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Education and Women in the Informal Sector: A Cross-Country Analysis

Abstract

This study investigates the effects of education on the participation of women in the informal sector of 40 developing countries using OLS linear regression. Through some econometric adjustments, the final model suggests that education, represented by years of schooling, is correlated with a 2.74% increase in women's chances of being employed in this sub-sector of the economy. This means that the better educated still end up doing the jobs that do not require such knowledge. An implication of the result is that the current way which schooling is delivered to the poor might not be the most efficient way.

Keywords

women, informal sector, education

I. Introduction

The purpose of this research is to examine the impacts of education on female participation in the informal sector across countries. It has been shown that education has a positive effect on women's share in the overall economy. However, in the informal sector where problems such as long hours of work and employment insecurities are prevalent, it is intuitive to think that the rise of education level might actually lead to a decline in the participation of women. Possible explanations could be that as they become qualified for more skilled jobs, women start to shift towards the formal sector for more secured and better paid positions. Or that educated women are able to make a selective decision whether or not to enter the informal market, even if they cannot find jobs in the formal side. Nobel laureate Amartya Sen once said: "[Education] can add to the value of production in the economy and also to the income of the person who has been educated. But even with the same level of income, a person may benefit from education – in reading, communicating, arguing, in being able to choose in a more informed way, in being taken more seriously by others and so on" (1999, p. 294). The study will utilize empirical analysis to evaluate such phenomenon, with regards to the contexts of 40 countries' economies and societies.

Informal employment in general and the informal sector in particular account for a large part of many developing economies. Activities categorized as informal occur, most of the time, spontaneously and on a seemingly subsistence level. There are no taxes imposed on these types of employment and the monetary value of the goods and services that they generate are not counted towards a nation's official economic output such as GDP. However, in reality, the informal sector constitutes a great proportion of developing countries' economies when compared to other types of institutional sectors.

Investments in human capital, especially for women, have been proven to generate substantial returns to employment in the economy as a whole. Yet the universality of this finding across sub-

sections of the market like the informal sector is yet to be officially recognized. Only when such causality is confirmed could there be more in-depth analyses on the efficacy of current education expenditures as well as suggestions for future adaptation. It is this intention that motivates the study, of which the goal is to investigate the correlation that holds for a broad pool of countries, ranging from Latin America, Asia to Africa so as to come up with a consistent solution for the informal sector on a global scale.

Often studies on the phenomenon focus on a singular country or a specific group of women. This research hopes to expand the finding to a more general level to see whether the relationship found in some countries is commonplace internationally or if it is only characteristic to some regions. The paper will utilize aggregate level data, rather than individual data unlike previous studies. Additionally, an ordinary least squares model will be used rather than the logit model as previous studies have carried out. The remainder of the paper includes the literature review, data description and methodology, the regression results, analysis and the conclusion. Tables and Figures can be found in the Appendix at the end of the paper.

I. Literature Review

Cling et al. (2011) defined informal sector as “all private unincorporated enterprises that produce at least some of their goods and services for sale or barter, are not registered (no business license) and are engaged in non-agricultural activities.” All employment taken place in the informal sector is regarded as informal employment, which is the type of employment that has no social insurance. Given the histories and subsistence cultures of developing countries, informal employment has been embedded in the minds of the people there. In addition, as the Lewis two-sector model (Todaro, 2012, pp. 115-118) describes, many developing economies nowadays are experiencing the transition from agriculture to industrialization. Often the poor and less educated

encounter difficulties in catching up with such movement and cannot meet the qualifications of the industry. On the other hand, informal jobs not only require knowledge at low level but also offer flexibility in terms of time and commitment. Evidence shows that the informal sector has become a major source of employment for the labor market in developing countries. Results from the Labor Force Survey (LFS) 2007 revealed that 82% of employment in Vietnam was in the form of informal employment. In 2000, the informal sector accounted for 70% of the total employment in Kenya (Atieno 2006).

Statistics have shown that women's participation in the sector is substantial. As Cling et al. (2011) calculated, women's share of Vietnam's informal sector was 48.7% in 2007, only second to that of their agricultural sector with 51.6%. In 2006, 71.2% of workers in the Turkish informal sector were female (Öksüzler et al. 2006). Data for countries such as Benin, Mali and Guinea were even higher with 97%, 96% and 84% respectively. Nevertheless, the numbers dropped significantly for predominantly Islamic places such as Tunisia, Kaduna and Nigeria with only 28% due to the practice of *purdah*, which restricted women to appear in public (Xaba et al. 2002). Leach (1996) argued that in many developing countries, women who did not participate in agricultural subsistence activities would find themselves, most of the time, carrying out some form of informal employment. She characterized the jobs as self-employed, casually or seasonally paid, often unskilled and physically demanding, with low productivity and offering barely any opportunities to improve skills and move upward. Studies such as Wilson (1998), Chen (2001), Chen et al. (2002) found that female workers in the sector could be categorized into home-based workers, street vendors, garbage pickers and brick makers and most of them received scant attention from the public.

Several studies have addressed the contribution of the sector towards the economy and its gender differentials in employment, yet factors that contributed to the decision of women to

participate have not been extensively explained by empirical works. Bigsten and Horton (1997) attributed the limits in labor market studies to the lack of household survey data. Among the factors that determine the involvement of women, there are traditional components such as access to credit, factors of production, information technology, training, and changes in the political and institutional systems (ILO 1995). World Bank (1995) and Addison (1993) added that labor market conditions such as income also played a role. Moreover, the dualism characteristics of the labor markets, the limited capacity of the formal sector, and working experience showed significant impacts as well (Lanot & Muller 1997; Kevane & Wydick 2001; Makonnen 1993).

Education is widely believed to be one key factor that affects women's involvement in the sector. Öksüzler et al. (2006) suggested that women who obtained post-elementary education were more likely to join the home-based artisan works instead of working in farms because they wanted to develop their skills in artisan production. Hill (1983) observed the same pattern in Japanese women in that they preferred being family workers to employees as they completed more years of schooling. Wambugu (2002) concluded that completing primary education increased the likelihood of women entering the sector, based on the data in Kenya in 1994. Using the Kenyan 1997 data set, Atieno (2006) also found a positive relationship between the two variables, with a roughly 3% increase in the female participation in the sector per 1 year increase in schooling. Yet he did not find any significant statistics when estimating the marginal effects of education. This led him to the justification that participation in the informal sector is a residual outcome of other sectors and not the direct outcome of the explanatory variables including education. In contrast, Pierre (2013) analyzed the economy of Cameroon and concluded that the probability of entering the informal sector declined as education level increased though he did

find a substantial increase of 33% in income of workers who finished secondary school. It is worthy to note that his sample is gender-blind, which can potentially lead to the difference.

Leach (1996) adds to the discussion by arguing that education is the way for women to redeem self-esteem, equalize social status and generate sustainable income. In assessing the goal of educating women which is to prepare them for employment and compete with men in other economic sectors, Leach found failures in both formal and non-formal types of education. Women were not equipped with enough skills to attain and secure well-paid jobs; as a result, they ended up coming back to the subsistence activities of the informal sector.

II. Data

A. Data Description and Expected Signs of Coefficients

- F_Informal: Women employed in the informal sector (as % of non-agricultural employment)

This is the dependent variable. Data is part of activities undertaken jointly by the ILO (International Labor Organization) and WEIGO (Women in Informal Employment: Globalizing and Organizing). Non-agricultural employment excludes employment in agriculture, hunting, forestry and fishing activities.

- Edu: Mean years of schooling of population ages 25 and above (years)

Education is the main independent variable in consideration. Data is obtained from the *Educational Attainment Query* of World Bank. Given the objective of this study, Edu is expected to have a negative sign when regressed against percent of women in the informal sector.

- Age: Total population ages 15-64 (% total)

This data is gathered by the World Bank. The age structure of the population determines the participation of women in economic activities. As Maglad (1998) described the Sudan economy, when not taking the number of children into account, it seemed to be likely that women of

younger age would participate in the market more than those of older age would. Moreover, child labor is not an uncommon practice in developing countries (Basu 1999). Atieno (2006) argued that a young population imposed more pressure on the working group, implying a high dependency ratio. A small number of working adults plus a large number of dependents required women to participate in the labor force in order to maintain the well-being of families. As a result, Age is expected to have a positive sign.

- Marital Status: Percent Distribution of Female Ages 25-29 Currently Married (% total)

Measures are part of the *World Marriage Data 2012* collected by the United Nations.

Maloney (1987) stated that the labor supply of wives had a positive response to their husbands' underemployment. On the other hand, when examining female participation within the informal sector of developing and developed countries, Hill (1983) concluded that the probability that a wife decided to work was negatively affected by her husband's income. Furthermore, married women often endure child-rearing responsibilities, which could influence their decision to join the labor force. Ribar (1992) argued that a high market child care cost could potentially reduce women's labor supply for they would rather take care of their children on their own than spend all their income from work on child care. It is noteworthy that the informal sector is characterized by low skill jobs which do not impose high opportunity costs on mothers. As women can carry their children along while working, child care seems not to be a hindrance for working decision in this sector. Disparities in religions (Lehrer 2002) and cultures (Reimers 1985) across nations and among ethnic groups of a country could also contribute to the propensity to join the labor supply of women. Hence, the sign of this variable is undetermined at the moment.

- Dependency: Age dependency ratio (% of working-age population)

Data is found on the World Bank website. Age dependency ratio is the ratio of people aged 15 or younger and 64 or older who are dependents of those aged 15-64. The responsibility to take care of their dependents has been embedded in the minds of women in most developing countries. Banerjee and Duflo (2011, p. 125) state that women tend to spend a higher percent of their earnings on food for the household than men do. It is therefore reasonable to consider dependency an impetus for women to join the market, which leads to a positive sign of Dependency in the regression.

- F_Formal: Share of women in the formal non-agricultural sector (% of non-agricultural employment)

This data is from the same source as that of F_Informal. Employment in the formal sector is in a direct relationship with employment in the informal sector. Chen (2005) described the structuralists' view on the formal economy and informal employment as being inherently interconnected. Firms that want to reduce their costs of production tend to decrease their labor input costs by shifting to informal employment relationships with laborers. The promotion of informal employment among firms creates a positive causality between the two sectors. Kevane and Wydick (2001) added that the increase in women in the informal sector was due to the selective entrance of the formal sector. Thus, a rise in female labor supply for formal employment means that the competition in that sector is fiercer, causing a speedy elimination of even ones that are slightly under-qualified and more women end up staying in the informal side.

- Fertility: Births per woman (Number of children)

The World Bank collected these statistics. Nobel laureate Garry Becker reasoned in his *Microeconomic theory of fertility* that the demand for children remained low if the net price of

children was expensive (Todaro, 2012, pp.285-290). In other words, if parents decide to have few children, it can be that they cannot afford costs such as health care and education for the children or that the mother has high opportunity costs of time because she has to work. Findings of Hotz and Miller (1988) were in agreement with Becker's model, stating that greater child care costs, which was often for younger children, lowered the mother's labor supply. In contradiction to Becker, Fleisher and Rhodes. Jr (1979) found a negligible relationship between two variables. Cain and Dooley (1976) also had the same conclusion, attributing to the multicollinearity between age and fertility. In this paper, if it is determined later that there exists such collinearity, either of the variables could be dropped depending on their statistical significances.

- Household: Average household sizes (persons)

Data is collected from a number of sources including the East African Community and the 2010 Census [INDEC] of Argentina (other sources can be found in the References). Similar to the arguments made on the dependency ratio, sizes of household should affect the independent variable positively.

- M_earn: Mean nominal monthly earnings of males (local currency)

Data is found on the ILO website. Maglad (1998) showed that spouses' wages affected women's participation in the market unfavorably. As men earn more, they can maintain both households' necessities as well as their current power imposed on women. Thus, women find it either unnecessary or difficult to go to work.

- F_earn: Mean nominal monthly earnings of females (local currency)

Data is found on the ILO website. Maglad (1998), and World Bank (1995) both showed the positive impact of women's own income on their decision to join the labor force. Perhaps, once

they start to be able to earn income and provide necessities for families, women also have more saying which allows them to work as they prefer.

- F_lfpr: Female labor force participation rate (% of female population ages 15+)

The statistics are found on the World Bank web page. It is clear that as more women participate in the labor force, the share of them in all sectors of the economy including the informal sector will increase.

- Headship: % of households with a female head

Head of household is another indicator of the decision to join the labor force of women. The person who is in charge has the authority over the entire family and is identified as the provider of basic needs such as food and shelter. Women who are head of household are more likely to work than the ones who are not (Maglad 1998). The World Bank gathered some data for this variable but unfortunately, there is a scarcity in its availability. Further analysis might imply a drop for significant purposes.

- F_Edu: Mean years of schooling of women ages 25 and above (years)

These statistics are collected by the World Bank. The mean years of schooling of women are a better indication of education than those of the entire population. Yet the data pool is too scattered to use for regression. Further analysis might imply a drop for the purposes of significance.

B. Summary Statistics

Below is a descriptive summary of the variables used in this paper. The average percentage of women in the informal sector of the countries in the sample is about 39%. Women

in general receive 7.4 years of schooling in this sample. About 62% of the population is between 15-64 years old which indicates a quite large working population. However, the mean dependency ratio is about 62%, meaning that 62 out of every 63 people are dependents. Women's participation in the formal sector is less than that of the informal sector by about 6% on average. And a typical family in this sample has about 4 members.

Variable	Obs	Mean	Std. Dev.	Min	Max
F_Informal	43	39.09	13.01	9.7	66.2
Edu	43	7.44	1.99	3.9	11.7
Age	47	62.29	6.76	49	74
Marital	41	51.59	25.13	13.6	92.4
Dependency	47	62.34	18.34	36	105
F_Formal	36	33.72	8.92	7.8	50.9
Fertility	47	3.00	1.41	1.4	6.8
Household	29	3.92	0.82	2.6	6.54
M_earn	19	222616.7	622616.1	304	2562000
F_earn	19	187832.5	528721.8	247	2175000
F_lfpr	47	55.80	16.25	15	90

A scatter plot of Edu and F_Informal is constructed in Figure 1 in the Appendix.

C. Correlation Matrix

The correlation matrix of all independent variables (not presented) shows perfect collinearity. This means that some of the explanatory variables are absolutely correlated to one another. Through speculation, two variables with the least data, F_Edu and Headship were dropped as expected. The resulting correlation matrix (Table 1) shows no significant collinearity with the exception of a 0.9957 correlation (absolute term) between Age and Dependency, a 0.8425 correlation between Age and Fertility, a 0.8633 correlation between Fertility and Dependency, and a 0.9999 correlation between M_earn and F_earn. High correlations do not always guarantee collinearity, thus these variables are still kept for the necessity of the model.

III. Methodology

A. Preliminary OLS Regression

A preliminary regression using Linear OLS Regression was used in estimating the data collected. As pointed out in the correlation matrix, three variables that caused perfect collinearity were dropped from the model. As a result, the equation was run as follows:

$$F_Informal = \beta_1 + \beta_2.Edu + \beta_3.Age + \beta_4.Marital + \beta_5. Dependency + \beta_6. F_Formal + \beta_7. Fertility + \beta_8.Household + \beta_9.M_earn + \beta_{10}.F_earn + \beta_{11}.F_lfpr + \varepsilon$$

As shown in Table 2, unlike the initial conjecture, the sign of Edu is positive. It indicates that an increase of 1 year of schooling in the population would lead to a 2.7% increase in the proportion of women in the informal sector of the countries in the sample, *ceteris paribus*. As expected, Age, Dependency, F_Formal, Household, F_earn and F_lfpr all have positive coefficients whereas Fertility and M_earn have negative coefficients. The coefficient of Marital turns out to be negative, implying that all else equal, a 1% increase in the distribution of married women aged 25-29 causes the numbers of women in the informal sector to decline by about 0.3%.

The t-Tests for each coefficient show that every explanatory variable except F_lfpr has statistically significant effect on the dependent variable at 5% level of significance. The F-test against the null hypothesis that all coefficients are 0 leads to a rejection of H_0 , indicating that the independent variables jointly have significant effects on the dependent variable at 1% level. Equivalently, a high R^2 of 0.9915 implies that about 99.15% of the variation of F_Informal is explained by the chosen independent variables in the model. Thus, the t-Tests and F-test show promising results.

B. Specification errors

Illustration of the Ramsey's RESET test can be found in Table 3. Applying the F-test gives $F = 0.465$ which is not statistically significant. The Ramsey test does not detect any omission of variables and/or inappropriate functional form. Other F-tests (not shown) also detect no sign of over-fitting the model. Thus, no variables needed to be dropped from the initial equation.

C. Multi-collinearity and Heteroskedasticity

To address the multicollinearity problem between the following pairs of variables as shown by the correlation matrix: Age - Dependency, Age - Fertility, Fertility - Dependency, M_earn - F_earn, further considerations have been carried out.

- Dropping Age: Adjusted R^2 dropped to 0.8965, signaling the decline in the combined effect of explanatory variables on the dependent variable. The Edu coefficient is only significant at 10% instead of 5% as before.
- Dropping Fertility: Adjusted R^2 decreased to 0.4697, significantly lower than before. All coefficients are only significant at 10%.
- Dropping M_earn: Adjusted R^2 dropped to 0.7325 and the Edu coefficient is also significant at 10%.

Dropping any of these variables would result in a lower goodness-of-fit measure; therefore all are kept for the necessity of the model.

From the residual plot (Figure 2), it is possible that there exists heteroskedasticity. Illustration of the Park test can be found in Table 4. Since the \hat{Y} coefficient is insignificant (p-value > 0.1), it seems that the Park test shows no evidence of heteroskedasticity.

To confirm Park test's result, the White's general heteroskedasticity test is applied as follows.

White's test for H_0 : homoskedasticity

against H_a : unrestricted heteroskedasticity

$\chi^2(2) = 1.63$

Prob > $\chi^2 = 0.4417$

Since the p-value of the computed chi-square is reasonably low (below 0.5), the null hypothesis of homoskedasticity can be rejected. The White's test confirms the existence of heteroskedasticity problem.

Table 5 exhibits the result after adjusting for heteroskedasticity, using the robust command in Stata. As it shows, some standard errors increase while others decrease, implying that the preliminary regression both overestimated and underestimated the coefficients. After controlling for heteroskedasticity, the signs of coefficients are unchanged and the p-value of Edu reduces to 0.013. F_lfpr is now significant at 10% while Age is no longer significant. Other variables are still significant at 5%.

With the adjustments made for the aforementioned problems, it is reasonable to conclude that the model represents a good fit for the question concerned. Based on the results given in Table 5 of the final model, the Edu coefficient is statistically significant at a lower level, indicating a relatively more reliable confidence interval than that of the initial regression.

Table 5: Adjusted OLS Regression
Dependent variable = F_Informal

Variables	Coef.	SE	T	p-value
Edu	2.74	.51	5.30	0.013
Age	9.22	4.44	2.07	0.130
Marital	-.218	.061	-3.56	0.038
Dependency	6.20	1.90	3.25	0.047
F_Formal	1.36	0.13	10.39	0.002
Fertility	-37.53	4.71	-7.96	0.004
Household	18.29	3.61	5.06	0.015
M_earn	-.0005	.0001	- 5.07	0.015
F_earn	.0007	.0001	5.17	0.014
F_lfpr	.21	.089	2.41	0.095
Constant	-956.3	385.7	-2.48	0.089
R ²	0.9915			
F	143.73*			

*: significant at 1%

IV. Summary and Interpretation

This study had the objective of investigating the relationship between education and women's participation in the informal sector. The regression result shows that education, represented by years of schooling, is correlated with women's chances of being employed in this sub-sector of the economy. A possible explanation for the observation can be attributed to the absorptive nature of the informal sector as well as the selective characteristic of the formal sector. When labor shifts from agriculture to manufacturing industries as described by developmental theories such as the Lewis' two-sector model (Todaro, 2012, pp. 115-118), the displaced or under-qualified workers from the agriculture sector who are not selected by the industries enter the informal sector to avoid unemployment. Moreover, the industrial growth has not been keeping pace with the increase in labor supply and so even qualified workers have no possibility of finding formal jobs. Studies such as Arizpe (1977) and Atieno (2006) found that the informal sector served as a bridge in the labor transition process which workers entered not

because of their desire but because they had no other choices. Therefore, even if they receive more education, workers still face the dilemma regardless of their improved abilities. This is not to negate Amartya Sen's assertion quoted in the introduction. Indeed, education allows the poor to make more informed decisions at their will, but perhaps such change only happens after a certain minimum point of education. The mean years of schooling found in this study is only 7.4 years, equivalent to an incomplete secondary training. With that much knowledge, it can be quite difficult for women to get a job in the industry, given its high entrance bar.

The use of years of schooling as an indicator for education is somewhat misleading. Jaeger and Page (1996) state that estimates of diploma effects which were based on individual's years of education were biased because many people did not complete their degrees in the standard number of years. Even if one goes to school for 7 years, there is no guarantee that she knows what a 7th grader is supposed to know. Especially among the poor in developing countries, teacher truancy and quality of schooling are prevalent. Banerjee and Duflo (2011, p. 75) said that about 35% of Indian children in poor families aged 7-14 could not read a simple paragraph for 1st graders. The failures are present in both formal schooling and informal training as Leach (1996) pointed out.

The study acknowledges the possible issue of education endogeneity. It is likely that a person who has a strong innate ability or motivation is eager to absorb more knowledge and try by all means to obtain a job in the modern sector. On the other hand, social rigidity and religious beliefs could restrict what a woman can do beyond her control. Nevertheless, statistics for these problems are difficult to obtain and therefore the coefficients might not be the true estimators. The research also encountered problems with finding data since statistics on the informal sector have not been thoroughly recorded.

Despite the negative relationship found in the analysis, it is still believed that the returns to education in the informal sector are there for women. However, how and how much we should invest in human capital are what matter more. Apparently, current ways of training the poor are not showing beneficial results as many of the better educated still end up doing informal jobs that are enduring, insecure, risky, and low paid. Thus, education policies targeting the poor, especially women, need to be more focused and targeted to allow women the opportunity to move up the ladder.

Appendix

Table 1: Correlation Matrix

	Edu	Age	Marital	Dependency	F_Formal	Fertility	Household	M_earn	F_earn	F_lfpr
Edu	1									
Age	0.38	1								
Marital	-0.30	0.07	1							
Dependency	-0.38	-0.99	-0.04	1						
F_Formal	0.37	0.37	-0.55	-0.40	1					
Fertility	-0.40	-0.84	0.17	0.86	-0.48	1				
Household	-0.53	-0.53	0.63	0.57	-0.79	0.79	1			
M_earn	-0.32	0.52	0.35	-0.53	0.19	-0.36	-0.09	1		
F_earn	-0.33	0.51	0.35	-0.53	0.19	-0.36	-0.08	0.99	1	
F_lfpr	0.25	0.58	0.27	-0.62	0.72	-0.68	-0.73	0.50	0.50	1

Table 2: Preliminary OLS regression results
Dependent variable = F_Informal

Variables	Coef.	SE	t	p-value
Edu	2.74	.71	3.86	0.031
Age	9.2	3.21	2.87	0.064
Marital	-.21	.06	-3.34	0.04
Dependency	6.20	1.42	4.36	0.02
F_Formal	1.36	.18	7.22	0.005
Fertility	-37.53	5.08	-7.39	-53.70
Household	18.29	3.92	4.66	0.019
M_earn	-.0005	.0001	-5.10	.015
F_earn	.0007	.0001	5.18	0.014
F_lfpr	.21	.104	2.05	0.133
Constant	-956.3	280.16	-3.41	-1847.94
R ²	0.9915			
F	35*			

*: significant at 1%

Table 3: Ramsey's RESET test
Dependent Variable = F_Informal

Variables	Coef.	SE	t	p-value
Edu	-1.16	1.02	-1.14	0.37
Age	-3.40	4.00	-0.85	0.48
Marital	-0.05	0.06	-0.77	0.52
Dependency	-1.67	1.88	-0.89	0.46
F_Forma	-0.39	0.32	-1.21	0.34
Fertility	Omitted			
Household	2.64	2.99	0.88	0.47
M_earn	0.0003	0.0002	1.23	0.34
F_earn	-0.0003	0.003	-1.23	0.34
F_lfpr	-0.02	0.01	-0.24	0.83
\hat{Y}	2.61	1.20	2.18	0.16
\hat{Y}^2	-0.01	0.01	-1.35	0.30
Constant	297.33	350.72	0.85	0.48
R^2	0.9956			

Table 4: Park Test

Dependent variable = $\ln e^2$

	Coefficient	SE	t-statistic	p-value
\hat{Y}	.035	.045	0.77	0.456
Constant	-2.38	1.89	-1.26	0.232

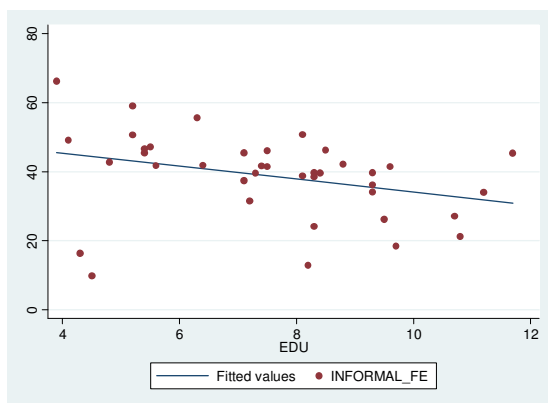


Figure 1: Scatter plot and line of best fit of F_Informal and Edu

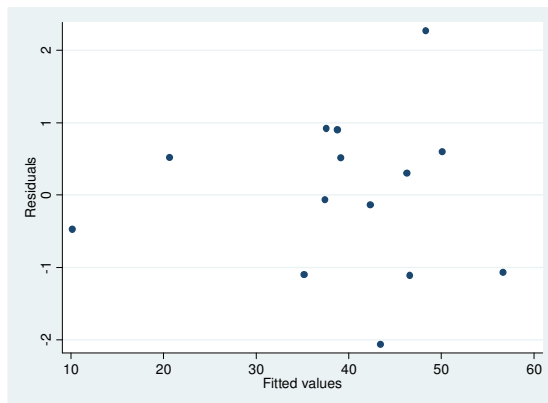


Figure 2: Residual plot

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