demonstrates that the gains in terms of the average wages of youth that benefitted from work-linked training is 4.796% of the salary that would be received without training. Youths that did benefit from work-linked training would have lower income if they had not benefitted from the training. The impact of work-linked training on wages of youth that did not benefit from work-linked training (ATU) was calculated

as the difference between cells (d) and (b). This effect demonstrates a loss of 0.572 percentage points in the average wages due to the absence of work-linked training. Young men and women who did not follow work-based professional training would have better salaries in the labour market if they had benefitted from the work-linked training. These results demonstrate that participating in work-linked training leads not only to an increase in future wages in regard to the salaries in the labour market, but also to significance losses due to a lack of training. This result is in agreement with that of Aakvik et al. (2000) who demonstrated the impact of vocational rehabilitation training on the employment results in Norway.

Figure 4: Distribution of income according to the level of participation in the training programme



Note: A = density among men; B = density among women; c = density in the set

Figure 4 confirms the existence of significant variations in the wages obtained in the labour market between young men and women who benefitted from work-linked training and those that did not benefit. At the lower end, the wage density of the beneficiaries and those that did not benefit from the training programme had similar distributions. However, at the higher level of the spectrum, beneficiaries of the training programme had the highest wages in the sample regardless of gender. This implies that the beneficiaries of the programme have a higher likelihood of obtaining better paying jobs than those that did not participate in the programme,

which demonstrates the effectiveness of the work-based professional training and how it improves the possibility of accessing better paying jobs. This leads us to believe that non-beneficiaries would benefit from participation in a work-linked training programme in order to improve the possibilities of their accessing better paying jobs. This representation is in agreement with that from previous studies that highlighted the impact of vocational training on the wages obtained in the labour market (Fabry et al., 2022).

5.4 The Impact of vocational training on job regularity and stability

Using the endogenous switching probit model, we examined the relationship between work-linked training and the stability and regularity of employment for young men and women who either benefitted from the work-linked training programme or did not. This model allows us to correct for the self-selection bias brought about by participation in the work-linked training programme and the endogeneity bias related to the observed and unobserved characteristics of the participants. The model has been used in several studies to evaluate the impact of vocational rehabilitation training programme on the employment of women (Aakvik et al., 2000). Table 4 presents results from estimations of parameters of this model of binary choice using the full information maximum likelihood method. Results from Table 4 show that there are strong coefficients of correlation between the error terms in the equation for participation in work-linked training and the equation for job stability, and the equation for regular employment. This rejects the hypothesis on the exogeneity of the participation in work-linked training, and thus encourages the use of the endogenous switching probit model.

Having controlled the observed and unobservable characteristics of participants, the average effect (ATT) of work-linked training was 19.27% for obtaining a job with a permanent contract (CDI), 24.18% for obtaining a job with a short-term contract (CDD) and 57.8% for regular employment. This indicates that Senegalese youth that participated in work-based professional training have a higher probability by 19.27 percentage points of accessing a stable job with a permanent contract, than those that did not benefit from the training. Equally, the sampled groups of youths who benefitted from training had a probability 224.18 percentage points higher, on average, in accessing a permanent job, and 57.8 percentage points higher in accessing a regular job than those in the counterfactual scenario of youths that did not benefit from work-linked training. On the contrary, youth that did not benefit from work-linked training (ATU) would have a higher probability by 10.79% and 56.41% to access a stable job with a CDI (permanent) or CDD (temporary) contract if they had benefitted from the training programme. This probability would also be on average 31.86% higher for accessing regular employment if the youth had benefitted from the work-linked vocational training programme. This indicates that young Senegalese jobseekers who have not participated in work-linked vocational training programmes have a lower

employment rate than those that have. This result agrees with those arrived at by Kane et al. (2020) on the impact of internship programmes in Senegal and those of Aavik et al., (2000) on the impact of these programmes on vocational rehabilitation training in Norway.

This result indicates that there is a positive impact of work-linked training on access to regular employment or a stable job with a CDI or CDD contract. This demonstrates that youth that benefitted from the CNEE work-linked training programme increased their chances of accessing a regular and stable job. CNEE is an agreement signed between Senegal's government and employers to share training and hiring costs for youths would have a positive impact in terms of providing access to stable and regular jobs. Although the youth that did not benefit from this work-linked vocational training had less chances of accessing a regular and stable job, some of the profiles adopted in the counterfactual scenario would need to be allowed access to the training programme for a better socio-professional insertion. We thus note that the CNEE system is structured to respond to the needs that characterize Senegal's society through the socio-professional insertion of the youth. Work-linked vocational training prepares youth for their future roles in society, by placing them in direct contact with their professional realities, allowing them to respond to the objectives of that society and to satisfy their needs in the labour market. Through this programme, youth develop their personality, relationships, acquire professional experience, and improve their professional competencies which adapt to the needs of the enterprise, enabling them to access regular and stable jobs with CDI or CDD contracts. The work-linked training programme provided by CNEE to jobseekers would be effective in the sense that it establishes a practical relationship between training received in the training centres and the possibilities of professional insertion via internships and apprenticeships.

In the context of heightened competition that characterizes the labour market in Senegal, work-linked training provides hiring opportunities, notably in jobs where the youth experience recruitment difficulties. This type of training breaks away from various measures for conditions of insertion that generally depend upon the level of education attained, since the fact that one has undertaken supplementary training through internships and apprenticeships contributes to facilitating their access to employment, even though the training may not have resulted in a certificate. Such results encourage the idea according to which internships in a business firm provide sufficient professional insertion to the youth and agree with the results arrived at by Simonnet and Ulrich (2000) which demonstrated that youth who have undergone apprenticeship training in a business firm are recruited in larger numbers than those that did not receive that apprenticeship.

Table 4: Impact of vocational training on access to a regular and stable job

Variables	Designation	Selection	CDI employment		CDD employment		Regular job	
		Decision to participate in training	Beneficiary of training	Non-beneficiaries	Beneficiary of training	Non-beneficiaries	Beneficiary of training	Non-beneficiaries
		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
Gender	Male	0.0805	-0.154	-0.207*	-0,186**	-0.104	-0.261**	-0.324***
		(0.0662)	(0.0984)	(0.114)	(0.0899)	(0.0930)	(0.133)	(0.0770)
Age	Age	9.561	9.306	18.59	-9.167	-5.442	11.23	3.196
		(6.600)	(10.66)	(12.22)	(9.827)	(8.200)	(10.05)	(6.551)
	Age squared	-1.389	-1.370	-2.517	1.334	0.788	-1.585	-0.394
		(0.948)	(1.533)	(1.731)	(1.415)	(1.171)	(1.449)	0.934
Level of education	BFEM	0.651***	-0.504	0.312	-1,013**	0,570**	-0.321	-0,291*
		(0.211)	(0.577)	(0.297)	(0.437)	(0.223)	(0.593)	(0.152)
	BAC	0.984***	-0.0603	0.619**	-1.057***	0.546**	0.153	0.372
		(0.196)	(0.505)	(0.304)	(0.409)	(0.222)	(0.588)	(0.150)
	BTS	1.133***	0.222	0.677**	-0.924**	0.650***	0.262	0.273***
		(0.195)	(0.488)	(0.337)	(0.427)	(0.239)	(0.596)	(0.165)
	Undergraduate degree	1.184***	0.102	0.424	-1.051**	0.555**	0.214	-0.547***
		(0.185)	(0.489)	(0.312)	(0.416)	(0.224)	(0.622)	-0.141
	Master's	1.245***	0.264	0.563*	-1.246***	0.482**	0.134	-0.544***
		(0.186)	(0.495)	0.335***	(0.409)	(0.230)	(0.662)	-0.147***
Marital status	Married	-0.0112	0.103	0.249**	-0.111	0.0213	-0.0430	0.122
		(0.0692)	(0.0992)	(0.120)	(0.100)	(0.0962)	(0.0976)	(0.0780)
Financial status	Difficult	-0.283***	(0.465)	0.650***	-0.164	-0.324***	-0.576***	-0.489***
		(0.0702)	(0.116)	0.194*	(0.167)	0.117	(0.107)	(0.0998)

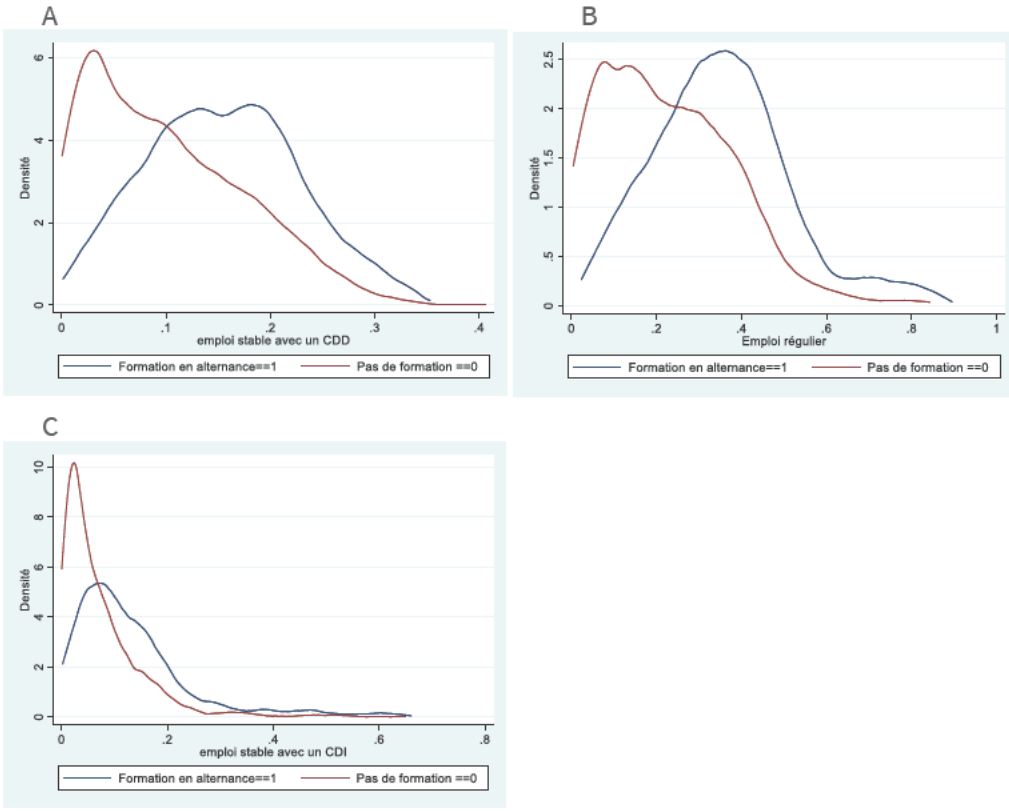
Socio-professional category of the mother	Senior executive	-0.0173	0.162	0.0667	0.0957	-0.157	0.176	-0.0972
		(0.121)	(0.147)	(0.207)	(0.149)	(0.189)	(0.158)	(0.150)
	Employed	-0.0137	-0.277	0.194	-0.144	0.160	-0.113	0.188
		(0.119)	(0.178)	(0.203)	(0.160)	(0.169)	(0.158)	(0.150)
	Employer/ Entrepreneur	0.0778	0.000663	0.423	-0.173	0.0286	-0.0193	-0.0329
		(0.0970)	-0.137	(0.206)	(0.133)	-0.136***	(0.133)	-0.110***
	Stay at home father	-0.0843	-0.475	-0.685	0.276	-0.247	-0.484*	-0.291
		(0.179)	(0.306)	(0.420)	(0.251)	(0.266)	(0.255)	0.198***
Socio-professional category of the father	Senior executive	0.293***	0.293***	0.0298	-0.157	-0.0978	0.185	(0.200)
		(0.0905)	(0.121)	(0.195)	(0.146)	(0.135)	(0.152)	-0.104***
	Employed	0.0906	0.117	0.0406	0,0660	-0.00913	0.108	-0.109
		(0.0975)	(0.142)	(0.167)	(0.150)	(0.127)	-0.140	0.102
	Employer/ Entrepreneur	-0.130	0.0128	0,133	0.117	-0.0812	0.0598	-0.0553
		(0.105)	(0.161)	(0.168)	-0.154	-0.138***	(0.165)	0.108
	Stay at home father	-0.202	-0.0260	-0.681	-0.908*	-0.230	0.0933	-0.118
		(0.196)	(0.325)	(0.449)	(0.508)	(0.276)	(0.305)	(0.207)
Political engagement	Political party member	-0.247*	-0,219	-0.330	0.132	0.190	0.298**	-0.140
		-0.111	(0.179)	(0.223)	(0.174)	(0.135)	(0.170)	(0.114)
Salary expectations or expected income	Expected new wages	-1.198***	-2.039***	-0.709	0.309	-0.470	-2.313***	-0.291
		(0.238)	(0.337)	(0.681)	(0.458)	(0.454)	(0.406)	(0.363)
	Expected salary squared	0.056***	0.094***	0.0318	-0.0129	0.0223	0.104***	0.0130
		(0.0113)	(0.0162)	(0.0315)	(0.0220)	(0.0211)	(0.0187)	(0.0168)
Parents level of education	At least a secondary school level of education	0,165** (0.068)						

Percentage participation in training	Percentage per region	0.515*** -0.137						
Constant		-11.80	-6.512	-32.05	15.31	10.27	-7.477	-4.389
		(11.52)	(18.48)	(20.89)	(17.08)	(14.33)	(17.72)	(11.39)
Rho			0.877 (0.264)	-0.499 (0.5536)	0.818 (0.5197)	-0.609 (0.4377)	0.672 (0.345)	-0.818 (0.120)
ATT			0.1927 (0.119)***		0.2418 (0.089)***		0.5780 (0.117)***	
ATU			0.1079 (0.109)***		0.5641 (0.153)**		0.3186 (0.133)**	
Wald chi^2 Prob > chi^2			262.66 0.000		260.37 0.000		262.09 0.000	
Observations		1.820	1.820		1.820		1.820	

Note: ATT = average treatment effect on the beneficiaries of the training programme; ATU = average treatment effect on the non-beneficiaries if they had benefitted from the training programme; ATE = the supplement of the average effect that leads to the participation of an additional individual; BAC = baccalaureate; BTS = Brevet de techniciens supérieurs (higher technical school certificate); DUT = Diplôme universitaire des techniciens (university diploma for technicians); BFEM = brevet de fin d'études moyens (junior secondary school certificate); standard deviations in parentheses; *** $p < 0.01$,** $p < 0.05$, * $p < 0.1$

Results in Figure 5 confirm the existence of significant variations in the wages obtained in the labour market between young men and women who benefitted from work-linked training and those that did not benefit. At the lower end, the wage density of the beneficiaries and those that did not benefit from the training programme had similar distributions. However, at the higher level of the spectrum, we found only beneficiaries of the training programme that have the highest probability of accessing regular and stable jobs among the sampled people, regardless of gender. This implies that the beneficiaries of the programme have a higher likelihood of obtaining better paying jobs than those that did not participate in the programme, demonstrating the effectiveness of the work-based professional training and how it improves the possibility of accessing better paying jobs. This trend leads us to believe that non-beneficiaries would benefit from participation in a work-linked training programme in order to improve the possibilities of their accessing regular and stable jobs. This representation is in agreement with recent studies that highlighted the impact of vocational training on employment stability (Kane et al., 2020).

Figure 5: Density curve for access to regular and stable employment after training



Note: A = density among men; B = density among women; c = density in the set

5.5 Impact of work-based professional training on labour productivity

Using the endogenous switching regression model, we examined the relationship between work-linked training of employees and labour productivity for enterprises in which employees participated in the training programme. For our estimation, we relied on the exclusion restrictions to identify the parameters of the participation in training equation from those of the labour productivity equation. In other words, at least a significant explanatory variable in the equation on participation in the training that appears in the labour productivity equation. The variable should have an effect on participation in training, but not affect labour productivity through training. The qualitative research showed that lack of access to finance was the main hindrance for business firms that would be willing to offer training in capacity building and apprenticeship to their employees (Zanello et al., 2016; Fu et al., 2018). Indeed, over the duration that the survey was undertaken, the promulgation of uniform act 2014-02 of 6th January 2014 allowed for access to less costly finance, a lowering of wear rates and of interest rates for finance, and support for small and medium sized firms to facilitate access to financing and reduce risks faced by banks. Consequently, access to subsidized loans had a direct impact on the behaviour of firms in regard to offering capacity building training to their employees without having a direct impact on the performance indicators of the firm. This impact on the performance indicators of a firm is indirect. The impact on performance therefore comes through investments notably in the strengthening the capacities of employees. We therefore used access to subsidized loans as exclusion restrictions in our analysis, having been convinced that the impact of that variable would affect performance through training.

Beyond the exclusion restrictions we also considered the fact that labour productivity and work-linked training in terms of capacity building are both endogenous. The more productive firms can have higher profits and more possibilities for skills transfer with other firms and provide training in capacity building or apprenticeship to their employees (Efobi and Orkoh, 2018). In this case, we used a measurement of an information source on activities on innovation. Information can come from the market, companies or institutions. Access to information allows the company to make future projections and improve its managerial capacity in order to achieve its short, medium and long term performance objectives. This information allows managers to have an innovative vision on where they envision the firms will be over the next few years. Thus, the economic intuition of this variable is that information is a strategic pillar form the firm, which allows it to define the actions to implement and the resources to mobilize in order to achieve those objectives. It allowed us a clear view of our direction and the objectives that the firm would like to achieve. Thus, we were convinced that the impact of this variable would affect labour productivity through the decisions taken in the production process in terms of training or strengthening the capacity of employees, which will formulate or develop the objectives of the firm.

Table 5 presents results from an estimation of the work-linked training on labour productivity using a full information maximum likelihood estimation. These results imply that competitive pressure, the use of ICT, inter-enterprise cooperation, access to subsidized financing and the sources of information on innovation activities increased the probability for a business firm to participate in work-linked training programmes in a positive and significant manner. With changes in their needs and quality demands, business firms are becoming more and more creative in order to improve their performance and their sustainability. Conscious of the impact of specific human capital on their growth and survival, they integrate strategies of training and retraining employees in their production strategies. This type of generally targeted training provides specific competencies to employees and could therefore have an impact on the turnover of the business firm (Karadag, 2017). The variables of exclusions of "access to subsidized finance" and the source of information on innovative activities" had a positive impact on participation in training (Table 5). The significance to a threshold of 5% of these coefficients suggests that the source of information is an important factor that promotes participation in training in the specification of our model. This strengthens the idea that the supply of information on capacity building of employees depends on information on innovative activities. Participation in the training and the performance of business firms is influenced to a large extent by the acumen and the skills of employees and entrepreneurs (Efobi and Orkoh, 2018). Then, access to subsidized financing is significantly correlated to participation in training. This supports our *a priori* expectation according to which access to financing is one of the major constraints to the supply of training or capacity building for employees.

Table 5: Impact of work-based professional training on labour productivity

Variables	Selection	Value added		Profitability		Cost of function	
	Training decision	No training	Training of employees	No training	Training of employees	No training	Training of employees
Capital (log)	0.0144*	0.0158**	-0.0333*	-0.127***	-0.0714	0.0108**	-0.0196
	(0.00793)	(0.00681)	(0.0188)	(0.0308)	(0.0543)	(0.00441)	(0.0177)
Operational charge (log)	0.0306	0.0393***	0.438***	0.493***	0.442***	0.945***	0.838***
	(0.0270)	(0.00863)	(0.0563)	(0.0316)	(0.0990)	(0.0181)	(0.0679)
Use of ICT	2.400***	1.204***	4.218***	-3.681*	3.052	-1.708**	-1.325
	(0.315)	(0.430)	(0.919)	(2.022)	(2.714)	(0.275)	(0.851)
Gender manager	-0.365	0.372*	0.343	2.984***	-0.779	0.136	0.993*
	(0.223)	(0.202)	(0.540)	(0.964)	(1.644)	(0.123)	(0.513)
Experience manager	-0.0170	-0.0383	-0.188	1.034*	1.181	-0.00701	-0.373
	(0.180)	(0.123)	(0.418)	(0.574)	(1.198)	(0.0823)	(0.402)
Inter-enterprise cooperation	0.294*	0.486**	0.226	-0.252	0.0276	0.0381	0.682*
	(0.184)	(0.210)	(0.417)	(1.135)	(1.168)	(0.136)	(0.382)
Technological innovation	-0.00712	-0.178	0.00503	-0.690	-0.831	0.000814	0.0238
	(0.170)	0.131	(0.359)	(0.611)	(1.002)	(0.0856)	(0.352)

Competitive pressure	0.0919*	-0.672***	-0.479	-0.534	-0.173	0.529***	0.152
	(0.181)	-0.174	(0.391)	(0.940)	(1.111)	(0.112)	(0.368)
Access to finance	0.278** (0.139)						
Information on innovations	0.138** (0.189)						
Constant	-2.358***	19.89***	8.908***	6.164***	8.901**	2.154***	8.367***
	(0.582)	-0.261**	(1.629)	(1.134)	(3.893)	(0.381)	(1.614)
Sigma		0.198***	0.737***	1.856***	1.542***	0.819***	2.177***
		0.0332	0.118	(0.0333)	(0.0742)	(0.0264)	(0.2149)
Rho		0.1117	0.8571	-0.5655	0.0798	0.0179	0.8938
		(0.1656)	(0.0941)	(0.1039)	0.2717	(0.1355)	(0.0553)
Wald chi^2		54.49		315.71		4,667.98	
Prob > chi^2		0.000		0.000		0.000	
Observations	723	723	723	723	723	723	723

Note: Rho= correlation coefficient; standard deviation in parentheses; *** p < 0.01, **p < 0.05, * p < 0.1

Table 6 presents expected labour productivity in real conditions and in counterfactual scenarios for work-linked training for employees where (a) and (b) indicate expected labour productivity that could probably be observed using a sample. This expected labour productivity for firms was about 22.42 for employees that benefitted from the work-linked training programme and about 20.97 for those that did not benefit. Labour productivity in counterfactual scenarios is indicated by (c) and (d). In case (c), employees who effectively participated in the training programme would have a labour productivity of about 21.66 had they not participated. In case (d), if the employees who did not participate in the training programme had done so, their labour productivity would have been at 16.18. The levels of labour productivity in the observed and counterfactual cases could be compared to those within the business firms in each system.

Thus, the treatment effects for participation in the training programme on the labour productivity of the beneficiaries (ATT) is equal to the difference between (a) and (c). This difference is 0.7622 percentage points, which demonstrates that the benefit in terms of average labour productivity for employees that benefitted from work-linked training is 0.7622 over the set of labour productivity. Those that effectively benefitted from training would be less productive had they not benefitted. The impact of vocational training on labour productivity of non-beneficiaries (ATU) is calculated as the difference between cells (a) and (b). This impact demonstrates a loss of 4.791 percentage points for the average labour productivity for employees due to a lack of training. The result agrees with that arrived at by Efobi et al. (2018) in a study in Ghana that demonstrated the positive impact on the training of young entrepreneurs on the labour productivity of business firms. Employees that did not benefit from the training programme would have been more productive had they benefitted. The results demonstrate that work-linked vocational training leads not

only to productivity gains, but also to significant losses arising from the absence of this type of training. Indeed, work-linked training allows employees to improve their skills and capacities, which are necessary for heightened efficiency, and in order to produce quality work. Short work-linked training programmes undertaken through courses and/or capacity building workshops, would allow employees to refine their skills, resulting in new ideas and allowing them to be more productive. This result agrees with that arrived at by Fafchamps et al. (2014) in a study on Ghana, which demonstrated the positive and significant impact of training of entrepreneurs on the growth of small enterprises, and also by Titley and Anderson-Macdonald (2015) which showed the impact of participation of employees in the training and management programmes in the performance of business firms in general.

Table 6: Impact of work-linked training on labour productivity using ESR

Variables	Training or no training	Training	No training	Treatment effect (ATT)
Value added	Training	(a) 22.4254	(c) 21.6631	ATT = 0.7622***
		(0.2004)	(0.0677)	(0.2115)
	No training	(d) 16.1844	(b) 20.9759	ATU= -4.7914***
		(0.1630)	(0.0217)	(0.1645)
Profitability	Training	(a) 19.7689	(c) 13.2571	ATT = 6.5119***
		(0.2415)	(0.3163)	(0.3979)
	No training	(d) 16.1844	(b) 20.9759	ATU= -4.7914***
		(0.1752)	(0.1997)	(0.2657)
Cost of function	Training	(a) 26.1382	(c) 25.6233	ATT = 0,5149***
		(0.4952)	(0 0.499)	(0.7028)
	No training	(d) 23.0663	(b) 18.2796	ATU= 4,7867***
		(0.3226)	(0 0.361)	(0 0.484)

Note: ATT = average treatment effect for training beneficiaries ; ATU = average treatment effect for no training beneficiaries; standard deviation in parentheses; *** p < 0.01, **p < 0.05, * p < 0.1

The use of value addition per worker as a proxy of labour productivity is widely used in research. In order to evaluate the sensitivity of the results, we examined the impact of participation in work-linked training on the profitability of business firms. The profitability was measured through the yields in production capacity (profit/size) of the firm and a performance proxy that provides information not only on the effectiveness of the business firm, but also of the competitiveness of the enterprise due to the work-linked training of its employees. Our results indicated a significant and positive impact of work-linked training of employees on the profitability of firms. This impact averaged at 6.5119 percentage points for the yields in the production capacity of Senegalese business firms that allowed their employees to undertake work-linked training. This improvement in the profitability of firms is due to the fact that work-linked training allows employees to benefit from refresher courses and supplementary information that is necessary for the development of their skills and to improve their performances.

We also used the function costs of the firm as a performance proxy. We assumed that the function costs are related to the costs of training employees. The results presented in Table 6 demonstrate that work-linked training increases functioning costs of business firms. Although training costs lead to an increase in function costs, they have unexpected economic advantages. Indeed, an examination of the impact of work-linked training on the yields from a business firm demonstrate a positive and significant effect. This result validates the hypothesis according to which the participation of employees in a work-linked training programme is associated with future benefits for the firms. The benefits go beyond the costs borne by the firm for training of employees since the training leads to a development of capacities, allowing ease of access to new professional skills within the enterprise, which contributes to an improvement in yields and production capacities. Offering a vocational training programme and a capacity building programme to employees is a way of increasing and developing the spirit of innovation which could have a positive impact on the indicators of performance and growth in a firm. This result agrees with that of a study obtained by Li et al. (2017) who found that retraining employees in a firm has a positive impact on the growth and the survival of the firm.

6. Robustness of the results

In order to appreciate the robustness of the results, we used propensity score matching. After calculating the propensity scores, we applied the nearest neighbour algorithm. The R^2 was 12.4% and the LR (chi^2) was 306.11 and significant to a threshold of 1% (see Table A3). These statistics demonstrate that the model is adjusted in overall and that at least one of the explanatory variables explains the decision to participate in the work-linked training programme.

Table A4 shows a reduction in the standardized bias before and after matching, whereas Figure A1 presents the common support for matched individuals. According to the results in Table A4, significant differences were recorded between individuals who participated in a work-linked vocational training programme and those that did not. If no difference was observed either before or after the matching between the average of explanatory variables for individuals who participated in a training activity, there was a large variation before and after the matching between the average of the explanatory variables for individuals that did not participate in work-linked training. This highlights the presumption of selection bias of which a comparison between the beneficiaries of training and the non-beneficiaries had allowed a reduction of, on average, 15.2% before matching and 2.8% after matching (Table A3). The total bias was thus reduced to 18.8% using a matching method.

Furthermore, the p-values (0.000) of maximum likelihood indicate the significance of the model before matching whereas the pseudo-R^2 indicates the level of performance of the probit model. The pseudo-R^2 was at 12.4% before matching and 0.6% after matching. This confirmed that, after matching, there was no significant difference in the distribution of the two-sub groups (beneficiaries and non-beneficiaries of work-based professional training). This high reduction in bias demonstrates that the individuals are similar after matching. The low level of pseudo-R^2 (0.006), the low level of the bias average (2.8), the high level of bias reduction (18.7) and the lack of significant impact of the maximum likelihood after matching indicate that the specification of the estimation process of the propensity score was successful in balancing the distribution of covariances between individuals that benefitted from training and those that did not.

The results of the estimation of the average impact of participation on training using the matching methods based on the nearest neighbour approach are presented in Table 7 The results demonstrate that participating in the work-linked vocational

training programme had a positive and significant impact on income obtained in the labour market and increased the probability of accessing and regular and stable job with a CDI or CDD contract. This impact was 0.742 percentage points of income obtained in the labour market. It increased the probability of accessing a stable job with a permanent contract by 6.14% (by 5.84% for a CDD) and by 8.27% for access to a regular job. This impact was more pronounced among women (9.75%) than among men (5.19%) for an increase in the probability of accessing a stable job with a CDI contract (6.11% among women and 3.95% among men respectively, for a CDD contract). The impact is balanced in terms of increasing the probability of accessing a regular job between men and women. Thus, the impact of PSM was significantly positive and similar to that of endogenous switching regression and endogenous switching probit model, which confirms the effectiveness of work-linked vocational training on regular, stable, and well-paying employment.

Table 7: Impact of the adoption of environmental protection policies by PSM

Variables	Nearest neighbour approach	Treatment	Control	Treatment effect (ATT)
Income/salary	Set	7.0695	6.3275	0.7420(0.3243)***
	Man	5.9727	5.5693	0.4035(0.47157)**
	Woman	8.02318	6.8129	1.2102(0.43335)***
Permanent employment	Set	0 ,23421	0.17283	0.0614(0.02018)***
	Man	0 ,19889	0.14696	0.0519(0.02806)**
	Woman	0 ,26650	0.16896	0.0975(0.02859)***
Short-term contract	Set	0.29342	0.23500	0.0584(0.02310)***
	Man	0.26243	0.22298	0.0395(0.03331)**
	Woman	0 ;31726	0.25617	0.0611(0.03186)***
Regular job	Set	0.66710	0.58438	0.0827(0.02667)***
	Man	0.59945	0.51005	0.0894(0.03971)***
	Woman	0.72589	0.63744	0.0885(0.03507)***
Labour productivity	Value added	22.70986	21.5229	1.1869***
	Profitability of the production capacity	19.62507	18.2761	1.3489***
	Cost of function	27.03755	25.5049	1.5327***

Note: ATT = average treatment effect for training beneficiaries; standard deviation in parentheses; CDI = permanent employment contract; CDD = short-term employment contract, ***p < 0.01, ** p < 0.05, *p < 0.1.

7. Conclusion

The objective of the study was to evaluate the effectiveness of work-linked training in terms of apprenticeship in enterprises. To do this, we highlighted several points. First, we identified the main factors that promote or limit access by individuals to work-linked training programmes. Second, we evaluated the impact of work-linked vocational training on the income (wages) of youth in the labour market. Third, we evaluated the impact of vocational training on access to regular and stable employment and labour productivity. To achieve these objectives, we used the use of an endogenous switching regression (ESR) model and an endogenous switching probit model; to examine the robustness of the results we used propensity scores. These methodologies considered observed and unobserved factors, enabling us to handle selection and endogeneity problems that may be related to vocational training. These methodological approaches were applied to survey data on the improvement of employment policies (EAPE) and survey data on determinants of the performance of enterprises in Senegal.

An examination of the determinants of participation in the work-linked training revealed interesting results for both men and women. The level of education of youth had a high impact on their participation in work-linked training programmes. The higher the level of education, the more youth tended towards undertaking work-linked training programmes that transform unskilled labour into skilled labour, improving their entry into the labour market. The difficulties related to meeting one's basic needs and political activism reduce the probability of participating in a work-linked training. Salary expectations had a U-shaped trend among the youth, who participated in the programme, with a high impact on access to regular and stable jobs. The education level of the parents and the percentage share of participants in the work-linked training programme in a region, had an impact on the level of income in the labour market, and access to regular and stable employment via their impact on participation in the work-linked training programme.

We drew three main conclusions from the results on the effectiveness of work-linked vocational training. First, the results suggest that the sampled groups of youth that participated in vocational training have different characteristics than the sampled groups of youth that did not participate in vocational training. This represents the source of the differences between the two groups, for which the estimation of an ordinary least squares procedure for the income function case including a dummy

variable for participation or not in the training program cannot be retained. Equally, for the stable and regular employment function whose dependent variable is binary, the estimation of a probit model that includes a dummy variable for participation or non-participation in the work-linked training programme could not be taken into account, given that the variable of participating in training is endogenous.

Second, participation in the work-linked training programme through internship and apprenticeship, increases the probability of access to regular and stable better paying jobs. Interesting trends are observed from an examination of the result in relation to these two different groups of individuals (participants and non-participants). Individuals who participated in work-linked training tended to have regular and stable jobs with better salaries than individuals who did not participate in work-linked training programmes, in the hypothetical case that they were not trained. Individuals who participated in work-linked training programmes have various unobserved characteristics and skills that allow for socio-professional insertions with higher income. This could be explained through the observation that, the impact of work-linked training on income was lower for individuals who did not effectively participate in work-linked training if they had done so. This favourable effect of work-linked training is important since, if individuals who did not participate in the training had participated, they would have the same probabilities of access to regular and stable employment with higher income than those that participated in the training.

Third, Senegalese youth who participated in work-based professional training had a higher probability by 19.27 percentage points of accessing a stable job with a permanent contract than those who did not benefit from the training. Equally, the sampled groups of youths who benefitted from training had a probability 24.18 percentage points higher, on average, in regard to accessing a permanent job, and 57.8 percentage points higher in regard to access a regular job than those in the counterfactual scenario who did not benefit from work-linked training. Thus, young Senegalese jobseekers who have not participated in work-linked vocational training programmes have a lower employment rate than those that participated in work-linked vocational training programmes.

These results are significant for the formulation of policies aiming to develop effective strategies for the development of human capital in order to address problems related to the socio-professional insertion of youth. Politics could play an important role in helping the youth engage more effectively in work-linked vocational training through combinations of work and training and the mobility between the training centre and the business firm. The government in collaboration with the private sector employers would benefit from extending and making sustainable, the activities engaged in by CNEE in order to promote the socio-professional development of youth.

One of the limitations of this study is related to the data that did not allow us to examine business sub-sectors. Furthermore, the data were cross-sectional which did not allow us to engage in a long-term analysis. In future, such an analysis will be necessary using panel data to facilitate obtaining an intertemporal point of view. Also, future studies could evaluate the effectiveness of work-based professional training in regard to labour productivity of youth in the labour market.

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Annexes

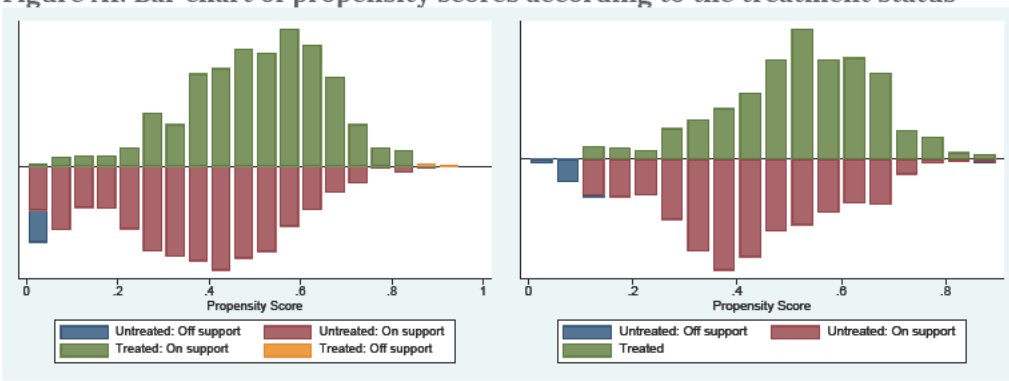
Table A1: Validation test for instruments (falsification test)

Variables	Designation	Contract CDI	Short-term contract	Regular job	Job satisfaction	Income (by OLS)
		Coef.	Coef.	Coef.	Coef.	Coef.
Gender	Male	-0.141	-0.0766	-0,315***	-0,340***	-0,294***
		(0.126)	(0.101)	(0.0886)	(0.0913)	(0.0657)
Age	Age	17.99	-4.222	4.553	11.36	0.185
		(12.54)	(8.611)	(7.337)	(7.570)	(5.441)
	Age squared	-2.484	0.618	-0.612	-1.640	0.0371
		(1.781)	(1.229)	(1.046)	(1.079)	(0.773)
Level of education	BFEM	0.433	0.666***	-0,118	-0,195	-0.00797
		(0.312)	(0.230)	(0.166)	(0.162)	(0.122)
	BAC	0,913***	0.694***	-0.0543	-0.423***	0.224*
		(0.281)	(0.224)	(0.164)	(0.163)	0.118
	BTS/DUT	0,969***	0.824***	0.136	-0.439**	0.469***
		(0.286)	(0.232)	(0.174)	(0.175)	(0.124)
	Undergraduate degree	0.760***	0.729***	-0.158	-0.638***	0.242**
		(0.276)	(0.217)	(0.155)	(0.156)	(0.114)
	Master's	0.964***	0.604***	-0.148	-0.790***	0.521***
		(0.279)	(0.224)	0.165**	0.165**	(0.123)
Marital status	Married	0.201	0.00222	0.120	-0.0559	0.0972
		(0.127)	(0.104)	(0.0917)	(0.0939)	(0.0647)
Household size	Number of children in the household	-0.323	0.0223	-0.0116	0.482*	-0.0603
		(0.331)	(0.266)	(0.233)	(0.250)	(0.168)
	Number of children in the household squared	0.0409	-0.0159	0.0198	-0.132*	0.00920
		(0.0990)	(0.0760)	(0.0650)	(0.0699)	(0.0477)
Financial status	Difficult	-0.741***	-0.426***	-0.752***	-0,480***	-0.331***
		(0.146)	(0.103)	(0.0867)	(0.0908)	(0.0686)

Socio-professional category of the mother	Senior executive	0.0239	-0.0996	-0.0623	-0.242	0.0478
		(0.220)	(0.207)	(0.184)	(0.200)	(0.125)
	Skilled worker	0.199	0.263	0.354**	0.214	0.00869
		(0.211)	(0.182)	(0.178)	(0.173)	(0.112)
	Employer/ Entrepreneur	-0.444**	0.0511	-0.0252	-0.0744	0.0190
		(0.215)	(0.145)	(0.128)	(0.134)	(0.0955)
	Housewife	-0.812*	-0.297	-0.399*	-0.146	0.00467
		(0.445)	(0.282)	(0.225)	(0.237)	(0.183)
Socio-professional category of the father	Senior executive	0.0310	0.0606	-0.0259	-0.117	0.0334
		(0.171)	(0.139)	(0.126)	(0.129)	(0.0913)
	Skilled worker	0.0323	0.0403	-0.0543	-0,184	0.108
		(0.172)	(0.136)	(0.120)	(0.124)	(0.0882)
	Employer/ Entrepreneur	0.0832	-0.120	-0.125	-0.0573	-0.0319
		(0.182)	(0.145)	(0.122)	(0.124)	(0.0928)
	Stay at home father	-0.905*	-0.320	-0.271	-0.335	0.0522
		(0.492)	(0.287)	(0.234)	(0.250)	(0.193)
Political engagement	Political party member	-0.326	0.155	-0.262**	-0.0583	-0.237***
		(0.223)	(0.142)	(0.124)	(0.128)	(0.0910)
Salary expectations	Expected new wages	-1.146***	-0.986***	-1.249***	-0.404	-1.237***
		(0.425)	(0.356)	(0.340)	(0.343)	(0.256)
	Expected salary squared	0.0522***	0.0461***	0.0571***	0.0190	0.0612***
		(0.0199)	(0.0166)	(0.0156)	(0.0160)	(0.0122)
Parents level of education	Parents level of education	0.227	-0,135	-0.0608	-0.0497	0.117
		-0.137	0.117	(0.104)	0.108	(0.0760)
Percentage share of participants in training	Percentage share of participants per region	-0.0536	0.434**	0,422**	-0.125	0.201
		(0.267)	(0.213)	(0.185)	(0.188)	(0.138)
Constant		-27.83	11.09	-1.087	-17.12	16.17*
		(22.20)	(15.19)	(12.97)	(13.35)	(9.663)
LR chi^2		139.21	76.61	177.00	104.48	F: 17.56
Prob > chi^2		0.000	0.000	0.000	0.000	Prob:0,000
Pseudo R^2		0.1881	0.0747	0.1207	0.0788	R^2: 0.309
Obs		1058	1058	1058	1058	1058

Note: BAC = baccalaureate; BTS = Brevet des techniciens supérieurs (Brevet for higher technicians), DUT = Diplôme universitaires des techniciens (University diploma for technicians) ; BFEM = brevet de fin d'études moyennes (middle school leaving certificate); standard deviation in parentheses; *** p < 0.01, **p < 0.05, * p < 0.1

Figure A1: Bar chart of propensity scores according to the treatment status



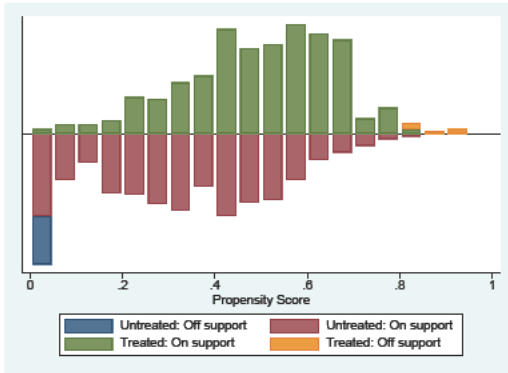


Table A2: Impact of work-based professional training according to gender

Variables	Designation	Selection	Men						Women					
		Training decision	Permanent employment		Short-term contract		Regular job		Permanent employment		Short-term contract		Regular job	
			Training	No training	Training	No training	Training	No training	Training	No training	Training	No training	Training	No training
		Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
Age	Age	19.18**	13.22	34.66	1.701	-3.580	24.88	15.00	4.286	7.230	-16.10	-7.692	-7.819	-5.834
		(9.573)	(17.07)	(21.87)	(18.70)	(12.43)	(20.46)	(12.02)	(16.03)	(13.13)	(16.03)	(10.56)	(13.06)	(8.558)
	Age squared	-2.77**	-1.938	-4.743	-0.273	0,480	-3.543	-2.046	-0.680	-0.991	2.309	1.115	1.061	0.849
		(1.382)	(2.469)	(3.128)	(2.718)	(1.789)	(2.954)	(1.717)	(2.299)	(1.855)	(2.296)	(1.499)	(1.874)	(1.216)
Level of education	BAC	0.436**	-0.0820	0.564	-0.490	0.598**	-0.345	-0.178	0.265	0.438*	0.258*	-0.162	0.899***	-0,224
		(0.206)	(0.409)	(0.440)	(0.377)	(0.272)	(0.409)	(0.209)	(0.485)	(0.225)	(0.730)	(0.219)	(0.275)	(0.166)
	BTS/DUT	0.401*	-0.0532	0.833**	-0.101	0.408	0.0317	0.0364	0.664	0.242	0.359	0.257	0.972***	-0.242
		(0.210)	(0.380)	(0.415)	(0.384)	(0.288)	0.426	(0.224)	(0.499)	(0.237)	(0.925)	(0.250)	(0.251)	0.194*
	Undergraduate degree	0.64***	0.235	(0.670)	-0.555	0.0621	-0,219	-0.428**	0.414	0.00109	0.421	0,349*	0.926***	-0.345
		(0.186)	(0.332)	(0.404)	(0.359)	(0.269)	0.433	(0.195)	(0.488)	(0.212)	(0.844)	(0.205)	(0.228)	(0.147)
	Master's	0.56***	0.521	0.738*	-0.713**	0.305	-0.296	-0.288	0.489	0.145	0.210	0.00375	(0.919)	-0.459***
		0.194*	(0.339)	(0.405)	(0.347)	(0.273)	(0.421)	(0.207)	(0.553)	(0.200)	(0.951)	(0.213)	(0.233)	(0.156)
Marital status	Married	-0.0115	-0.0065	0.144	-0.393**	-0.142	-0.503***	-0.0552	0.247	0.296**	0.170	0.134	0.391**	0.287***
		(0.0982)	(0.144)	(0.163)	(0.190)	(0.134)	(0.175)	(0.120)	(0.166)	(0.137)	(0.160)	(0.129)	(0.170)	(0.107)
Financial status	Difficult	-0.192*	-0.58	-0.538**	-0.222	-0.268*	-0.462**	-(0.437)	-0.419**	-0.571***	-0.351**	-0.353**	-0.549***	-0.526***
		(0.106)	(0.195)	(0.215)	(0.234)	(0.161)	(0.234)	(0.168)	(0.176)	(0.162)	(0.324)	(0.152)	(0.128)	(0.129)

Socio-professional category of the mother	Senior executive	0.0121	0.517***	-0.00551	0.106	-0.234	0.464*	-0.0453	-0.311	-0.0119	0.0254	-0.0873	-0,151	-0,168
		(0.166)	(0.193)	0.244	(0.221)	0.257	(0.259)	(0.218)	(0.267)	(0.247)	0.244	0.257	(0.210)	(0.209)
	Skilled worker	0.0866	-0,262	0.0139	-0,0882	0.0682	-0.0616	0.148	-0.361	0.238	-0.317	0.243	-0.305	0.267
		(0.171)	0.278**	0.257	(0.233)	(0.250)	(0.231)	(0.233)	(0.260)	(0.210)	(0.287)	(0.221)	(0.205)	(0.202)
	Employer/ Entrepreneur	0.0930	-0.0662	-0.406	-0.106	0.145	-0.0463	0.143	0.0230	-0.321	-0.251	-0.0607	-0.00163	-0,134
		-0.137	(0.211)	(0.281)	(0.196)	0.194*	0.194*	(0.177)	(0.205)	(0.233)	(0.218)	0.189	(0.172)	0.148
	Housewife	-0.0461	-0.258	-8.177	0.299	-0.448	-0.0475	-0.471	-0.569	-0,390	0,277	-0.173	-0.581*	-0,209
		(0.297)	(0.521)	(3.256)	(0.444)	(0.502)	(0.439)	(0.404)	(0.409)	(0.427)	(0.369)	(0.311)	(0.298)	(0.231)
Socio-professional category of the father	Senior executive	0.400***	-0.351**	-0.140	-0.250	-0.351*	-0.245	-0.352**	0.268	0.0373	0.0996	0.0536	0.376***	-0.0829
		0.131	(0.193)	(0.206)	(0.230)	(0.182)	(0.234)	(0.170)	(0.201)	(0.171)	(0.305)	(0.179)	(0.145)	-0.137
	Skilled worker	0,203	0.216	0.221	0.0595	-0.264	-0.199	-0.155	0.113	-0.0943	0.189	0.201	0.282*	-0,0621
		(0.144)	(0.233)	(0.226)	(0.241)	(0.191)	(0.227)	(0.165)	(0.203)	(0.190)	(0.233)	(0.166)	(0.165)	(0.133)
	Employer/ Entrepreneur	0.0552	0.0379	0.130	-0.157	-0.202	-0.153	-0.175	0.0227	0.112	0.295	0.0323	0.106	0.0539
		(0.162)	-0.271	-0.283***	(0.250)	(0.220)	(0.256)	(0.187)	(0.246)	(0.188)	(0.269)	(0.173)	(0.205)	(0.134)
	Stay at home father	-0.272	0.208	-7.762	-6.872	-0.162	0.221	-0,145	-0.0205	-0.475	-0.885	-0.381	0.154	-0.0814
		(0.311)	(0.542)	(11.39)	(51.23)	(0.386)	(0.520)	(0.340)	(0.471)	(0.465)	(0.590)	(0.417)	(0.347)	(0.267)
Political engagement	Political party member	-0.308*	-0.489	-0.469	0.463	-0.450	0.0830	-0.238	-0.0737	-0.259	-0.159*	0.378**	-0.353**	-0.0894
		(0.189)	(0.383)	(0.457)	(0.298)	(0.305)	(0.347)	(0.224)	(0.254)	(0.223)	(0.310)	0.153	(0.181)	(0.133)
Salary expectations	Expected new wages	-0.93***	-1.179**	-0.767*	0.0485	-0.458	-1.302	-0.802	-2.138***	-0.380	-0.128**	-0.316	-2.434***	0.299
		(0.354)	(0.544)	(0.465)	-0.802	(0.616)	(0.843)	(0.718)	(0.702)	(0.451)	(0.943)	(0.595)	(0.579)	(0.421)
	Expected salary squared	0.0424**	0.0495*	0.0372*	0.00372	0.0242	0.0545	0.0393	0.0999***	0.0148	0.00551	0.0142	0.112	-0.0161
		(0.0167)	(0.0264)	(0.0222)	(0.0388)	(0.0283)	(0.0388)	(0.0336)	(0.0336)	(0.0215)	(0.0451)	(0.0280)	(0.0266)	(0.0197)
Parents level of education	Parents level of education	0.140* (0.0977)												
Percentage participation in training	Percentage share of participants per region	0.658*** (0.200)												

Constant		-29.27*	-17.35	-61.45*	-3.004	7.392	-34.61	-23.50	2.623	-12.29	28.04	13.66	25.75	8.848
		(16.70)	(29.41)	(38.35)	(31.18)	(21.86)	(34.08)	(20.01)	(28.13)	(23.28)	(28.27)	(18.74)	(23.35)	(15.05)
Rho			0.9996	-0.991	-0.6329	-0.8426	-0.4275	-0.7793	0.5881	-0.9985	-0.0922	-0.6098	0.9015	-0.8716
			(0.1448)	(0.00269)	(0.4612)	(0.4147)	(0.5833)	(0.2916)	(0.5395)	(0.0849)	(1.044)	(0.3840)	(0.1135)	(0.1221)
ATT			0.2029 (0.1714)		0.2687(0.1337)		0.5345(0.1485)		0.2597(0.1382)		0.2833(0.0897)		0.6472(0.1446)	
ATU			0.0973 (0.1235)		0.4936(0.2081)		0.3348(0.1495)		0.0948 (0.1198)		0.1393(0.1091)		0.4951(0.1809)	
Wald chi^2			100.15		94.65		96.12		164.36		175.79		178.85	
Prob > chi^2			0.000		0.000		0.000		0.000		0.000		0.000	
Observations			788		788		788		1.032		1.032		1.032	

Note: ATT = average treatment effect on the beneficiaries of the training programme; ATU = average treatment effect on the non-beneficiaries if they had benefitted from the training programme; ATE = the supplement of the average effect that leads to the participation of an additional individual; BAC = baccalaureate; BTS = Brevet de techniciens supérieurs (higher technical school certificate); DUT = Diplôme universitaire des techniciens (university diploma for technicians); BFEM = brevet de fin d'études moyens (junior secondary school certificate); standard deviations in parentheses; *** p < 0.01,**p < 0.05, * p < 0.1

Figure A2: Standard bias before and after matching

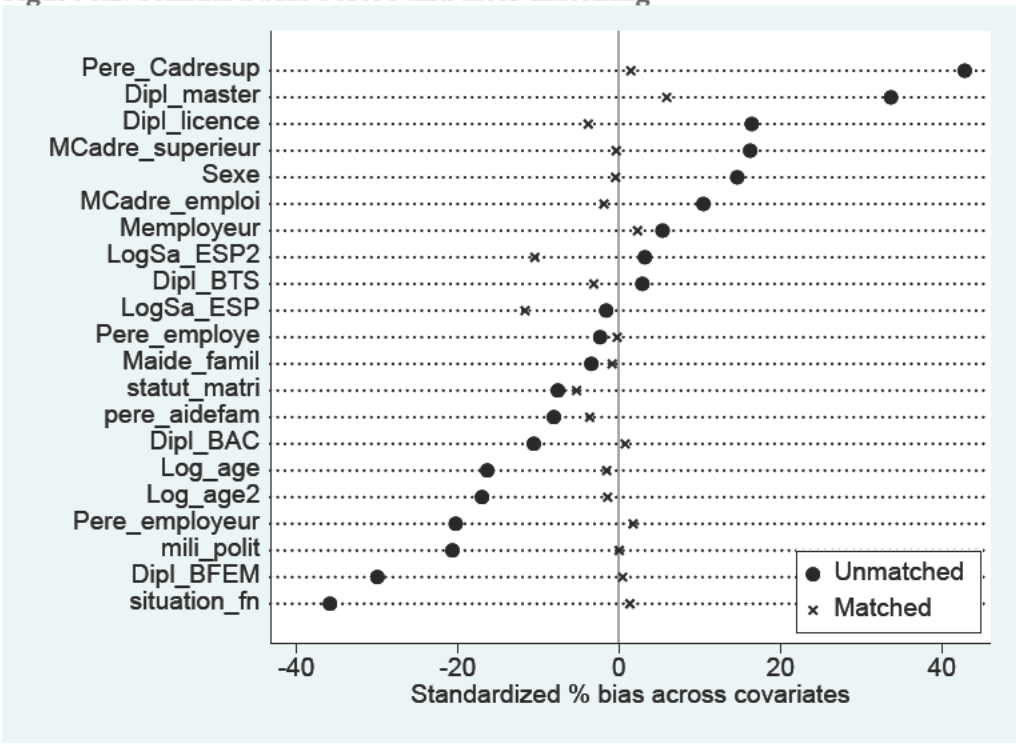


Table A3: Quality of matching

Sample	Ps R^2	LR chi^2	p > chi^2	Mean bias	Med bias	B	R	% Var
Unmatched	0.124	306.11	0.000	15.2	14.6	85.9	-0.44	100
Matched	0.006	13.42	0.893	2.8	1.6	18.7	1.53	50

Table A4: Difference test before and after matching

Variables	Designation	Matching	Average		Bias reduction		T - test		V(T)/ V(C)
			Treatment	Control	% Biais	% Biais	T of student	P > T	
Gender	Male	Before	0.47507	0.40265	14.6		3.08	.0.002	
		After	0.47632	0.47859	-0.5	96.9	-0.09	0.929	,
Age	Age	Before	30.434	30.4591	-16.3		-3.38	0.001	0.67*
		After	30.434	30.4364	-1.6	90.5	-0.34	0.731	1.06
	Age squared	Before	110.811	110.994	-17.0		-3.52	0.000	0.65*
		After	110.811	110.827	-1.4	91.5	-0.32	0.749	1.06
Level of education	BFEM	Before	0.03675	0.11531	-30.0		-6.07	0.000	
		After	0.03684	0.03574	0.4	98.6	0.12	0.908	,
	BAC	Before	0.10105	0.13516	-10.6		-2.20	0.028	
		After	0.10132	0.09895	0.7	93.1	0.15	0.878	,
	BTS/DUT	Before	0.12073	0.11153	2.9		0.61	0.545	
		After	0.12105	0.13117	-3.2	-9.9	-0.59	0.553	,
	Undergraduate degree	Before	0.33071	0.25614	16.4		3.48	0.001	
		After	0.33158	0.34904	-3.8	76.6	-0.72	0.473	,
	Master's	Before	0.39895	0.24386	33.7		7.16	0.000	
		After	0.39737	0.37026	5.9	82.5	1.09	0;278	,
Marital status	Married	Before	0.42913	0.46692	-7.6		-1.60	0.110	
		After	0.43026	0.45655	-5.3	30.4	-1.03	0.303	,
Financial status	Difficult	Before	0.23885	0.40359	-35.8		-7.46	0.000	
		After	0.23947	0.23341	1.3	96.3	0.28	0,781	,

Socio-professional category of the mother	Senior executive	Before	0.1063	0.06144	16,2		3.49	0.001	
		After	0.10658	0.10764	-0,4	97.6	-0.07	0.946	,
	Skilled worker	Before	0.09449	0.06616	10.4		2.22	0.026	
		After	0.09342	0.09858	-1.9	81.8	-0.34	0.733	,
	Employer/ Entrepreneur	Before	0.14304	0.12476	5.4		1.13	0.257	
		After	0.14342	0.13571	2.3	57.8	0.43	0.665	,
	Housewife	Before	0.0315	0.03781	-3.4		-0.72	0.471	
		After	0.03158	0.03318	-0.9	74.6	-0.18	0.860	,
Socio-professional category of the father	Senior executive	Before	0.44488	0.24575	42.8		9.12	0.000	
		After	0.44342	0.43674	1.4	96.6	0.26	0.793	,
	Skilled worker	Before	0.18635	0.19565	-2.4		-0.50	0.619	
		After	0.18684	0.18788	-0.3	88.8	-0.05	0.959	,
	Employer/ Entrepreneur	Before	0.11417	0.1862	-20.3		-4.20	0.000	
		After	0.11447	0.10838	1.7	91.5	0.38	0.706	,
	Stay at home father	Before	0.02231	0.03592	-8.1		-1.67	0.094	
		After	0.02237	0.02854	-3.7	54.6	-0.76	0.445	,
Political engagement	Political party member	Before	0.06955	0.13138	-20.7		-4.25	0.000	
		After	0.06974	0.06976	-0.0	100;0	0.00	0.998	,
Salary expectations	Expected new wages	Before	12.374	12.396	-1.6		-0.35	0.726	2,32*
		After	12.367	12.523	-11.7	-624.5	-2.14	0.032	1,62*
	Expected salary squared	Before	155.63	154.74	3.2		0.69	0.490	2.12*
		After	155.44	158.38	-10.5	-228.4	-1.93	0.054	1,52*

Note: BAC = baccalaureate; BTS = Higher Technicians Certificate; DUT = technicians university diploma; BFEM = middle school leaving certificate; standard deviation in parentheses. ; *** p < 0.01, **p < 0.05, * p < 0.1 ; Biais mean= 2.8

Mission

To strengthen local capacity for conducting independent, rigorous inquiry into the problems facing the management of economies in sub-Saharan Africa.

The mission rests on two basic premises: that development is more likely to occur where there is sustained sound management of the economy, and that such management is more likely to happen where there is an active, well-informed group of locally based professional economists to conduct policy-relevant research.

Bringing Rigour and Evidence to Economic Policy Making in Africa

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Contact Us
African Economic Research Consortium
Consortium pour la Recherche Economique en Afrique
Middle East Bank Towers,
3rd Floor, Jakaya Kikwete Road
Nairobi 00200, Kenya
Tel: +254 (0) 20 273 4150
communications@aercafrica.org