Proceedings of ICEMGD 2024 Workshop: Innovative Strategies in Microeconomic Business Management
DOI: 10.54254/2754-1169/115/2024BJ0206

The Impact of Parental Education on Children's Future Income

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Abstract: This study examines the casual effect of parental educational achievement and family background on educational outcome and income for children. In addition, the study tests the parental education as an instrumental variable for children's education. The 2022 United States General Social Survey (GSS2022) has been used as the dataset. This article uses Mincer earning function and instrumental variable regression to generate the outcomes between parental status, parental educational achievement, and the outcomes for children. The result indicates that the impact of parental educational achievement and advantage family background on income for children is negligible. The result also shows that the education has a significant effect on income. Furthermore, the study finds out that there is significant correlation between parental educational achievement and the educational achievement for children. In addition, the advantage family background has a significant impact on educational attainment for children. Moreover, the instrumental variable regression outcomes indicate that the difference between IV regression and OLS regression is small. This research uses the latest dataset to find out the casual effects of family background and parental education on children's education and future income.

Keywords: Intergenerational mobility, Parental education, Education, Income, Human capital.

1. Introduction

In many developed countries, the social mobility rates are relatively low, and the equality level of opportunity is relatively high. However, family factors are still key determinants of intergenerational social-economic status and education [1]. United States is a developed country that has large population and relatively high correlation between family background and children's achievement compared to some European countries [2]. This paper uses the latest General Social Survey in United States in 2022 to identify the relationship between family social-economic status and parental educational attainment on children's education level and future outcomes. This research uses the children's income as a proxy variable for future outcomes. To clarify the correlation between family background and children's future outcomes, the result can provide intuition to researchers who aim to reduce social inequality and mobility level by decreasing the effect of family background on children's future outcomes. Moreover, the study of parental education and family background on children's educational and future achievement is popular and has long interested social scientists. However, in recent years, the high qualitied data, such as GSS2022, helps researchers to generate more valid result. In addition, researchers keep using parental education as an instrumental variable

DOI: 10.54254/2754-1169/115/2024BJ0206

to evaluate the effect of children's education on their future outcomes since there may be omitted variable bias. This article uses Mincer earnings function and instrumental variable regression to examines the effect of family background on children's educational attainment and income.

2. Literature Review

2.1. Background Information

In the developed country, the family background is still an important factor that influence the children's outcomes. Anders's team finds that the correlation between parental educational achievement and educational attainment for children is significant in most countries from 0.30 to 0.50 [3]. The intergenerational correlation in education is because of parental educational choices, unobserved genetic cognitive abilities, families' cultural backgrounds, endowments, and public resources [3]. Higher parental educational attainments will lead to increase children's human capital, and they are more likely to increase the investment in educational attainment for children [3]. Parents with high educational achievement are more likely to realize the pecuniary and nonpecuniary advantages of education and they are more likely to force and support their children to achieve certain education level [3]. A study which uses Norwegian data illustrates that father's education plays a more important role in children's educational attainment than mother's education [4]. The reason from the study is that educated mothers spend more time on working than time interacting with their children [4].

Moreover, the family size will influence the investment in children, and result in different adulthood outcomes. The quantity and quality theory shows that parents are making trade-off between quantity of education and quality of education when they have large family size. The parental education is the one of the key determinants of household size which can influences children's future outcomes. Dwi's paper examines the casual effect of household size on children's future outcomes [5]. A significant negative effect is found for household size on years of schooling and family size only influence the income via education [5]. This is consistent with the resource dilution theory that, given the resources for each family, more children will decrease the resources and investments per child. Furthermore, a CGSS dataset paper uses the highest educational attainment for mother as an instrumental variable for household size to examine the causal effect of number of siblings on educational achievement in male and female separately [6]. The result shows that the number of siblings has a negative effect on years of schooling and females are experienced more negative effect [6].

The social-economic status for parents influences the social-economic status for children more significantly in United States than in Nordic countries [2]. The financial constrains is the main obstacle for low social-economic background children to enjoy education [3]. The correlation in income, cognitive skill, ability, and welfare between parents and children is also significant [3]. Parental ability is correlated with children's ability, which will increase years of schooling [3]. Higher parental human capital will lead to better performance for children in school [3]. Parents with high social economic status are less likely to face budget constraints which force parents to make a trade-off between their own utility and investment for their children [3]. High social economic background children are more likely to go to primary school since primary school students are more likely to earn higher income in the future [7]. Furthermore, children from advantage family are more likely to enter school later [8]. Children who enter school later are more likely to perform better at school since they have more mature brain which helps children to learn.

However, the parental education has larger influence on children's future outcomes compared to parental income [1]. Moreover, the biases caused by omitting life course variation is negligible [1].

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Furthermore, the result from Norwegian data indicates that the additional one year of parental education increases only a small amount of children's education [4].

2.2. Hypothesis

The ability and education are key determinants for high income level. Increase in cognitive ability rises the probability to have higher education level. There is evidence that parental ability and parental education are correlated with children's ability and education. According to Anders team's paper, parental educational decisions will influence the children's decisions and high parental human capital will lead to increase in children's educational performance [3]. Similarly, parental cognitive abilities may be passed though the later generation via genetic [3]. Hence, high parental education is more likely to increase the children's future income. The first hypothesis:

H1: Ceteris paribus, the parental education is positively correlated with children's income.

Higher educational attainment increases the human capital and productivity. High educational attainment is the signal to the employers that this worker is productive. Thus, workers with higher educational attainment are more likely to have higher income. Therefore, years of schooling have a positive relationship with income. The second hypothesis:

H2: Ceteris paribus, the years of schooling are positively correlated with income.

Increase in parental educational attainment will lead to increase in the educational outcomes for children. Higher educational achievement increases incomes. The third hypothesis:

H3: Ceteris paribus, the parental educational achievement is positively correlated with the educational attainment and the income for children.

3. Research Method

3.1. Data

This study uses the data from GSS2022 dataset which is the General Social Survey in United States. The General Social Survey is a national wide highly representative survey in the United States [9]. The survey is generated since 1972 [9]. It aims to provide high-quality and easily accessible data to scholars and student [9]. The GSS2022 dataset is collected from May 2022 to December 2022 [9]. It contains 4149 observations and 1156 variables. It covers three main topics which are demographic, behavioural, and attitudinal [9].

3.2. Theoretical Model

Generating the result for parental education on the educational achievements and incomes for children is the main idea of this study. The human capital factors have been involved in the model. Hence, Mincer earnings function can be used to generate the outcomes [10]:

$$Log(income_i) = \beta_0 + \beta_1 Education_i + \beta_2 Experience + \beta_3 Experience^2 + \cdots \quad (1)$$

However, the $Experience^2$ may led to multicollinearity between $Experience$ and $Experience^2$ [5]. Thus, the quadratic term can be dropped.

To find out whether the parental education is a good instrumental variable, the regression for parental education on children's income is needed since it provides evidence that parental education does not influence the children's income directly. To test previous hypothesis and find out the effect between parental education and children's income, the following multiple linear regression model is generated:

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$$Log(rincome)_i = \beta_0 + \beta_1 maeduc_i + \beta_2 paeduc_i + \gamma X_i + \varepsilon_i \quad (2)$$

Where i is the number of observations from 1 to N.

X_i is the vector of control variables including race, gender, exp, sibs, marital, city, Advan, Fulltime and hrs1.

Table 1: Variables' definition

Variables	Definition
rincome	This variable represents the personal income per year.
maeduc	This variable is the mother's highest educational achievement.
paeduc	This variable is the father's highest educational achievement.
race	This binary variable represents the race of individual, race = 1 means that this individual is white, and race = 0 means that this individual is race other than white.
gender	This binary variable represents the gender of individual, gender = 1 means that this individual is male, and gender = 0 means that this individual is female.
exp	Working experience is calculated by the formula that uses the participants' age minus their years of schooling minus 6. This study assume that each individual joins the first year of schooling at age of 6.
sibs	This variable means the number of siblings which represents the household size for each individual.
marital	This binary variable indicates that whether or not this individual is married, marital = 1 means that this individual is married, and marital = 0 means that this individual has marital status other than married.
city	This binary variable represents the regional information of individual, city = 1 means that this individual live in city or suburb at age of 16, city = 0 means that this individual live in the area outside of the city at age of 16.
Advan	This binary variable represents the advantage family background of individual at age of 16, Advan = 1 means that this individual live in a family with income higher than average social income, Advan = 0 means that this individual live in a family with income lower than or equal to average social income.
Fulltime	This binary variable represents the working status for individual, Fulltime = 1 means that this worker is full time worker, Fulltime = 0 means that this worker is part time worker or he/she has other type of status.
hrs1	This variable represents the number of hours worked last week before taking this survey. Number of hours worked last week has been used since there are a lot of missing values in the average working hours.

The second model is generated to find out the casual effect of children's education on their income. The following multiple linear regression model is generated:

$$Log(rincome)_i = \beta_0 + \beta_1 educ_i + \gamma X_i + \varepsilon_i \quad (3)$$

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X_i is the vector of control variables including race, gender, exp, sibs, marital, city, Advan, Fulltime and hrs1.

Table 2: Variables' definition

Variables	Definition
educ	This variable represents the years of schooling for individual.

The third model, which is an instrumental variable regression model, is generated to compare the result between linear regression model and instrumental variable model. The instrumental variables for children's years of schooling are mother's educational attainment and father's educational attainment. The following instrumental variable model is established:

$$Educ_i = \beta_0 + \beta_1 maeduc_i + \beta_2 paeduc_i + \gamma X_i + \varepsilon_i \tag{4}$$

$$Log(income)_i = \beta_0 + \beta_1 \widehat{educ}_i + \gamma X_i + \varepsilon_i \tag{5}$$

X_i is the vector of control variables including race, gender, exp, sibs, marital, city, Advan, Fulltime and hrs1.

3.3. Descriptive Statistics

The dataset contains 1151 variables. However, not all the variables are necessary to this study. Hence, only 13 variables are included, and rest of variables are omitted. The income is a categorical variable that has different categories for different level of income, such as $rincome = 2$ means that this respondent has an income between \$1000 ~ \$2999 per year. Hence, the median of the categories has been taken and used in the further evaluation. Mother's highest education and father's highest education are highest years of schooling for respondent's mother and father. The experience is not included in the original dataset. Hence, this formula is used to generate the data for experience:

$$Experience = Age - Education - 6$$

Table 3: Data descriptive

Variables	N	Mean	Min	Max	SD
Income	1221	11.39	1	12	3.437
Mother's Highest Education	1221	12.8	0	20	12.113
Father's Highest Education	1221	12.97	0	20	14.152
Education	1221	15.05	3	20	7.602
White	1221	0.706	0	1	0.208
Number of Siblings	1221	2.987	0	36	7.734
Male	1221	0.5184	0	1	0.250
Experience	1221	24.65	0	62	175.017
Married	1221	0.5217	0	1	0.249
Full Time Job	1221	0.8518	0	1	0.126
Number of Hours Worked Last Week	1221	41.02	0	89	189.769
City	1221	0.3931	0	1	0.239
Advantage Background Family	1221	0.2244	0	1	0.174

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4. Empirical Results

4.1. Figures Analyse

Figure 1 illustrates the visualization of the effects of educational attainment on average income. The diagram indicates that the years of schooling and average income have an overall positive relationship and upward trend. The lowest educational attainment is 3 years of schooling, and the highest educational attainment is 20 years of schooling. The average income increases from approximately 11000 dollars per year to 24000 dollars per year when the year of schooling increases from lowest to highest. Thus, the higher years of schooling will lead to better future outcomes.

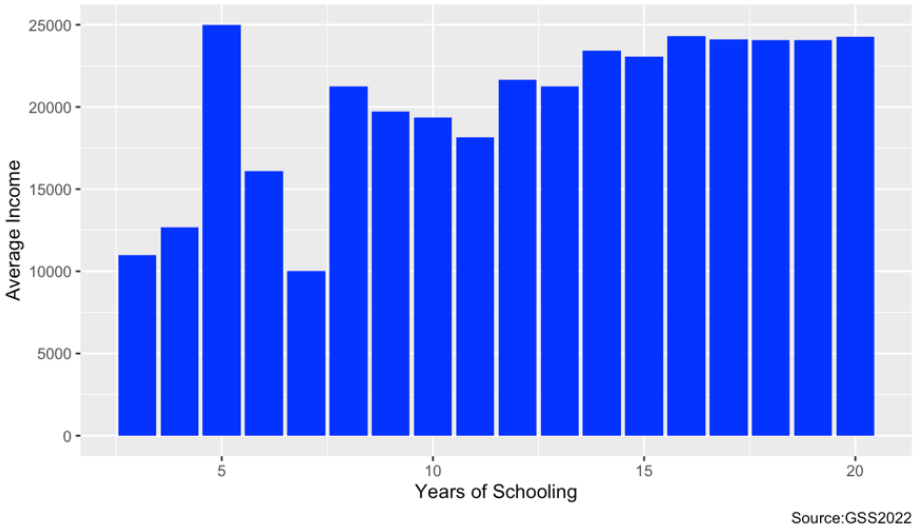

Figure 1: Average income by Years of Schooling
Photo credit: Original

Figure 2 indicates the relationship between the educational achievement for mother and the average income for children. The average income fluctuates around 21000 when the mother's years of schooling increases from 0 to 20. Moreover, there is a weak upward trend in the diagram. Hence, the causal effect for educational achievement for mother on future income for children is weak.

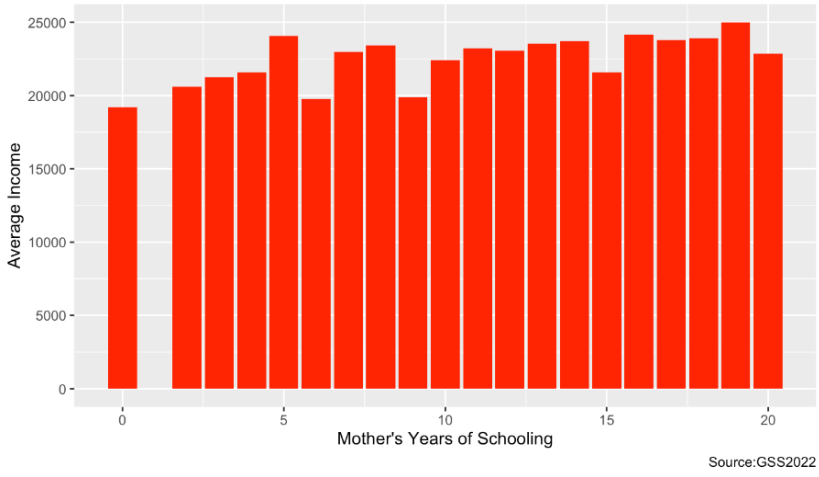

Figure 2: Average income by mother's educational attainment
Photo credit: Original

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Figure 3 shows that the father's years of schooling has little relationship with children's average income since the upward trend is negligible and average income fluctuates around 21000 when father's educational attainment increases from 0 to 20.

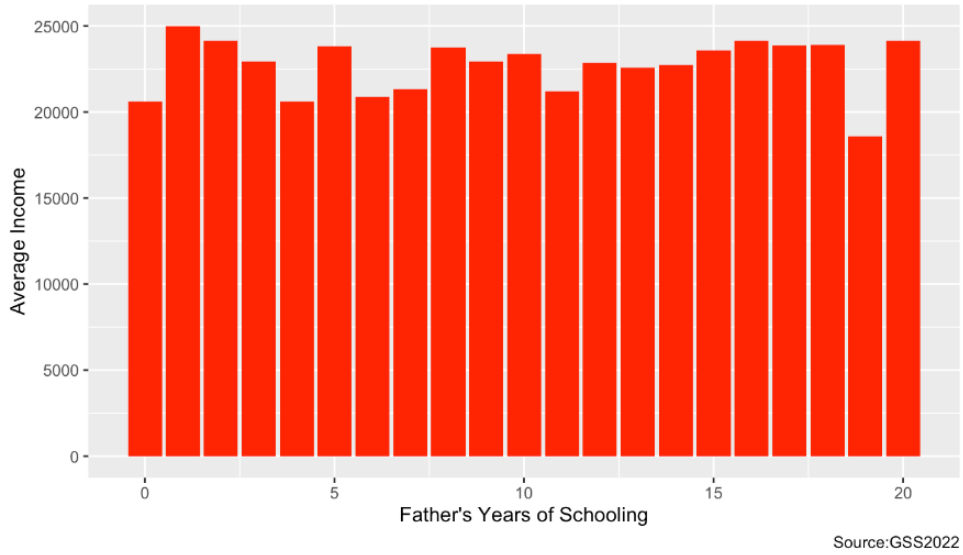

Figure 3: Average income by father's educational attainment
Photo credit: Original

4.2. Baseline Regression

Table 4 and Table 5 provides further support for the visualized results. Table 4 illustrates the multiple linear regression for parental education on income in the logarithm form (Model 1) and multiple linear regression for children's education on income in the logarithm form (Model 2). Model 1 demonstrates that, ceteris paribus, additional 1 year of mother's educational attainment will lead to on average 1.0% increase in children's income. Similarly, ceteris paribus, additional 1 year of father's educational attainment will lead to on average 0.1% increase in children's income. Hence, the mother's educational attainment has a higher effect on children's future outcomes. The reason may be that mothers with higher educational achievement are more likely to spend more time with their children since they are more likely to realize the benefits of the children's early investment, which is the one of the key determinants for the development of children. Furthermore, table 4 shows that the impact of the advantage family background on children's income is negative.

However, the coefficients for parental education and advantage family background in Table 4 model 1 are not highly significant. Therefore, there is evidence that the parental education and advantage family background have little effect on children's future outcomes. Anders's team's paper indicates that this is due to the high school reforms in US that took place before World War II [3]. Comprehensive school reforms prolong the mandatory years of schooling and increase the public investment in low secondary school as an early human capital investment. Although, the mother's highest education is not highly significant, mother's educational attainment is weakly significant and advantage family background is insignificant. This is consistent with the study from Jani's paper that the parental education has a crucial impact on children's future outcomes compared to parental status [1].

DOI: 10.54254/2754-1169/115/2024BJ0206

Table 4: Baseline Linear Regression

VARIABLES	(1) OLS Income	(2) OLS Income
Mother's Highest Education	0.010*	
	(0.005)	
Father's Highest Education	0.001	
	(0.005)	
Education		0.042***
		(0.005)
White	0.018	0.024
	(0.031)	(0.030)
Number of Siblings	-0.019***	-0.014***
	(0.005)	(0.005)
Male	0.040	0.053*
	(0.028)	(0.028)
Experience	0.002	0.002**
	(0.001)	(0.001)
Married	0.054*	0.023
	(0.028)	(0.027)
Full Time Job	0.491***	0.467***
	(0.049)	(0.048)
Number of Hours Worked Last Week	0.001	0.001
	(0.001)	(0.001)
City	0.041	0.024
	(0.029)	(0.028)
Advantage Family Background	-0.012	-0.036
	(0.035)	(0.033)
Constant	9.322***	8.816***
	(0.090)	(0.103)
Observations	1,221	1,221
R-squared	0.156	0.195
Adjusted R-squared	0.149	0.188
Residual Std. Error	0.479 (df = 1209)	0.468 (df = 1210)
F Statistic	20.344*** (df = 11; 1209)	29.301*** (df = 10; 1210)

Model 2 illustrates that, ceteris paribus, additional 1 year of schooling will lead to on average 4.2% increase in income. This result is consistent with people's perception, since people believe that higher educational attainment will increase the probability to find a high paid job. However, the result generated by model 2 may be invalid since there is omitted variable. People's ability is a key determinant factor for sincome. Higher ability will increase the probability of higher income. Moreover, ability is correlated with education. A people with higher ability usually have more years

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of schooling. However, ability is hard to quantify and there is no data about ability. Similarly, GSS dataset does not provide a valid proxy variable for ability. Thus, omitted variable bias existed.

4.3. Instrumental Variable Regression

To study the indirect effect of parental education on income, two stage least square regression is needed. Moreover, instrumental variable regression allows author to generate more valid and unbiased result for education on income. Table 5 model 1 demonstrates the first stage regression result. This result illustrates that parental education have a significant effect on years of schooling. Ceteris paribus, additional 1 year of mother's education will lead to 0.131 increase in children's educational achievement. Similarly, ceteris paribus, additional 1 year of father's education will lead to 0.132 increase in children's educational achievement. Hence, the effect of educational attainment for mother and father on children's educational outcomes is similar. The outcomes are partially consistent with previous Ermisch team's work [4]. Outcomes from Ermisch team's work shows that additional parental education increases the children's education by one-tenth of a year [4]. However, this result only weakly supports the evidence from previous work that father's education is more important than mother's education [4].

Moreover, the result for advantage family background shows that, ceteris paribus, children from advantage family are on average 0.497 higher in children's educational achievement. The result is consistent with the previous literatures that family background will influence that children's educational attainment. Hence, advantage family are less likely to face budget constrain on children's educational investment. Similarly, children who have educated parents are more likely to go further education.

However, the first stage regression may generate an overestimated outcomes since the ability which is relevance with both parental education and children's education is omitted. Hence, the actual coefficient may be lower.

Table 5: Instrumental Variable Regression

	(1)	(2)
	IV (First Stage)	IV (Second Stage)
VARIABLES	Education	Income
Mother's Highest Education	0.131***	
	(0.026)	
Father's Highest Education	0.132***	
	(0.024)	
Education		0.040**
		(0.017)
White	-0.125	0.024
	(0.160)	(0.030)
Number of Siblings	-0.113***	-0.014**
	(0.027)	(0.006)
Male	-0.304**	0.052*
	(0.144)	(0.028)
Experience	-0.023***	0.002**
	(0.006)	(0.001)
Married	0.677***	0.025
	(0.143)	(0.030)
Full Time Job	0.589**	0.468***
	(0.250)	(0.049)

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Table 5: (continued).

Number of Hours Worked Last Week	-0.007	0.001
	(0.006)	(0.001)
City	0.380**	0.025
	(0.148)	(0.029)
Advantage Background Family	0.497***	-0.034
	(0.177)	(0.037)
Constant	11.974***	8.849***
	(0.460)	(0.276)
Observations	1,221	1,221
R-squared	0.218	0.195
Adjusted R-squared	0.211	0.188
Residual Std. Error	2.449 (df = 1209)	0.468 (df = 1210)
F Statistic	30.667*** (df = 11; 1209)	

Note: 30.667 in table 5 model 1 F Statistic is the F statistic for first stage regression.

Model 5 model 2 shows the second stage regression result. The second stage regression is generated by regressing fitted education, which is generated from first stage, on income. Ceteris paribus, additional 1 year of schooling will lead to on average 4.0% increase in income. The result for two stage least square regression is similar to the result from table 4 model 2.

5. Conclusion

In conclusion, based on the General Social Survey, this study analyses the impact of parental educational attainment and family background on the educational achievement and the future outcomes for children. The result shows that the parental educational achievement has little impact on the income for children which rejects the hypothesis that parental education has a positive effect on children's income. Moreover, the result for educational attainment on income provides strong support to the hypothesis that higher education level increases the future outcomes. In addition, the first stage regression in instrumental variable regression provides evidence that the parent's years of schooling has a significant correlation on the educational achievement for children and advantage family background has a significant positive relationship with the education for children. Furthermore, the instrumental variable regression generates a similar result for education on income with OLS regression. The mechanism behind the family background and parental education on children's education and future outcomes is necessary to understand. Increase in education for this generation would lead to more years of schooling for the next generation, hence the outcomes for future generation will improve. Panel data can be used to generate more valid result which incorporates the long-term effect of parental educational achievement and family background on future outcomes for children.

The article only generates the result for a specific country at a specific period. Hence, this provides room for future study which can cover more countries and longer period. Such study can generate more applicable result. Moreover, this study does not conclude the information about intergenerational health condition and occupation due to no relevant information in the dataset. Health condition is correlated to the productivity. Hence, children's health condition is one of the key aspects of country's future development. Therefore, future study should use more advanced dataset which includes health condition and occupation for both parent and children to generate the result for intergenerational mobility.

DOI: 10.54254/2754-1169/115/2024BJ0206

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