CHAPTER 4

Free Education, Schooling Outcomes, and Wages: An Inequality Analysis in Benin after the 2006 Free Tuition Policy

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Introduction

Studies have documented the key role of education and human capital in economic development, particularly at the primary level (see, for example, Hanushek and Kimko 2000; Pritchett 2001; Wantchekon et al. 2015). Education is also associated with income distribution (for example, Mincer 1974; De Gregorio and Lee 2002). Schooling attainment has a significant effect on individual earnings in Benin, even in the informal sector (Kuepie et al. 2009). As such, differences in educational outcomes may drive income inequality with its relationships to growth, poverty reduction, and the attainment of key development goals, at least for poor countries (Barro 2000). The commitment of several governments to achieve universal primary education has prompted more countries to make access to primary education free.

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Benin's inequality measured by the Gini coefficient of per capita consumption was relatively high, at 53 percent, in 2006 (Alofa et al. 2011). Moreover, the Gini coefficient of average years of schooling for the 15-to-24-year-old cohort was 71 percent in 2006. In Benin, dimensions of educational inequality include region, wealth, and gender. In 2006, more than 20 percent of school-aged children were not enrolled in school, and eight of the twelve regions had education indicators below the national average. According to a survey of parents, the primary factor that kept children out of school was the inability of their families to pay school-related fees (INSAE and ILO 2009). This explanation is consistent with the finding by Kattan and Burnett (2004) that user fees are a major obstacle to universal education in developing countries. About 61 percent of school-aged children in the poorest quintile were not enrolled, compared to only 16 percent for the top quintile. The gender imbalances are stronger since 67 percent of the poorest girls were kept out of school, compared to only 39 percent of the wealthier girls.

These schooling disparities, if not corrected, may translate into higher income inequality for future generations. To reduce the dispersion and achieve universal primary education, a key strategy adopted in Benin was to reduce costs borne by parents. In October 2006, the Government of the Republic of Benin announced the abolition of tuition fees for primary and preschool education in all public schools. In fact, this policy is in line with the country's Constitution, the Orientation Law on Education, and other international conventions signed by Benin to promote primary education. Subsidies to schools and increased resources to primary education support the decision. The primary-level share of public expenditure on education increased on average from 52 percent in 2005 to 56 percent in 2006–2011. The number of schools increased by 49 percent, translating into more than one school per 300 children aged 5 to 14 in 2005.

As a result, the country has experienced a rapid expansion of primary education enrollment in recent years. Data from education statistics in Table 4.1 suggest that the net enrollment rate rose from 77 percent in 2005 to 91 percent in 2011. The differences in non-enrollment between poor and rich have significantly narrowed. Based on the results from the Integrated Modular Survey of Household Living Conditions (EMICoV) and the Demographic and Health Survey (DHS) in 2011, only 35 percent of the poorest children are not in school, which is significantly closer to 18 percent in the top quintile. The catchup is faster for girls. Their non-enrollment rate is only 39 percent in the poorest quintile, compared to 22

Table 4.1 Evolution in enrollment indicators in primary education (2004–2011)

	2004	*2005*	*2006*	*Average 2004–2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*Average 2007–2011*
Number of pupils (millions)	1.177	1.163	1.178	*1.172*	1.290	1.454	1.519	1.787	1.869	*1.584*
Admissions in first year	255,195	275,672	294,506	*275,124*	333,095	411,579	404,755	405,755	412,180	*393,473*
Gross enrollment rate (%)	95	93	92.9	*93.6*	98.5	104	109	110.58	112.62	*106.9*
Net enrollment rate (%)	80.56	77.05	77.73	*78.4*	82.7	83.04	88.64	90.28	91.23	*87.2*
Gross intake rate (%)	99.33	NA	NA	*99.3*	119.32	142.96	140.01	132.18	130.73	*133.0*

Source: Benin Ministry of Education and author's calculations

percent in the richest one. The northern region, even with some progress, leaves 43 percent of children unenrolled compared to less than 20 percent for the center and the south in 2011.

Overall, the free primary education policy and the improved supply of education has increased enrollment significantly and will increase the educational attainment of the population. Gender and regional gaps in education have also improved substantially over time. The average number of years of schooling achieved was 5.37 years in 1990. It reached 7.01 years for boys and 4.96 years for girls. The proportion of the population who has completed at least the primary school level has increased from 40.5 percent in 2005 to 45.6 percent in 2010 and 50.9 percent in 2011, according to the National Institute of Statistics (INSAE 2012).

In this chapter, I first assess the changes in the distribution of educational outcomes by evaluating whether the policy contributed to eliminating the gender gap and geographical disparities in educational outcomes and whether there were any trade-offs between broad access to schooling and quality of learning. This is important since the improvement in human capital depends both on years of schooling and on the quality of learning. Next, using individual Mincer-type earnings functions, I estimate returns to education by accounting for possible endogeneity of the education variable. Finally, given that the short length of the policy implementation does not allow more precise quantitative estimates, I use simulations to provide some magnitude of the impact of the free primary education policy on future wage differentials, as schooling inequalities get smaller.

Understanding changes in the distribution of educational outcomes is important in designing policies to achieve development goals, such as universal primary education for all children, the elimination of gender inequality, and the reduction of regional disparities.

The chapter leverages a unique combination of administrative educational data at the municipal level and two nationally representative household-level surveys to provide both descriptive and econometric evidence of the changes in educational outcomes and their distribution across gender, region, and wealth levels.

The result suggests that the abolition of primary school tuition has attenuated the inequality of access to primary school by increasing enrollment of traditionally disadvantaged groups, including girls, low-income groups, and the populations of the northern region. While the importance of family background on enrollment has been significantly reduced after the policy was implemented, student socioeconomic characteristics are still

important determinants of student learning. The simulations suggest only limited changes in wage inequalities in the short term following the policy implementation.

The rest of the chapter is organized as follows. I first discuss the policy for free primary education and describe the methodology for analyzing changes in inequality using a Mincer-type wage equation and simulations. Then, the data description and a discussion of the results comprise the final sections.

Methodology of Inequality Analysis

The inequality analysis of the impact of the free primary education policy includes the determinants of access to the education system, the determinants of student's performance in schools, and the implications for income distribution using an earning equation.

Effects of the Policy on the Determinants of Access to Education and Student Performance

In order to analyze the inequality of access to education and the inequality of performance in schools, I evaluate the impact of the policy in Benin, using both municipal and household-level data. I assess the impact of the policy on the determinants of enrollment and student performance across gender, region, and socioeconomic status.

Municipality t's educational achievement, A_{it}, in period t is modeled as the outcome of a production function that combines students' characteristics and socioeconomic conditions as inputs:

$$A_{it} = A\left(C_{it}, M_{it}, E_{it}, u_{it}\right), \tag{4.1}$$

where u_{it} is an error term. The education outcome of interest—the enrollment status or passing of the CEP exam—is a binary variable measured for each student. The CEP is the national examination for completion of primary school, and passing the exam is used as a proxy for quality of learning in this analysis. The inputs are students' characteristics C_{it}, family and community characteristics M_{it}, and school characteristics E_{it}. Most education data are only available aggregated at the municipal level, suggesting a log-odds specification for the process of data generation:

$$\ln\left(odds_i|X_i\right) = \ln\left(\frac{\left(p_i|X_i\right)}{\left(1-p_i|X_i\right)}\right) + \varepsilon_i = \beta_0 + \beta_1 X_i + \varepsilon_i, \tag{4.2}$$

in which p_i is the observed proportion of occurrences of the outcome in the i^{th} municipality. The log-odds equation is similar to the "logit" equation since the logit is defined as the natural log of the odds. The log-odds model can be *consistently* estimated as an ordinary least squares (OLS) regression for the data available at the municipality level.

When using household-level data, with enrollment status for each individual child in the sample, a logit model is directly estimated.

Schooling Inequality and Simulation of Wage Inequality

As detailed in the results section, the analysis of municipal and household-level data suggests a positive effect of free primary education (FPE) on enrollment, especially for the poor, the girls, and the school-age children in the northern region. Since schooling attainment has a significant effect on individual earnings in Benin (Kuepie et al. 2009), any reduction in schooling inequality may also drive income inequality.

In order to assess the magnitude of the relationship between schooling inequality and income inequality, I use a Mincer-type wage equation to simulate future wage differentials, as schooling inequalities get smaller. The relationship between education and income is a basic concern for labor economists and development economists. Wages and salaries are the most important sources of income. Wage differentials exist across individuals with different levels of education, years of experience, gender, race, and marital status. I focus on human capital theory with the framework of Mincer's (1974) wage equation. The data set allows the estimation of an earning model with an analysis of potential endogeneity of the education variable.

I consider a "one-factor" human capital model with a single measure S_i for schooling such as the number of years of schooling. As a starting point, return to education will be first estimated using OLS on a simple Mincer-type earnings function, as in the following equation:

$$\ln y_i = \alpha_i + \beta S_i + \varepsilon_i, \tag{4.3}$$

where α_i represents relative levels of earnings for individual i for any given level of schooling, and β measures the marginal return to schooling level, S_i,in terms of the earnings y_i. The term ε_i is meant to capture measurement error in earnings.

The β estimate varies with the method of estimation used. I used three alternative methods: OLS, the instrumental variable method, and the Heckman sample selection method (Card 1999, 2001; Duflo 2001; Heckman and Li 2004). The instrumental approach requires an instrument that determines education choices but not earnings. The Heckman models account for selection into employment or sector of employment. The returns to education are estimated for the working population. I use the father's characteristics as instruments to account for any potential endogeneity of the education variable.

The wage equation is only estimated for urban workers, using data from the 1–2–3 surveys conducted in Cotonou in 2001–2002 by INSAE, the Benin Institute of Statistics. Assuming that the wage equation remains stable over the period of analysis, I simulate the effects of different scenarios of changes in educational attainment on changes in wage inequality. Since the 1–2–3 survey used for the wage equation only samples urban dwellers, I use the urban sample of the 2006 DHS survey as the baseline for individual characteristics. Taking the individual characteristics from this sample as given, I calculate predicted hourly wages. This allows the estimation of the initial wage inequality measures in the samples (Grosse et al. 2009). To simulate the effect of the policy on wage distribution, I draw samples of working hours, based on the mean and standard deviation from the 1–2–3 sample. Finally, using various scenarios of change in educational attainment, I assess the change in income inequality. The Gini coefficient and the 90/10 ratios are used as measures of income inequality.

One might expect general equilibrium effects since an expansion of education will lead to an increase in the supply of educated people and reduce the returns to education (Heckman et al. 1998). For example, there is some evidence that China's expansion of higher education in 1999, along with a small cohort, due to China's one-child policy, led to important labor market consequences, including a decrease in job opportunities and wages for college graduates (Li and Xing 2010). On the other hand, the increased educational attainment may result in knowledge spill–overs when a critical number of well-educated workers help grow the economy faster with shared benefits (Moretti 2004). Therefore, the overall effect is a priori ambiguous.

Data limitation does not allow an estimation of the magnitude of the general equilibrium effect on wages to build this into the simulation. For example, it would be helpful to know how much wages would fall if primary school completion increased by 10 percent. This information could provide an idea of whether the results are sensitive to reasonable general equilibrium effects.

If $y_{0,i}$ is person i's wage with no primary school attendance, and $y_{1,i}$ is a person's wage with the completion of primary school, then $\Delta_1 = y_{1,i} - y_{0,i}$ is the treatment effect on person i. This difference can be used to evaluate the impact of free primary education on wages. This effect is constant only if wages before and after the policy are invariant to the number of primary school graduates in the economy. The analysis at the primary school level is also valid at the high school, college, and graduate levels, as FPE might induce higher completion rates at the higher-education level. If there is any general equilibrium effect, a policy for free primary education increases the number of primary school graduates and decreases their relative wages, $y_{1,i}/y_{1,i}$. Therefore, the wages of untreated individuals may be affected by the policy. Moreover, to cover the policy cost, more educated workers may pay more taxes, and this may affect their schooling behavior as well. A general equilibrium analysis accounts for these effects.

Heckman, Lochner, and Taber (1998) analyzed the effects of changes in tuition on schooling and earnings, accounting for general equilibrium on skill prices. They assumed that different schooling levels correspond to different skills, for which prices are endogenously determined. Individuals differ both in learning and in initial endowments of human capital. They argued that using a general equilibrium framework reduces the effect of a revenue-neutral $500 college tuition subsidy from 5.3 percent to a mere 0.46 percent.

The ideal data set for the purpose of this study would be a combination of micro-level data on firms, earnings of workers, the life-cycle consumption of the workers, and their wealth assets, as well as macroeconomic data on prices and aggregates. With such data, we could estimate the distribution of wages, wealth, and earnings. Using the microdata along with aggregate prices, we could construct aggregates of human capital and determine the output technology. With the lack of information on individual consumption, labor earnings, and skill prices, I assume that the returns to educations are stable. The general equilibrium effects of the policy for free primary education in Benin may be limited since more than

two-thirds of the workforce is active in the informal sector—the sector that values education the least.

Expanding education up to five years may not be enough to move people into the modern/urban sector since the average educational attainment in the sample is 12 years for the public sector and nine years for the formal private sector. However, this could make people a little more productive in agriculture, but there is not enough information to estimate returns to education in the agricultural sector.

Data Description

Education and Household Data

The data set compiled from the education statistical yearbooks, published by the Ministry of Education, includes yearly education outcomes and inputs in a panel for 77 municipalities from 2005 to 2011. I linked these data to sociodemographic and community characteristics from the 2002 population census and the 2006 and 2011 DHS. Following Lucas and Mbiti (2012), I also assume that municipalities with higher dropout rates before 2006 will experience a larger impact from the policy, therefore providing a measure of the intensity of the treatment in each municipality.

For the 2006 DHS, the field data collection was done between August 3 and November 18, 2006, a month after the policy went into force. The second survey is the 2011 DHS, for which the data was collected between December 2011 and March 2012, is the microdata of the analysis of the determinants across gender, regions, and wealth level between 2006 and 2011, conditional on household characteristics. Lincove (2009) and Grogan (2009) used similar household surveys to assess the effects of free primary schools.

The descriptive statistics in Table 4.2 show an increase in the student–teacher ratio, on average, from 45 to 48 students. The average probability of passing the national primary school exit exam (CEP) has decreased from 78 percent to 62 percent between 2006 and 2010.

Earning Data

I use a rich data set to estimate returns to schooling in Benin, testing a variety of econometric models. The data is from the 1–2–3 surveys, conducted in Cotonou in 2002, by INSAE, the National Institute of

Table 4.2 Summary statistics of passing the CEP*

	2006		*2010*	
	Mean	*Std. Dev.*	*Mean*	*Std. Dev.*
CEP rate	0.778	0.112	0.624	0.178
Log-odds of CEP rate	1.389	0.733	0.554	0.758
Initial log-odds of CEP rate (2005)	2.809	0.661	2.809	0.661
Student-to-teacher ratio	45.349	5.307	47.642	7.461
Intensity of FPE	0	0	0.396	0.189
Northern region	0.351	0.480		
Qualified teachers (%)	0.453	0.070	0.440	0.066
Per capita expenditure	197,590	94,053	182,604	70,890
Center region	0.312	0.466	0.312	0.466
Southern region	0.455	0.501	0.455	0.501
Male population 2002	0.485	0.013	0.485	0.013

Source: Author's construction based on data from Ministry of Education's statistical yearbooks (2005–2010)

(*) Note: The CEP is the national primary school exit exam

Statistics in Benin. The 1–2–3 surveys have three phases: employment, informal sector, and consumption. This chapter mainly uses the first phase (employment and earnings), with information on individuals' sociodemographic characteristics (including education and literacy), labor market integration (supply of labor, pay, professional mobility), and working conditions (premises, working hours). The data set has about 3000 household and 5285 individual observations (Razafindrakoto et al. 2009).

The labor market outcome variable, individual earnings, is not easily measured here since a large proportion of workers are in the informal sector, in which there are no accounts or payslips. The 1–2–3 surveys provide an estimate of the total benefits relating to the job (sundry bonuses, paid holidays, housing, in-kind benefits, etc.), whether monetary or non–monetary, which are added to the direct income. Two strategies were adopted in the 1–2–3 surveys to address the issue of measurement errors, particularly in the informal sector. First, for nonwage earners (self-employed and employers), the interviewers helped them reconstitute their earnings by recapitulating incoming and outgoing money over a reference period. Then, nonwage earners' incomes were translated into monthly sums in the questionnaire. The monthly income can then be divided by the number of hours worked per month, available from both phases 1 and 2 of the 1–2–3 surveys, to obtain hourly earnings. Second, the individuals who were

Table 4.3 Summary statistics for paid-work participants

Variable	*Mean*	*Std. Dev.*
Log of hourly earnings—all sectors	4.845	1.230
Log of hourly earnings—public sector	5.728	1.176
Log of hourly earnings—formal private sector	5.162	1.288
Log of hourly earnings—informal sector	4.627	1.174
Years of completed education	7.782	4.364
Experience	14.154	14.561
Female	0.517	0.500
Rural migrants	0.165	0.372
Urban migrants	0.244	0.430
Foreign	0.050	0.218
Muslim	0.110	0.313
Christian	0.820	0.384
Other religion	0.107	0.309
Dependence ratio	0.308	0.319
Years of schooling	8.294	4.268
Father's education	1.158	1.292
Father is executive	0.152	0.359
Father is wage employee	0.175	0.380
Father is self-employed	0.430	0.495
Father's profession not available	0.243	0.429
Income earner	0.579	0.494

Source: Author's construction based on data from the INSAE's 1–2–3 survey in 2002

unable or unwilling to disclose their exact earnings were asked to select an income bracket. Seven brackets were defined by multiples of the minimum wage in force. One could use the imputation method to deal with this kind of information, but for this chapter, these observations were ignored.

Summary statistics are reported in Table 4.3. The number of working individuals at least 15 years old in the sample is 2885, mainly comprised of informal sector workers. The public sector accounts for only 10 percent of the sample, the formal private sector for 25 percent, and the informal sector for 65 percent.

The accumulation of education is quite low, with the average number of years of completed schooling about eight years. About 24 percent have never attended school, and if we include those who attended school but

did not complete the primary cycle, the number is 29 percent of the sample. Assuming that people are literate when they have completed primary school, only 61 percent of individuals aged 15 and over are able to read and write.

A public sector worker has completed, on average, 12 years of schooling while in the informal sector, the average is only 6 years of schooling. A formal private sector worker has completed, on average, 9 years of schooling.

Measurement errors are an issue for non-salaried workers, particularly in the informal sector. The evaluated nonwage earners' incomes were translated into monthly sums in the questionnaire. This monthly (net) income was then divided by the number of hours worked per month to obtain hourly earnings.

The average monthly earnings for individuals aged 15 and over in Benin are 51,450 CFA francs (79 euros). A breakdown by sector also reveals substantial earnings differences. Public sector workers earn an average of 84,200 CFA francs (€129) per month, which is more than double the earnings of informal sector workers, who earn just 38,578 CFA francs (€59) per month. Formal private sector workers are also high earners, of an average of 77,645 CFA francs (€119) per month.

The ranking of the sectors based on average earnings is, therefore, similar to that of the average years of schooling, suggesting a positive correlation between years of schooling and monthly earnings.

Effect of Free Primary Education on Access to Education and Student Performance

The econometrical analysis suggests an attenuation of the inequality of access, but the disparities in student performance remain prevalent.

An Attenuation of the Inequality of Access to Education

Descriptive evidence suggests a positive effect of the free tuition policy on enrollment, especially for the poor, for girls, and for students in the northern region. Table 4.4 shows the attendance rates for girls and boys by quintile of the per capita income for the families of the cohort of 6- to 11-year-old students.

Table 4.4 Attendance rates for girls and boys by quintile of the per capita income for families of 6–11-year-old students (2006 and 2011)

2006	All			Boys			Girls		
	Obs.	*Mean*	*Std. Dev.*	*Obs.*	*Mean*	*Std. Dev.*	*Obs.*	*Mean*	*Std. Dev.*
Q1	4073	0.392	0.488	2210	0.443	0.497	1863	0.332	0.471
Q2	3933	0.515	0.500	2054	0.547	0.498	1879	0.481	0.500
Q3	3756	0.627	0.484	1965	0.650	0.477	1791	0.601	0.490
Q4	3371	0.738	0.440	1721	0.766	0.423	1650	0.709	0.454
Q5	2750	0.837	0.369	1359	0.893	0.309	1391	0.782	0.413
All	*17,883*	*0.602*	*0.489*	*9309*	*0.635*	*0.481*	*8574*	*0.566*	*0.496*
2011	**All**			**Boys**			**Girls**		
	Obs.	*Mean*	*Std. Dev.*	*Obs.*	*Mean*	*Std. Dev.*	*Obs.*	*Mean*	*Std. Dev.*
Q1	5572	0.645	0.479	2983	0.674	0.469	2589	0.611	0.488
Q2	5466	0.695	0.460	2977	0.727	0.446	2489	0.658	0.475
Q3	4989	0.738	0.440	2623	0.756	0.429	2366	0.719	0.450
Q4	4344	0.788	0.409	2236	0.795	0.404	2108	0.781	0.414
Q5	2975	0.818	0.386	1470	0.854	0.353	1505	0.783	0.412
All	*23,346*	*0.725*	*0.446*	*12,289*	*0.748*	*0.434*	*11,057*	*0.700*	*0.458*

Source: Author's construction based on DHS data (2006 and 2011)

The differences between poor and rich have significantly narrowed between 2006 and 2011. This suggests a significant effect of free tuition on the poor. In 2006, attendance in the bottom quintile was only about 39 percent, as compared to 84 percent for the top quintile, a difference of 45 points. By 2011, differences in attendance based on income had narrowed: primary attendance has increased relatively to 65 percent for the bottom quintile, which is significantly closer to 82 percent achieved by the top quintile. Only 17 points separate the bottom and top quintiles.

The catchup has been more visible for girls. The poorest quintile has almost doubled girls' attendance from 33 percent to 61 percent while the richest quintile has only increased girls' attendance from 61 percent to 78 percent.

Table 4.5 shows the changes in attendance by place of residence of the children. As expected, the rural areas have experienced the most increase in the attendance rate following the free tuition policy for the 6- to 11-year-old children, who have been fully exposed to the policy change. The 12- to 18-year-old population has experienced a decrease in enrollment, because most of them are able to enroll early in primary school with this policy, and later age enrollments are on the decline. The northern region, even with some increase in attendance, is still lagging behind the

Table 4.5 School attendance among 6–18-year-old children (2006 and 2011)

	All Benin	*Urban*	*Rural*	*North*	*Center*	*South*
2006						
Children ages 6–11 in primary school (%)	0.602	0.704	0.546	0.483	0.694	0.666
Children ages 12–18 in primary school (%)	0.315	0.272	0.345	0.266	0.304	0.336
2011						
Children ages 6–11 in primary school (%)	0.725	0.779	0.702	0.572	0.823	0.801
Children ages 12–18 in primary school (%)	0.240	0.198	0.261	0.238	0.225	0.238

Source: Author's construction based on DHS data (2006 and 2011)

center and the southern regions, which both attained the 80 percent mark in 2011.

However, the universal primary education goal has not yet been achieved. A possible explanation lies in the importance of the indirect opportunity costs of schooling, in terms of foregone income, which might deter parents from sending their children to school, even with free tuition. To explore this hypothesis further and confirm the descriptive analysis, I estimate a logit model.

The regression results from Table 4.6 suggest that FPE has reduced the income effect on the odds of enrollment in primary school and reduced the incidence of direct and indirect costs of schooling on the odds of enrollment in primary schools.

In 2006, the literacy rate has a positive impact while family size and the proportion of private schools in the municipality have a strong negative impact on the odds of enrolling children in primary education. The proportion of private schools here is used to capture the extent of the direct cost of schooling. However, the literacy rate and the share of private schools are not significant in explaining the odds of a child enrolling in primary school in 2010, suggesting that the poverty explanation for the low enrollment rate might be valid in Benin. Yet, family size still negatively affects the odds of enrollment.

The indirect costs or opportunity costs of schooling captured here by the proportion of 12- to 14-year-old students are statistically significant. The enrollment data obtained from the Ministry of Education in Benin include 16 percent of municipalities in 2006 and 33 percent of municipalities

Table 4.6 Determinants of net enrollment rate in Benin (municipal level)

	Odds ratio from ministry education		*Corrected odds ratio*		*Odds ratio from survey*	
	2006	*2010*	*2006*	*2010*	*2006*	*2010*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Literacy rate	2.012*	−0.395	4.032***	2.801***	4.332***	4.309***
	(1.156)	(1.335)	(0.793)	(0.928)	(0.701)	(0.578)
Family size	−0.375**	−0.529***	−0.217**	−0.176	−0.145	−0.27***
	(0.141)	(0.171)	(0.0988)	(0.135)	(0.0896)	(0.0767)
Pop. aged 12–14	−1.222**	−1.653***	−1.667***	−2.95***	−0.876***	−0.97***
	(0.487)	(0.536)	(0.362)	(0.435)	(0.323)	(0.261)
Share private schools	−2.763**	−0.282	−2.606***	−0.378	−1.770**	−0.900
	(1.234)	(1.609)	(0.898)	(1.289)	(0.790)	(0.778)
Log # schools	1.310**	1.526**	0.991**	2.620***	−0.723	0.555*
	(0.652)	(0.644)	(0.494)	(0.493)	(0.436)	(0.316)
Log pop. density	−0.0829	−0.00684	0.206**	0.142	0.154**	0.0523
	(0.117)	(0.144)	(0.0809)	(0.105)	(0.0729)	(0.0646)
Log community teachers	0.267	0.127	0.101	−0.0137	0.921***	0.140
	(0.448)	(0.188)	(0.345)	(0.140)	(0.302)	(0.0913)
Intercept	7.412***	11.99***	9.760***	15.08***	6.492***	6.640***
	(2.528)	(2.555)	(1.914)	(2.068)	(1.699)	(1.290)
N	65	52	75	67	77	77
R^2	0.467	0.473	0.626	0.630	0.626	0.726

Source: Author's construction

Note: Standard errors in parentheses. The unit of observation is the municipality. Columns 1 and 2 are the enrollment rate from the Ministry of Education, dropping rates that are higher than 100%. Columns 3 and 4 are corrected rates, based on enrollments and population projects. Columns 5 and 6 use the enrollment rates estimated by the Statistical Bureau INSAE, based on Household Surveys in primary school. For Columns 2, the sample is limited to 6–11-year-olds, the official school-age range for primary school. Column 3 uses the sample of 12–18-year-olds (late enrollment)

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

in 2009, with a net enrollment rate abnormally greater than 1 (Ministere de l'Education Nationale 2009). To account for this problem, I explore alternative measures of enrollment: the corrected enrollment rate and the enrollment rate from the surveys. Using those two alternative measures has changed the conclusions regarding the literacy rate. The literacy rate is now significant in both years. However, the influence of the literacy rate on enrollment probability was smaller in 2010 than in 2006.

The individual-level analysis in Table 4.7 is consistent with the conclusions from the municipal-level regression. The conclusions about the share of private schools remain similar as it affects significantly the odds of enrollment in 2006, but not in 2010. The literacy rate remains an important determinant of the odds of enrolling in primary education.

The significant reduction of the influence of family background (education, female head of household), direct costs of schooling, and being a male child on the probability of enrollment suggests that the abolition of primary school tuition has attenuated the inequality of access to primary schools for the poor, the girls, and the children from the northern region of the country.

A Prevalent Inequality of Student Performance

With respect to student performance, there may be a trade-off between broad access and quality improvements. To evaluate this possibility, I analyzed the national exit exam (CEP) data across municipalities. The data lacks any measure of student abilities. To control for students' backgrounds, I use the initial level of the dependent variable in 2005 and the percentage of males in the municipality.

For the school environment, the controls include the student–teacher ratio and the percentage of qualified teachers. In the case of Benin, a qualified primary school teacher is any holder of a diploma from a school of education or a school known for training teachers. Additional variables that describe school facilities are the numbers of potential seats, the number of seated students, the importance of private schools, and the percentage change in the enrollment rate, which measures the intensity of the policy on the municipality between 2006 and 2010–2011.

The variables representing parental education, income, and family size are also controlled for in the model. I have also included regional dummy variables to control for geographical disparities (north, center, and south).

In terms of quality, Table 4.8 shows that increased enrollment has only a limited effect on student's performance. The 2010 dummy variable is

Table 4.7 Determinants of child enrollment in primary school (individual level)

	The dependent variable is child enrollment status in primary school					
	Full sample		*6–11 year-olds*		*12–18 years-olds*	
	(1)		*(2)*		*(3)*	
Male child	0.346***	(0.0262)	0.339***	(0.0324)	0.345***	(0.0405)
Log household per capita expenditure	0.122***	(0.0222)	0.0678**	(0.0277)	0.165***	(0.0326)
Female head of household	0.363***	(0.0369)	0.551***	(0.0470)	0.095*	(0.0524)
Child in farm or household production	0.181***	(0.0278)	0.143***	(0.0338)	0.321***	(0.0447)
Education attainment head of household	0.0824***	(0.0036)	0.170***	(0.0054)	−0.041***	(0.00494)
Age 10–14 dummy	−0.071***	(0.0264)	0.505***	(0.0367)	1.796***	(0.0441)
Male*2011	−0.156***	(0.0355)	−0.0582	(0.0443)	−0.33***	(0.0557)
Log household per capita expenditure*2011	−0.0314	(0.0316)	0.216***	(0.0404)	−0.45***	(0.0478)
Female head of household*2011	0.0287	(0.0498)	0.0795	(0.0654)	−0.0459	(0.0718)
Child in farm or household production*2011	−0.521	(0.665)	−0.537	(0.826)		
Education attainment head of household*2011	−0.043***	(0.0051)	−0.060***	(0.0077)	−0.0093	(0.00754)
Age 10–14 dummy*2011	−0.859***	(0.0359)	−0.777***	(0.0488)	0.291***	(0.0629)
2011 dummy	−0.148	(0.270)	−2.443***	(0.354)	3.072***	(0.424)
Constant	−0.140***	(0.0375)	−0.356***	(0.0450)	−2.06***	(0.0652)
N	56,655		40,485		31,742	
R^2 pseudo	0.0386		0.0665		0.1493	
Log-likelihood	−36567.7		−23970.5		−15835.6	

Source: Author's construction

Note: Standard errors in parentheses. The unit of observation is the child enrollment status. For Column 1, the sample includes children of all ages in primary school. For Column 2, the sample is limited to 6–11-year-old children, the official school-age range for primary school. Column 3 uses the sample of 12–18-year-olds (late enrollment)

*Significant at the 10% level

**Significant at the 5% level

***Significant at the 1% level

Table 4.8 Effects of FPE on municipality CEP passing rate

	The dependent variable is log-odds of CEP passing rate			
	Full sample		*Top 50% in 2005*	
	(1)	*(2)*	*(3)*	*(4)*
Initial log-odds of CEP Pass rate (2005)	0.244** (0.115)	0.214* (0.110)	0.303 (0.274)	0.353 (0.265)
2010 dummy (policy)	−1.053 (0.997)		−0.897 (1.847)	
Initial log-odd CEP * 2010 dummy	0.0432 (0.162)		0.00586 (0.378)	
Student-to-teacher Ratio	−0.0500*** (0.0143)	−0.0487*** (0.0131)	−0.0454** (0.0207)	−0.0370* (0.0188)
Student-to-teacher Ratio * 2010 dummy	0.00444 (0.0175)		0.000882 (0.0246)	
Intensity of policy		−3.635* (1.973)		−2.233 (4.251)
Initial log-odd CEP * Intensity of policy		0.109 (0.307)		−0.144 (0.893)
Student-to-teacher Ratio * intensity		0.0395 (0.0353)		0.0219 (0.0537)
Constant term	2.971*** (0.772)	2.909*** (0.723)	2.607* (1.500)	1.949 (1.363)
N	154	154	78	78
R^2	0.434	0.398	0.434	0.361

Source: Author's construction

Note: Standard errors in parentheses. The unit of observations is the municipality. Columns 1 and 3 use year 2010 as the policy variable, while columns 2 and 4 use the policy intensity measure (percentage change in municipality enrollments) as the policy variable

*Significant at the 10% level

**Significant at the 5% level

***Significant at the 1% level

significant, suggesting a general decreasing trend of student performance. However, when using the intensity variable, the effect of the policy is not significant when additional controls are included. Another interesting result is that when the sample is limited to the municipalities that were performing above the median in 2005, the effect of FPE on enrollment becomes nonsignificant, suggesting that FPE does not have a deteriorating effect on the quality of learning in municipalities that were top performers (top 50 percent) in 2005. If making schooling more affordable and available can close the education disparities without negatively

Table 4.9 Effects of FPE on determinants of municipality CEP passing rate

	The dependent variable is log-odds of CEP passing rate, using alternative policy variables	
	Year 2010 dummy	*FPE intensity*
Initial log-odds of CEP pass rate (2005)	0.270***	0.229***
Policy variable	−9.422*	−12.73
Student-to-teacher ratio	−0.0642***	−0.0548***
Student-to-teacher ratio * FPE variable	0.0499***	0.118***
Qualified teachers (%)	−0.773*	−0.742*
Qualified teachers * FPE (%)	0.621	−1.296
Male proportion	13.16**	14.41**
Male proportion * FPE	−7.588	−28.96
Log of per capita expenditure	−0.606***	−0.438**
Log of per capita expenditure * FPE	0.893***	1.552**
Northern region dummy	−0.342*	−0.366**
Northern region * FPE	−0.773***	−0.877
Constant	4.003	0.997
N	154	154
R^2	0.629	0.580

Source: Author's construction

Notes: The unit of observations is the municipality. Column 1 uses year 2010 as the policy variable, while column 2 uses the policy intensity measure (percentage change in municipality enrollments) as the policy variable

*Significant at the 10% level

**Significant at the 5% level

***Significant at the 1% level

affecting quality, Benin's experience in promoting human capital may have important policy implications for other developing countries. The results suggest that there is welfare improvement, as traditionally disadvantaged groups experience catch-up, becoming better in terms of education access, without making top performers worse in terms of quality.

Table 4.9 shows the determinants of the passing rate. The student–teacher ratio has a significantly negative impact on the passing rate both before and after the policy, suggesting that it is a key variable, along with the family income. The interaction between the per capita expenditure and the FPE variable remains significant.

These results show that the factors that affected quality before the policy change continue to be relevant after the policy was implemented. In particular, student socioeconomic characteristics are still important determinants of student performance. The result suggests that the inequality in

education has moved somewhat from access to quality. In fact, the importance of family background and direct costs of schooling on enrollment has been significantly reduced after the policy. However, student socioeconomic characteristics remain important determinants of student performance on the national primary school exit exam.

Education and Earnings

To understand how education is related to earnings, I first estimate an earnings equation for all the sectors together. Then, I account for selectivity in paid work and endogeneity of education.

Earnings Function Specifications

The baseline model is an ordinary least squares (OLS) empirical specification, in which lny_i is the natural logarithm of the hourly wage. The explanatory variables are years of schooling and other covariates X to control for individual and job characteristics, such as marital status, potential experience, gender, and the employment sector. There is a linear and a quadratic term in potential experience, which is defined as age, less the years of schooling minus six (Mincer 1974).

The OLS results are summarized in Table 4.10. The regression coefficient for education is positive and significant. According to Regression (1) in the table, if an individual with the average years of schooling acquires 1 additional year of education, this will increase his/her hourly wage by 8.7 percent. The dummy for the public sector is also significantly positive, suggesting a positive hourly wage differential of 33 percent, compared to the private sector.

The significantly negative female dummy variable indicates that women's hourly wage is on average 49 percent lower than that of their male counterparts.

Correction for Selectivity into Paid Work

Since individuals may self-select into employment, I account for sample selection by using the Heckman selection procedure. The first stage of the Heckman sample selection model for all sectors together shows a nonsignificant probit model, with the inverse Mill's ratio having a p-value of 40 percent. This suggests that the allocation into the two groups (paid-work

participants vs. nonparticipants) is somewhat random and may not affect earnings when using a pooled population across different sectors of activity. In other words, paid work participation is associated with unobserved characteristics that are not correlated with earnings. It is, therefore, not surprising that the estimates for education and education squared are very close to the OLS results (column 6, Table 4.10).

Endogeneity of Education with Selectivity

To account for any potential endogeneity of education, I re-estimate the equations by using the father's education and the father's work categories as instruments for the individual's education. More specifically, I consider the father's education as a continuous variable, with three dummies for his work status, that is, self-employed, unskilled wage employee, and executive or manager. The joint *F*-test of significance shows that the father's characteristics are significant in the first-stage regression wherein education is regressed on all exogenous variables, suggesting that the exogeneity assumption can be rejected.

Using the predicted education in the selectivity model leaves the estimated returns to education unchanged in the pooled population across sectors. This result is not surprising since the Mills ratio is still nonsignificant for the pooled model. The result is similar to Oyelere (2010), who found no significant differences between OLS and IV estimates of returns to education in Nigeria when necessary controls are included in the wage equation.

Overall, accounting for selectivity and endogeneity of the schooling does not affect significantly the estimated returns to education. The income inequality analysis in the following section is based only on the OLS results.

Analysis of Inequality

With the positive effect of the free primary education policy on enrollment, education attainment will potentially increase, particularly, for traditionally disadvantaged groups (females, poor, rural). Since returns to education are positive in Benin, one would expect a more homogeneous distribution of schooling attainment, which might translate into a more equally distributed wage.

Table 4.10 OLS and Heckman Method

	(1)	(2)	(3)	(4)	(5)	(6)
	Pooled OLS	*Pooled OLS*	*OLS-Public*	*OLS-private*	*First-stage pooled Heckman (positive revenue)*	*Second-stage pooled Heckman*
Education	0.0885***	0.0870***	0.0896***	0.0848***	0.0189***	0.0888***
	(0.0103)	(0.00595)	(0.0148)	(0.00654)	(0.00560)	(0.00601)
Experience	0.0866***	0.0357***	0.0936***	0.0255***	0.0231***	0.0392***
	(0.0141)	(0.00809)	(0.0217)	(0.00873)	(0.00763)	(0.00822)
Experience squared	−0.001***	−0.0005***	−0.002***	−0.0003**	−0.000180	−0.0006***
	(0.000250)	(0.00015)	(0.00042)	(0.00016)	(0.00014)	(0.00015)
Female	−0.558***	−0.492***	−0.143	−0.540***	−0.239***	−0.513***
	(0.0869)	(0.0476)	(0.135)	(0.0509)	(0.0469)	(0.0484)
Married	0.411***	0.136**	0.355**	0.131**	−0.253***	0.154***
	(0.103)	(0.0550)	(0.175)	(0.0579)	(0.0577)	(0.0556)
Public sector		0.331***				0.329***
		(0.0728)				(0.0726)
Dependency ratio					1.639***	3.754***
					(0.0604)	(0.129)
Constant	1.252***	3.928***	3.277***	4.088***	−1.578***	
	(0.182)	(0.110)	(0.325)	(0.120)	(0.107)	
N	3680	2167	292	1875		3733
R^2	0.067	0.212	0.205	0.166		

Source: Author's construction

Note: Standard errors in parentheses. Marital status also included
$*p < 0.10$, $**p < 0.05$, $***p < 0.01$

Measures of Inequality

Using inequality measures with the wage equation estimated earlier, I now turn to simulating the magnitude of future changes. I use two complementary inequality measures: the Gini coefficient and the quantile ratio 90/10.

The 90/10 ratio compares the 90th percentile to the 10th percentile of the income distribution. For example, a 90/10 ratio of 2 suggests that the poorest person of the richest 10 percent of the population earns twice as much as the richest person of the poorest 10 percent. Even though the 90/10 ratio is robust to outliers of the wage distribution, it does not reflect any change in inequality between the 11th and the 89th percentiles.

On the other hand, the Gini coefficient is more sensitive to changes in the middle of the distribution and complements well the analysis of the 90/10 ratio.

The Gini coefficient is given by:

$$Gini = \frac{2}{\mu n^2} \sum_{i=1}^{n} \left(r_i - \frac{n+1}{2} \right) W_i, \tag{4.4}$$

where n is the number of observations, each individual i earning wage W_i. The mean wage is μ, and r_i is the rank of individual i in increasing order of wages.

The Gini coefficient is bounded between 0 and 1, with 0 indicating absolute equality and 1 indicating absolute inequality.

Hypotheses and Scenarios

In order to simulate potential inequality of wages, I first assume that each education level earns the same hourly wage, so that the variation in wage only arises from variation in worked hours. I randomly draw future hours worked from a normal distribution with the empirical mean of 46.5 hours per week and standard deviation of 17.2, calculated from the data.

I consider two scenarios for future changes in educational attainment to simulate changes in wages. In the first scenario, I assume:

- no additional schooling for individuals who have completed at least 18 years of schooling;
- one additional year of schooling for those with 13–17 years of schooling;

- two additional years of schooling for those with 10–13 years of schooling;
- three total years of schooling for those with less than three years of schooling;
- six total years of schooling for those with 3–6 years of schooling.

In the second scenario the assumptions are stronger and are as follows:

- no additional schooling for those who have completed at least 18 years of schooling;
- two additional years of schooling for those with 13–17 years of schooling;
- four additional years of schooling for those with 10–13 years of schooling;
- ten total years of total schooling for those with less than 3 years of schooling;
- six total years of schooling for those with 3–6 years of schooling.

Simulation of Wage Inequality

Changes in Inequality of Wages

I rely on two reference samples: the first one is the 1–2–3 data used to estimate the wage equation itself, while the second one is based on the urban sample of the 2006 DHS.

The simulations results are summarized in Table 4.11. The initial scenarios are obtained by using the observed data on the covariates to predict the wage, using the Mincer equation. The same approach is used to simulate the predicted wages in scenarios 1 and 2. For each scenario, the standard deviation and the Gini coefficient of the educational attainment are calculated to assess the magnitude of the hypothesized changes in years of schooling. From the initial state to scenarios 1 and 2, the assumptions translate into higher education measured as average schooling level and into a more equal distribution of the educational attainment. Both the standard deviation and the Gini coefficient of years of schooling decrease from the initial state to scenarios 1 and 2 for the 1–2–3 survey and the urban sample of the DHS data, both used as reference data.

The 90/10 ratio and the Gini coefficient are also calculated for each scenario. Overall, the hypothesized increased educational attainment leads

Table 4.11 Simulations of inequality of wages assuming constant return to education by educational attainment

	Panel A Using 1–2–3 survey			*Panel B Using Urban DHS*		
	Initial	*Scenario 1*	*Scenario 2*	*Initial*	*Scenario 1*	*Scenario 2*
Average schooling	7.78	9.75	12.22	1.319	4.214	6.729
Std. Dev. of schooling	4.36	4.12	3.64	3.502	3.199	2.471
Gini coefficient of schooling	0.31	0.275	0.16	0.926	0.200	0.100
Average wage	8375.0	9466.9	1437.6	3878.8	4851.5	6021.9
Std. Dev. of wage	6747.8	7117.9	8219.3	2118.7	2556.1	3156.3
Gini coefficient of wage	0.385	0.372	0.367	0.292	0.287	0.286
Std. error of Gini coefficient	0.004	0.004	0.005	0.001	0.001	0.001
10th percentile wage	2692.9	3099.3	3736.2	1615.8	2048.7	2543.1
90th percentile wage	16,210.0	18,189.0	22,187.0	6647.7	8314.7	10,346.4
90–10 ratio wage	6.024	5.873	5.944	4.115	4.059	4.069

Source: Author's construction

Note: The simulations of inequality analysis use the scenario of future changes in educational attainment to evaluate the impact of the policy on wage inequality. Panel A is based on the 2002 data from the 1–2–3 survey as reference and Panel B is based on the 2006 DHS data. Scenario 2 assumes a larger equalization of education distribution

to higher average wages and to a decreasing standard deviation in both scenarios.

Using the 1–2–3 sample as a reference, the Gini coefficient decreased from 0.385 in the initial state to 0.372 in scenario 1 and to 0.367 in scenario 2, suggesting only a small decrease in inequality. The trend is not monotonic with the 90/10 ratio, which has changed from 6.024 to 5.873 and to 5.944. The more erratic evolution of the 90/10 ratio suggests some changes in the tails of the wage distribution over time. These results are consistent with changes recently published by the National Institute of Statistics in Benin, which documented a Gini coefficient of consumption expenditures changing only marginally from 0.472 in 2007 to 0.469 in 2011 (INSAE 2012).

With the 2006 DHS data, the Gini coefficient shows a similar decrease with 0.292 in the initial sample, 0.287 in scenario 1, and 0.286 in scenario 2. Similar to the 1–2–3 data, the 90/10 ratio shows some changes in the tails of the distribution, with the ratio moving from an initial 4.115 to 4.059 in scenario 1 and 4.069 in scenario 2.

Sensitivity Analysis

While the assumption of a constant predicted wage by educational attainment is a good starting point, it tends to underestimate the magnitude of the potential inequality. As a sensitivity analysis, I introduce more noise in the model by drawing a random error from a normal model, which is added to the predicted hourly wage to allow heterogeneity of wages within educational attainment levels. The results are summarized in Table 4.12.

As expected, the magnitude of the inequality measure across scenarios increased compared to results from Table 4.11. However, the trend remains similar to the results obtained by assuming constant wage by educational attainment for both the Gini coefficient and the 90/10 ratio. Together, these results suggest that the dynamics of the change in inequality over time are not sensitive to adding more variation to the relationship between wages and years of schooling.

Table 4.12 Simulations of inequality of wages assuming variable return to education by education attainment

	Panel A Using 1–2–3 survey			*Panel B Using Urban DHS*		
	Initial	*Scenario 1*	*Scenario 2*	*Initial*	*Scenario 1*	*Scenario 2*
Average schooling	7.782	9.754	12.215	1.319	4.214	6.729
Std. dev. of schooling	4.364	4.122	3.637	3.502	3.199	2.471
Gini coefficient of schooling	0.310	0.275	0.161	0.926	0.200	0.100
Average wage	14,795.1	16,720.1	20,176.2	6870.3	6993.1	8670.9
Std. dev. of wage	29,439.7	32,280.9	38,102.3	11,984.0	12,561.2	15,505.3
Gini coefficient of wage	0.636	0.631	0.628	0.605	0.613	0.611
Std. error of Gini coefficient	0.012	0.012	0.013	0.004	0.003	0.003
10th percentile wage	1201.2	1392.4	1693.1	659.4	635.4	803.3
90th percentile wage	33,761.6	38,298.0	46,377.5	15,718.2	16,046.3	19,871.9
90–10 ratio wage	28.169	27.568	27.482	23.845	25.256	24.742

Source: Author's construction

Note: A random normal error term is added to the predicted log (wage) to allow for heterogenous returns to a given level of education. The simulations of inequality analysis use the scenario of future changes in educational attainment to evaluate the impact of the policy on wage inequality. Panel A is based on the 2002 data from the 1–2–3 survey as reference and Panel B is based on the 2006 DHS data. Scenario 2 assumes a larger equalization of education distribution

Simulating General Equilibrium Effects

With the increase in the number of workers with higher educational attainment, I assume alternative percentages of decrease in the return to one additional year of schooling. In practice, this hypothesis translates into a decrease of the coefficient on the schooling variable in the Mincerian wage equation by 5 percent, 10 percent, or 20 percent. I use these numbers to simulate the impact of these general equilibrium effects on the inequality analysis of wages.

In the first case considered, the return to education decreases by 5 percent in scenario 1, corresponding to a modest increase in educational attainment and by 10 percent in scenario 2, when the change in educational attainment is more important. In the second case, I use a decrease of 10 percent in scenario 1 and 20 percent in scenario 2, respectively.

The results summarized in Tables 4.13 and 4.14 suggest that as educational attainment increases by 25 percent, the inequality of wages decreases more significantly from the initial state to scenario 1 and to scenario 2. For example, when using the 1–2–3 dataset as a baseline, the Gini coefficient decreases by about two percentage points from 0.385 to 0.366 and to 0.347. When the decrease in scenario 2 is limited to only 10 percent, the Gini coefficient decreases less to 0.357, compared to 0.347 for the 20 percent decrease. These conclusions suggest that the wage inequality seems to decline more notably, as the importance of education for wages becomes less significant, than other determinants when education opportunities are more available. In terms of magnitude, these changes are limited. In comparison, data available from the World Development Indicators between 2005 and 2014 suggest that the average Gini coefficient in sub-Saharan African countries is 0.442, with a standard deviation of 0.09, which is much larger than the 0.01–0.02 reduction in wage inequality seen in the simulations.

Given the mobility of educated workers within the country, it is reasonable to assume that the average effect of education on wages is the same throughout the country in urban areas. As education becomes more affordable, general equilibrium effects may reduce the scope by which workers living in urban areas gain from their education, reducing the inequality of wages.

Conclusion

In 2006, Benin implemented a free primary education (FPE) policy by eliminating fees paid by parents in all public schools. The analyses of municipal and household-level data suggest a positive effect of the policy

Table 4.13 Simulations of inequality of wages, assuming a general equilibrium decrease of the average return to education (10% and 20%)

	Panel A Using 1–2–3 survey			*Panel B Using Urban DHS*		
	Initial	*Scenario 1 (5% decrease)*	*Scenario 2 (20% decrease)*	*Initial*	*Scenario 1 (5% decrease)*	*Scenario 2 (20% decrease)*
Average schooling	7.782	9.754	12.215	1.319	4.214	6.729
Std. dev. of schooling	4.364	4.122	3.637	3.502	3.199	2.471
Gini coefficient of schooling	0.310	0.275	0.161	0.926	0.200	0.100
Average wage	8375.0	8987.0	8973.5	3878.8	4748.8	5324.6
Std. dev. of wage	6747.8	6599.2	6004.1	2118.7	2472.6	2738.9
Gini coefficient of wage	0.385	0.366	0.347	0.292	0.284	0.282
Std. error of Gini coefficient	0.004	0.004	0.005	0.001	0.001	0.001
10th percentile wage	2692.9	3004.6	3134.2	1615.8	2016.6	2273.4
90th percentile wage	16,210.0	17,112.0	16,879.3	6647.7	8108.9	9078.6
90–10 ratio wage	6.024	5.699	5.391	4.115	4.021	3.994

Source: Author's construction

Note: I assume that general equilibrium effects lead to a decrease in returns to education by 5% in scenario 1 and 20% in scenario 2, assuming constant return for each education level. The simulations of inequality analysis uses the scenario of future changes in educational attainment to evaluate the impact of the policy on wage inequality. Panel A is based on the 2002 data from the 1–2–3 survey as reference, and Panel B is based on the 2006 DHS data. Scenario 2 assumes a larger equalization of education distribution

on enrollment, especially for the poor, the girls, and in the northern region. However, the country is still a long way from its goal of universal primary education. There is some evidence that opportunity costs of schooling, in terms of foregone income, could continue to deter parents from sending their children to school, even with the FPE policy. I also found that the policy significantly reduced the influence of parental income and literacy on the probability of enrollment between 2006 and 2011, lending support to the poverty explanation of non-enrollment. However, parental literacy and income still determine student performance, as measured by the CEP passing rate.

Table 4.14 Simulations of inequality of wages, assuming a general equilibrium decrease of the average return to education (5% and 10%)

	Panel A Using 1–2–3 survey			*Panel B Using Urban DHS*		
	Initial	*Scenario 1 (5% decrease)*	*Scenario 2 (10% decrease)*	*Initial*	*Scenario 1 (5% decrease)*	*Scenario 2 (10% decrease)*
Average schooling	7.782	9.754	12.215	1.319	4.214	6.729
Std. dev. of schooling	4.364	4.122	3.637	3.502	3.199	2.471
Gini coefficient of schooling	0.310	0.275	0.161	0.926	0.200	0.100
Average wage	8375.02	8986.96	10,123.42	3878.80	4748.82	5655.34
Std. dev. of wage	6747.77	6599.16	7018.17	2118.74	2472.60	2924.50
Gini coefficient of wage	0.385	0.366	0.357	0.292	0.284	0.283
Std. error of Gini coefficient	0.004	0.004	0.005	0.001	0.001	0.001
10th percentile wage	2692.92	3004.61	3423.24	1615.76	2016.64	2405.09
90th percentile wage	16,210.04	17,111.95	19,337.33	6647.72	8108.87	9668.43
90–10 ratio wage	6.024	5.70	5.65	4.115	4.02	4.02

Source: Author's construction

Note: I assume that general equilibrium effects lead to a decrease in returns to education by 5% in scenario 1 and 10% in scenario 2, assuming constant return for each education level. The simulations of inequality analysis uses the scenario of future changes in educational attainment to evaluate the impact of the policy on wage inequality. Panel A is based on the 2002 data from the 1–2–3 survey as reference, and Panel B is based on the 2006 DHS data. Scenario 2 assumes a larger equalization of education distribution

While the importance of family background on enrollment has been significantly reduced after the policy, socioeconomic characteristics remain important determinants of student performance. Hence, the inequality of access decreases, but the inequality in student performance across socioeconomic characteristics remains significant.

The increased educational attainment leads to higher average wages and to a decreasing dispersion across individuals. However, as the inequality of the distribution of schooling gets smaller, the simulated inequality of

wages displays only a very limited change after the free primary education policy. This stability in inequality may be due to smaller returns to primary education or to high negotiation power of union workers, a situation that may weaken the relationship between wages and educational attainment. As more schooling opportunities become available, more workers may be able to earn more years of schooling, and general equilibrium effects may decrease returns to education. The simulations of these possible effects translate into a slightly higher reduction of the inequality of wages.

Overall, the policy reduced inequality in years of schooling, potentially increasing average wage, with no worsening of the inequality of wages, suggesting some welfare improvement that may have important policy implications for Benin and other developing countries.

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