

## Economic Freedom, Capital, and Growth: Evidence from the States

American Business Review  
May 2022, Vol.25(1) 25 - 35  
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ISSN: 2689-8810 (Online)  
ISSN: 0743-2348 (Print)

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<https://doi.org/10.37625/abr.25.1.25-35>

### ABSTRACT

Hall et al. (2010) develop a growth model where the allocation and productivity of human and physical capital depend on the quality of institutions in a country. We apply their model to the US states from 1980 to 2000. Using the Economic Freedom of North America as our measure of institutional quality, we find evidence that increases in human capital lead to increases in output per worker only in states with average EFNA scores above 5.91. Physical capital, unlike in the cross-country case, always has a positive effect on output per worker.

### KEYWORDS

Economic Freedom, Human Capital, Economic Growth, Migration

### INTRODUCTION

World Bank economist Lant Pritchett (2001) was among the first economists to note that cross-country data show a lack of association between rising human capital levels and the rate of growth of output per worker. This finding is surprising given the high individual returns to education. Pritchett puts forth three possible answers to this puzzle. First, a poor institutional environment might actually have perverse enough incentives that more education leads to lower economic growth. Second, demand for educated workers could be so sluggish as to have greatly reduced the marginal returns to education. Third, the observed level of education in many countries could be so poor that more years of schooling does not actual mean more human capital.<sup>1</sup> Hall et al. (2010) empirically test the first hypothesis using data on 96 countries from 1980 to 2000. Using two different measures of institutional quality – “risk of expropriation” from the International Country Risk Guide and the Economic Freedom of the World index – Hall et al. (2010) find that the effect of increases in human and physical capital on output per worker depend on the quality of institutions.

In this paper, we extend the analysis of Hall et al. (2010) to US states. While there is a large literature on the positive effects of human capital on state economic growth (Turner et al., 2007; Aghion et al., 2009; Hanushek et al., 2017), no papers have estimated the extent to which output per worker depends on institutional quality. While much of the state-level growth literature does not address institutional quality, there are two papers that include education levels as a control while looking at state-level growth or income levels. Compton et al. (2011) include education in their analysis of the relationship between economic freedom and economic growth at the state level. The coefficients on

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<sup>1</sup> In a series of papers, Eric Hanushek and co-authors have found a robust relationship between schooling and growth once the quality of education is measured (Hanushek and Kimko, 2000; Hanushek et al., 2008; Hanushek, 2013).

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education levels are negative (but statistically insignificant) in all of their specifications. In their analysis of economic freedom and state income levels, Hall et al. (2019) show that the direct and indirect (spillover) effects almost perfectly offset one another, leading to null total effects.

We build off the work of Hall et al. (2010) by examining the relationship between institutional quality and the impact of increased human capital on state economic growth. We empirically test whether the effect of human capital per worker depends on the level of institutional quality by interacting a measure of institutional quality with human and physical capital in a cross-state growth regression from 1980 to 2000. We use data from the Economic Freedom of North America (EFNA) as our measure of institutional quality (Stansel et al., 2020). The EFNA measures the extent to which the policies of states were consistent with economic freedom on a 0-to-10 scale, with higher values reflecting higher levels of economic freedom.<sup>2</sup> This is the state-level version of the Economic Freedom of the World (EFW) index (Gwartney et al., 2020) used by Hall et al. (2010).<sup>3</sup>

To preview our results, we find that the relationship between increases in human capital per worker depend on the level of economic freedom. We find that human capital increases positively affect output per worker only if states have an average economic freedom score above 5.91. To put this in perspective, 19 among the 50 states had an average EFNA score higher than that. For example, the state of Alabama had an average EFNA score from 1980-2000 of 5.95. Our results suggest that in states below Alabama, such as West Virginia (3.83) and New York (3.43), increases in human capital per worker are associated with decreases in output per worker over the studied period. With respect to physical capital per worker, we find that physical capital per worker always has a positive impact on output per worker, regardless of the institutional environment.

## THEORY AND LITERATURE REVIEW

The view of human capital accumulation in the eyes of many is that it has the same effect on output, no matter the institutional environment. Figure 1 illustrates this view. The dotted line represents the marginal return to human (and physical) capital. As depicted in the figure, a marginal increase in human (or physical) capital has the same return to society whether a state has high levels of economic freedom or low levels. From this perspective, for example, a student deciding to get an associate degree has the same effect on output per worker in West Virginia (3.83 average EFNA score from 1980-2000) as in New Hampshire (7.08 average EFNA score from 1980-2000).

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<sup>2</sup> Hall et al. (2015) provide a survey of the literature using the EFNA index.

<sup>3</sup> We use the EFNA as our sole measure of institutions as there is no state-level version of “risk of expropriation.” Hall and Lawson (2014) provide an accounting of the literature that uses the EFW index.



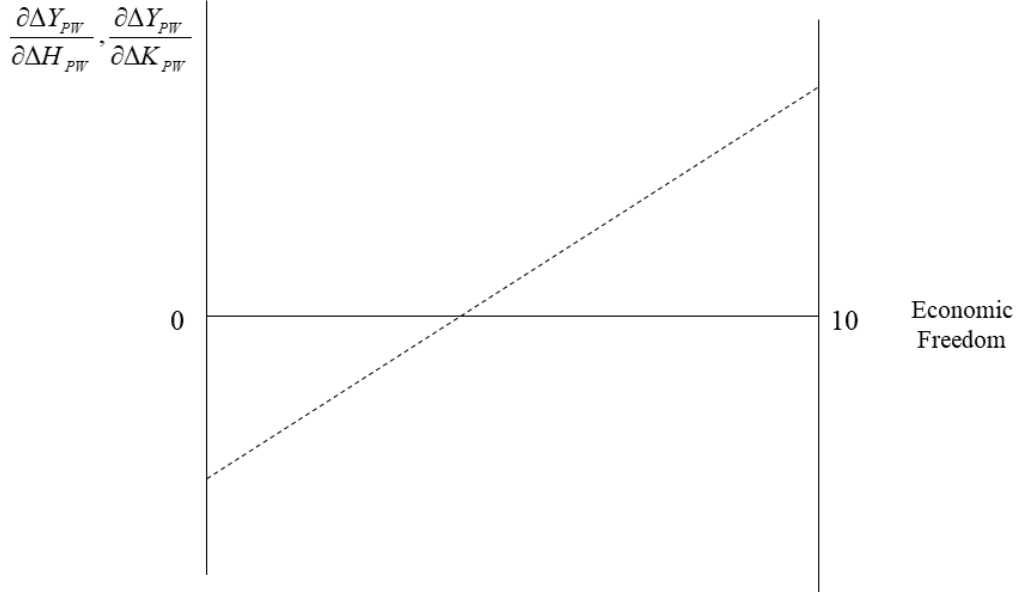
**Figure 1.** Marginal Effect of Capital on Output Per Worker: Conventional View

The problem with this view – even in a federal system like the United States – is that institutional quality influences both the productivity and allocation of labor. For example, economic freedom has been shown to be related to overall labor market conditions, which would influence both the private and public return on human capital investment. Heller and Stephenson (2014) use data on US states from 1981 to 2009 and find that higher levels of economic freedom are associated with lower unemployment levels and higher labor force participation rates. When paired with the literature showing that economic freedom is related to greater economic dynamism (Barnatchez and Lester, 2017), it is clear that economic freedom influences the number and types of opportunities for individuals in an economy should they want to work for others.<sup>4</sup> For those interested in working for themselves, economic freedom also has a positive relationship with entrepreneurship measures across states (Hall and Sobel, 2008; Powell and Weber, 2013; Shakya and Plemmons, 2021).

Given the importance of economic freedom to the allocation and productivity of labor, Hall et al. (2010) suggest that the actual relationship looks like Figure 2. The figure shows the marginal return to physical and human capital accumulation varying by the level of economic freedom, with the marginal effect actually being negative for low levels of economic freedom and rising with economic freedom. Hall et al. (2010) show that the hypothesized relationship in Figure 2 holds in cross-country data, with the marginal effect of human and physical capital starting negative at low levels of institutional quality and eventually turning positive at some “break-even” point.<sup>5</sup>

<sup>4</sup> Economic dynamism is typically defined in terms of gross reallocation and net creation. Gross reallocation is the number of jobs or firms created plus the number of jobs or firms destroyed. Net creation is just the difference between jobs or firms created and jobs or firms destroyed. For more, see Davis and Haltiwanger (1992).

<sup>5</sup> Though Hall et al. (2010) imply a linear relationship; it may be nonlinear if with different growth model specifications.



**Figure 2.** Marginal Effect of Capital on Output Per Worker: Hall et al. (2010) View

The effect of institutions on output per worker was first added to a macroeconomic growth model by Dawson (1998). Starting with the following aggregate production function

$$Y_t = A_t K_t^{\alpha_1} H_t^{\alpha_2} L_t^{\alpha_3} \tag{1}$$

where  $Y$  is output,  $A$  is the level of technology,  $K$  is physical capital,  $H$  is human capital, and  $L$  is labor.

Assuming constant returns to scale, we get everything in per worker terms by dividing through by  $L$ , yielding:

$$y_t = A_t h_t^{\alpha_1} k_t^{\alpha_2} \tag{2}$$

Building off Dawson’s (1998) insight that technology should be a function of institutions, Hall et al. (2010) define the technology parameter as

$$A_t = A_0 h_t^{\beta_1(EF-EF^*)} k_t^{\beta_2(EF-EF^*)} \tag{3}$$

where  $A_0$  is the baseline level of technology,  $EF^*$  is the highest level of attainable economic freedom and  $EF$  is the current level of economic freedom in a country. Substituting Equation (3) into Equation (2), taking logs, taking differences (to get the growth rate of output), simplifying some terms, and adding an error term yields an estimating equation of

$$\hat{y}_t = \alpha_0 + \delta_1 \hat{h}_t + \beta_1 EF \hat{h}_t + \delta_2 \hat{k}_t + \beta_2 EF \hat{k}_t + \varepsilon_t \tag{4}$$

For a full derivation of the model, please see Hall et al. (2010). We use Equation (4) to test the impact of economic freedom on human capital (and physical capital). The coefficient estimates from Equation 4 are easily mapped onto Figure 2.  $\delta_1$  and  $\delta_2$  representing the left y-axis intercept for human capital and physical capital respectively. These coefficients represent the return to human and physical capital investments in the hypothetical environment with zero economic freedom.  $\beta_1$  and  $\beta_2$  are

the slopes of the dotted line in Figure 2. While Figure 2 shows just one line, there are likely to be different returns to physical and human capital, if only because physical capital is more mobile than human capital (King et al., 2012), even in a federal system with no legal barriers to migration. We hypothesize that  $\beta_1$  and  $\beta_2$  are positive based on theory and the findings of Hall et al. (2010).

## EMPIRICAL APPROACH AND DATA

Equation (4) can be estimated using Ordinary Least Squares (OLS) assuming that all variables can be obtained. Our analysis covers a cross-section of all US states from 1980 to 2000. We look at the 1980 to 2000 period for two reasons. First, to be comparable to Hall et al. (2010). Second, our preferred measure of human capital is only available until 2000.

We obtain state-level data on real output per worker ( $\hat{y}_t$ ), human capital per worker ( $\hat{h}_t$ ), and physical capital per worker ( $\hat{k}_t$ ) from Turner et al. (2007) and Turner et al. (2013). From their data we calculate the cumulative growth of output per worker, human capital per worker, and physical capital per worker from 1980 to 2000. Table 1 presents descriptive statistics for these and other variable used in our analysis.

**Table 1.** Descriptive Statistics

Variable	Mean	Std. Dev.	Min.	Max.
<b>Growth of Output per Worker, 1980-2000</b>	37.429	14.439	-8.464	72.808
<b>Growth of Human Capital per Worker, 1980-2000</b>	11.972	2.529	5.378	17.262
<b>Growth of Physical Capital per Worker, 1980-2000</b>	39.217	8.887	19.210	56.484
<b>Average EFNA, 1981-2000</b>	5.477	0.911	3.430	7.080
<b>Latitude</b>	39.477	6.124	21.109	61.385
<b>Landlocked</b>	0.460	0.472	0.00	1.00

The average state over this time frame saw a 37.429% increase in output per worker, with the maximum being 72.808% (Massachusetts) and the minimum being Alaska at -8.464%.<sup>6</sup> Human capital is measured by annual average years of schooling in the labor force from Turner et al. (2007), who use a perpetual inventory method.<sup>7</sup> We use Turner et al.'s (2007) human capital data as we feel using human capital per worker is important given our focus on the effect of institutions on the allocation and productivity of workers. The average state over this period saw a 11.972% increase in the average years of schooling in the labor force, with the lowest being California at 5.378% and the maximum being Louisiana at 17.262%. Finally, our measure of physical capital per worker comes from Turner et al. (2013). The average state saw its physical capital stock increase an average of 39.217% from 1980-2000, with the minimum increase being Alaska (19.210%) and the maximum increase being North Carolina (56.484%).

To estimate the interaction terms ( $EF\hat{h}_t$  and  $EF\hat{k}_t$ ) we use the Economic Freedom of North America by Stansel et al. (2020). Published by the Fraser Institute in Canada, the index measures the extent to which the policies of US states (and Canadian provinces and Mexican states) are consistent

<sup>6</sup> Alaska is the only state with a decline in output per worker over this period. Their decline is entirely driven by 1980 being the peak of the oil boom, with Alaska primed to take advantage of the high real price of oil due to the Trans-Alaska pipeline opening up the Prudhoe Bay oil fields.

<sup>7</sup> We refer interested readers to pages 102-103 of Turner et al. (2007) for a more detailed discussion of their calculations.

with economic freedom. The EFNA index theoretically varies from 0 to 10, with higher values indicating higher values of economic freedom. Stansel et al. (2020) measure economic freedom at the sub-national level using ten variables in three areas: government spending, taxes, and regulation (primarily labor).<sup>8</sup> Following Hall et al. (2010), we calculate the average level of economic freedom in a state from 1981 to 2000. (The EFNA started in 1981.) Over this time period, the average level of economic freedom observed across the fifty US states was from 3.430 (New York) to 7.080 (New Hampshire), with the average state having a score of 5.477.

Measures of human capital per worker, physical capital per worker, and average EFNA are the three variables necessary for us to estimate Equation (4). In a robustness section, we follow Hall et al. (2010) by including geographic measures thought to be associated with growth. The variables we include are whether the state is landlocked and its latitude. Both of these variables come from Murphy and Nowrasteh (2018).

## EMPIRICAL RESULTS

Table 2 presents our baseline regression results. Based on the R-squared, our model fits the data well, with 79.5% of the variation in output per worker from 1980 to 2000 explained by the growth of human and physical capital per worker and its interaction with the measure of state economic freedom. The coefficients on the growth of human capital per worker and physical capital per worker are both statistically significant. With respect to our primary variables of interest – namely the interaction terms – we have a positive and statistically significant coefficient on the human capital interaction term. The interaction term between EFNA and physical capital, however, is negative but not statistically significant.<sup>9</sup>

**Table 2.** The Determinants of State Economic Growth

Independent Variables	(1)
Constant	-8.804 (5.394)
Growth of Human Capital per Worker, 1980-2000	-3.613 ** (1.769)
Growth of Physical Capital per Worker, 1980-2000	1.862 *** (0.509)
Growth of Human Capital per Worker, 1980-2000 ×Average EFNA, 1981-2000	0.611 * (0.305)
Growth of Physical Capital per Worker, 1980-2000 ×Average EFNA, 1981-2000	-0.110 (0.091)
R-squared	0.795

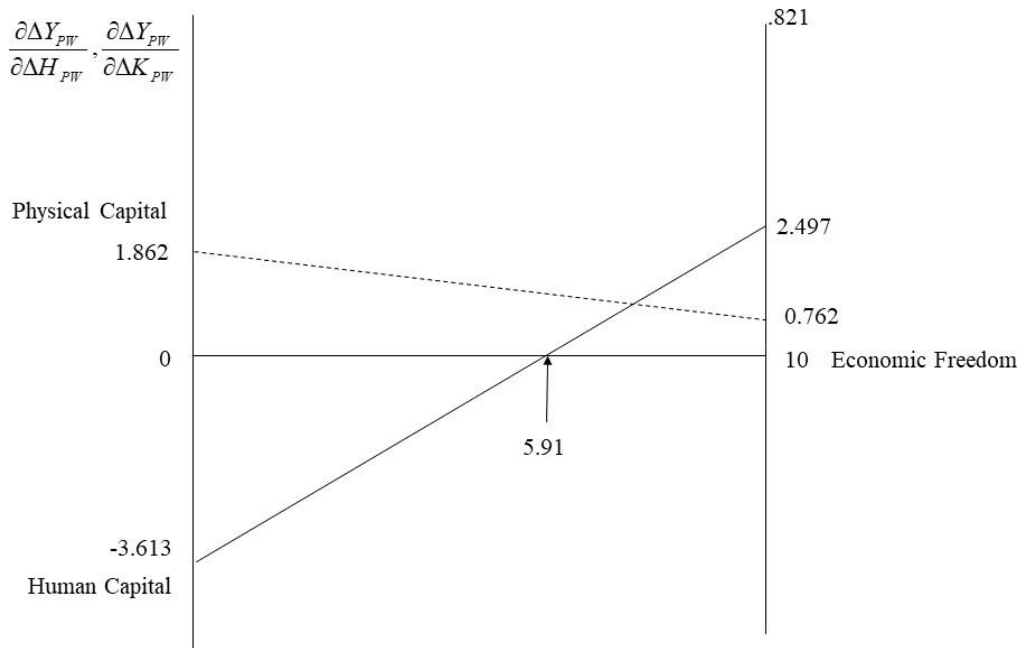
**Notes:** Dependent variable is Growth of Output per Worker, 1980-2000. Absolute value of robust standard errors in parentheses. \* Indicates statistical significance at the 10% level, \*\* at the 5% level, and \*\*\* at the 1% level. N=50

<sup>8</sup> The EFNA has two measures for US states: subnational and national. The subnational does not take into account national policies, while the national measure does. When comparing among Canadian provinces and US and Mexican states, the national measure would be appropriate. Given that we are only looking at US states, the subnational measure is more appropriate. For more on the construction of the EFNA and the difference between the two measures, we refer the reader to pages 9 to 16 of Stansel et al. (2020).

<sup>9</sup> A joint F-test shows that the pair of variables are jointly significant at the 1% level.

As Hall et al. (2010) suggested, regions “with bad institutions have more zero- or negative-sum opportunities, and thus the marginal effect of more education could be negative if enough of the additional education goes into negative-sum activities. (389)” Valuable resources could be moved from productive and innovative sectors into pursuing more education, which does not necessarily lead to economic growth. Meanwhile, more educated people can now engage in rent-seeking activities, which are counter-productive for overall economic growth. Last but not least, the results suggest that even though a US state had a mean level of economic freedom in 1981-2000, the estimated marginal effect of human capital growth on economic growth was still negative.

In Figure 3 we take the coefficients from Table 2 and apply them to the theoretical framework depicted by Figure 2. The negative coefficient of -3.613 on growth of human capital per worker translates to the left y-axis intercept for the marginal effect of human capital in Figure 3. This intercept value reflects the social return on education per worker in a hypothetical zero economic freedom environment. The coefficient on the interaction term (0.611) determines the slope of the marginal effect of human capital line. The “break-even” point where human capital increases translate to positive increases in output per worker is estimated at 5.91, between Oklahoma (5.83) and Alabama (5.95).



**Figure 3.** Marginal Effect of Capital on Output Per Worker: Empirical Results

The positive coefficient on the growth of human capital per worker of 1.862 translates to the left y-axis intercept, reflecting a positive return on physical capital, even in a hypothetical zero economic freedom environment. Although not individually significant (but jointly significant), we use the interaction term estimate of -0.110 to plot out the marginal effect of physical capital conditional on economic freedom line, denoted by the dotted line in Figure 3. Given that Hall et al. (2010) find a negative coefficient on a similar variable, it is important to remember that the national levels of institutional quality and sub-national differ. National levels of institutional quality such as Gwartney et al. (2020) include measures of property rights protection and the rule of law, which are very important to owners of capital. Within the United States and specifically in the context of Stansel et al. (2020), these measures are assumed constant across states. Given this, the observed levels of subnational economic freedom do not reflect the overall level of investor protection provided by US policies. From

this perspective it is not surprising that the marginal return on physical capital is always positive.

In Table 3 we add two geographic variables as a robustness check to the specification from Table 2. Latitude and whether an area is landlocked are used extensively in the economic development literature. The addition of these variables does not change the explanatory power of the model, nor do they change the qualitative conclusion about the role that institutions of economic freedom play with respect to the marginal productivity of human capital. Growth of human capital per worker from 1980 to 2000 is still negative and statistically significant at the 10% level, and the same is true for its interaction term. Results for physical capital per worker are similar to those in Table 2, with the interaction term being negative at -0.127 but statistically insignificant.<sup>10</sup>

**Table 3.** The Determinants of State Economic Growth: Geography

Independent Variables	(1)
Constant	-11.220 (7.435)
Growth of Human Capital per Worker, 1980-2000	-4.010 ** (2.207)
Growth of Physical Capital per Worker, 1980-2000	1.940 *** (0.573)
Growth of Human Capital per Worker, 1980-2000 ×Average EFNA, 1981-2000	0.685 * (0.386)
Growth of Physical Capital per Worker, 1980-2000 ×Average EFNA, 1981-2000	-0.127 (0.105)
Landlocked	-0.359 (2.297)
Latitude	0.079 (0.170)
R-squared	0.796

**Notes:** Dependent variable is Growth of Output per Worker, 1980-2000. Absolute value of robust standard errors in parentheses. \* Indicates statistical significance at the 10% level, \*\* at the 5% level, and \*\*\* at the 1% level. N=50

## CONCLUSION

In this paper we extend the research of Hall et al. (2010) on the role of institutions on the marginal productivity of human and physical capital to US states. We find evidence that increases in human capital per worker have a similar relationship to output per worker, namely that the marginal effect of increases depends on the quality of the institutional environment. We find, using data from 1980 to 2000, that increases in human capital per worker only have positive marginal effects on output per worker in states with economic freedom scores above 5.91. For states below that level such as Rhode Island (4.30), Oregon (4.44), or Montana (4.34), increases in human capital per worker do not lead to increases in output per worker.

Why this is the case remains an open question. In the developing country context, it has been argued that it may be related to the structure of the economy. For example, if all the jobs for educated individuals are in the government sector where incentives for productivity may be muted or rent-seeking may be encouraged (Pritchett, 2001). This is unlikely to be a major factor across US states, although they do differ in the amount of government employment. A more likely reason in the case of US states relates to migration. There is a large literature on economic freedom and migration (Ashby,

<sup>10</sup> A joint F-test shows that the pair of variables are jointly significant at the 1% level.



2007; Watkins and Yandle, 2010; Cebula, 2014; Cebula et al., 2016; Mulholland and Hernández-Julián, 2019; Cebula et al., 2019; Arif et al., 2020). Education makes it more likely for individuals to migrate and when they migrate, they are more likely to migrate to economically free states. Thus, increases in education per worker might ultimately lead to less output per worker if educated individuals do not stay in the state.

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