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American Enterprise Institute for Public Policy Research

The Effect of Labor Market Regulations on Educational Attainment

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Abstract

This paper develops a theoretical and an empirical model to study the effect of higher employment protection on investments in tertiary education. The mechanism driving this link is the effect of employment protection on worker flows. Worker flows (which are synonymous with job flows in my model), are significantly lower with firing taxes, leading to fewer vacancies available per unemployed worker (also referred to as market tightness). This reduces the probability of finding a job and therefore lowers the expected return to education. In equilibrium, with high firing taxes, only the highest ability individuals invest in costly education.

I test my model using panel data for more than a 100 countries over the period 1970-2005. Using data from the World Bank as well as from the Barro-Lee dataset on education, I find that, controlling for other factors, more flexible labor markets (or those with lower employment protection) are associated with relatively higher tertiary enrollment and graduation rates than more rigid markets.

JEL Codes: J24, J64, I2

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1. Introduction

A recent OECD study highlighted the fact that those with tertiary education had significantly higher earnings on average than those with less than upper secondary or post-secondary non-tertiary earnings.¹ In a frictionless and costless world, therefore, all individuals should aim to attain the highest level of education possible in order to maximize the return from schooling. However, patterns of educational attainment across countries show widely differing levels of enrollment in higher education (though enrollments in primary education are fairly uniform). In this paper, I argue that labor market frictions in the form of employment protection laws are responsible to a degree for these observed differences.

Theoretical models of labor markets with employment protection legislation (EPL) conclude that the effect of such legislation is to reduce job turnover, reduce productivity, increase the duration of unemployment and under certain circumstances, increase unemployment.² The model employed in this paper argues that the reduced job reallocations that result as a consequence of labor market rigidities have negative effects on investments in education. Reduced job reallocations, measured as the sum of job creation and job destruction rates, imply that workers have fewer vacancies to which they can apply for jobs.³ This reduces the return to education in two ways. The “job creation” effect is that even with an education, the likelihood of finding a job through search, and earning a productive wage, is reduced. The “job destruction” effect is that since firings are reduced, workers with jobs will face fewer opportunities to search for re-employment. Therefore, they will have less “use” of education as a signaling device to secure their next

¹ For instance, OECD’s Education At a Glance (Table A.9.1a) reports that those with tertiary education had significantly higher earnings on average than those with less than upper secondary or post-secondary non-tertiary earnings.

² Empirical studies using annual cross-country data flows, have however, not been able to document this link. A recent paper by Wolfers (2008) however, argues that this lack of empirical results may be partially due to the frequency of the data examined. Using quarterly household employment survey data, the paper finds a significant effect of employment protection on job flows. Another NBER working paper by Autor, Kerr and Kugler (2007) finds that wrongful-discharge protection laws in U.S. states reduce employment flows and firm entry rates and also lead to declines in total factor productivity. For papers on the political economy of employment protection, see Saint-Paul (2002) and Acemoglu and Robinson (1998). For effects on job turnover, see Bertola and Rogerson (1997).

³ This follows the definition of job reallocations employed in Davis and Haltiwanger (1999).

job.⁴ With flexible labor markets and higher job mobility, these conditions are reversed. Job reallocations are higher leading to more vacancies per unemployed worker. This yields a higher expected return to job search for educated workers since the likelihood of finding a job is higher. Further, workers are either fired or they quit more frequently (i.e. job destruction is higher) leading to a greater “use” (or need) of education as a signaling device. Job flows in the model are synonymous with worker flows. Higher worker flows or reallocations, measured as the sum of worker hires and separations, are similarly lower in rigid labor markets. This, in turn, leads to lower worker investment in higher education in these markets relative to freer labor markets.

The empirical analysis uses cross-country panel data for several developing and developed economies for the period 1970-2005 to confirm this hypothesis. Results from a fixed effects regression show that countries with stricter employment protection laws see lower tertiary enrollments and graduation rates.

The literature on this topic is relatively sparse, and to my knowledge, almost entirely theoretical. Further, education in these models is indistinguishable from “on-the-job” training. Fella (2005) shows in a model with incomplete contracting that termination restrictions increase the firm’s and the worker’s incentive to invest in training. Burda (2003) models education as human capital investment made by firms. The paper shows that stronger employment protection results in lower education because the firm tries to compensate for the additional costs of more employment protection by reducing education. Wasmer (2003) distinguishes between general and specific human capital investment made by the worker on the job. If employment protection is high, workers invest more in specific human capital. The paper that comes closest to this one is Stahler (2005). Similar to the model presented in this paper, education is modeled as occurring prior to the job. The result, however, is the opposite of what I obtain. More employment protection increases the incentive to skill formation as long as the worker obtains a sufficiently large fraction of this investment. The difference with my model is that there is worker heterogeneity in skill levels. Skilled and unskilled workers operate in two different labor markets, so that the decision to invest in higher education is a function of

⁴ For papers discussing the signaling effect of education, see Jaeger and Page(1996), Olneck (1977), Hungerford and Solon (1987), Belmen and Haywood (1991) and Card and Krueger (1992).

the relative market tightness in the two markets. In my paper I assume that all educated workers face the same market conditions. However, firing taxes lower the number of vacancies per unemployed worker, and that in turn reduces the incentive to invest in education, particularly for those with a high cost of attaining education.

Some other papers have studied the impact of differences in education policy on growth rates between U.S. and Europe. Krueger and Kumar (2003) point out that in Europe, the focus is on acquiring vocational education at the upper secondary level, while in the U.S., there is a greater entry rate for universities imparting general education. This results in higher university attainment for the U.S. labor force. This is also reflected in the expenditure on tertiary education in the U.S. versus Europe. For instance, the ratio of expenditure per student to GDP per capita was higher for the U.S. than for Germany.

Mincer (1991) and Nickell (1976) explore the linkages between education and labor market outcomes. These studies highlight the lower risk of unemployment incidence among more educated workers relative to workers with low levels of education. Mincer (1991) also provides evidence that the costs of on-the-job search relative to searching while unemployed are lower for more educated workers and firms and workers search more intensively to fill skilled vacancies. Other papers focus more closely on estimating the return to graduate education in terms of wages. For example, see Weiss (1971), Becker (1960) and Oshenfelter and Mooney (1968) among others.

In the next section, I present my theory model. Section III discusses the available data on education and employment protection indices. Section IV presents the empirical model and the regression results. Section V concludes.

II. The Education Decision in Regulated Markets

My approach follows Pissarides (2000) in specifying a matching function model to capture labor market dynamics. In particular, I employ a model that accounts for employment protection for workers through the imposition of a firing tax (F) on the employer when a separation takes place. Firing taxes are assumed to be a function of the workers productivity (p) so that higher taxes are paid when relatively higher skilled workers are laid off. This is plausible since in these types of markets firms may find it tougher to fire skilled workers as opposed to unskilled workers.

The basic framework of the model is as follows. Suppose there are L workers in the labor force. Vacant jobs as a fraction of the labor force (v/L) and workers (L) become matched to each other according to the prevailing matching technology. The number of job matches taking place per unit time is given by

$$mL = m(uL, vL) \quad \text{where } uL \text{ is the number of unemployed workers} \quad (1)$$

Assuming homogeneity of the matching function, the rate at which vacant jobs get filled is defined as

$$q(\theta) \equiv m\left(\frac{u}{v}, 1\right) \quad (2)$$

The mean duration of a vacant job is $\frac{1}{q(\theta)}$. Hence unemployed workers find jobs more easily when there are more jobs relative to the available workers. θ is therefore a measure of market tightness and is defined as the ratio $\left(\frac{v}{u}\right)$.

Job Creation takes place when a firm and searching worker meet and agree to form a match at a negotiated wage. The productivity of the job is denoted by px , where p denotes a general productivity parameter and x an idiosyncratic one. At the start of the job, the firm realizes the highest value of productivity since the firm can choose the best technology and product type. Once job creation has taken place, the firm has no choice of either. Profit maximization trivially requires that all new jobs are created at maximum productivity, p .

Idiosyncratic shocks arrive to jobs at Poisson rate λ . When an idiosyncratic shock arrives, the productivity of the job moves from its initial value x to some new value x' , which is a drawing from a general distribution $G(x)$ with support in the range $0 \leq x \leq 1$. At the new productivity x' , the firm can either continue to produce or shut down. Job destruction takes place when the realized x is below the firm's reservation productivity R . Noting that all jobs are created at maximum idiosyncratic productivity, $x=1$, the expected profit from a new job vacancy satisfies:

$$rV = -pc + q(\theta)(J(1) - V) \quad (3)$$

The asset value of a job with productivity in the range $1 \geq x \geq R$ satisfies

$$rJ(x) = px - w(x) + \lambda \int_R^1 J(s) dG(s) - \lambda J(x) - \lambda G(R)pF \quad (4)$$

When a job is destroyed, the firm gives up $J(x)$ and pays a termination tax pF . So a job with idiosyncratic productivity x will be destroyed if $J(x) < -pF$, giving the reservation productivity equation

$$J(R) + pF = 0 \quad (5)$$

The unemployed worker's net worth is given by

$$rU = z + \theta q(\theta)(W(1) - U) = z + \frac{\beta}{1-\beta} pc\theta \quad (6)$$

where W is the average net worth of employed workers. The employed worker's net worth in a job that pays $w(x)$ is given by

$$rW(x) = w(x) + \lambda \int_1^R W(s) dG(s) + \lambda G(R)U - \lambda W(x) \quad (7)$$

Wages are chosen to maximize the Nash product. In general, the wage rate divides the job surplus in fixed proportions at all x , so that the sharing rule is

$$W(x) - U = \beta [J(x) + pF + W(x) - V - U] \quad (8)$$

This rule is derived under the condition that after the worker is taken on, the benefit to the firm from continuation of the contract is only $J(x)$, and there is a loss to the firm of $J(x) + pF$ if the job is destroyed.

In equilibrium with $V=0$, the resulting wages are

$$w(x) = (1 - \beta)z + \beta p(x + c\theta + rF) \quad (9)$$

Using these wages and following the methodology described in Pissarides (2000) to solve for the job creation and job destruction conditions yields the following equations:

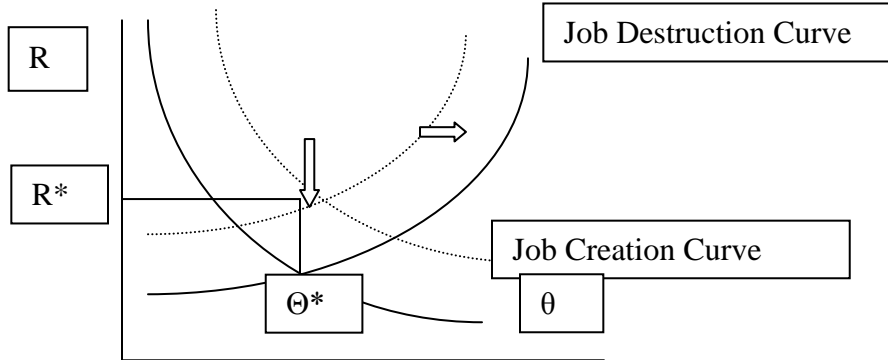
$$(JD) \quad R + rF - \frac{z}{p} - \frac{\beta c}{1-\beta} \theta + \frac{\lambda}{r+\lambda} \int_R^1 (s - R) dG(s) = 0 \quad (11)$$

$$(JC) \quad (1 - \beta) \left(\frac{1-R}{r+\lambda} - F \right) = \frac{c}{q(\theta)} \quad (12)$$

These equations can be plotted in (R, θ) space as shown below. The JC curve is downward sloping in this space while the JD curve is upward sloping. It can be

seen clearly that an increase in firing taxes will shift the JC curve left and the JD curve down, so that both job creation and job destruction decrease as a result of this policy. This can also be seen by taking derivatives of equations (11) and (12) with respect to F . In the diagram therefore, at the new equilibrium both R and θ are at a lower level.

Diagram 1. Effect of Firing Taxes on JC and JD curves (Pissarides, 2000)



Our results so far have established the following two propositions.

Proposition 1: $\frac{d(\text{JobFlows})}{dF} < 0$

Firing taxes or employment protection leads to a decrease in overall job flows and worker flows. Job flows or worker flows are simply the sum of job creation and job destruction (or worker hires and separations). Since both job creation and job destruction are adversely affected as a result of firing taxes, overall job flows are reduced as well.

Proposition 2: $\frac{d\theta}{dF} < 0$

These reduced job flows lead to a reduction in market tightness. Therefore, an increase in firing taxes leads to a reduction in market tightness i.e. there are now fewer vacancies per unemployed worker.

The next step is to see how these reduced job flows affect the incentive to invest in education.

EDUCATION

Let worker productivity or ability be distributed uniformly in an interval $e \in [0,1]$ where zero represents the highest ability. The cost of education is k per unit. The lower an

individual's ability to learn, the more units of education x an individual needs to become high-skilled. Therefore, the highest ability individuals have a total cost of education, calculated as ke that is approximately zero.

We assume that only educated individuals find jobs. Therefore, for a worker to get educated, the expected utility of employment net of costs of education has to equal (or be ε greater than) the utility from unemployment. Since all workers start off at the highest level of productivity, this condition translates to;

$$W(1) - ke = U \quad (13)$$

The threshold value for an individual to be willing to get educated is therefore calculated as

$$\bar{e} = \frac{W(1)-U}{k} \quad (14)$$

It can be shown that $rU = z + \frac{\beta}{(1-\beta)}pc\theta$

Therefore,

$$W(1) - U = \frac{\beta}{(1-\beta)q(\theta)}pc \quad (15)$$

and

$$\bar{e} = \frac{\beta}{k(1-\beta)q(\theta)}pc \quad (16)$$

This equation shows that education depends inversely on the costs of education and the degree of market tightness and is a function of the relative bargaining power of workers.

Proposition 3: The effect of firing costs on education is negative.

$$\frac{d\bar{e}}{dF} = \frac{\beta}{k(1-\beta)(q(\theta))^2}pc \cdot -q'(\theta) \cdot \frac{d\theta}{dF} < 0 \quad (17)$$

By the properties of the matching function, $q'(\theta) < 0$. Also, from Proposition 2, $\frac{d\theta}{dF} < 0$.

This proposition implies that higher firing taxes lower the threshold education level \bar{e} . In other words, with high firing taxes only the highest ability individuals find it worthwhile to get educated. Therefore, the variation in education levels can be explained to some extent by employment protection rules that reduce job and worker flows and

subsequently, market tightness. Figures 1A-1D show variations in enrollments in primary, secondary and tertiary education across countries.

In the empirical analysis that follows, I focus on higher schooling and tertiary enrollments rather than total schooling for the following reason. Several countries, such as Canada, England, India and even the U.S. have compulsory schooling laws that apply to primary and secondary education. Several countries also subsidize schooling for children in the early years. Therefore, schooling is less of a choice variable at that level. This is less likely to be a problem with tertiary or higher schooling. The decision to enroll in higher schooling presumably involves more of a cost-benefit calculation. To some extent, the empirical data reflect this fact. In Figures 1A-1D, we see the highest degree of variation in tertiary enrollment rates across countries, followed by secondary enrollment and then the least variation in primary enrollment rates.

III. Education Data and Employment Protection Indices

III.A. Education Data

To perform this analysis, I obtained data on educational attainment from two sources. The first is the Barro-Lee education data set available from the Center for International Development at Harvard University. These data are available at five year intervals, starting from 1960 to 2000. From these data, I chose variables that showed the percentage of total population older than 25 years that have attained or completed higher schooling.

The other data source is the World Bank's Education Statistics database.⁵ The variable that I selected from the database is titled "Gross Tertiary Graduation Ratio" which is defined as the total number of graduates from first degree programs ISCED97 Level 5A, regardless of age, expressed as a percentage of the total population at the theoretical graduation age for such programs. ISCED 97 refers to the International Standard Classification of Education which is used to compile statistics on education

⁵

<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTEDUCATION/EXTDATASTATISTICS/EXTEDSTATS/0,,contentMDK:21272698~menuPK:4323930~pagePK:64168445~piPK:64168309~theSitePK:3232764,00.html>

internationally and distinguishes among six levels of education. ISCED Level 5A are largely theory based and are designed to provide sufficient qualifications for entry to advanced research programs and professions with high skill requirements, such as medicine, dentistry or architecture. Tertiary-type A programs have a minimum cumulative theoretical duration (at tertiary level) of three years' full-time equivalent, although they typically last four or more years. The source of these data is the UNESCO Institute of Statistics. These data are available for the period 1998-2005, though several countries have missing data for in between this period.

Apart from the data availability for different years, some discrepancies exist between the World Bank's graduation rates data and the Barro-Lee data. Table 1 lists the tertiary graduation rates for the one year that the two databases have in common, 2000. For this year, we can see that for some countries like Australia, Austria, Ireland, France, the differences are extremely high. The Barro-Lee numbers are one-half or one-third of the World Bank numbers. For several other countries, the numbers are fairly close. The overall correlation between the two series is high, at 0.72. The differences could be due to the fact that the World Bank data refer to graduates from first degree programs ISCED 97 Level 5A, while the Barro-Lee data makes no such distinction. The Barro-Lee variable is simply "the percentage of higher school complete in the total population". Further, the Barro-Lee data includes all individuals aged 25 and above, whereas the World Bank data include all individuals regardless of age, but divides by the population specific to the graduation age for such programs.⁶

⁶ I also experimented with the OECD data. The OECD categories are below upper secondary, secondary and tertiary. In general, according to Barro (⁶), the first three categories of UNESCO should match well with the first category of OECD. However, it is unclear whether the OECD's concept of upper secondary attainment corresponds closely to the U.N. concept of complete secondary attainment. For many countries, the correspondence between the Barro-Lee and the OECD data is good. But, for several countries, the OECD data indicate much higher attainment at the upper secondary level and above — Austria, Canada, Czech Republic, France, Germany, Netherlands, Norway, Switzerland, and the United Kingdom. The source of the difference, in many cases, is likely to be the distinction between some and complete secondary schooling. The OECD classification probably counts as upper secondary many persons whom the U.N. ranks as less than complete secondary. The treatment of vocational education is particularly an issue here. Another source of discrepancy is that the Barro-Lee figures refer to persons aged 25 and over, whereas the OECD data are for persons aged 25 to 64. Since secondary and tertiary attainment have been rising over time, this difference would tend to make the OECD figures on upper secondary and tertiary attainment higher than the corresponding numbers for Barro-Lee.

In addition to graduation rates for higher education, I also collected data on enrollment rates from the World Bank Education Statistics database. The advantage of these data is that the data coverage for all countries is significantly better than for the graduation rate. Further, they should be a better indicator of the demand for education than the graduation rates data since the latter could be affected by factors such as ability, financing etc. Gross tertiary enrollment ratio, tertiary is the number of pupils (total, male, female) enrolled in tertiary programs, regardless of age, expressed as a percentage of the population (total, male, female) of the five-year age group following on from the secondary school leaving age. These statistics are compiled from UNESCO Institute for Statistics and are available from 1970 to 2006.

Figures 1A and 1B show tertiary graduation and enrollment rates using the Barro-Lee and World Bank data respectively. Graduation rates are available for about 515 country-year observations with a mean value of 4.96 percent and a standard deviation of 4.45. The distribution is fairly skewed across countries. In the year 2000, the final year of the Barro-Lee data, the United States had the highest tertiary graduation rate of 30 percent relative to all the countries in our sample. Most of the OECD countries had rates higher than 10 percent. Low-income countries such as Bangladesh, Botswana, Ghana, Mali and Mozambique had rates lower than 4 or 5 percent.

The enrollment data, available from the World Bank EdStats database, show a similar pattern across countries. The United States had an enrollment rate of 82 percent in 2005, the latest year available from the World Bank database. However, in terms of enrollment, there are more countries that exceed or match the level of the United States, such as Finland, South Korea and New Zealand. The variation across countries in enrollment is much higher with a standard deviation of 22.

Figures 1A and 1B show the change in graduation rates and enrollment rates across countries between 1970 and the latest year. For all countries in the sample, investment in higher education, as measured by tertiary graduation rates or tertiary enrollment rates, has gone up tremendously over the 30 to 35 year period.

Figures 1C and 1D plot enrollment in secondary and primary education across countries. The interesting difference is that there is very little variation across countries in

these rates. Most countries now uniformly have higher enrollments in these programs. This is a striking contrast to the pattern of enrollment in tertiary education.

Figures 2A and 2B show that there has been a gender shift in enrollment in these programs. In 1970, more than 50 percent of those enrolled were male. Today, there has been a complete demographic reversal with females comprising more than 50 percent of those enrolled.

To further explore patterns of change in tertiary enrollment, I augmented the data set with information on graduate enrollment by field of study. Figure 3 shows total enrollment across fields. As is clear from the figure, the highest share of graduate enrollment in 2005 is in the fields of business, and health, humanities and services. The lowest share appears to be science, with the United States having a slightly above average enrollment of approximately 9 percent. Note that the percentages are measured as a fraction of total enrollment across all fields.

To summarize the education data so far, we observe an increase in enrollment and graduation rates over the years across all countries. The higher enrollment is associated with more female graduates and is also associated with a greater degree of enrollment in fields such as “business” and “health, humanities and services”.

III.B. Employment Protection Indices

The other main variable is the labor market regulation indicator. These data are available from the Economic Freedom of the World Index compiled by the Fraser Institute. For some countries, the data are available from 1970 onwards, again at five year intervals. The data availability improves for several countries starting from the 1990s. The labor market regulation index includes as sub-components indices relating to minimum wage regulation, hiring and firing, mandated cost of hiring, mandated cost of dismissing, centralized collective bargaining and conscription. The index ranges from 1 to 10. The higher the index, the less the regulation and therefore the lower the employment protection.

Figure 4 shows the trend in the index between 1990 and 2005 across countries. The positively sloped fitted line shows that countries are in general moving towards freer labor markets. Loosely tabulated, there are more countries in the upper right quadrant

than in the bottom left. Also, there are more countries situated below the fitted line than above it, which suggests that countries that had high protections in 1990 have moved towards somewhat more flexibility in 2005.

I will use this space to graphically document some of the established features of labor markets with employment regulations. For instance, prior literature has shown that rigid labor markets such as those in Europe lead to low worker mobility and longer job tenures, while more flexible labor markets such as the US lead to high worker mobility and a lower incidence of long-term employment. Burgess (1998) presents a survey of comparable statistics measuring the fraction of workers who had been in their jobs for 1 year or less in the 1990s for ten developed countries. This fraction is substantial in most countries in all age groups, but it is among the highest in the United States. Burgess reports that approximately 20 percent of employed males in the US aged 25-64 were on their jobs for 1 year or less, compared to 11.4 percent in France, 16.3 percent in Germany, 8.2 percent in Italy and 4.3 percent in Japan. Unfortunately, data on job tenure are available only for the OECD countries from the OECD Statistical database for the years 1992-2007. The job tenure data show the average number of years of tenure for all jobs with a tenure range of 1 to 3 years. The data for 2005 are plotted against the employment protection index in 2005 in Figure 5A. The fitted line shows a clear downward trend suggesting that more flexible labor markets are correlated with shorter job tenures.

Similarly, Figures 5B and 5C show the percent of long-term unemployed and the incidence of long-term unemployment plotted against the employment protection index. The percent of long-term unemployed refers to the number of people who have been unemployed for longer than a year as a fraction of the total labor force. The incidence of long-term unemployment shows the proportion of people who have been unemployed for longer than a year as a fraction of all unemployed. As we might expect, both variables are negatively linked to the employment protection index. With free labor markets, the average duration of unemployment is shorter since there are relatively more job flows and vacancies. Another interesting result that shows up in the data is the return to education in labor markets with employment rigidities. Figure 6A shows that the return to education, measured as the dollar wage per hour, is lower in rigid labor markets. Of

course, wage data are affected by several other factors that I am not controlling for in this graph. However, it is interesting that this relationship, which has not been documented before, shows up clearly in the data. Further, plotting educational attainment against the return to education yields a positively sloped line, as we may expect (Figures 6B and 6C).

The wage data, and the unemployment incidence data mentioned in the previous paragraph were obtained from the International Labor Organization (ILO) KILM database.

III.C. Educational Attainment and Labor Market Rigidity

The final figures, 7A-D plot the employment protection index against tertiary graduation rates and enrollment rates. Without controlling for other factors, I find that there is a clear positive link between the two variables. Freer labor markets are associated with higher educational attainment than rigid labor markets. Therefore, labor market institutions affect not only labor market outcomes but also educational attainment levels. This relationship holds for each of the sub-indices as well.⁷

IV. Methodology and Results

We estimate the regression model using a fixed effects specification. The dependent variable is a measure of the population with tertiary education (either graduation rates or enrollment rates), while the explanatory variables include 1-year and 5 year lagged values of the labor market regulation index as well as other explanatory variables mentioned below. The 1-year and 5-year lags are important since individuals enrolled in these programs may make decisions about whether to continue with the program or even to initially enroll for a degree that they will earn in 4 to 5 years based on how they perceive the labor market to be today.

⁷ The link between labor market outcomes and education is explored in the most recent OECD Education At a Glance Report (2007). The report clearly shows that for all OECD countries, there is a negative link between unemployment rates and educational attainment. When unemployment rates are broken down by educational attainment, the lowest unemployment rates are reported for people with tertiary education, with a gradual increase in the unemployment rates as we move to groups with secondary or lower education levels. For instance, in Australia and Canada, more than 80 percent of adults between 25-64 years of age and with a tertiary education were employed, while only around 50 percent with a below upper secondary education had a job.

Note that the Barro-Lee data on graduation rates are available at 5-year intervals starting in 1970 which exactly matches the availability of the employment protection index. However, the tertiary enrollment rates data from the World Bank are available annually. Therefore, to maximize the use of these data, we assume that the EPL data are identical to the later year in between each 5 year period.

Table 2 provides summary statistics for the variables used in the analysis.

IV.A. Demand for Higher Education

Results using the tertiary graduation rates from the Barro-Lee data are presented in Table 3 and those using the World Bank data are presented in Table 4.

In Column (1) of Table 3, I include only the lagged labor market regulation variable. The coefficient in this case is 0.749 and is positive and significant at 1 percent, suggesting that less regulation (a higher value of the index) is associated with higher educational attainment. A 1 unit increase in the index raises the percent of tertiary graduates by 0.75 percentage points.

Tertiary graduation rates could vary across countries for several other reasons. For instance, in general, countries with higher incomes are likely to have more resources devoted to higher education. This would affect the supply of education in terms of the availability of graduate programs, as well as the quality of schooling. At the same time, since average incomes are higher, individuals in these countries would be willing to spend more on attaining higher education. Both these factors would lead to an increase in the demand for tertiary education as measured by higher tertiary graduation rates. In addition, factors such as the degree of urbanization, the fraction of the government education budget devoted to tertiary education programs and the unemployment rate should influence the demand for higher education. The extent of urbanization is a proxy for the extent of industrialization as well as the availability of non-agricultural jobs. Urbanization captures the proportion of population earning a living from non-agricultural jobs such as those in manufacturing, trade and services. The higher the magnitude of this variable, the greater will be the demand for high-skilled workers. At the same time, the fewer the jobs available in the labor market (as captured by the unemployment rate), the greater will be the pull of higher education programs. In Columns (2), (3) and (4), I add

these additional variables to see if the coefficient on the regulation index changes significantly once I control for them. The magnitude of the coefficient, however, does not change substantially across these different specifications.

The coefficient on GDP per capita is positive and significant suggesting that richer countries have a higher proportion of their population with tertiary education. As mentioned earlier, this could be due to the provision of better quality education through good schools and facilities. The sign on the unemployment variable is also not surprising. A high unemployment rate could mean that people have a lower opportunity cost of staying in school and therefore are more likely to do so. Other variables, such as urbanization and government expenditure to GDP are not significant, perhaps since I am already controlling for GDP per capita.

In Table 4, I use exactly the same specifications but work with the graduation data from the World Bank. In this case, the number of observations is higher than for the Barro-Lee data, however the significance levels are unchanged. The coefficients are nearly double the size of the estimated coefficients in Table 3. In Column (1) of Table 4, I find that without controlling for other variables that affect tertiary graduation rates, the coefficient on the lagged regulation dummy is 1.96 and is significant at 1 percent. The coefficient varies somewhat across specifications depending on the number of controls, but is still fairly high when I include all the other variables such as GDP per capita and government expenditures on tertiary education as a fraction of GDP.

The difference in coefficients could be due to several reasons. First, the Barro-Lee data essentially measures a change in the tertiary graduation rate over five year periods for the period 1970-2000. The World Bank data instead measures annual changes in graduation rates. The graduation data is available for the period 1999-2006 and as I have shown in Table 2, the percentages are typically 2 to 3 times higher than the numbers that Barro-Lee report for a common year. Further, as mentioned earlier, there are differences in the population covered by the two measures. The World Bank data refer to graduates from first degree programs ISCED 97 Level 5A, while the Barro-Lee data makes no such distinction. The Barro-Lee variable is simply “the percentage of higher school complete in the total population”. Further, the Barro-Lee data includes all individuals aged 15 and

above, whereas the World Bank data include all individuals regardless of age, but divides by the population specific to the graduation age for such programs.

In general, despite differences in the magnitude of the coefficients, the picture that emerges from both datasets is the same. Our results show that the more flexible the labor market, the greater the incentive to invest in education. The coefficient on the lagged labor market regulation index is positive and significant at conventional significance levels in both regressions and is robust to the inclusion of other controls.

In Table 5, I use a different measure to test whether people invest more in higher education in more flexible labor markets. The dependent variable in these regressions is the enrollment rate in tertiary programs, rather than the graduation rate. This itself should be indicative of the demand for higher education and may even be a better measure since it measures the demand for higher education as opposed to just the output of higher education programs. The results in this case are significant and positive. In Column (1), the coefficient on the labor market regulation index is 5.71 suggesting that a 1 unit increase in the regulation index changes the enrollment in tertiary programs by 5.7 percentage points. This result is significant across specifications including other explanatory variables. The size of the coefficient however drops in magnitude depending upon the controls. In general, the only other variables that are significant are the GDP per capita and the average hourly wage, suggesting that all other information relevant to the decision to enroll in higher education programs is contained in these two variables. Intuitively, the former captures all factors affecting the quality and quantity of education available, while the latter captures the return to investment in education. The coefficient on wages is particularly interesting since even after controlling for that, we still get a significant coefficient on the EPL index. This suggests that EPL affects other features of the labor market as well, which in turn have an effect on enrollment decisions. These other variables could relate to the incidence of long-term unemployment or job tenure which influence the likelihood of obtaining a job and a positive return to education. In other words, while the observed wages are an indicator of the return to education for a person who is able to obtain employment, it provides no information to a person outside the labor market of the possibility of obtaining a job. It is this latter probability that is affected by labor market institutions such as employment protections and which may

explain the significance of the EPL coefficient despite inclusion of the wage variable in the regression.

Finally, Table 6 shows the effect on transitions from secondary to tertiary enrollment. I define the dependent variable as the ratio of the tertiary enrollment rate to the secondary education graduation rates. The regression results in Table 6 show that labor market regulation is a significant factor in the choice to transition from secondary to higher education. Individuals are more likely to demand higher education in more flexible labor markets. The size of the coefficient varies from approximately 0.06 to 0.10 and is significant at 10 percent level of significance. The other factors affecting the transition choice are the unemployment rate and the income level. Presumably, if labor market unemployment rates are low, then more individuals would forego obtaining a higher degree.

IV.B. Testing the Mechanism

The starting point of our analysis is the idea that workers in more flexible labor markets have relatively shorter job tenures, relatively shorter unemployment durations and relatively low incidence of long-term unemployment. This explains their use of education as a risk mitigation mechanism as they move from job to job. I test this by using data on job tenures derived from the OECD and data on average hourly wages and long-term unemployment derived from the ILO's KILM database. The job tenure data are available from 1993-2006 and the wage data from 1980-2005.

The job tenure data are available for all OECD countries (except the US) and show the average number of years that a person is employed at a job in different tenure intervals. For instance, for jobs with a tenure interval of between 1-3 years, the average tenure in Austria was about 1.89 years in 1995-1996. The data for a few countries are shown in Table 7.

The correlation between the labor market regulation index and the job tenure data are negative, which is what we would expect. The magnitude of the correlation is about -0.1437. This is also evident in the chart shown in Figure 5A. In general, countries such as Iceland and UK have more flexible labor markets and short average job tenures, while others such as Sweden and Belgium have more labor market regulation and longer job

tenures. These results show up significantly in a regression of job tenure on labor market regulation (Table 8). The coefficient on the index is -0.032 implying that a 1 unit increase in the index lowers the average job tenure by 0.03 years.

Countries with high employment protection also typically have lower rates of return to education and a higher proportion of long-term unemployed. This shows up in a regression of average hourly dollar wages on the index, and a separate regression of the proportion of long-term unemployed on the index. The coefficient in the former is positive and significant, while in the latter regression is negative and significant.

Therefore, employment protection legislation affects the labor market in multiple ways—all of which significantly reduce the return to education. This is more directly captured using the wage data, but also indirectly captured using data on job tenures and long-term unemployment.

In the final column in Table 8, I regress the total enrollment rate on each of these variables individually. The results support the view that higher wages, lower long-term unemployment and shorter job tenures lead to higher enrollment rates. While this regression by itself is not proof of the effect of employment protection on education outcomes, the two regressions together provide some idea of the mechanism through which employment protection legislation affects returns to education in the labor market, and therefore affects investments in education.

V. Conclusion

This paper makes a theoretical and empirical contribution to the literature linking employment protection legislation and education outcomes. Most, if not all, of the literature on the topic so far has been theoretical and has reached different conclusions based on the modeling and the definition of education as “on-the-job” training or schooling.

In this paper, I am able to show that employment protection affects the incentive to invest in graduate education. In particular, higher employment protection reduces tertiary graduation and enrollment rates due to the effect on market tightness. Such protection increases average job tenure and therefore job mobility, and also adversely affects wages. These factors in turn, affect the demand for education since workers face

fewer opportunities for re-employment and therefore have less of a need to use their educational attainment as a signaling mechanism. The opposite is the case in freer labor markets where job mobility and re-employment opportunities are high and workers signal their ability through investments in education.

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<http://bpp.wharton.upenn.edu/jwolfers/Papers/EmploymentProtection.pdf>

Figure 1A: Tertiary Graduation Rates, 1970 and 2000

Source: Barro-Lee

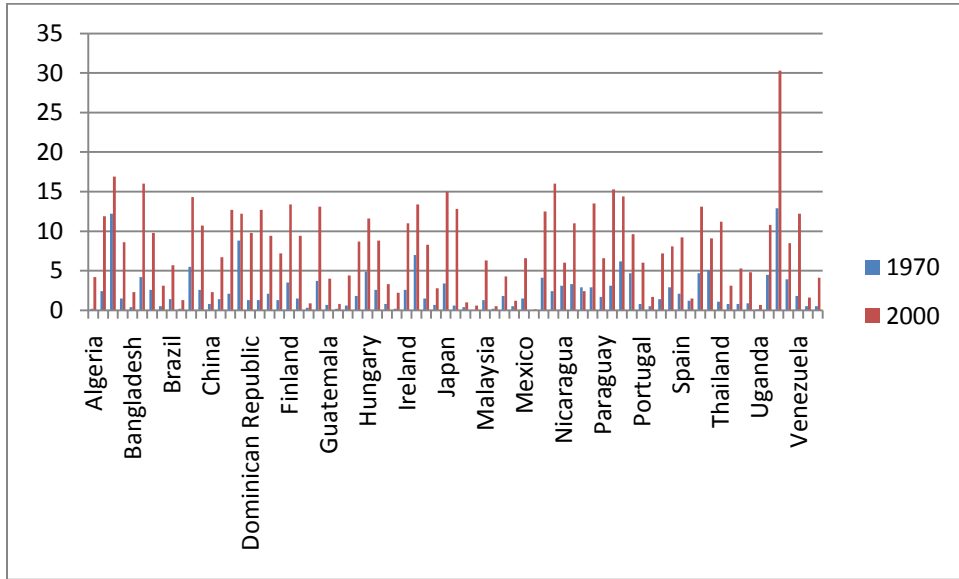


Figure 1B: Enrollment in Tertiary Programs, 1970 and 2005

Source: World Bank

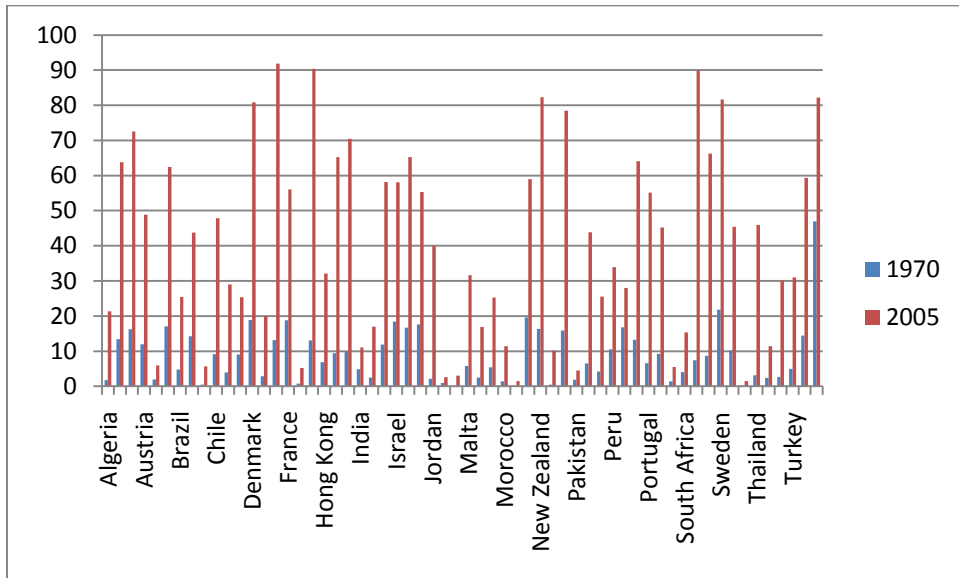


Figure 1C: Enrollment in Secondary Programs, 2005

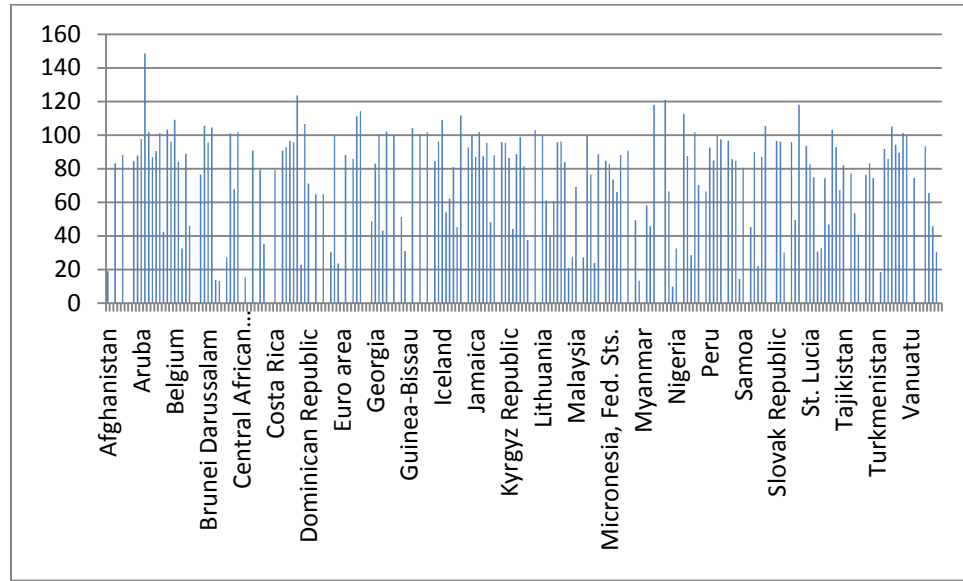


Figure 1D: Enrollment in Primary School, 2005

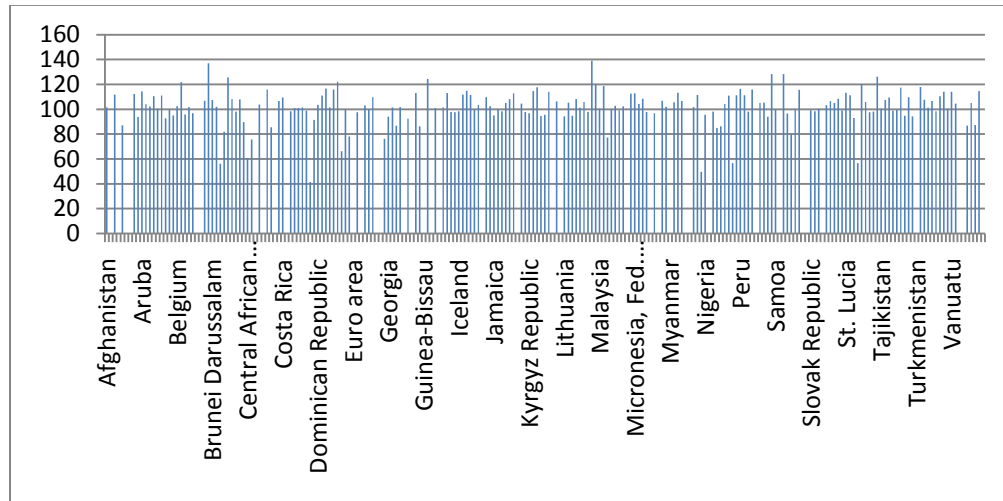


Figure 2A: Male-Female Enrollment in Tertiary Programs, 2005

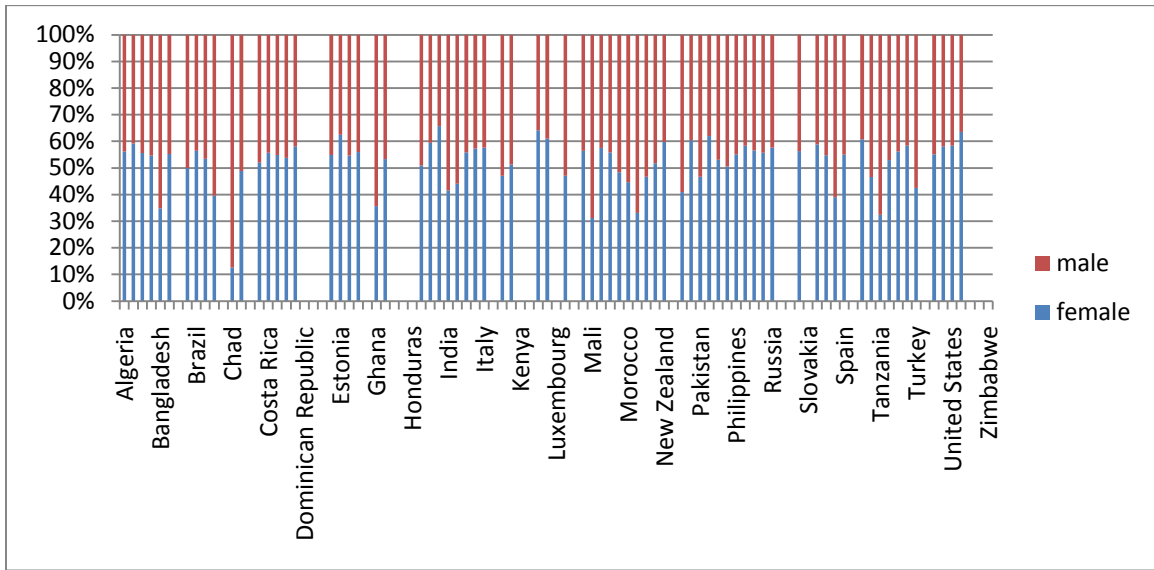


Figure 2B: Male-Female Enrollment in Tertiary Programs, 1970

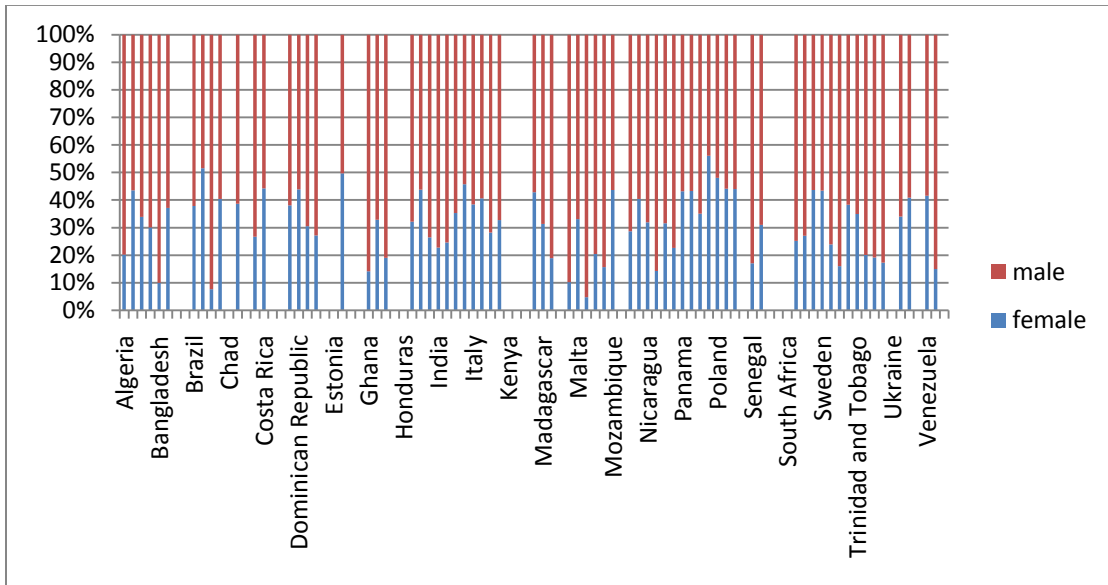


Figure 3: Distribution of Total (Male and Female) Enrollment Rates by Graduate Field,

2005

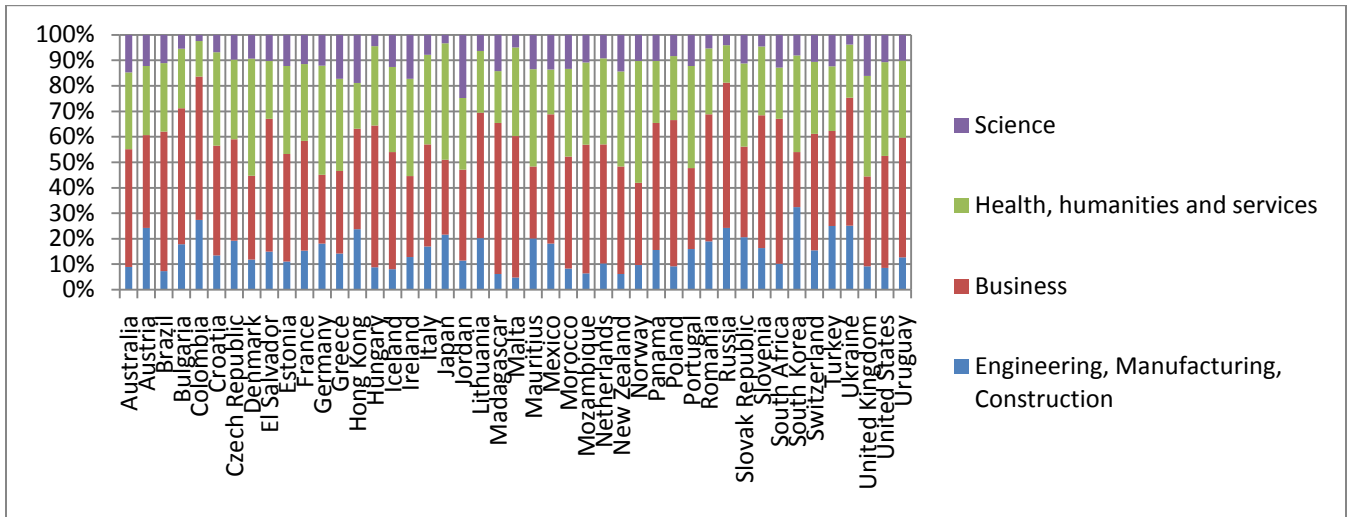
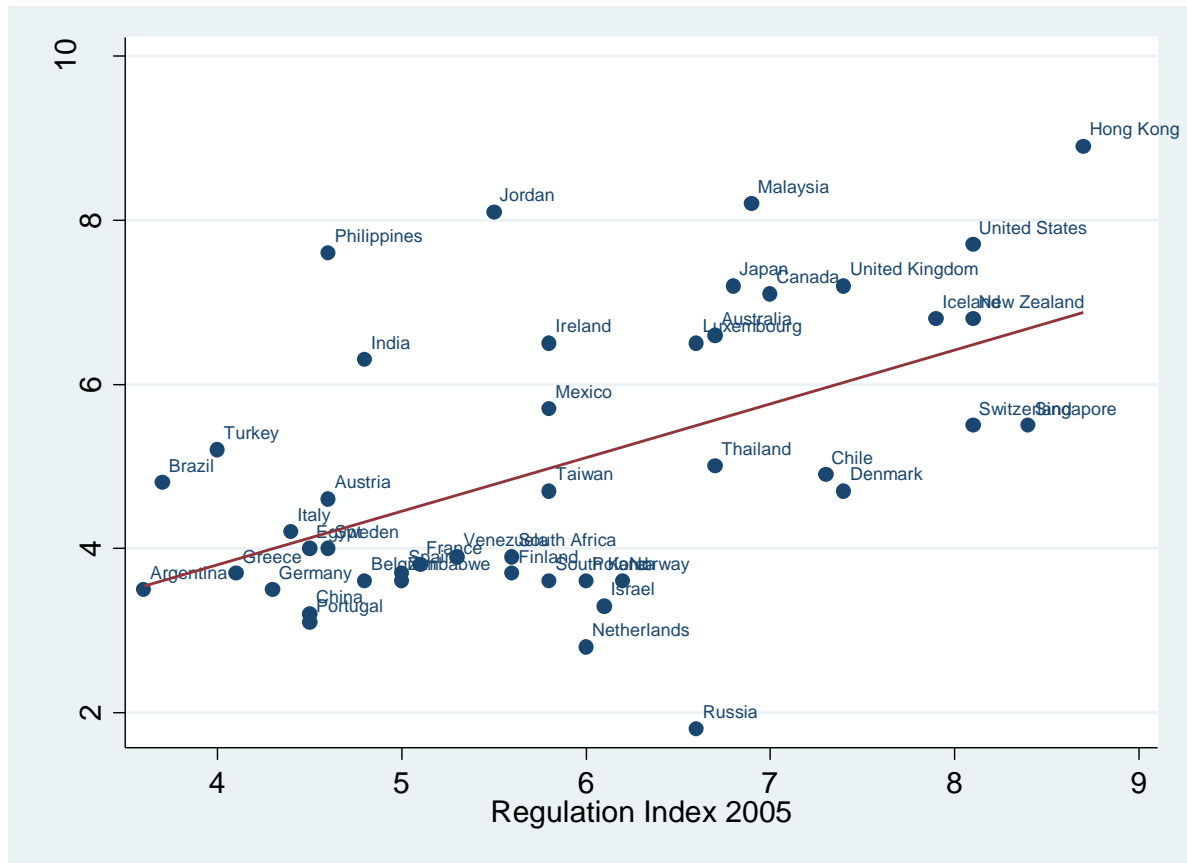


Figure 4: Employment Protection Legislation Index: 1990-2005



Note: The higher the index, the fewer the regulations.

Figure 5A: Job Tenure and Labor Market Regulation, 2005

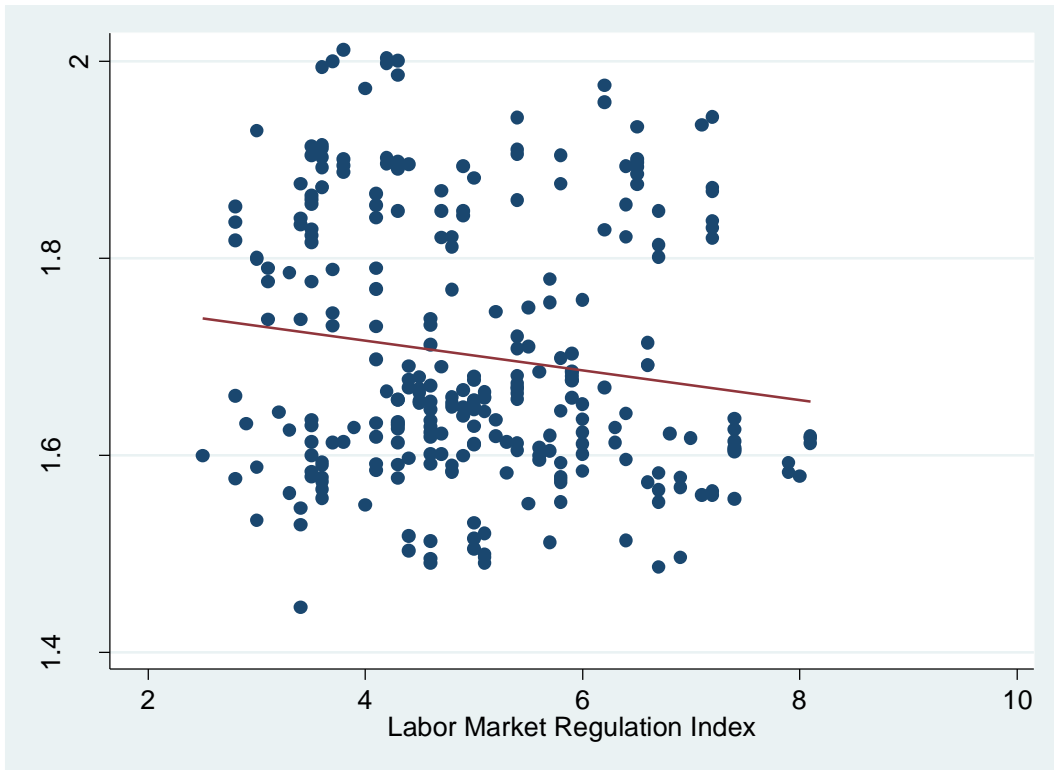


Figure 5B: Long-Term Unemployment Percent and Labor Market Regulations

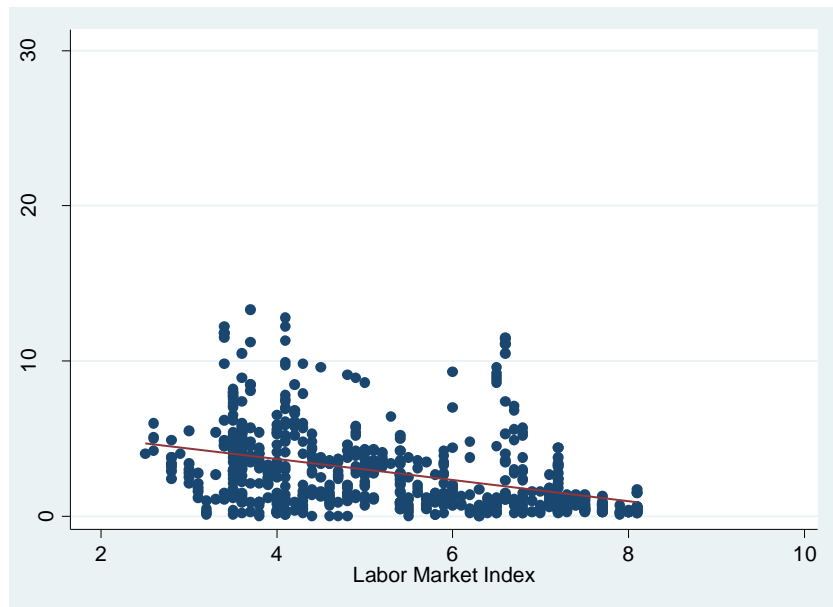


Figure 5C: Incidence of Long Term Unemployment and Labor Market Regulations

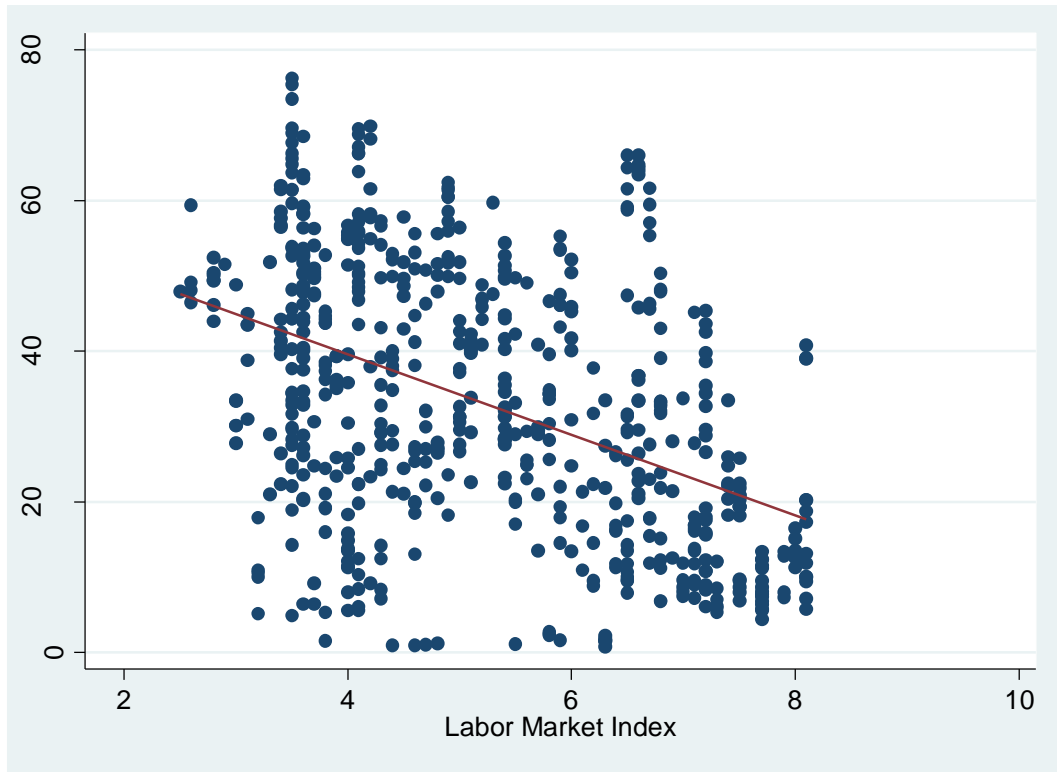


Figure 6A: Labor Market Regulations and Dollar Wages, 2000

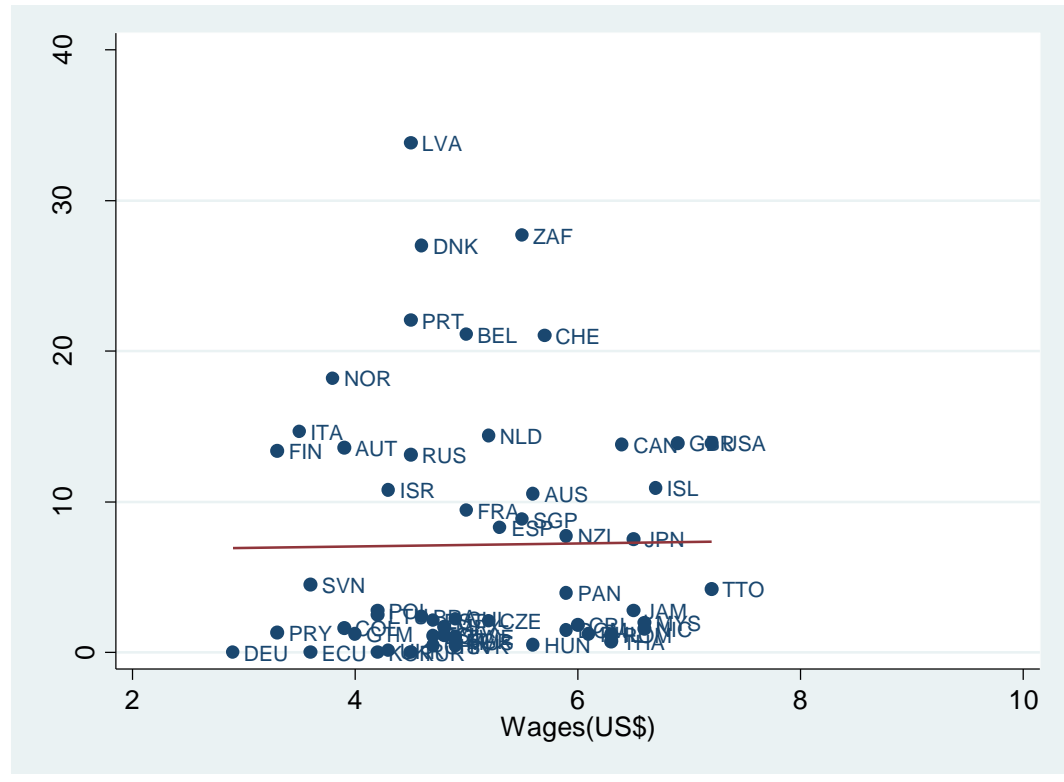


Figure 6B: Tertiary Graduation Rates and Dollar Wages: BL data

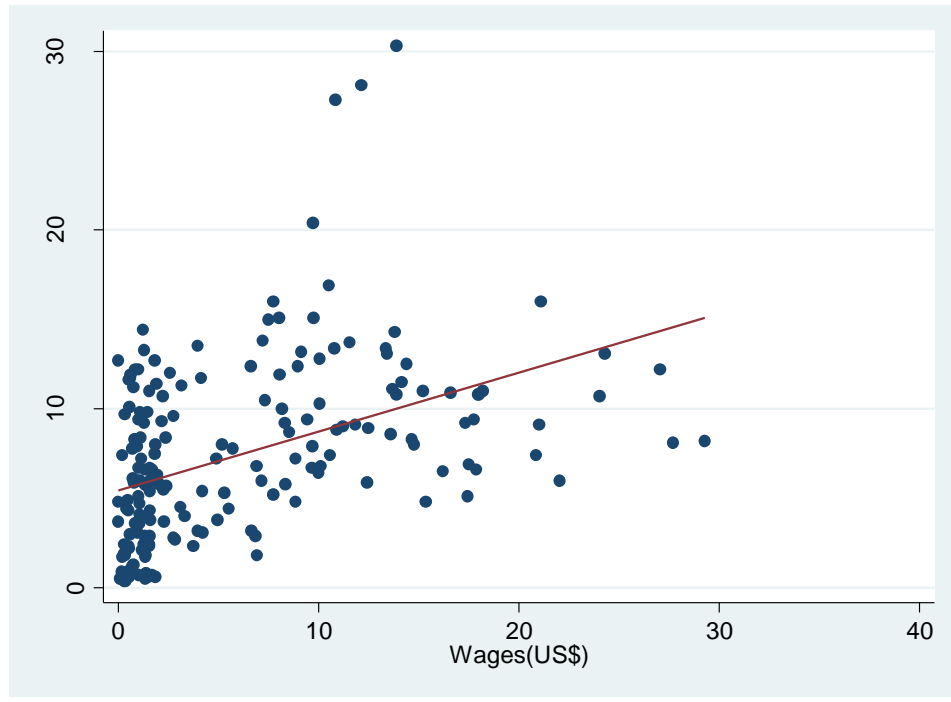


Figure 6C: Tertiary Graduation Rates and Dollar Wages: WB data

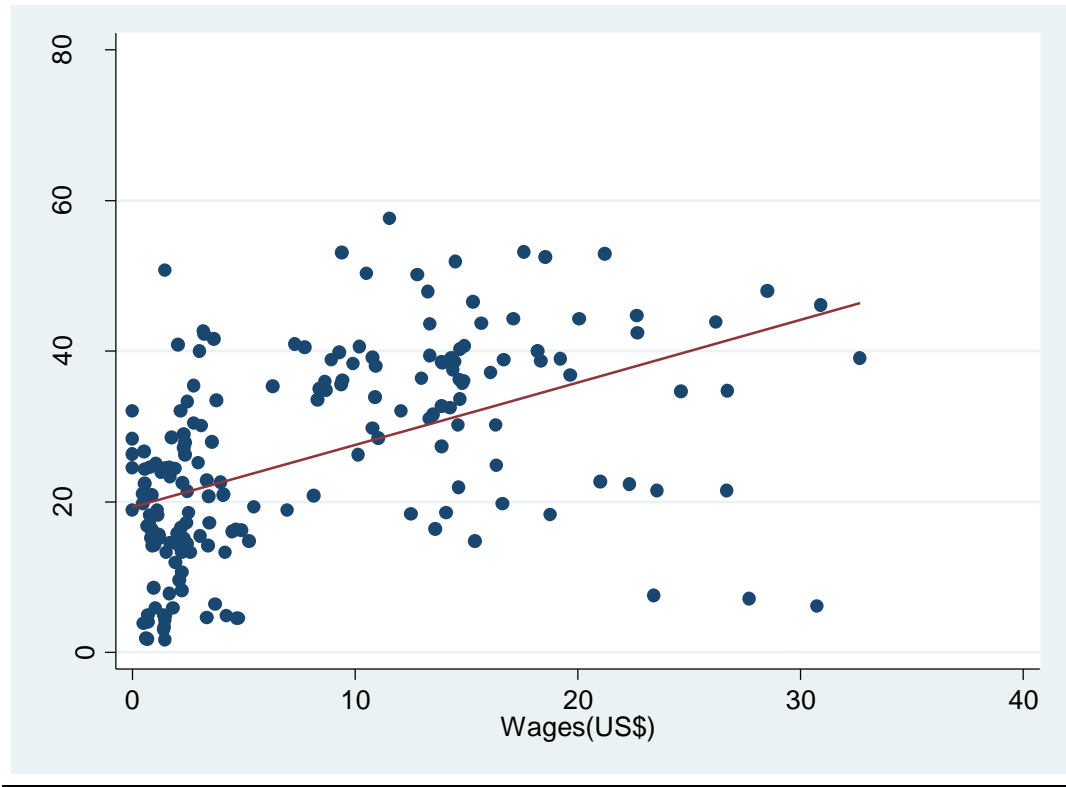


Figure 7A: EPL And Tertiary Graduation Rates, Barro-Lee, 1970-2000



Figure 7B: EPL And Tertiary Graduation Rates, World Bank, 1998-2005

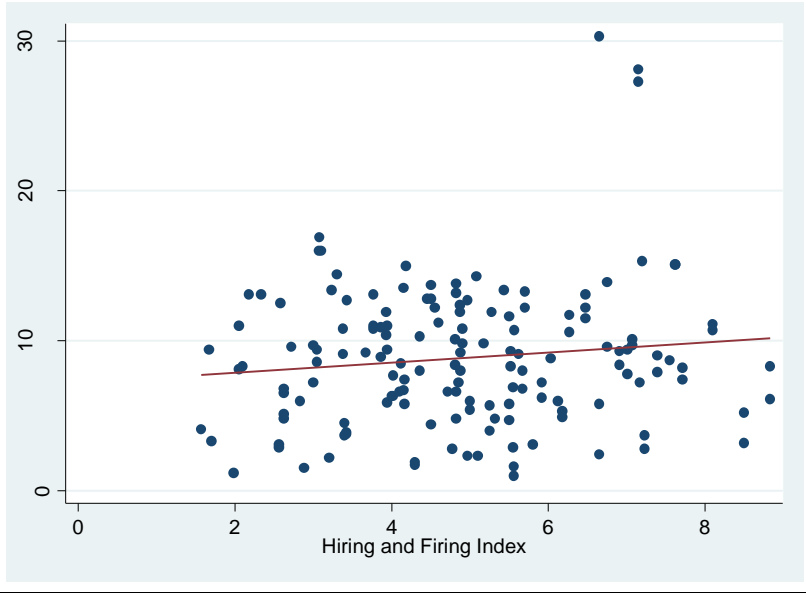


Figure 7C: EPL and Tertiary Enrollment Rates, All Years

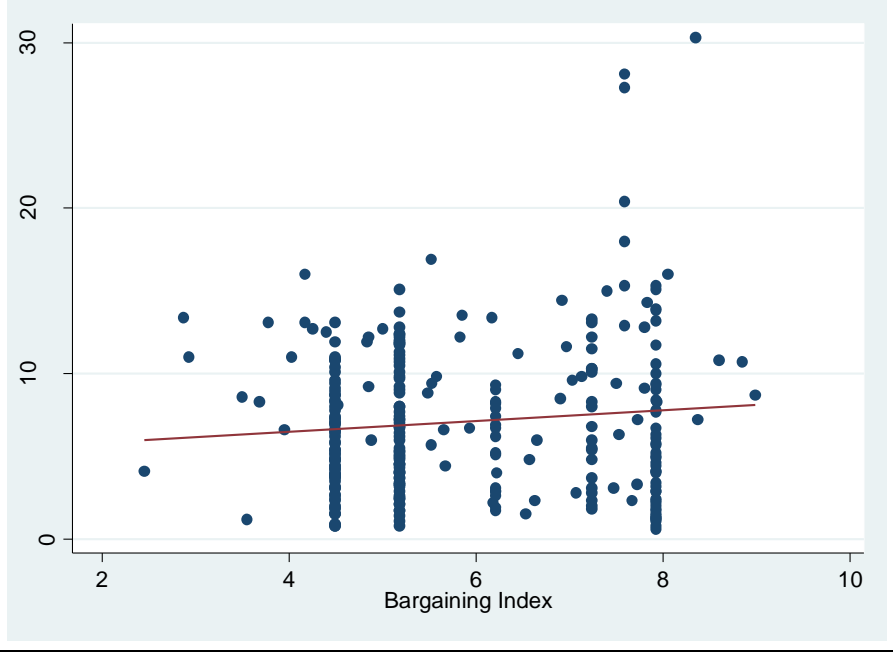


Figure 7D: Tertiary Graduation Rates and Types of Labor Market Regulation

(a)



(b)



(c)

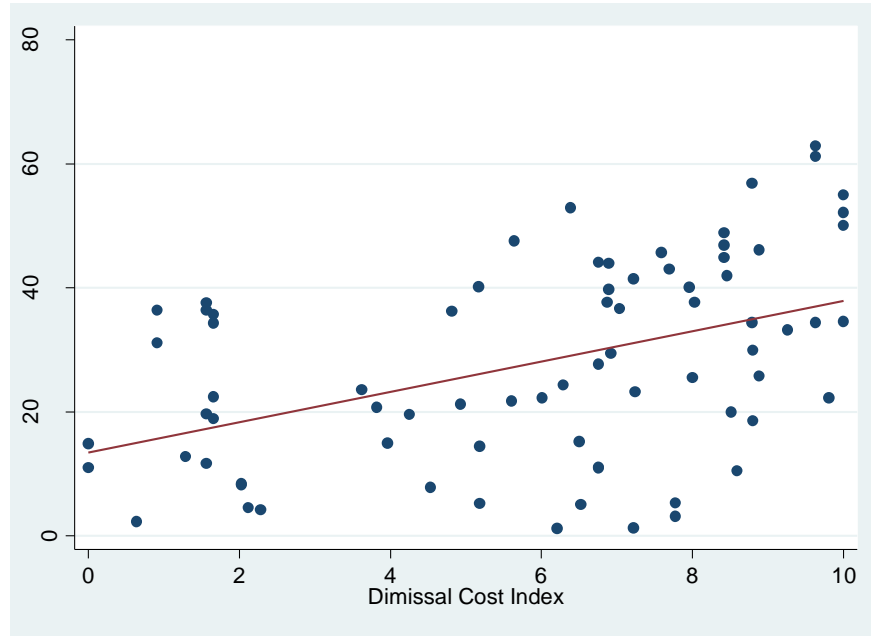


Table 1: Discrepancies Between Barro-Lee and WB Databases, 2000

Country	Barro-Lee	World Bank
Australia	16.90	50.33
Austria	8.60	16.37
Bangladesh	2.30	4.97
Chile	10.70	13.23
China	2.30	3.81
Costa Rica	12.70	5.90
Finland	13.40	43.61
France	9.40	36.14
Honduras	4.40	2.23
Hungary	11.60	26.65
Iceland	8.80	33.86
Indonesia	2.20	6.37
Ireland	11.00	29.57
Israel	13.40	29.77
Italy	8.30	21.95
Jordan	12.80	14.26
Kenya	1.00	1.86
Lesotho	1.00	2.05
Liberia	1.90	3.92
Malta	4.30	15.11
Mexico	6.60	14.49
Netherlands	12.50	37.45
New Zealand	16.00	40.55
Norway	11.00	40.04
Poland	9.60	35.45
Sierra Leone	0.80	1.80
South Africa	8.10	7.11
Spain	9.20	33.58
Swaziland	3.30	4.87
Sweden	13.10	32.51
Switzerland	9.10	22.72
Togo	1.60	5.66
Tunisia	5.30	7.16
Uganda	0.70	1.50
United Kingdom	10.80	38.54
United States	30.30	32.71
Uruguay	8.50	6.72
Correlation		0.72

Table 2: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max	Database
Percent of Tertiary Graduates (Barro-Lee)	531	4.960264	4.457927	0	30.3	Barro-Lee
EPL Index	1611	5.209373	1.465891	1.8	8.9	EFW
GDP Per Capita	1241	8621.882	10723.84	121.6039	54778.65	WDI
Urbanization	1278	58.04382	22.77584	6	100	WDI
Unemployment Rate	668	8.442964	5.042734	.6	35.5	WDI
Percent of Tertiary Enrollment (World Bank)	1707	26.82764	22.28149	.0665	95.2108	EdStats
Tertiary Graduation Rate (World Bank)	373	23.46556	14.85848	.2582568	65.48208	EdStats
Tertiary Expenditure to GDP	837	77.16952	168.053	1.8458	1685.702	EdStats
Long-Term Unemployment Rate	720	2.902917	2.637898	0	13.3	KILM
Incidence of Long-Term Unemployment	721	32.53883	17.61102	.8	76.2	KILM
Female Enrollment (Tertiary)	1541	29.26079	26.20267	.0162	102.8832	EdStats
Male Enrollment (Tertiary)	1540	26.37834	20.26242	.1772	111.1605	EdStats
Log(Wage)	1317	.8075501	1.68121	-10.33735	3.580711	KILM

Notes:

EFW: Economic Freedom of the World Index, Fraser Institute

<http://www.freetheworld.com/>

WDI: World Development Indicators, World Bank

<http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20398986~menuPK:64133163~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html>

EdStats: Education Statistics Database, World Bank

<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTEDUCATION/EXTDATASTATISTICS/EXTEDSTATS/0,,contentMDK:21528247~menuPK:3409442~pagePK:64168445~piPK:64168309~theSitePK:3232764,00.html>

KILM: Key Indicators of the Labor Market (ILO)

<http://www.ilo.org/public/english/employment/strat/kilm/>

Table 3: Tertiary Graduation Rates
Data Source: Barro-Lee

	(1)	(2)	(3)	(4)
Dependent Variable: Percent of Tertiary Graduates				
LaggedLaborMarketReg.	0.749 (3.21)***	0.690 (3.39)***	0.683 (3.33)***	0.687 (3.18)***
GDP Per Capita		0.0003 (6.19)***	0.0003 (6.02)***	0.0003 (6.21)***
Urbanization			0.021 (0.36)	0.007 (0.12)
Unemployment Rate				0.055 (1.73)*
TertiaryExp/GDP				0.0019 (0.23)
Constant	6.490 (5.36)***	0.949 (0.69)	-0.505 (0.12)	-0.588 (0.13)

Observations 167 167 167 165

Absolute value of t statistics in parentheses
 ***significant at 1%; **significant at 5%;*significant at 10%

Table 4: Tertiary Graduation Rates
Data Source: World Bank

	(1)	(2)	(3)
Dependent Variable: Percent of Tertiary Graduates			
LaggedLaborMarketReg.	1.966 (3.29)***	1.315 (2.25)**	1.244 (2.14)**
GDP Per Capita		0.003 (5.46)***	0.003 (5.45)***
Urbanization		0.469 (1.10)	0.421 (0.99)
Unemployment Rate		-0.363 (1.79)*	-0.275 (1.32)
GovtExpTert/GDP			-0.061 (1.70)*
Constant	15.758 (5.39)***	-48.893 (1.67)*	43.617 (1.48)
Time Dummies	Yes	Yes	Yes
Observations	251	246	244

Absolute value of t statistics in parentheses
***significant at 1%; **significant at 5%;*significant at 10%

Table 5: Enrollment in Tertiary Programs

Data Source: World Bank

	(1)	(2)	(3)
<hr/> Dependent Variable: Enrollment in Tertiary Programs (Percent) <hr/>			
LaggedLaborMarketReg.	5.713 (7.23)***	2.296 (3.93)***	1.779 (1.87)*
GDP Per Capita		0.003 (17.43)***	0.002 (6.80)***
Urbanization		0.666 (3.16)***	0.177 (0.50)
TertExp/GDP		-0.052 (1.82)**	-0.029 (0.77)
Unemployment Rate		0.423 (3.46)***	0.257 (1.06)
Wage/Hr(\$)			0.528 (3.32)***
Constant	4.473 (1.05)	-52.572 (4.03)***	16.609 (0.74)
Time Dummies	Yes	Yes	Yes
Observations	548	519	243

Absolute value of t statistics in parentheses

***significant at 1%; **significant at 5%; *significant at 10%

Table 6: Effect On Transitions from Secondary to Tertiary Enrollment

Data Source: Barro-Lee		
	(1)	(2)
Dependent Variable: (TertEnroll/SecondEduc)		
LaggedLaborMarketReg	0.103 (3.11)***	0.058 (1.83)*
GDP Per Capita		-0.0002 (0.84)***
Urbanization		0.0002 (0.00)
Unemployment Rate		-0.012 (2.67)**
TertExp/GDP		0.002 (1.50)
Constant	0.114 (0.66)**	0.828 (1.12)
Time Dummies	Yes	Yes
Observations	167	165
Absolute value of t statistics in parentheses		
***significant at 1%; **significant at 5%;*significant at 10%		

Table 7: Average Job Tenure by Country and Year for Tenure Interval 1-3 years

Country/Year	2000	2001	2002	2003	2004	2005	2006
Austria				0.6549608	0.6919898	0.692914	0.6899858
Belgium	1.6560497	1.648446	1.6549827	1.6897233	1.6762758	1.6588913	1.6493325
Czech Republic	1.7452853	1.720593	1.6221881	1.666417	1.6493199	1.6755674	1.6840325
Denmark	1.6235195	1.6016252	1.6187393	1.6351376	1.6589378	1.6078039	1.6144999
Finland	<u>1.6250611</u>	1.5927079	1.6138609	1.6127656	1.6279644	1.5950742	1.5992525
France	1.5309679	1.5157308	1.5210351	1.5049663	1.5118522	1.4964157	1.49915
Germany	1.6321519	1.5759655	1.5992081	1.6605127	1.5616299	1.6315797	1.6336363
Greece	1.7204701	1.6457037					
Hungary	1.6847987	1.6987937	1.7086422	1.7101759	1.9350958	1.6796849	1.6851236
Iceland	1.5816051	1.4962944	1.622453	1.6175648	1.5788112	1.5824606	1.5922572
Ireland	1.5819401	1.5504676	1.6201508	1.612392	1.5777496	1.5724859	1.575382
Italy	1.5782285	1.5565892	1.5736411	1.5659315	1.7503974	1.668983	1.690523
Luxembourg	1.6806081	1.6573142	1.6131782	1.757808	1.7552289	1.6910008	1.7143466
Netherlands	1.6359009	1.6194141	1.6295435	1.6587589	1.6677632	1.6523181	1.6365349
Norway	2.0116627	1.9722149	1.9941989	2.0000424	2.0035866	1.9583556	1.9756588
Poland	1.6648252	1.6130078	1.6186061	1.630219	1.5837956	1.5835458	1.6116644
Portugal	1.6793394	1.6544991	1.6563242	1.6565047	1.7031958	1.6637939	1.6533662
Spain	1.6134574	1.6461284	1.6440659	1.6641873	1.6688511	1.6551447	1.6119448
United Kingdom	1.5770783	1.5596498	1.5528419	1.5730653	1.5677477	1.555544	1.604033

Table 8: Effect of Employment Protection on Labor Market Variables

(1) Indep. Var: Labor Market Regulations (<i>t</i>) (obs)		(2) Dep. Var: Enrollment Rate
Dependent Variables:		Independent Variables:
Average Job Tenure (1-3 years) (145)	-0.032 (2.73)***	-23.319 (3.32)***
Log(Wage, \$) (303)	0.218 (2.45)**	1.911 (2.52)**
Long-Term Unemp. (%) (264)	-0.428 (3.29)***	-1.358 (2.29)**

All regressions include GDP per capita and time dummies and are estimated using fixed effects.

Absolute value of *t* statistics in parentheses
 ***significant at 1%; **significant at 5%; *significant at 10%