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Effect of Human Capital Development on Household Income Growth in Burkina Faso: An Analysis Through a Decomposition Method

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Abstract

The paper analyses the relationship between human capital formation and income growth in Burkina Faso using data from household surveys conducted in 2009 and 2018. By combining estimates from multiple linear regressions of the impact of human capital variables on income with variance decomposition techniques, this paper quantifies the contribution of education, health, underemployment, and dietary diversity to income growth. It distinguishes between the shares related to the effects of increasing capital factor endowments and those related to the returns on these endowments. The results demonstrate that an increase in human capital endowment is a key factor in determining workers' income growth. Furthermore, the impact of human capital on income growth is greater when the endowment and return effects of these factors are both positive and high. These results also indicate that a significant improvement in household income is more likely to be achieved by interventions focused on both increasing human capital endowments and improving human capital outcomes.

Keywords: human capital; Oaxaca–Blinder; decomposition methods; income growth; prosperity

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1. Introduction

Since the seminal work on human capital by T. W. Schultz (1961, 1962), and G. S. Becker (1964, 1975), human capital endowments, i.e., education, technical skills, health and nutrition, and their distribution among individuals, have been recognized as determinants of prosperity, poverty, and income inequality.

According to Sen (1997) and Bebbington (1999), individuals endowed with human capital are not only better qualified, more productive, and more efficient; they are also better able to transform their potential into reality.

From a long-term economic perspective, proponents of endogenous growth consider that human capabilities—education, technical skills, nutrition, and health, which are nothing other than the main dimensions of human capital—are the real driving forces behind economic growth and increased prosperity (Lucas, 1988; Romer, 1990; Hanushek, 2013).

Furthermore, the literature on equity and equal opportunity suggests that human capital plays a key role in improving the prosperity of households or individuals and that accumulating it is an important lever for equalizing opportunities between social groups

and between the sexes, particularly in vulnerable communities (Moser, 2006; Roemer, 2002; Lefranc et al., 2008).

The abovementioned economic theories recognize that human capital accumulation not only has a positive impact on economic growth and household prosperity but also helps to reduce income inequality.

These theoretical predictions have largely influenced the conduct of development policies. In Burkina Faso, from the early 1980s to the present day, investment in human capital has been an important dimension of public policy (MEF, 2001, 2004, 2011; MINEFID, 2016; Primature, 2021).

Understanding the exact extent to which human capital accumulation contributes to improved prosperity or income for households and individuals remains an important question, given its consequences for household well-being, social peace, and development in general.

On the empirical front, a large number of studies have attempted to estimate the exact extent to which human capital variables help explain prosperity or income improvement. These include studies by Appleton (2001), T. W. Schultz (1982), Asfaw and Admassie (2004), and Salahuddin et al. (2020) on the role of education in increasing agricultural productivity, as well as Aref (2011), Chaudhry and Rahman (2009), Aloysius Mom Njong (2010), and Moyo et al. (2022) on the role of education in poverty reduction. Recent studies in this field include those by Ali (2022), who examined the impact of human capital development on poverty and inequality reduction in Nigeria; Widarni and Bawono (2020), who investigated the positive effect of education on income and economic growth in Indonesia; and Sairmaly (2023), who conducted a literature review on the economic growth effect of education, skills, and productive labour.

The approaches commonly used for this purpose to determine the effects of human capital on prosperity or well-being have largely relied on the use of multiple linear regressions and, consequently, on the statistical significance of the estimated parameters. The use of these approaches has at least two limitations. First, the estimated parameters provide information on the direction of the correlation between the variables and its statistical significance in the form of the calculated probability statistic, the *p*-value. However, the "*p*-value", or statistical significance, does not measure the size of the effect of the explanatory variable on the dependent (Wasserstein, 2016).

Second, the estimated parameters do not allow us to rank the explanatory variables in order of importance, and consequently, they do not allow us to quantify the real or relative contribution of each variable to the explanation of the variable of interest, in this case, prosperity or well-being (Israeli, 2007; Nathans et al., 2012).

This article breaks new ground by not only quantifying the impact of human capital variables on household income but also decomposing the impact coefficients into the portions linked to the level of factor endowments and the returns on said endowments. It advances the empirical literature on the links between human capital development and improved household income by extending the estimation of the direct impacts of the explanatory variables and quantifying the underlying drivers of each estimated impact coefficient.

Empirically speaking, to consider only the relationship between progress in secondary education and well-being, Burkina Faso's gross secondary school enrolment rate rose from 8.3% in 1994 to 20.3% in 2009, while the incidence of income poverty increased from 44.5% to 46.7%. In contrast, from 2009 to 2014, while the secondary school enrolment rate improved from 20.3% to 30.4%, the incidence of poverty fell from 46.7% to 40.1%. Poverty incidence continued to fall in 2018, to 36.2%, at the same time as the school enrolment rate rose to 40.7%, as if the return on human capital accumulation were improving over time.

The article therefore also attempts to explain the heterogeneity observed above in the relationship between human capital and household prosperity, thanks to the variance decomposition approach used. In particular, it attempts to assess the extent to which variation in average household income (prosperity) is explained by each of the components of the coefficients of effect of human capital on income.

The rest of the article is structured as follows. Section 2 presents the theoretical framework of the research and reviews the relevant literature on the subject. Section 3 describes the methodology followed. Section 4 presents and discusses the research findings. Section 5 concludes with the article's recommendations.

2. Theoretical Framework and Review of the Empirical Literature

2.1. Review of the Theoretical Literature

The relationship between the development of human capital and increased prosperity for individuals and even for entire nations dates from T. W. Schultz's (1961) seminal article on investment in human capital, which encompasses education, skills, health, and nutrition. In his article, T. W. Schultz (1961) defends the idea that investment in the accumulation of these human capital endowments expands opportunities for labour market participation and household prosperity, which translates into income gains.

Besides the positive impact of the above mentioned dimensions of human capital on labour market participation, household income growth, many authors have added the fact that capital accumulation also contributes to increasing household prosperity and well-being and reducing inequality and poverty (G. S. Becker, 1975; G. Becker, 1995; T. P. Schultz, 1993; Roemer, 1998; World Bank, 2005; Santos, 2009; Teixeira, 2014).

According to authors such as Cumming et al. (2019), and the Commission on Growth and Development (2010), enhancing people's human capital endowments enables them to contribute to growth and benefit more from it.

In addition, the Commission on Growth and Development (2010) recognizes that investment in human capital, particularly in education and health, promotes equality of opportunity and access to paid employment. Similarly, Mincer (1991), Ridell (2011), and Larionova and Varlamova (2015), by adding nutrition to the education and health components of human capital, have highlighted its positive contribution to generating equal opportunities for all citizens.

G. Becker (1995) used a literature review to analyse the role of human capital in reducing poverty. In the theory of human capital put forward by authors such as G. S. Becker (1964), Grossman (1972), education and health are identified as the main determinants of current and future well-being. The two factors increase employment and employability prospects (Yuko et al., 2006). Recent advances in the formalization of human capital theory by Cunha et al. (2006), Cunha and Heckman (2008), and Heckman (2007) have further confirmed the role of human capital accumulation in household prosperity.

The theoretical literature on the relationship between human capital development and household income or well-being has identified the natures of existing relationships between these two groups of variables. These relationships are summarized in Figure 1. It has also identified the channels through which human capital variables lead to an increase in income and well-being. However, it has not established a hierarchy relating to the extent of the contribution of each of the dimensions of human capital to income and well-being variables. Similarly, it has not predicted whether the influence of the accumulation of human capital endowments on household prosperity and well-being is likely to change over time. There is thus a need to review the empirical literature on the relationship between human capital accumulation and household prosperity and well-being.

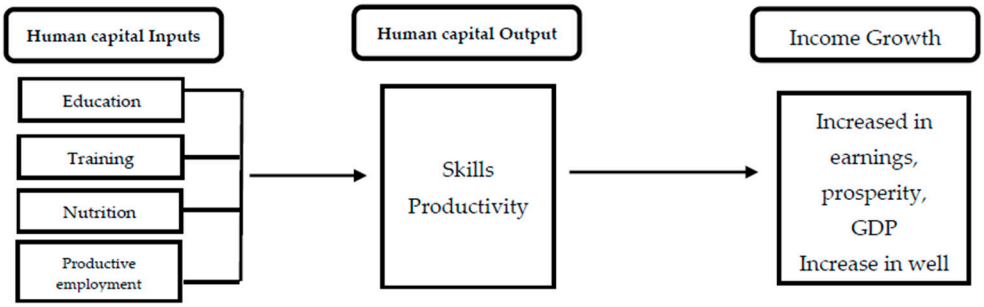


Figure 1. Theoretical framework on human capital development and income growth framework. Source: Based on the literature review.

2.2. Review of the Empirical Literature

There is an extensive empirical literature on the relationship between human capital accumulation and an increase in household and individual prosperity. It can be subdivided into two categories: the literature on the relationship between human capital accumulation and individual productivity and the literature on the relationship between human capital, well-being, and income inequality.

2.2.1. Human Capital and Individual Productivity

This line of research on the positive impact of human capital on individual productivity has particularly focused on the influence of education on farmers' productivity. In this regard, Kafando et al. (2022) have grouped together the empirical studies conducted according to the channels through which the accumulation of human capital leads to enhanced productivity and revenue. The first channel through which education contributes to enhancing farmers' productivity consists of enhancing farmers' managerial skills. This managerial-quality channel, which enhances farmers' productivity, has been identified notably by Asadullah and Rahman (2009) and by Reimers and Klasen (2013). Enhancing farmers' managerial skills has enabled them to optimize their use of fertilizers and pesticides.

The second channel through which farmer education leads to enhanced productivity and revenue has to do with farmers' better management of asymmetric information on input markets. According to some studies, educating farmers helps them to acquire inputs at affordable prices and to sell their produce at better prices, which results in better profits and higher incomes. This channel has been identified by authors such as Nelson and Phelps (1966), Welch (1970), Lockheed et al. (1979), T. W. Schultz (1975, 1982), Asfaw and Admassie (2004), and Salahuddin et al. (2020).

The third channel is related to the easy adoption of technologies induced by the status of being educated. According to this channel, educated farmers adopt new agricultural techniques more quickly than uneducated ones and thus increase their income more quickly (Nelson & Phelps, 1966; Lin, 1991; Foster & Rosenzweig, 1995; Sharada & Knight, 2004).

Finally, the fourth channel has to do with the fact that education has the effect of reducing risk aversion. In turn, reduced risk aversion encourages farmers to adopt new technologies, which are generally more productive and profitable (Asadullah & Rahman, 2009).

2.2.2. Human Capital, Poverty, and Income Inequality

Because education provides individuals with skills and abilities that enable them to find better-paid employment, it has the knock-on effect of improving their incomes and therefore of reducing their poverty. Numerous case studies exist that formally establish the positive impact of capital accumulation and education on the reduction in poverty and/or income inequality.

In relation to the positive influence of education on poverty reduction, Appleton (2001) highlighted the fact that during the 1990s, improvement in living conditions and reduction in monetary poverty were more rapid among educated people than uneducated ones.

For example, Aref (2011) found that education had a positive and significant impact on reducing poverty in the rural areas of Iran. Chaudhry and Rahman (2009) found the same result based on data from rural Pakistan. Njong's (2010) study of Cameroon used logistic regression to highlight the fact that as the employed population attained higher levels of education and greater professional experience, the probability of them being poor reduced. The case study by Ahmad et al. (2005) on unequal access to secondary education in rural Bangladesh led the authors to identify education as an important determinant of poverty reduction. Moyo et al. (2022) obtained virtually the same result, based on data from Western Cape Province in South Africa, namely, that improving the level of education led to a reduction in poverty in the province in the long term.

In addition to education and skills, health and nutrition have been identified in numerous empirical studies as determinants of poverty reduction (Fogel, 2004). For example, in the case of health, Yang et al. (2022), using quantile regression on data from rural China, found that access to public health services was essential for the accumulation of health capital. Improving the health status of individuals increases their individual capabilities, which in turn are required to reduce the relative poverty of rural households.

The above review of the empirical literature stresses the importance of human capital as a determinant of household prosperity and/or improved well-being. Above all, it reveals the overall impact of specific dimensions of human capital development on household well-being or income, but without generally identifying which of the human capital dimensions had the greatest impact on either income or well-being as variables. Given that the strength of the relationship between human capital endowments and the well-being indicator was found to vary over time, this study adopted an analytical perspective that identified the factors underlying that variation in the influence of human capital on well-being. In addition, the approach used in this study enables several dimensions of human capital to be taken into account at the same time.

3. Methodology and Research Data

3.1. The Methodology

The Blinder–Oaxaca decomposition method was used to assess the contribution of the various dimensions of human capital to the increase in prosperity observed in Burkina Faso between 2009 and 2018 and to identify the factors underlying the variation in the extent of their influence on prosperity trends.

The method is based on the estimation of a model of the determinants of the prosperity variable. Thus, following Epo et al. (2021), by designating Y as the function of the generation of a person's income, a function whose arguments are made up of the vectors of exogenous and endogenous variables, the income-generating mechanism of this function is specified as indicated in Equation (1):

$$LnY = a_0 + \sum_{k=1}^{K} a_1 X_k + \eta_1 E_1 + \sum_{j=2}^{j} \eta_j E_j + \epsilon_1 \quad (1)$$

The term LnY represents household income taken as a logarithm, E_1 is an indicator of the labour market participation, and E represents human capital endowment, which encompasses level of education and training (or qualifications), quality of nutrition, health capital, etc. The vector X contains K exogenous variables as determinants of household income level. The coefficient a is a K vector of the parameters of exogenous explanatory variables. As for the vector η, it contains the coefficients of potential endogenous explanatory

variables. Finally, ϵ_1 is the vector containing both the random error terms and the variables that are unobservable but are correlated with the endogenous determinants of income.

Estimating the parameters contained in the vector η will provide the effects of a household's human capital endowment on its standard of living; that is, its level of income. However, given that both household income and human capital endowment are jointly determined in the same equation, the error term ε_1 in Equation (1) is likely to be correlated with the variables characterizing human capital endowment.

Once Equation (1) had been properly estimated, the Blinder–Oaxaca decomposition method (D) was used to assess the contribution of each of the income explanatory variables to changes in income while quantifying the factors underlying each contribution (Neuman & Oaxaca, 2004; Oaxaca, 1973). All that was performed using the following formula:

$$\begin{aligned} D = Ln\overline{Y}_{t+n} - Ln\overline{Y}_t & \\ &= \{E(X_{t+n}) - E(X_t)\}'\beta_{t+n} + E(X_{t+n})'(\beta_{t+n} - \beta_t) \\ &+\{E(X_{t+n}) - E(X_t)\}'(\beta_{t+n} - \beta_t) \end{aligned} \quad (2)$$

X is the vector of explanatory variables (exogenous and endogenous) in Equation (1).

In Equation (2), the expression $\{E(X_{t+n}) - E(X_t)\}'\beta_{t+n}$ represents the endowment effect, while $E(X_{t+n})'(\beta_{t+n} - \beta_t)$ is the coefficient effect or the return to endowments and $\{E(X_{t+n}) - E(X_t)\}'(\beta_{t+n} - \beta_t)$ is the interaction effect

The term to the left of the equal sign measures an individual's income growth, while the terms to the right of it measure the share of income growth attributable to the endowments in the different characteristics of the vector X. The second term to the right-hand side of the equal sign measures the share of income growth arising from an increase in returns from the different characteristics in the generation of income. Finally, the third term on the right-hand side component of Equation (2) expresses the interaction between the endowment effect and the coefficient effect.

3.2. The Data

The data used in this study were taken from the multi-sector surveys conducted in 2009 and 2018. They were collected using the World Bank's Living Standards Measurement Survey (LSMS) format. The data from these two surveys, collected using the same methodology, are representative at the national and regional levels (each of the country's 13 regions), as well as in terms of place of residence (urban and rural). Given the focus of this study, which is an analysis of the effects of human capital dimensions on the increase in individual incomes, it narrowed down the LSMS databases to those concerning the employed population; that is, basically those aged between 18 and 60.

The following paragraphs outline the variables employed in the estimated models, their specifications, the reasons for their choice, and the assumptions underlying their utilization.

In order to explain the variable under consideration, namely, prosperity or household income, the average per capita income was used, the latter being approximated by per capita consumption expenditure. Indeed, in developing countries where agriculture is a significant component of the population, consumption expenditure has been shown to be a reliable indicator of household income. It is evident that this consumption is predominantly derived from the household's own production, i.e., self-consumption. Consequently, when considering wages alone, this would result in the exclusion of more than half of the self-employed population (Deaton & Zaidi, 2002; Srivastava & Mohanty, 2010).

With regard to the human capital variables selected as determinants of household income growth, these include education level, access to modern healthcare, dietary diversity, and employment under-productivity. The precise measures of these variables and the

assumptions underlying their use as determinants of household income (prosperity) are as follows:

The level of education was measured by the number of years the worker had been in school. As demonstrated in the extant literature (Appleton & Balihuta, 1996; Aref, 2011; Chaudhry & Rahman, 2009; Moyo et al., 2022), we expect a positive relation between the number of years of education a worker has received and their subsequent income.

Access to healthcare is measured by attendance at modern public or private healthcare facilities, as opposed to the utilization of other types of healthcare provision. In accordance with the extant literature, it is anticipated that workers with access to modern healthcare systems will exhibit higher mean incomes in comparison to those lacking such access (Yang et al., 2022).

The diversity of household diets is assessed using the dietary diversity score indicator. This is a score spread over an index ranging from 1 to 12 points, proposed by the Food and Agriculture Organization of the United Nations (FAO). The index in question measures a total of 12 distinct groups of food products, ranging from cereals to roots and tubers, meat, fish and seafood, dairy products, sugars, and "other products". In line with Yang et al. (2022), who identified a positive effect of nutrition on poverty reduction, particularly in rural China, improving workers' dietary diversity is expected to have a positive effect on their income through improved productivity.

Underemployment was measured by the proportion of economically active people in the household who worked less than 9 out of 12 months during the year. In terms of the research hypothesis, it is expected that a fall in the rate of underemployment will lead to an improvement, and conversely, that an increase in this rate will lead to a fall in the income of the worker or household.

In addition to the human capital variables, a number of control variables were added to the estimated equations. These were age, gender, area of residence, and marital status.

The reasons for the choice of these control variables and the expected signs of their impact on income are as follows. With regard to worker age, it is expected to have a positive influence on income, at least up to a certain threshold, due to the productivity effect linked to the worker's experience. As for place of residence, given the size of the demand due to the population of large cities, it is expected that workers residing in cities will have, on average, higher incomes than those living in rural areas. Also, due to the different levels of development of the country's regions, it is expected that the regions will have specific impacts on the average income of their residents.

The worker's gender (sex) was also retained among the control variables in order to test whether or not there was an upward bias in the income of male workers. Finally, by introducing the worker's marital status, the underlying hypothesis tested was whether or not the average income of married workers was higher than that of unmarried workers.

To estimate each of the equations to determine the change in income from one year to the next, the databases for the years in question were pooled.

The average values for the different variables are given in Table 1 below.

Table 1. Average values of the different variables.

Variables	Variables' Definition	2009	2018
PCEX	Per capita expenditure	155,585.9	282,418.2
PCEXD	Expenditure per capita adjusted for fluctuations in the price of the basket of goods	155,585.9	223,786.2
YEDUC	Number of years of education	1.45	2.46
Age	Age	34.87	34.39
HFDS	Food Diversity Score	7.68	9.60

Table 1. *Cont.*

Variables	Variables' Definition	2009	2018
Female (%)	(=1 if female)	54.39	52.70
Urban (%)	(=1 if urban area)	27.79	39.19
Married (%)	(=1 if married)	92.18	76.57
Under-employment (%)	Average household underemployment rate	69.40	78.22
Health_Centre (%)	(=1 if a person frequents a modern health centre)	8.54	13.76
alpha_pere (%)	(=1 if father is literate)	10.96	12.95
alpha_mere (%)	(=1 if mother is literate)	5.30	6.02
access_health (%)	(=1 if a person has access to a health centre)	71.33	92.23
access_education (%)	(=1 if a person has access to a formal education centre)	45.37	62.81
Sector (%)	(=1 if in formal employment)	2.56	4.34
N	Number of observations	19,894	4055

4. Results

4.1. Results of the Estimations of the Determinants of the Employed Population's Prosperity

Given the possibility of endogeneity bias in some of the explanatory variables selected as determinants of income, such as the number of years of education, the dietary diversity score, and access to modern health services, the models were estimated using the instrumental variables method.

In the economic literature, several instruments, such as compulsory schooling (Angrist & Krueger, 1991, 1995), geographical proximity of schools, level of education of father and/or mother (Arestoff, 2001), etc., have been used to correct for endogeneity bias. Estimates obtained using the instrumental variables technique have generally shown that OLS estimates underestimate the return to education. In the case of our model, we use ease of access to education measured by home-to-school travel time, father's level of education, age, and his square as instruments.

In order to assess the appropriateness of using the instrumental variable estimation method, the joint endogeneity tests on the four instruments were first conducted. When applied to the data from a model identifying the factors behind the increase in earnings of the employed between 2009 and 2018, the statistic associated with the *p*-value of the estimated model came out below 1%, thus rejecting the null hypothesis of no endogeneity bias.

Next, Hansen's test for non-correlation of the error term with the model's exogenous variables was performed. The probability associated with this test was found to be greater than 10%, leading to acceptance of the null hypothesis of independence between the error term and the exogenous variables.

Finally, given that the calculated probability of the test of under-identification of the instruments whose null hypothesis is the absence of correlation between the instruments and the human capital variables is zero, this hypothesis was rejected in favour of the alternative hypothesis of the presence of a significant correlation between the instruments and the human capital development factors they are supposed to represent.

The statistics for the three instrument validity tests are given in Table 2 below.

Table 2. Results of the estimation of the determinants of the change in income between 2009 and 2018.

	Statistics	*p*-Value
Hansen J statistic (overidentification test)	1.284	0.2571
Under-identification test	36.793	0.000
Endogeneity test of endogenous regressors	355.747	0.000

Given the results of the above tests, we therefore prefer the instrumental variables estimator to that of the ordinary least squares (OLSs).

The results of the estimation of the effect of human capital on the increase in income of employed persons using the instrumental variables method or the ordinary least squares method are shown in Table 3. In essence, and considering the results of the instrumental variables method, they highlight the predominant role played by human capital in household well-being in Burkina Faso, whatever the period of analysis. This result is similar to those of Appleton (2001), Njong (2010), Epo and Baye (2013, 2016), Epo et al. (2021), and Moyo et al. (2022) on the pro-income-increasing effect of access to education in developing African countries.

In terms of education levels, one additional year of education increases per capita consumption by 3.9%.

With regard to the dietary diversity score, a one-unit increase in the household nutritional scale increases household consumption by 19%. These returns are higher than those for education. Households with higher dietary diversity have higher incomes, which explains these yield levels. Here too, the pro-income effect of identified dietary diversity corroborates the work of Haddad and Bouis (1991), Behrman (1993) and Yang et al. (2022) on the contribution of nutrition to increasing workers' productivity, and then their incomes.

With regard to health, workers who use modern health facilities in the event of illness have a per capita consumption one and a half times higher than those without access to this range of services. This figure is 1.5. It is consistent with the study by Srivastava and Mohanty (2010), Epo and Baye (2016), and Epo et al. (2021).

Finally, concerning human capital variables, underemployment logically appeared negatively correlated with per capita consumption of the worker's household. The coefficient is −0.17.

The coefficients of the control variables all show the expected sign in our regressions. Women and people living in rural areas have lower per capita consumption than other categories. Also, people living in the capital, Ouagadougou, the Grand Sahel, the Grand Est, and the Grand-Centre have a higher standard of living than those living in the Grand-Ouest. The difference is greatest in the capital, Ouagadougou, which has the highest level of consumption per head.

Table 3. Estimation results for income (PCEX) growth determinant models.

	OLS			**IV**		
	Coef.	**Z**	***p* > z**	**Coef.**	**z**	***p* > z**
YEDUC	0.047	35.97	0.000	0.059	5.79	0.000
Health_Centre	0.154	11.61	0.000	3.425	5.4	0.000
HFDS	0.075	33.78	0.000	0.304	3.22	0.001
Years2018	0.443	39.13	0.000	−0.159	−0.88	0.381
Female	−0.039	−4.91	0.000	−0.124	−4	0.000
Urban	0.255	24.64	0.000	0.010	0.16	0.874
Married	−0.023	−1.76	0.079	−0.067	−1.81	0.070
Age	0.003	1.54	0.124			
age2	0.000	−1.24	0.215			
Underemployment	−0.232	−24.1	0.000	−0.068	−1.44	0.151
Grand_est	0.072	6.86	0.000	0.058	1.82	0.069
Grand_centre	0.103	8.67	0.000	0.094	1.89	0.059
Grand_sahel	0.108	9.76	0.000	0.292	4.07	0.000
Ouaga	0.360	19.93	0.000	0.290	5.74	0.000
_cons	10.950	245.83	0.000	8.984	12.16	0.000

4.2. Results of the Estimation of the Sources of the Employed Population's Income Growth Using the Blinder–Oaxaca Decomposition Method

Estimates of the two multiple linear regression models were used to identify the explanatory factors for the variation in average earnings of employed people between 2009 and 2018. They also enabled us to identify the positive or negative nature of the relationships existing between the rise in income and each of the determinants retained in the regressions. However, they did not allow us to rank the determinants in terms of the importance of their contribution to the variation in income or even to break down the contribution of each determinant in terms of the effect due to the increase in its endowment and the effect due to the variation in its yield in the increase in income.

To better understand the factors behind the rise in income between 2009 and 2018, the Oaxaca–Blinder decomposition method was used. Columns 2 to 4 in Table 4 provide the results of the decomposition of determinant effects into endowments, coefficients or returns, and interaction effects for each variable.

Overall, the increase in income from 2009 to 2018 is due to the increase in factor returns or coefficient effect (the total effect is 0.446), the increase in endowments (the total effect of endowments is 8, 0.285), and the interaction effect, which measures the simultaneous effect of differences in endowments and returns and is −0.067.

The results for each group of variables—human capital variables and control variables—are also shown in Table 4. According to these results, the growth in average income of employed persons observed between 2009 and 2018 can be explained by the increase in human capital endowments (endowment effects), notably the improvement in nutrition (0.227), the increase in the average duration of education between the two years (0.033) and the improvement in access to modern health services (0.010). The positive signs of these coefficients indicate that the endowments of these human capital factors favoured, on average, income growth in 2018 and therefore contributed to the estimated income differential (0.664) between the two years. These results argue in favour of implementing policies to extend the provision of these endowments: provision of education, modern health services, and nutrition services. In contrast, given that the endowment effect of the underemployment variable is negative (−0.009), this calls for the implementation of measures to reduce the scale or incidence of underemployment in the country.

Among the control variables, urbanization or an increase in the rate of urbanization contributes positively and significantly to explaining the income gap between the two years (0.023), while underemployment of the employed has a negative and significant influence (−1.92) on the increase in average income of the employed.

In terms of specific regional contributions to income variation, it appears that regional income endowments have had no significant effect on the average income gap between 2009 and 2018.

With regard to the efficiency of factor use (endowments), the yield effects (coefficient effects) and the results of the Oaxaca–Blinder decomposition indicate that the yield effect of education contributed negatively (−0.047) to income growth (column 3 in Table 4). This result calls for the implementation of policies to improve the external performance of education, in particular the development of technical and vocational education and training, which are conducive to the generation of productive employment.

As for access to health and dietary diversity, the return effects of these two variables came out positive (0.009 and 0.482), signifying, first, an increase in the contribution of each endowment of these variables to average income. Second, these coefficients reflect an increase in the contribution of these variables to the income gap between 2009 and 2018. Under these conditions, in terms of policy measures, existing health and nutrition policies need to be strengthened, in particular by improving workplace nutrition.

Table 4. Results of the Blinder–Oaxaca decomposition of the factors in the change in income between 2009 and 2018.

	Coef.	**z**	***p* > z**
Differential			
Prediction_1	12.301	1215.42	0.000
Prediction_2	11.637	2263.66	0.000
Difference	0.664	58.48	0.000
Endowments			
YEDUC	0.033	10.86	0.000
Health_Centre	0.010	6.59	0.000
HFDS	0.227	21.56	0.000
Years2009	0.000		
Female	0.001	1.46	0.144
Urban	0.023	8.51	0.000
Married	0.002	0.78	0.433
Age	−0.006	−1.88	0.060
age2	0.006	1.82	0.069
Underemployment	−0.009	−3.82	0.000
Grand_est	0.001	1.09	0.276
Grand_centre	−0.001	−0.71	0.479
Grand_sahel	0.001	0.88	0.377
Ouaga	−0.002	−1.19	0.235
Total	0.285	21.47	0.000
Coefficients			
YEDUC	−0.047	−7.49	0.000
Health_Centre	0.009	2.46	0.014
HFDS	0.482	8.72	0.000
Years2009	0.000		
Female	0.005	0.6	0.546
Urban	−0.025	−2.89	0.004
Married	0.035	1.74	0.081
Age	0.441	2.55	0.011
age2	−0.204	−2.35	0.019
Underemployment	−0.059	−3.7	0.000
Grand_est	0.026	4.48	0.000
Grand_centre	0.017	4.14	0.000
Grand_sahel	−0.028	−5.95	0.000
Ouaga	0.009	3.87	0.000
_cons	−0.215	−2.04	0.041
Total	0.446	43.3	0.000
Interaction			
YEDUC	0.019	6.75	0.000
Health_Centre	−0.003	−2.39	0.017
HFDS	−0.097	−8.65	0.000
Years2009	0.000		
Female	0.000	0.58	0.564
Urban	0.007	2.83	0.005
Married	0.007	1.74	0.082
Age	0.006	1.74	0.083
age2	−0.006	−1.67	0.094
Underemployment	0.003	2.7	0.007
Grand_est	−0.001	−1.07	0.285
Grand_centre	0.000	0.7	0.484
Grand_sahel	−0.005	−3.73	0.000
Ouaga	0.001	1.14	0.253
Total	−0.067	−5.45	0.000
Number of observations	**23,949**		

For the control variables, the statistically significant contributions of their performance effect (coefficient effect) to income variation are −0.025 for urbanization, 0.441 for age of employed person, and −0.025 for age squared. The coefficient associated with urbanization indicates that, over time, the income gap between urban and rural dwellers has narrowed, contributing negatively to the variation in income between 2009 and 2018. The coefficient of the square of age being negative, this means that the effect in question admits a threshold.

Finally, with regard to the contributions of the country's regions to income growth, compared to the Grande Ouest region, taken as a reference, only the yield effect of workers residing in the Sahel region came out negative (−0.028), meaning first a fall in the incomes of these residents and then a fall in the contribution of their incomes to the income gap.

The use of decomposition methods has enabled us to gain a better understanding of the causes of the increase in the average income of employed persons in Burkina Faso between 2009 and 2018. It also enabled us to deepen a number of results established in the literature on the role of human capital in improving incomes.

As numerous theoretical and empirical studies have demonstrated, education is a key determinant of household prosperity. This relationship was established by T. W. Schultz (1975, 1982) and Salahuddin et al. (2020). Furthermore, the results of this study appear, at first glance, to confirm those of previous empirical studies conducted in African countries south of the Sahara. These studies looked at the impact of different levels of education (notably school enrolment) on improving household incomes. Reference studies in this field include those of Appleton (2001) and Appleton and Balihuta (1996) on Uganda, Moyo et al. (2022) on data from Cape Town in South Africa, and Bennell (1996) on data from sub-Saharan African countries, including Burkina Faso. As part of this study, the impact of an additional year of education on income was assessed. The results of this analysis reveal an estimated 4% increase in income. This value of education the rate of return on education is comparable to that reported by Bigsten et al. (2000) in their study based on data from Cameroon, Ghana, Kenya, Zambia, and Zimbabwe. Indeed, previous research has shown that the impact of an additional year of education on income is generally in the 2–5% range. In addition, the coefficient analysis of the effect of education on income extended and supported the results of previous studies. Analysis of the data revealed that the effect of education on income is primarily influenced by the increase in investment in education, measured by the increase in the educated population, rather than by the benefits obtained from this investment in terms of returns, i.e., the additional earnings resulting from an extra year of education. These benefits actually declined between the years 2009 and 2018. In this study, it was observed that the second effect, characterized by the decline in returns to an additional year of education between the two years, contributed negatively to the pro-income effect of education.

With regard to nutrition and health, the article validates the observations made by Mincer (1991), Ridell (2011), Strauss and Thomas (1998), Behrman (1993), Yang et al. (2022), and Haddad and Bouis (1991) concerning their positive impact on income and poverty reduction. By highlighting the mechanism by which improving workers' health and nutrition positively affects their income, this study extends the findings of T. Schultz and Tansel's's (1997) study of Côte and Ghana, two of Burkina Faso's neighbours. Analysis of the impact coefficients of health and nutrition on income and wages revealed that the endowment effect, i.e., the increase in access, and the yield effect, corresponding to the improvement in the contribution of endowments between 2009 and 2018, contributed positively to the variation in income. This indicates an increase in both effects between the two periods considered.

5. Conclusions

The results of the various estimates in this study show that investing in health, nutrition, and education increases the well-being of Burkinabè households. Conversely, underemployment has a negative impact on the standard of living of the working population. The results also demonstrate that health and nutrition are key factors in explaining the increase in income among the working population.

Decomposing the impact of the different determinants of household income revealed that the contributions of endowment effects and returns to endowment effects were both significant.

However, in the case of education, this study recommends the implementation of reforms aimed at improving the external efficiency of education in Burkina Faso, given that its output effect was found to be significantly negative while its return to endowment effect is positive, thus reducing its net contribution to income growth. To achieve this, this study recommends strengthening and expanding vocational and technical education and training. Additionally, given that the endowment effect of education is positive and significant, policies to increase or extend educational provision should be strengthened.

With regard to health, the endowment effect and the return to endowment effect are both positive and significant, albeit to a relatively modest degree. It is therefore recommended that measures be taken to expand the provision of modern healthcare and improve services. As for, the endowment effect and the return to endowment effect are both positive and relatively high. This study therefore recommends strengthening current nutrition policies and promoting improved nutrition in the workplace above all else.

Similarly, as the endowment and return to endowment effects of underemployment on the working population were found to be negative and significant, this study recommends strengthening and extending policies that promote productive employment and combat job insecurity.

Finally, although the endowment effect of urbanity was found to be negative between 2009 and 2018, its total effect on income remained positive and significant. Therefore, policies to reduce inequalities between living environments should be implemented or pursued. Similarly, as average incomes in the major regions (Grand-Est, Grand Centre, Grand Sahel, and Ouagadougou) have grown faster than in the comparison region (Grand-Ouest), it is important to develop and implement programmes to reduce spatial disparities within the country.

Despite the insights this study sheds on the factors underlying the levels of impact of human capital variables on household income growth, it also has a number of limitations. Econometric estimates may suffer from shortcomings such as omitted variable bias. This does not affect the variance estimate, but the components calculated in the decompositions should not be interpreted as precise causal estimates of the individual impact of a specific factor or group of factors on the dependent variable. They provide a measure of their relative importance. Future research could involve incorporating other variables into the income growth regression model.

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