

Effect of Educational Program and Tax Relief on Labor Market Outcomes

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Introduction

We are interested in exploring the relationship between human capital, tax relief policies, wages, and unemployment, for the purposes of understanding whether it would be economically viable to propose a tax relief system to fund educational programs, with the goal of positive labor market outcomes. In order to study the relevant effects, we take data from various sources including the World Bank, previous literature and other international organizations to observe the effect of educational reform policies on wages and unemployment. We observe policies from Jordan and India specifically to analyze the effects of educational reform policies and tax relief policies respectively.

From our analysis of labor market models, we find that educational reform policies increase wage and labor market tightness (and therefore either decrease unemployment or increase vacancies) in both Jordan and India. However, only India sees these results reflected in real world data. There was only an increase in wage observed in data for Jordan, while unemployment increased.

Theory

We use the models seen in the Labor Market section of the class that explain the value of a hired worker to a firm, the value of the wage and the value of labor market tightness (J_π, w, θ respectively) to look for results, given the data, specifically the following three equations:

$$\begin{aligned} J_\pi &= \frac{\gamma}{q(\theta)} = \frac{\gamma}{\mu\theta^{-\eta}} \\ J_\pi &= \frac{x - w}{r + s} \\ w &= (1 - \alpha)z + \alpha(\gamma\theta + x) \end{aligned}$$

Throughout the analysis we assume that the value of x is normalized to 1, therefore all values related to monetary value are interpreted relative to the average productivity of a firm. Using these equations we can assume the values of J_π , wage and θ will vary with the change in productivity, which we change with various parameters that are explained below:

To explore the particular question of this project, we introduce a parameter h to capture an increase in education, which we assume then increases the productivity of the firm by a linear factor. We test the effect of this increase in productivity at the value of 1.2 to find the effect on wage and unemployment from an increase in education in Jordan and India. These values and the assumption itself are taken from Sweetman (2002), which looks at the effect of education (outside of tertiary education) on labor productivity. We also see a linear positive relationship between secondary school enrollment and GDP per capita (which we assume to be a reasonable proxy for x), which is shown later in the results.

Similarly to estimate the effect of an increase in tax relief used to provide an incentive for the population to receive more education, we introduce a parameter δ which reduces x by a linear factor when tax relief increases. This assumption is made through the argument that with an increase in tax relief, individuals have more disposable income therefore the relative value of output of firms (i.e. x) reduces. Given the values found in the literature that the tax relief saves approximately 15% of household income, we assume δ to be $1 - 0.15 = 0.85$.

Therefore we can hold other parameters constant, the values of which are found using publicly available data, to estimate the different values of w and θ at different rates of productivity. Therefore we can see the change in labor market outcomes given the change in educational outcomes and tax relief.

Given the existing literature and theory, we expect that productivity will increase wages. However, unemployment increases with wages and decreases with productivity given fixed wages. We expect that on net, unemployment will decrease and wages will increase when productivity increases, but it is not entirely clear. Particularly in the case of a tax relief, it is unclear which has a greater effect on the labor market.

Institutional Context

Jordan

Jordan has seen many policies that aim to improve their educational infrastructure, one of which being the National Agenda, a program that ran from 2006-2015. The National Agenda differentiates itself from past reform programs by taking a holistic approach to improving the country's economy, with one of the areas of focus being education. Through this program, Jordan aimed to expand access to and improve the quality of primary and secondary education via actions such as the establishment of a Public Education Accreditation and Quality Assurance Council and decentralizing authority in the public education sector (Hashemite Kingdom of Jordan, 2014). Although it may seem straightforward to say that improving human capital in this way will improve Jordan's economy, labor market frictions may prevent such positive effects; hence, we will investigate the predicted effects of such a program using the Bellman Equations and compare these results to observed data.

India

The Indian tax system provides several tax benefits for education to help individuals and families manage the cost of education. While this improves access to education, it's not straightforward to assume whether these policies translate into better labor market outcomes. Placement rates for the approximately 1 million graduates per year from existing government-affiliated institutes are low; available data from three states, Orissa, Andhra Pradesh and Maharashtra, show that only 16%, 41% and 35%, respectively, of new graduates were wage or self-employed as of 2009.

Section 80E of the Income-tax Act, introduced in 1961, provides for a deduction, from the gross total income of an individual, of the amount paid by him by way of interest on loan taken from any financial institution or approved charitable institution for the purpose of pursuing higher education. This tax benefit was introduced with a view to sustain high quality human resources in India and to encourage talented men and women to take up higher studies despite the constraints of resources.

For a long time, only the interest on loans qualifies for this deduction, while principal repayments do not. Loans from friends or relatives are excluded. This act underwent several amendments throughout the years including one in 2008 which allowed loans from friends and relatives to be included in the deduction which expands the outreach of this tax benefit. We use the 2008 amendment later in the analysis as a proxy for the introduction of a more generous education tax relief policy.

Parameter Specifications for Jordan

The parameters η , α , and x were assumed to have certain values in order to obtain a baseline estimate for the economy. η and α were assumed to take the value 0.5, and x was normalized to 1. The other parameters for Jordan were estimated using evidence from studies/reports on the Jordanian economy.

- The separation rate s was estimated using data from a report by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and Amman Chamber of Industry (AIC). Although this report specifically targeted Jordan's industrial sector in Amman and Irbid, we believe that the figures presented by this report are a good enough representation of the economy to use. Amman and Irbid are two of the largest cities in Jordan, making them good proxies for estimating this parameter for Jordan as whole. Additionally, the industrial sector comprises about 25% of the Jordanian economy (Statista, 2024) and produces many of its major exports, including potassium, fertilizers, textiles, and pharmaceuticals (TRADING ECONOMICS). Therefore, we found that this was an appropriate enough estimate to use for this project.
- The matching friction parameter μ was estimated using the study "Testing the importance of search frictions and matching through a randomized experiment in Jordan" by Groh et al. This study focused on youth unemployment and matching, but since most separation occurs with new hires or young people, we believe that this study provides an appropriate estimate for the separation rate. This study indicates a high level of labor market friction in Jordan, reporting difficulties for employers to accurately assess and hire appropriate workers (Groh et al., 2015). Therefore, we assume a high value for μ .
- The leisure parameter z was also estimated using the study by Groh et al., as it indicates a high level of voluntary unemployment. When surveyed, 84% of job candidates cited personal preferences about the type of job as a reason for turning down job offers (Groh et al., 2015). This indicates a preference for staying unemployed over taking a less desirable job, and therefore we can assume a high value for z .
- The parameter γ was estimated using the report by GIZ and AIC and average wage statistics from CEIC. The GIZ and AIC report states that the average cost of replacing an employee is 800 JOD (2018), and CEIC states that the average real monthly wage in Jordan is 474.75 (2024); thus, γ was obtained by dividing the average cost of replacing an employee by the yearly average wage: $800 \div (474.75 \cdot 12) \approx 0.14$.
- The values for f and q will be calibrated in the results section when θ is calculated.

Table 1: Parameters for Jordan

Parameter	Value	Source
η	0.5	arbitrary
s	0.2	GIZ and AIC
r	0.05	World Bank
μ	0.7	Groh et al.
x	1	arbitrary
z	0.7	Groh et al.
γ	0.14	GIZ and AIC, CEIC
α	0.5	arbitrary
U	252,945	World Bank

Parameter Specifications for India

Similar to Jordan's case, the parameters η , α , and x were assumed to have certain values to obtain a baseline estimate for the economy. η and α were assumed to take the value 0.5, and x was normalized to 1. The other model parameters for India were estimated using figures from previous literature, news reports, and online databases:

- The separation rate s is based on attrition or turnover rate in 2019 from a report by Salman et. al;
- The matching friction parameter μ is based on an estimation from a 2014 study by Pedro Gomes titled "Optimal Public Sector Wages". We expected the matching friction parameter to be high;
- The interest rate r was estimated by averaging yearly lending interest rate data from 2004-2023 from the World Bank database;
- γ , the cost of opening a vacancy is estimated based on a LinkedIn article by Vishal Sangale and the average salary value based on cleartax.in;
- The leisure parameter z is estimated based on the value of unemployment benefits. A report by cleartax.in indicates that usually, unemployment allowance is 50% of a worker's daily average earnings. Under the allowance, individuals are also eligible for medical assistance for up to one year. However, the unemployment allowance scheme in India is different for every state;
- The probability of finding a job f is based on a job matching experiment's results by Banerjee et. al where we take the average probability of the control group in the experiment of landing their preferred job;
- The number of unemployed people U are estimated using numbers for the labor force population and the unemployment rate which is estimated at around 8%;
- Parameter q and f are later estimated using the results of the calibration of the model.

Table 2: Parameters for India

Parameter	Value	Source
η	0.1	arbitrary
s	0.18 (0.045 quarterly)	Salman et. al
r	0.1	Statisa
μ	0.8	Gomes
x	1	arbitrary
z	0.5	cleartax.in
γ	0.115	cleartax.in, LinkedIn
α	0.5	arbitrary
U	60,000,000	Forbes India, World Bank

Results

Calibrating Model for Jordan

To calibrate the effect of an increase of human capital, we first model the values of Jordan without human capital.

(1) To do this we can obtain a system of 3 equations and 3 variables by assuming J_π, θ, w will change and holding $\gamma, \mu, r, s, \alpha, \eta, z$ constant:

$$\begin{aligned} J_\pi &= \frac{\gamma}{q(\theta)} = \frac{\gamma}{\mu\theta^{-\eta}} = \frac{0.14}{0.7\theta^{-0.5}} \\ J_\pi &= \frac{x - w}{r + s} = \frac{1 - w}{0.25} \\ w &= (1 - \alpha)z + \alpha(\gamma\theta + x) \\ &= (0.5)0.7 + 0.5(0.14\theta + 1) \end{aligned}$$

Solving this system gives us the following:

$$\begin{cases} w = 0.94 \\ \theta = 1.32 \\ J_\pi = 0.23 \end{cases}$$

(2) Similarly for the model with an increased level of education and therefore human capital, we can solve a system of equations holding the same variables constant and allowing J_π, θ, w to vary. To account for the increase in human capital, we derive the same equations with the addition of a variable h which is multiplied with x , which for the baseline model we hold $h = 1.2$, $\therefore xh = 1 * 1.2 = 1.2$ Solving the system as before, we obtain the following:

$$\begin{aligned} J_\pi &= \frac{0.14}{0.7 \cdot \theta^{-0.5}} \\ J_\pi &= \frac{1.2 - w}{0.25} \\ w &= (0.5)0.7 + 0.5(0.14\theta + 1.2) \\ \begin{cases} w = \frac{1.121}{1.2} = 0.93 \\ \theta = 2.77 \\ J_\pi = 0.31 \end{cases} \end{aligned}$$

Here as before we take wages as a proportion of overall productivity, which in this case is 1.2. Therefore we identify that wages relative to productivity have in fact reduced slightly although absolute wages will have increased, which is consistent with the existing theory. Additionally, labor market tightness has increased and therefore $q(\theta)$ has decreased and $f(\theta)$ has increased.

This figure shows data from Jordan from 2010-2022, and matches with the results obtained from our analysis. Firstly, the graph "Enrollment vs. GDP per Capita" shows an increasing relationship between secondary school enrollment rates and GDP per capita (which we use as a proxy for productivity), thus the data shows that our assumption that education/human capital increases productivity is valid. Next, the graph "Enrollment vs. Real Wages" shows that there seems to be a negative relationship between real wages and enrollment rate. This does not seem to be consistent with theory, since theory indicates that wages increase with productivity. However, since wages are decreasing in θ and θ is increasing in productivity, it is possible that the change to θ resulting from the increase in productivity is "drowning out" the positive effects of productivity on wages, hence the observed result. Finally, two time series graphs show the change in wages and unemployment over time. Average monthly wage has increased over time with some fluctuations after the completion of the National Agenda in 2015 (highlighted in yellow). The absolute increase in wages was seen in our model, and the fluctuations are likely a result of other economic factors. Unemployment has also increased after 2015. This is the opposite of the result we would expect from theory. However, it should be noted that Jordan's labor market was heavily impacted by their hosting of Syrian refugees. In 2016, Jordan enacted new labor laws that would allow for non-Jordanians to have easier access to work (ReliefWeb, 2023);

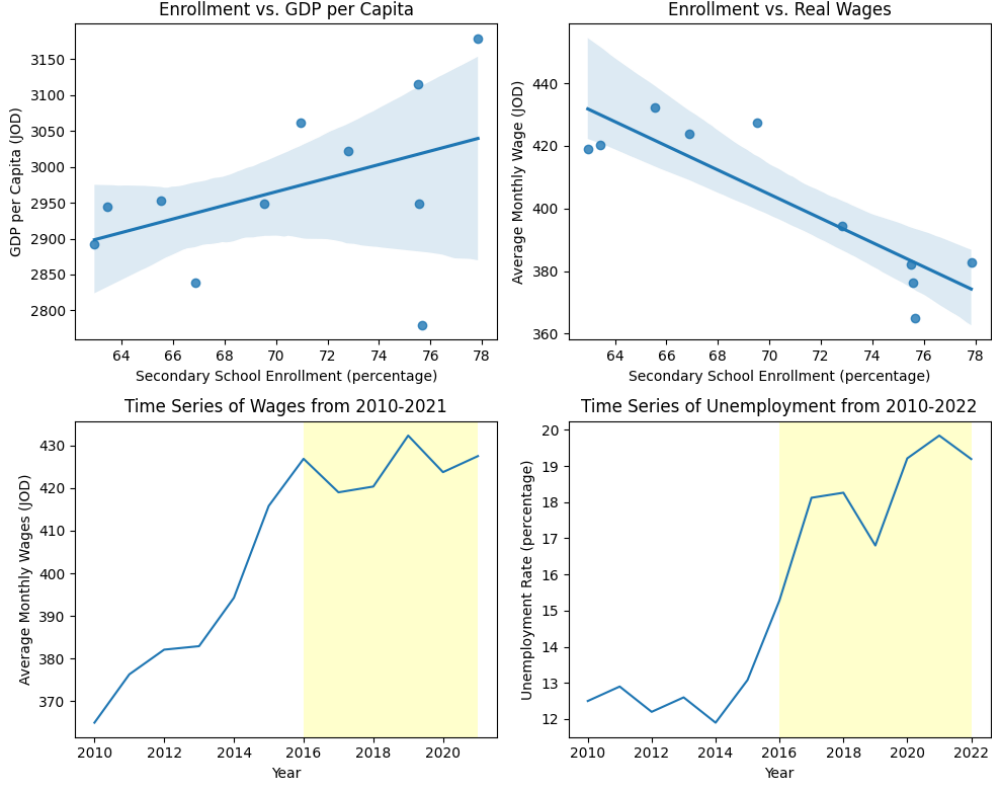


Figure 1: Data for Jordan from 2010-2022

therefore, the unemployment rate was raised significantly due to outside factors not accounted for in our model.

Calibrating model for India

To calibrate the values J_π, w, θ we use the same system of equations as before by holding $\gamma, \mu, r, s, \alpha, \eta, z$ constant, albeit this time with the values relevant to India.

(1) First we calibrate the values assuming that there is no taxation or increase in human capital, i.e $x = 1$.

$$\left. \begin{aligned} J_\pi &= \frac{1-w}{0.28} \\ J_\pi &= \frac{0.115}{0.5\theta^{-0.5}} \\ w &= (0.5)0.5 + 0.5(0.115\theta + 1) \end{aligned} \right\} \begin{aligned} J_\pi &= 0.18 \\ \theta &= 3.5 \\ w &= 0.95 \end{aligned}$$

(2) Values with tax relief but no increase in human capital: ($\delta = 0.85$)

$$\left. \begin{aligned} J_\pi &= \frac{0.85-w}{0.28} \\ J_\pi &= \frac{0.115}{0.5\theta^{-0.5}} \\ \omega &= (0.5)0.5 + 0.5(0.115\theta + 0.85) \end{aligned} \right\} \begin{aligned} J_\pi &= 0.14 \\ \theta &= 1.9 \\ w &= \frac{0.76}{0.85} = 0.9 \end{aligned}$$

(3) Values with tax relief and an increase in human capital ($\delta=0.85$) $\therefore \delta * x * h = 0.85 * 1 * 1.2 = 1.02$

$$\left. \begin{aligned} J_\pi &= \frac{0.85 \cdot 1.2 - w}{0.28} \\ J_\pi &= \frac{0.115}{0.5\theta^{-0.5}} \\ w &= (0.5)0.5 + 0.5(0.115\theta + 1.02) \end{aligned} \right\} \begin{aligned} J_\pi &= 0.17 \\ \theta &= 3.5 \\ w &= \frac{0.96}{1.02} = 0.94 \end{aligned}$$

As with our analysis of Jordan, we take wages as a proportion of overall productivity, which here changes with both h and δ . Calibration 1 shows that market tightness, represented by θ , is quite high, in the absence of an increase in tax relief or human capital.

We identify that J_π , the value of being employed decreases with the introduction of tax relief but with no effect observed on human capital (Calibration 2). Once human capital increases (Calibration 3), J_π also increases.

Market tightness decreases with the introduction of tax relief potentially indicating lower numbers of vacancies or higher numbers of people in unemployment. Market tightness increases with the decrease in productivity. On the other hand, when there is an increase in productivity due to the increase in human capital, market tightness goes back to Calibration 1's value, indicating either more labor supply or a lower number of job seekers. Since labor tightness doesn't really change after the introduction of tax relief and human capital, $q(\theta)$ and $f(\theta)$ should remain the same.

Lastly, wages increase (although only slightly) as tax relief increases. In Calibration 3 where we introduce tax relief and increase human capital, we observe that wages barely increase with productivity.

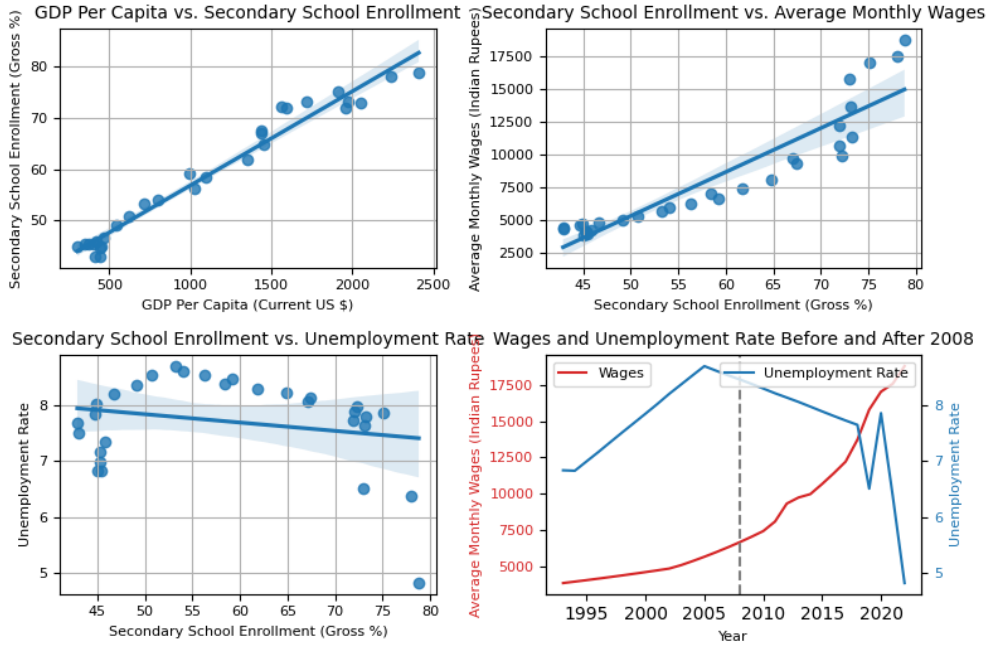


Figure 2: Data for India 1993-2022

Figure 2 uses 1993-2022 data from India to observe the relationships we calibrated above. First, we see that GDP per capita and school enrollment are correlated which validates our assumption that human capital increases productivity.

Secondly, we observe increase in wages as enrollment in secondary school increases, although more substantial than what the calibrations indicated. Similarly, the unemployment rate decreases (although slightly) as enrollment increases, as observed through θ in the calibrations.

Similarly, the introduction of the 2008 education tax relief amendments is associated with a relative increase in wages and a decrease in the unemployment rate. Therefore overall, the data seems to be consistent with the theory.

Conclusion

From these results, we can see that there are some positive results from these programs, but overall the effects seem to be minimal. In the case of Jordan the impact of educational reform policies on unemployment cannot be estimated since the data does not match with economic theory; but, we can conservatively estimate for both Jordan and India that educational reform policies will result in an increase in wage since the data does match with theory in this case. These results cannot necessarily be extrapolated to all countries, since both of these countries have specific economic contexts as developing nations and therefore many of the parameters would be quite different in other countries.

It should also be noted that this research exercise is limited due to the lack of access to reliable data. However, we see potential in expanding on these calibrations in a more rigorous research setting (i.e difference-in-difference analysis) to see the effect of the introduction of tax-relief programs on labor market dynamics.

Based on these results, we would hesitate to recommend this policy to any country attempting to raise its average wage rate or lower its unemployment rate. Our results show a relatively small increase in wage and in the case of Jordan no positive effect on unemployment; therefore, it seems most prudent to either conduct further study or utilize a different policy to achieve better results.

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