Economic Crises and Private Rates of Returns to University Education:
A Conceptual Framework, Stylized Facts from Three Middle-Income Countries, and COVID-19 Implications

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In this study, we develop a conceptual framework that explains the reasons behind a widening of the gaps in private rates of return to university education during an economic crisis such as COVID-19. Next, we report stylized facts on the private rates of return to university education before and after economic crises in Indonesia, Pakistan, and South Africa. We further conduct panel regression analysis to assess the statistical significance of the relationship between private returns and crises in the three countries. We conclude by speculating on COVID-19 implications and future research.

Introduction

The COVID-19 pandemic has created an ongoing economic crisis that is leading to loss of jobs, lower incomes, and increased poverty. Preliminary evidence suggests that the impact of the crisis is not only immediate, with low-income workers suffering more than high-income workers (Reeves & Rothwell, 2020), but learning loss for the current cohort of students will cause a long run negative impact on their earnings which will be felt over the lifetime of individuals. Some recent estimates project the future earning gap at individual level to be over $11,000 USD globally (Psacharopoulos et al., 2020).

As predicted by pioneer education economist Theodore Schultz (1975), educated workers are better able to cope with the disequilibria brought on by economic crisis because they are able to adapt to the changing needs of employers and new technologies. The studies that document this pattern use data on educational attainment and earnings of workers, and belong to a subset of the extensive literature on the private rates of return to education (Patrinos & Psacharopoulos, 2018). In Argentina, during the volatile period of 1992-2002, the earnings of educated workers were less affected by crises than the earnings of the less educated workers (Fiszbein, Giovagnoli & Patrinos, 2007). Educated workers in Mexico enjoyed larger advantages than less educated ones during non-crisis years, and even larger advantages during crises and recessions (Psacharopoulos et al., 1996). During the

2007-08 economic crisis in Greece, university educated graduates enjoyed better prospects in the labor market than those with lower educational levels (Cholezas et al., 2013). The private rates of returns to education also increased during crisis years in Venezuela (Patrinos & Sakellariou, 2006). Overall, the studies on the changes in private rates of return before, during and after a crisis suggest that the Schultz thesis holds about educated workers being more able to adapt to crisis-induced disequilibria.

In this paper, we contribute to the comparative economics of education literature in several ways. First, we present a conceptual framework that explains the reasons behind a widening of the gaps in the private rates of returns to education during an economic crisis; in particular, we note the conditions necessary in order for the Schultz thesis to hold. Second, we present stylized facts on the private rates of return to university education (versus secondary education) before and after economic crises in Indonesia, Pakistan, and South Africa, three middle-income countries (as categorized by the World Bank) from different regions and varied socio- and macro-economic contexts. Third, we use panel regression analysis to examine whether the relationship between returns and crises are statistically significant in the three countries. Finally, based on our findings, we speculate on COVID-19's implications on education and income inequality and suggest topics for further research.

Conceptual Framework
The private rate of return to a level of education is the internal rate of return from completing a level of education for an individual. As mentioned earlier, we focus on the private rate of return to university education (versus secondary education), which is computed by comparing the monetary costs (foregone earnings from only secondary education) and benefits (earnings) of university educated workers. In Table 1, we consider three possible scenarios during an economic crisis. In this study, our focus in on current workers—we do not address students (that is, future workers) and parents whose decisions on investing in a university education are likely influenced by university returns during a crisis (Shafiq, 2010).

Table 1. Possible Changes in Earnings and Returns to University Education (versus Secondary Education) during an Economic Crisis

Scenario	Changes in earnings of workers with university education	Changes in earnings of workers without university education	Change in rate of return to university education
1	↓	↓↓	↑
2	↓↓	↓	↓
3a	↓	↓	Unchanged
3b	↓↓	↓↓	Unchanged

Notes: ↓ denotes "decrease", ↓↓ denotes "significant decrease", ↑ denotes "increase".
Source: Authors' conceptualization.

In Scenario 1, and according to human capital theory, educational attainment increases cognitive skills and, hence, improves labor market outcomes such as productivity and earnings. In his seminal paper, "The Value of the Ability to Deal with Disequilibria," Nobel laureate Theodore Schultz (1975) argued that educated (or skilled) workers are better able to cope with the disequilibria brought on by events such as economic crises because they are able to adapt to the changing needs of employers and new technologies. In addition, educated workers are better able to seek information about job opportunities from family, friends, advertisements, former employers, radio and the labor bureau (Oreopoulos, et al., 2012).

The ability to deal with disequilibria implies that the private rates of return to university education rise during a crisis. This is because the earnings of those with less education fall partly due to increased unemployment among the less educated. The resulting pool of unemployed less-educated workers dampens the wages of all less-educated workers. If the earnings of the university graduates remain unchanged or decline modestly, then the rate of return to university education increases during a crisis. Also, more educated workers can more easily find other work to maintain earnings. More educated workers can switch to better jobs quickly while less educated workers tend to take lower paying jobs during a crisis and typically do not have that ability to switch to better jobs (Autor, et al., 2014). Finally, employers may be reluctant to lay off educated workers because they are better able to adapt to changing economic conditions.

In Scenario 2, the Schultz disequilibria thesis does not hold as the rates of return to university education fall because university-educated workers experience greater declines in earnings relative to secondary-education workers. This can happen if the economy is not experiencing technological advancement (Katz & Murphy, 1992), or when higher education is over-expanded (Gonzalez & Oyelere, 2011). Both developed and developing economies can experience the phenomenon of over-education. Scandinavian countries, for instance, have an oversupply of highly educated labor, especially among immigrant labor. There is a relative penalty for this overqualification: while years of overeducation do increase wages, this increase is much less than the wage increase for those with adequate years of education (Halaby, 1994; Nielson, 2007).

In Scenarios 3a and 3b, the rates of return to university education remain unchanged because the crisis has a similar impact on secondary-educated and university-educated workers. The difference between scenarios 3a and 3b is that the earnings reductions are more severe in 3b than 3a. The reduction in earnings between both groups of workers is such that the rate of return is the same before and during the crisis. Therefore, the Schultz thesis does not hold in scenarios 3a and 3b because university-educated workers do not have an advantage in coping with the disequilibria during a crisis.

Stylized Facts from Past Crises in Indonesia, Pakistan, and South Africa
To present stylized facts from past crises in the three countries, we use data on economic growth rates from the World Development Indicators and estimates of the private rates of return to university education from a variety of sources. As noted earlier, these countries were selected because all three middle-income countries are from different

regions and varied socio- and macro-economic contexts. In addition, these countries were selected because our study required available rates of return estimates for multiple crisis and non-crisis years. Table 2 presents details on the years and sources of rates of return estimates.

Table 2. Country, Years and Sources of Private Rate of Return Estimates

Country	Year	Source
Indonesia	1990, 1992, 1994, 1996, 1998, 2000, 2002	Psacharopoulos and Patrinos (2018)
	1999, 2003, 2004, 2006, 2008, 2009, 2010	Montenegro and Patrinos (2014)
Pakistan	1991 and 1995	Psacharopoulos and Patrinos (2018)
	1992, 1999, 2004, 2005, 2006, 2007, 2008, 2010	Montenegro and Patrinos (2014)
	2012, 2014, and 2018	Authors' calculations
South Africa	1993	Psacharopoulos and Patrinos (2018)
	2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, and 2011	Montenegro and Patrinos (2014)

We use the Mincerian earnings function due to its simple structure. The parsimonious nature of the equation enables us to estimate returns over repeated cross-sectional data for multiple countries. The general form of earnings equation is usually defined as:

$$ln\ w_i = a + b_1 S + b_2 EX + b_3 EX^2 + u_i$$

where the natural log (ln) of w_i —the real earnings of individual i — is a function of years of schooling (S) and experience (EX); a is the constant term, b_1 is the coefficient of schooling (returns to schooling), b_2 and b_3 are the coefficients of experience and experience-squared, and u is the residual.

The literature identifies a variety of methodological issues in determining the private rates of return specifically comparing the parsimonious Mincer type estimation to more econometrically elaborate approaches requiring detailed individual level data (Fasih, 2008; Heckman, et al., 2006; Patrinos, 2016). Research shows that the Mincerian function delivers a precise method of modeling the relationship between earnings, schooling and experience, though with the caveat that it might be biased upwards (or downwards) due to omitted variables. Hertz (2003), after correcting for nonclassical measurement error, finds rates of return to education to be of almost half the magnitude of those using OLS estimates for South Africa. Duflo (2001), using a large-scale school construction policy in

the 1970s in Indonesia, finds an economic rate of return to education in the range of 6.8-10.6 percent. Research has also identified over the years that unlike the initial studies on rates of return to education, returns have a convex profile over levels of education with lower returns for primary education and higher returns for university education (Moll, 1996; Mwabu & Schultz, 1996), and higher for women (Aslam, 2009; Behrman & Deolalikar, 1995). The convexity of returns has important implications, as it leads to an increase in demand for university education and puts pressure on policymakers to decide on expenditure between education levels (Patrinos, 2016). Nevertheless, more robust estimates of the causal impact of education on earnings are in line with the parsimonious estimates (Harmon,et al., 2003; Patrinos, 2016). Finally, we also wish to acknowledge that the rates of return analysis have been criticized for not capturing numerous non-monetary benefits, and having a disproportionate influence on government resource allocation decisions in education (Klees, 2016).

Figures 1, 2 and 3 present economic growth rates and the private rates of return to university education in Indonesia, Pakistan and South Africa. These three figures reflect 33 separate private rates of returns estimates. Despite the different social and political circumstances, we find two patterns across the three countries. First, the returns to university education steadily increased in all three countries. With globalization and economic development, including the expansion of the service sector, automation (reduces the earnings of secondary-educated workers) and the technological revolution (increases the earnings of university-educated workers) those with university education experienced higher earnings growth than those with only secondary education for most of the years (see, for example, Goldin & Katz, 1996).
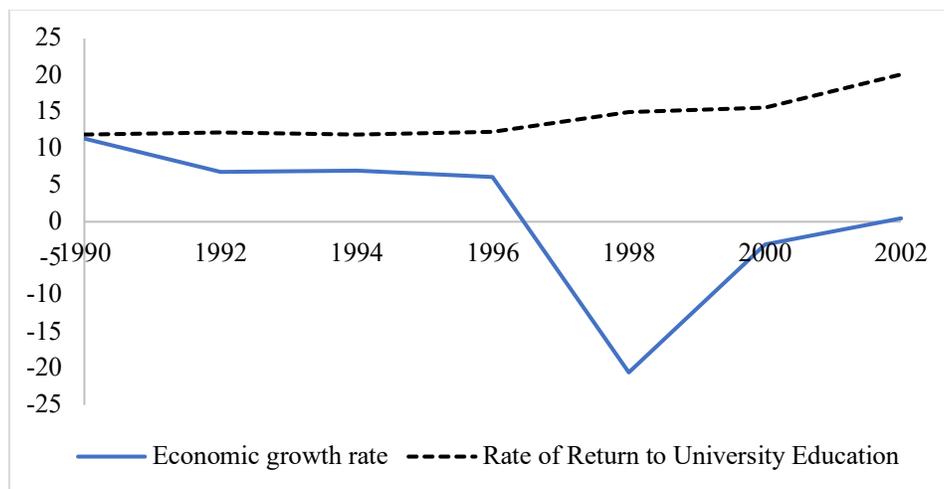
Figure 1. *Economic Growth and Rate of Return to University Education in Indonesia. Sources:* Computed from Psacharopoulos and Patrinos (2018); Montenegro and Patrinos (2014)
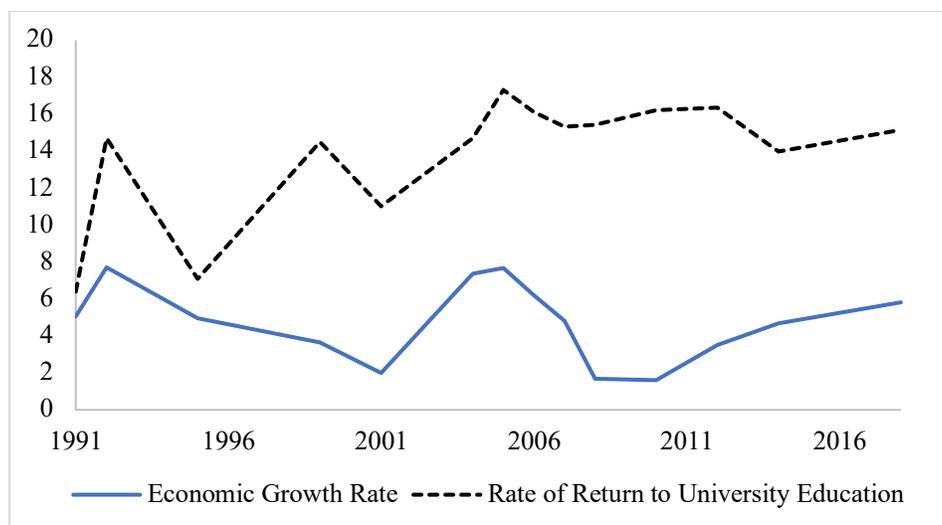
Figure 2. *Economic Growth and Rate of Return to University Education in Pakistan*. *Sources:* Computed from Psacharopoulos and Patrinos (2018); Montenegro and Patrinos (2014); and authors' calculations.
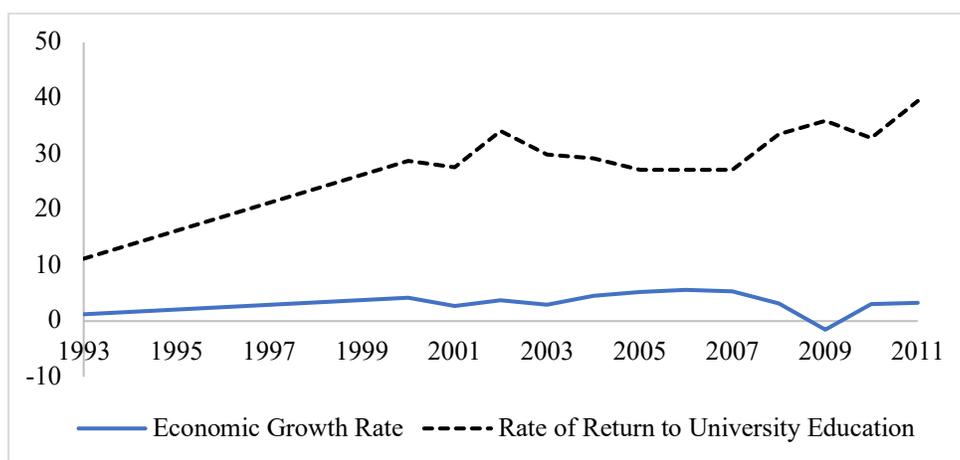
Figure 3. *Economic Growth and Rate of Return to University Education in South Africa*. *Sources:* Computed from Psacharopoulos and Patrinos (2018); Montenegro and Patrinos (2014).

The second pattern in all three countries is that returns to university education rise during economic crises years. In short, we find support for Schultz's thesis during the financial crises of the 1990s and the global recession of the late 2000s. In Indonesia, returns increased from 12.3 percent to 15.6 percent, a 27 percent increase, during the 1998-2002 recession. Pakistan experienced low (but not negative) growth during the 2008-2010 recession, and returns increased from 15.3 percent to 16.2 percent, a 6 percent increase. Finally, South African returns increased from 27.2 percent to 35.9, a 32 percent increase, during the 2007-2009 recession. After the crises, private rates of return to university

education narrowed to pre-crisis levels in Indonesia and Pakistan. In South Africa, however, the returns to university education continued to widen.

Panel Data Regression Analysis
To assess whether there is a statistical relationship between crises and the returns to university education, we turn to panel regression analysis. Before proceeding, we wish to acknowledge a causal inquiry is beyond the scope of this article. We are simply interested in whether there exists a statistically significant correlation in Indonesia, Pakistan and South Africa for the years considered.

To select an appropriate panel regression model, we need to examine the data characteristics. We have a long panel because there are more years of data than number of countries. The panel is also unbalanced because not all individuals are observed in every year. Furthermore, the sample is small, which affects model selection as well the number of control variables that can be included.

Conceptually, an economic crisis is inversely related with rates of return to university education. Accordingly, in Model 1, we include the economic growth rate and also include the squared-growth rate to consider any non-linear relationship between growth rates and returns to schooling. In Model 2, we assess the robustness of the crisis and returns relationship by adding a control variable; as noted earlier, the small sample size does not permit the inclusion of multiple control variables. The labor market unemployment rate is a good candidate for the control variable because it may inform the relationship between crisis and returns in several ways. For instance, during an economic crisis, unemployment rises disproportionately among the secondary-educated compared to the university educated. The secondary-educated workers who remain employed are likely the ones who can adapt to the crisis; their earnings are included in the samples used for returns. If the earnings of university educated workers remain relatively stable, then the returns computed during crisis years could actually be smaller than in non-crisis years. By controlling for unemployment rate, we assume that unemployment rates are the same during crisis and non-crisis years and focus on the direct relationship between the crisis and returns.

Since there is correlation across individual countries, we follow the recommendation of using generalized least squares (GLS) rather than the default ordinary least-squares. For such cases, the typical panel regression models are fixed effects, random effects and mixed models (Cameron & Trivedi, 2010). Each model has its strengths and weaknesses, and recommended tests (such as the Hausman test) provide no clear answers on which model is most appropriate for our long but small panel dataset. Accordingly, to examine the relationship between economic crisis and rate of return to university education, we present the results from six different regressions: fixed effects, random effects, and mixed models with and without the unemployment control variable. Table 3 shows the descriptive statistics for the panel data. As noted earlier, the sample size of 33 reflects the three countries and different years.

Table 3. Summary Statistics of Dependent and Independent Variables

	Indonesia	Pakistan	South Africa	Pooled
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Dependent variable:				
Rate of return to university education	14.14	14.09	29.55	20.19
	(3.04)	(3.38)	(6.74)	(9.04)
Independent variables:				
Economic growth	1.13	4.99	3.35	3.53
	(10.68)	(2.02)	(1.92)	(5.15)
Economic growth-squared	99.18	28.69	14.66	38.12
	(149.19)	(19.60)	(10.04)	(73.69)
Unemployment	4.38	1.03	28.19	12.44
	(1.75)	(1.02)	(3.49)	(13.17)
Number of years	10	13	13	33

Note: Data obtained from sources described in Table 2.

Table 4 presents the fixed effects, random effects, and mixed model GLS regression results where we regress the rate of return to university education on economic growth and economic growth-squared (which captures the non-linear relationship). One set of regressions includes the control variable (unemployment rate). The results show inconsistent statistical evidence in support of the inverse relationship between returns to university education and economic crisis. Consistent with Schultz's disequilibria thesis, the results from the random effects and mixed models with control variables show that the rate of return to university education increases during an economic crisis. But the statistically insignificant coefficients elsewhere suggest that the support for the Schultz thesis is sensitive to the model and consideration of control variables.

Table 4. Regression Results from Fixed Effects Models, Random Effects Models, and Mixed Linear GLS Regression Models: The Effect of Economic Crises on the Private Rates of Return to University Education (N=33)

Outcome variable: Rate of return to university education	Fixed Effects Models		Random Effects Models		Mixed Linear Models	
	Coeff. (SE)	Coeff. (SE)	Coeff. (SE)	Coeff. (SE)	Coeff. (SE)	Coeff. (SE)
Economic growth	-0.211 (0.107)	-0.261 (0.167)	-0.679 (0.269)	-0.190* (0.093)	-0.679 (0.260)	-0.190 * (0.088)
Economic growth-squared	-0.011 (0.008)	-0.128 (0.012)	-0.578† (0.031)	-0.016* (0.007)	-0.578† (0.298)	-0.155* (0.007)
Unemployment		-0.532 (0.269)		0.530* (0.029)		0.530* (0.027)
Constant	21.350* (0.684)	28.215* (3.194)	24.790* (6.891)	14.861* (1.205)	24.790* (6.672)	14.861* (1.147)

R squared within	0.029	0.095	0.022	.010		
R-squared between	0.991	0.988	0.814	.993		
R-squared overall	0.105	0.620	0.140	.662		
Number of observations	33	33	33	33	33	33

Notes: (1) † $p<0.10$ and * $p<0.05$. (2) Includes cluster-robust standard errors. (3) This table reveals the results from six separate regressions.

The interpretation of the regression coefficients is tricky since they include both the within-entity and between-entity effects. In the case of our three-country data, it represents the average effect of economic growth over returns to university education when the returns change across time and between countries by one unit. Although the data and regression models do not permit generalizations or projections for the three countries beyond the years covered, the results provide some statistical evidence confirming the negative relationship between economic growth and the rate of return to university education in the three countries.

COVID-19 Implications and Future Research
We acknowledge that it is improper to make generalizations on years beyond those covered in our study, and for countries other than Indonesia, Pakistan, and South Africa. As a speculative exercise, however, we consider the following as possible implications during the COVID-19 pandemic in the three countries and beyond.

Based on the simple analyses of percentage changes in the three countries, one could posit that the returns to university education will increase by 25 to 33 percent in the three countries during COVID-19. The emerging data from the United States and Europe during COVID-19 provides further support for Schultz's thesis: the unemployment rate for those with university degrees rose less than the unemployment rate for those without university degrees (Berube & Bateman, 2020; Lund et al., 2020; Fuchs-Schundeln et al., 2020). These patterns are likely to be even stronger in low- and middle-income countries because of the larger differences in technology education provided in universities versus secondary schools. That is, university educated workers in low- and middle-income countries may be far better at adapting to work-from-home technologies, or shifting to jobs that require technological skills, compared to the secondary-education graduates in their countries. Given the severity of the COVID-19 crisis, it is possible that the rates of returns to university education will increase by even more than the levels suggested in this study.

Going forward, we need more research in real time on the actual impacts of the crisis on employment and earnings by level of education as well as across occupational status. The COVID-19 pandemic has caused an economic shock that has brought about sudden change in the demand and supply in the labor market (Kramer & Kramer, 2020). Different occupational groups are differentially impacted which will in the medium term change the relative returns to occupations among university-educated workers. It is also critical to understand how the returns to university education have changed differently for women and racial minorities during COVID-19. Having a handle on what these mean for

educational policy and equity should be an important consideration for governments globally.

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