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FERTILITY LEVELS IN RELATION TO EDUCATION IN PAKISTAN

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ABSTRACT... The **objective** of this study was to examine the effect of education on fertility levels in Pakistan using data for 4125 females aged 15-49 years from the Pakistan Social and Living Standards Measurement Survey (PSLM) 2007-08 both at the aggregate and disaggregate level. The **methodology** of this study uses Poisson regression, the estimated **results** of which verify that education (measured by the highest class passed) has a negative and statistically significant impact on fertility levels, but this relation does not hold true for all levels of education. While higher secondary and higher education are significant across all specifications in the aggregate analysis, the impact of matriculation on fertility levels is mixed. Although, similar results are obtained from the disaggregate analysis, an interesting **conclusion** is that no level of education comes out to be statistically significant in affecting fertility levels in the provinces of Balochistan and NWFP.

Key words: Fertility, Education, Wealth, Urban

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INTRODUCTION

High population level over the years with low levels of literacy has been a persistent problem in Pakistan. At the time of independence in 1947, Pakistan's population was just touching 33 million with a literacy rate of 15 per cent. Currently Pakistan's population is touching a figure of 160 million, women accumulate to 48 per cent of this population figure. It is estimated that half the adult population is illiterate, including two out of every three women. Apart from education, people living the life below the poverty line is also quite high, as one out of every four people are living below the poverty line. After Nigeria and India, Pakistan ranks third in out-of-school population in the world, in global absentees Pakistan accounts seven per cent. The government estimates of the overall dropout rate suggest that only 30 per cent of students continue beyond the primary level. Of the 6.8 million currently estimated to be out of school in Pakistan, at least 4.2 million are girls.

In late 1980s in a study conducted by Demographic and Health Surveys (DHS) reflected the relationship between fertility and female education, study showed that female who were enrolled and completed primary education tend

to have less children than who are not enrolled. These associations persist despite controlling for other variables. However less of a significant relationship was seen in half of the countries when income, primary education and fertility were controlled. Universally female secondary schooling and fertility also had a negative relationship. The effects of higher secondary schooling (11 years of schooling or more) were 2-4 times larger as compared to those of lower secondary schooling. Husband's education had a negative effect on fertility too; though this effect was weaker than that of wife's education. The DHS data as compared to the earlier World Fertility Surveys of late 1970s shows a greater reduction in fertility due to education.

According to ESCAP (United Nations Economic and Social Commission for Asia and the Pacific) though not as much as other countries, still there has been a persistent decline in fertility levels in Pakistan. According to the statistics of different countries such as India(6.0) and Bangladesh(6.7), which had almost the same fertility levels in 1955, as compared to Pakistan (6.3), in the year 2000 India(3.3) and Bangladesh(3.4) were able to reduce it by half. Till 2005, India reduced

its fertility levels to 3.07, but Pakistan has been able to reduce its fertility levels to 4.27 in 2005; even Bangladesh which had similar fertility levels succeeded in reducing it to 3.25. Hence, considering above statistics and literature reviewed, it can be deduced that fertility is a major problem for Pakistan. According to the statistics of UNICEF (United Nations International Children's Emergency Fund) birth rate has not declined as fast as death rate over the years which might be another reason for high population and fertility levels.

There are several factors which can affect fertility, one of the most important factors discussed in literature is education which influences women's childbearing patterns and will be the focus in this study. Therefore, the study will be done to analyze persistent problem of high fertility rates in Pakistan and how it is affected by education. Education is an important source of investment in human capital and increase in education level of women can help decrease high fertility level of Pakistan through different channels. The hypothesis tested in this study is that education is inversely related to fertility levels.

A theoretical basis for this relationship between education and fertility levels is that education¹:

1. improves mental health which enhances the possibility of contact between women and institutes of public health.
2. improves understanding of the biology of human reproduction which increases the chances for birth control methods
3. attitude towards the birth control methods is likely to change
4. delays the age of marriage which reduces the likelihood of having more children.

Tuman, Ayub and Roth-Johnson employed data from the most recent Demographic and Health Surveys (DHS) in Colombia (2005) and Peru (2000); this study tests the complementary hypothesis about the effects of education on fertility using negative binomial regression. The hypotheses are that education may depress fertility rates for a number of reasons, including: (1)

improved education and mental skills will increase the chances that the incumbent will interact with the institute of public health (2) improved information of the biology of reproduction (which enhances the value of contraceptive use); and (3) modification in approach that raise the probability of using contraceptives. The facet for fertility (dependent variable) takes the number of live children ever born during the respondent's lifetime while the main independent variable is various variables used for the level of education completed by respondents of study and another proxy variable about exact knowledge of the cycle of ovulation. Other control variables include wealth, use of contraceptives, marital or residential status, living children and age¹.

A similar study examined the relationship in 14 Middle Eastern Countries between fertility, education level, women's participation rate in labor market, urbanization, infant mortality and relative cohort size using the panel data and GLS model. Findings suggest that at primary secondary and tertiary level of female education, female labor participation, and urbanization are negatively related to fertility in females. All coefficients are significant except tertiary levels of education. It is implied that regions having traditional values in the society, enhancing female status may change fertility decisions. Furthermore, better facilities of health care may not be sufficient to lower the fertility rate, but family planning at broader level could lower fertility rate. This study also reflects that countries in region of Middle East are still in the transition stage while looking in terms of demographical dynamics and younger generation of particular study region gives higher priority to have children so that the number of children desired overcomes the fierceness of the competitive labor market².

Ayoub explored the economic relationships between women's schooling, fertility rates, and use of contraceptive in Tanzania using the negative binomial equation for fertility and the Logit equation for contraceptive use. The fertility model used in the study indicates that higher education levels are consistently related with

lower fertility rates. Likewise, the contraceptive use model indicates that higher education is positively related with the use of contraceptive. Both models reflect that the relations become stronger as level of education and schooling is increased. The findings indicate that as women's education levels are raised in result an improvement in their economic opportunities, increasing the value of their time and, in turn reducing their desire for large families is seen³.

Boadu examined group of factors that influence fertility behavior in Ghana, while keeping the influence of contraception as an intermediate variable. Study covered the period of 1988 to 1998 and the factors analyzed in the study are age, residence, education, religion and ethnicity. Using multivariate regression analysis and path models, the study examines that among all the factors, age is the only variable that has a moderate effect on fertility. Another important finding is that the positive influence of contraceptive use on fertility in 1988 is reversed in 1998 which is considered as an encouraging happening for the Ghanaian economy⁴.

Study conducted by Kravd analyzed that average educational level in a village or a community of a similar size has a considerable depressing effect on a woman's birth rates, net of urbanization and her own education. Data from 22 countries in sub-Saharan African community is used, discrete-time hazard regression models was applied. Monte Carlo simulations were used which signify that average fertility for these countries would be 1.00 lower if education was enhanced from the current level in the region to the relatively higher level in Kenya. Keeping aggregate education out from the model leaves a response of only 0.52. Including indicators of wealth, economic modernization, religion, and women's status, the effect of average education on first-birth rates is reduced to less than half in size. This finding points that there is a need to consider aggregate education in future assessments of the total impact of education⁵.

Lloyd, Kaufman and Hewett in their article explore the relation of universal primary schooling in sub-

Saharan Africa progress toward the timing of the onset of fertility decline. The paper begins with a argument and extension of Caldwell's hypothesis. His hypothesis was based on appraisal of the experience of industrialized countries associated to the onset of fertility decline and the timing of the arrival of mass schooling. The following evaluation of educational progress was based on the recent household survey data from various sub-Saharan African countries which had taken part in the Demographic and Health Survey Program. Caldwell's original hypothesis about the link between the attainment of mass schooling and the onset of the fertility transition was strongly supported by the empirical result conducted. The paper finds that all countries that have achieved mass schooling also confirms of having entered the fertility transition if contraceptive practice is taken to be more exact marker of that stage of the transition than maybe imperfectly estimated fertility change. The only countries that have begun the transition prior to the achievement of mass schooling were Madagascar and Rwanda⁶.

Martin and Juarez examined the relationship between education and fertility of nine Latin American countries using data from Demographic and Health Surveys (DHS) using regression analysis. According to these surveys women with no education have large family sizes and women with better education have small family sizes. Over the years, women's achievement in education in Latin American countries has increased and fertility differentials by education have narrowed. The inverse relation between education and fertility is analyzed. Number of children ever born is taken as dependent variable and independent variables are women's education, husband's education, knowledge, economic status, attitudes, family formation paths and working paths. According to the regression results, magnitude of women's education coefficient is considerably reduced after controls such as economic status and family formation paths are introduced; however, it still remains significant⁷.

Kravdal stated that a considerable negative effect of aggregate education was found for the use of

contraceptive. There is a weaker desire of fertility among women in districts with many educated women and a high average education, than among women at the same educational level in other districts of same area. Also in this article as well a strong impact of the region has been emphasized⁸.

Axin and Barber studied the relationship between the spread of mass education and fertility limiting behavior. Current theories that relate literacy to fertility limitation are also added to the model, including theories relating women's education to their fertility behavior, those relating the existence of educational opportunity to fertility decline, and theories related to children's education to the fertility behavior of their parents. This paper has used survey data from a sample of 5,271 residents of 171 neighborhoods from the rural areas of Nepal. The empirical strategy used is the event history analysis to the model and discrete-time methods to estimate the model. This study has tested the individual-level mechanisms and linking with the community-level changes in educational opportunity to behavior related with fertility. A woman's immediacy to a school during childhood significantly increases the permanent use of contraceptive in adulthood⁹.

Breierova and Duflo completed the study of a massive school construction program that took place in Indonesia between 1973 and 1978 to measure the effect of education on fertility and child mortality. In this article simple OLS and IV techniques were used. The results on the difference between the effect of male and female education are more nuanced. It has been shown that that education as variable for females is a stronger determinant of age at marriage and early fertility than male education. However, to reduce child mortality female and male education seems equally important factors¹⁰.

Murthi and Dreze analyzed determinants of fertility levels and fertility decline, using panel data on Indian districts for years 1981 and 1991 using panel data regression. The dependent variable studied in this paper is the accumulative fertility at

district-level. The independent variables consist of adult female literacy, adult male literacy, poverty, urbanization, caste, tribe, religion, son preference and regional location. Study concludes that out of various variables education important factor that explains fertility differences across the country and over different periods of time. Decreasing rate of child mortality and preference for having a son are also important factors in reducing fertility among the women. In contrast to these factors, various indicators of modernization and others of development such as urbanization, poverty reduction and male literacy have no significant effect on fertility¹¹.

Mahmood analyzed the reasons for high fertility in Pakistan. The dependent variable is whether women want more children or not. The independent variables included are education, husband's occupation, household income, child education etc. The basic analysis of the desired fertility reveals that a significant minority of currently married women want no more children after four children or more. This article also finds out that there is significant difference between urban and rural women's fertility desires. Fertility rates are higher in rural areas¹².

Hakim discussed different determinants of fertility of Pakistani women. Factors such as age at marriage, education of women, husband's education, working status of women, place (rural/urban) have been used. The dependent variable of the study includes children ever born in the concerned family. The detailed bivariate analysis has been carried out to see differentials in fertility by demographic and socioeconomic variables. It was found in this study that age is the most important variable in explaining the variance in fertility. Additionally, this study also predicts a strong negative relationship between education and fertility¹³.

Sathat, Crook, Callum and Kazi examined that female education, labor force participation, and age at marriage are considered to be imperfect, but workable indicators of women's status in Pakistan. All these indicators are considered

to be significant determinants of fertility in a survey of 1979-80. Age at marriage is related to female education and labor force participation, in urban areas. Furthermore, education of the next generation of mothers is also considered as dependent upon parental education. In urban areas, the discrimination against girls' education reduces as the occupational and educational level of their parents increase. However, these differentials and their implications for future change are covered by the absence of national fertility decline¹⁴.

Study conducted by Siddiqui used recent collective data from more than 100 countries from the epoch of 1955–1985 to measure the fertility model. The results show that the impact of socio-economic factors differs across different age-cohorts. Particularly among the younger age-cohorts, the negative effect of betterment in female status on the fertility rate has found to be increasing. Similarly, the study found that cross-country differences influence fertility rates significantly. However, the differences are found to be decreasing when country under discussion was developed. These results show that differences among the cross-country behavior, but also the changes in age-composition of female population observed should be considered in account in making policies to control fertility and population growth. Also, it is concluded that advancement in female literacy rate turn out to be the most valuable tool to control the growth in population¹⁵.

Subbara explored the function of female secondary education relative to and in other factors as of combination with health and family planning programs and policies that lessen the fertility and infant mortality. The article used a cross-country data from more than 70 developing countries, accounting for over 95% of the population of developing countries observed under study; data was drawn from World Bank and other data sources. The period of research was from 1970 to 1985. The study explored that family planning and programs related to health reforms reduce fertility and infant mortality, and the impact of escalating female secondary school enrollments appears

to be even greater, especially in countries with low female secondary school enrollment. The impact can be multiplied when female education is combined with health and various programs of family planning¹⁶.

Study conducted by Jain regarding the structure of relationship between fertility and female education, this paper was published in First Country Reports of the World Fertility Surveys for eleven countries. The cumulative marital fertility of educated women is found to be alike in different settings. Not much of consistency was seen in education and fertility relationship including the curvilinear nature of this relationship observed across countries, results shown to be attributable to the marked dissimilarity between countries in the average fertility of women with no education, however against the assumptions, differences in the average fertility of the educated women is the cause of a lack of uniformity in the education and fertility relationship including the curvilinear nature of this relationship observed across countries. Across the developing countries the formation of relation is found to be analogous with each other. This investigation forwards that advancement in education for the female sector can persuade fertility behavior of the females without changing the other factors of the study, such as increasing opportunity for participation in the paid labor force in the modern sector¹⁷.

Martin presented an up to date paper having overview of the relationship between fertility of women and her education. The data examined for research was collected from Demographic and Health Surveys for 26 countries across the map. The analysis verifies that higher education is consistently associated with lower fertility. However, a significant range exists in the magnitude of the gap between upper and lower educational strata and in the strength of the association. Education might have a positive impact on fertility at the lower end of the educational range in some of the least developed countries. However, the impact of enhancing the fertility on schooling has become increasingly rare when the patterns are compared with the

period of past decade. The study also looks at the impact of female education on family-size preference, age at marriage, and contraceptive use. It verifies that education enhances women's ability to make reproductive choices¹⁸.

Boyd studied the effect of mobility in educational sector at intergenerational level, while mobility on the fertility of heterogeneous participants including black and white women in a test of the minority group status hypothesis. Statistical technique of Regression was run on data from the National Survey of Family Growth. The analysis of the study provided very little support for the hypothesis that the fertility is lower in upwardly mobile black women compared to their white counterparts. The key finding is that educational origins (parents' education) influence the parity of upwardly mobile black women more strongly than the parity of upwardly mobile white women¹⁹.

Rindfuss and Bumpass investigated the theoretical linkages between education and fertility and then studied relationships between the two variables at three different stages in the life cycle. The study found that the mutual relationship between education and age at first birth is dominated by the effect of education to age at first birth with only minor effect in the other direction of the model. When mother starts bearing the child then education has essentially no direct effect on fertility, but it has significant indirect effect through age at first birth²⁰.

METHODS & MATERIALS

The equation to be estimated was:

$$CEB_i = \beta_0 + \beta_1 Education_i + \beta_3 X_i + \varepsilon_i \quad (1)$$

Where CEB is defined as children whom the woman has given birth (in numbers); education is highest class completed by the respondent; X is a vector of control variables (explained later) that affect the fertility of women in Pakistan; and ε is the disturbance term.

The coefficient of interest is β_1 which measures the impact of education on fertility level. The hypotheses will be rejected if β_1 turns out to be negative and statistically significant.

Independent variables

Education of Women: It is calculated as the utmost level of education attained by the respondent. Different dummies will be created for each level of education, with base category of no education. Primary is defined as completion of grade five. Middle is defined as completion of grade sixth and seventh. Secondary is defined as the completion of grade eighth and ninth. Matric will be defined as the completion of tenth and eleventh grade. Higher secondary education will be defined as completion of twelfth and thirteenth grade. Higher education will be defined as fourteenth grade and above.

Age at marriage: This variable describes the age at which the woman in question got married. This variable will be in numeric form. Expected sign of this variable is negative with respect to the dependent variable, the number of children ever born per woman because a woman who got married at an early age will be expected to have more children as compared to woman who got married at later age.

Living Sons: It is the total number of living sons a woman has. It is likely to be negatively associated to children ever born per female participant of the study, because the greater the number of sons, the lesser the desire to have additional children.

Urban: It will be a dummy variable which takes on the value of "1" if woman is living in an urban area and "0" otherwise. It is expected to be negatively related to dependent variable because urban women are more educated, more aware and also more likely to be working which reduces their likelihood of having more children.

Province: It is used to measure differential impact of the four provinces of Pakistan. Provincial dummies for Sind, NWFP and Balochistan will be added to measure fixed effects, with Punjab being the base category.

Wealth Index: wealth index has been used instead of income. Firstly, as literature suggests that income causes endogeneity issues. Income

could be correlated with other variables as well as the error term. For instance, income and education, (which is our main independent variable) are correlated. People with high levels of income can afford better education; whereas high level of education also leads to better paid jobs. Apart from unobservable factors such as innate ability, both affect income and education. Income and age(another independent variable) may also be correlated through experience, i.e. as age increases, experience increases and so does the income. Lastly, income may be correlated with the region in which the female in question is residing. Urban areas are usually associated with higher levels of income as compared to rural areas.

RESULTS

The data set used in this study is extracted from the PSLM (Pakistan Social and Living Standards Measurement Survey) survey for the year 2007-08. It is a nationally representative survey obtaining data from both the rural and urban areas of all the four major provinces of Pakistan. The survey was based on 107, 207 females. However, after accounting for all data measurement errors the final sample comprises 4125 females.

As shown in Table I, 37.3% are from rural areas and 62.69% are from urban areas. Of these, 53.8%

are from Punjab, 25.26% from Sindh, 15.18% from NWFP and 5.77% from Baluchistan (See Table I in Appendix for further statistics about females according to region and province).

A statistical analysis of the data reveals that a woman in Pakistan, on average, gives birth to three children and, surprisingly, this average is almost same across the four provinces of the country as well as for rural and urban areas (see Table II, Appendix). The maximum number of children given birth to by a woman is 15 as recorded in our sample from this survey.

Contrary to available literature, Table II clearly shows that the mean and variance for CEB are almost equal both at the aggregated and disaggregated (provincial) level rejecting the possibility of over dispersion. Therefore Equation 1 can reasonably be estimated using Poisson regression.

One of the important reasons to explain the high fertility level of women in Pakistan is the culture of early marriages. On average, a woman is married at the age of 19 or 20 years, with 10 years being the minimum age at the time of first marriage (see Table-III in Appendix).

	Rural	%	Urban	%	Total
Punjab	896	43.38	1323	56.62	2219
Sindh	286	27.45	756	72.55	1042
NWFP	275	43.93	351	56.07	626
Baluchistan	82	34.45	156	65.55	238
Total	1539	37.3	2586	62.69	4125

Table-I. Total Females (province wise)

	Observations	Mean	Variance	Min	Max
Punjab	2219	3.37	3.67	1	15
Sindh	1042	3.43	4.33	1	13
Baluchistan	238	3.24	3.67	1	9
NWFP	626	3.11	3.35	1	10
Overall	4125	3.34	3.80	1	15

Table-II. Number of childre

	Mean	St. Dev	Min	Max
Punjab	20.5	3.38	13	35
Sindh	19.7	3.55	12	35
NWFP	19.55	3.29	11	33
Baluchistan	20.6	3.95	14	37
Overall	20.2	3.47	11	37

Table-III. Age at marriage (province wise)

	Mean	St. Dev	Min	Max
Punjab	1.60	1.19	0	8
Sindh	1.67	1.28	0	7
NWFP	1.40	1.15	0	5
Baluchistan	1.60	1.23	0	5
Overall	1.60	1.2	0	8

Table-IV. Living sons (province wise)

Moreover, socio-cultural norms still favor sons as children because of which the desire to have a/ more son(s) results in women giving birth to more children. According to this survey, a woman, on average, has two sons alive with 8 being the greatest number of living sons in our sample. (For details, see Table IV, Appendix)

Looking at our main independent variable, education; the base category, which is of no education has 8.44% respondents. The highest percentage is for primary level of education, that is 26.93 % females have completed primary education. Then middle was 4.36%, secondary

13.5%, matric 24.07%, higher secondary 11.98% percent and postsecondary 10.72% (See Table V, Appendix). In case of rural areas the highest percentage is that of primary level education (38.6%). In case of urban areas, the higher percentage is that of matric level education (27.03%). A further analysis of education cohorts province wise is provided in Appendix.

Before the estimation of the model correlation analysis for all variables in the model is also done to identify possible multicollinearity. However, there is no significant issue of multicollinearity since all correlations come out to be less than 0.5.

	Rural	%	Urban	%	Total	%
No education	196	12.74	152	5.88	348	8.44
Primary	594	38.60	517	19.99	1111	26.93
Middle	67	4.35	113	4.37	180	4.36
Secondary	229	14.88	328	12.68	557	13.5
Matric	294	19.10	699	27.03	993	24.07
Higher-secondary	98	6.37	396	15.3	494	11.98
Post-secondary	61	3.96	381	14.73	442	10.72
Total	1539	100	2586	100	4125	100

Table-V. Education (region wise)

DISCUSSION

The results obtained from the aggregated analysis of the impact of education on fertility levels in Pakistan use Ordinary Least Squares (OLS) regression to estimate Equation 1. The results of first regression use highest class passed by the mother as a measure of education while the second regression uses different education cohorts to measure the differential impact of different levels of education on the productiveness (fertility) level (measured by children ever born (CEB)). The coefficients of education come out to be negative (except for primary education) and statistically significant, rejecting the null hypothesis and implying that academics, schooling and education have a statistically significant adverse impact on fertility levels.

However, since the dependent variable (CEB) is in the form of count data which takes on discrete values, the OLS estimates are likely to be inefficient, inconsistent and biased. The regression results further illustrate Poisson regression with different levels of specification, first estimated using one education variable (highest class passed), and later estimated with education cohorts. As a robustness check, these specifications of the model were also estimated with negative binomial regression. The results obtained come out to be exactly similar to the Poisson regression estimates which further reject the presence of over dispersion in this data.

Across all specifications, highest class passed comes out to be both negative as well as statistically significant at the 1% level reinforcing the hypothesized impact of education on fertility levels. Results indicate that an additional class passed by the female reduces the difference in the logs of expected CEB by 0.013, holding all other control variables constant.

However, using one variable to measure education assumes that the impact of all levels of education upon fertility levels is similar i.e. if the respondent either completes primary education or graduate education, the impact on fertility level would be same. This limits the understanding

of the effect of education. Therefore, education cohorts measuring the impact of a particular level of education relative to no education are also used for analysis.

Contrary to expectations, not all education levels come out to be statistically significant which further reinforces the presumption that education has varying levels of impact. Across all specifications, primary, middle and secondary education, though negative, come out to be statistically significant; matriculation is negative and statistically significant while higher secondary and post-secondary education are adversely and statistically significant at the level of 1%. A further analysis of the estimates for education cohorts reveal that changes in the specification of the present age of the respondent does not bring about any significant change in the magnitude of the estimated coefficients. The results show that relative to females with no education, those who possess at least a matriculation degree are likely to have fewer children, *ceteris paribus*. However, lower levels of education are not likely to have a significant impact on the fertility levels in Pakistan.

Besides, an analysis of the controls used to estimate the impact of education shows that income (proxied by the wealth index), age at marriage, present age and the number of living sons are significant determinants of fertility levels in Pakistan. However, an important finding is that contrary to expected, the number of living sons has a positive impact on the fertility levels in Pakistan. Furthermore, this study undertakes a disaggregated analysis by estimating Equation 1 both at the provincial level as well as the regional level (urban vs. rural) in order to further analyze the relationship between education and fertility levels in Pakistan.

CONCLUSIONS

On the provincial level, contrary to the findings from the aggregated analysis, postsecondary and higher secondary level of education exert a adverse and statistically significant impact on fertility levels only in Punjab and Sind with secondary and matriculation education having a

significant effect only in Sind. For the provinces of Baluchistan and NWFP, education has no major impact on fertility levels.

On the regional level, education (except for primary education) has a negative impact and statistically significant impact is observed on fertility levels only in the urban areas of Pakistan, while there is no impact of education on fertility levels in rural areas.

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