

Education, Income and Personal Ambition: Following Up on the Tipping Point

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Abstract:

The impact of education on wage attainment is, and has long been, the focus of studies by researchers and policy makers. Through utilizing wage and education data from Indiana, this study endeavors to further such research by attempting to parse the mingling influences of individual wage ambition and educational achievement. A model is used and a variable is created controlling for personal wage ambition. The wage ambition variable is both positive and significant, indicating a positive impact of individual drive in wage growth. Over time, a person of drive and high goal setting is known to outperform their peers. However, even after controlling for wage ambition, education at all levels above high school is still shown to be positive and highly significant. The results are consistent with the claim that although the influences of individual drive as measured by wages and educational attainment are intertwined, both are independently important in wage growth over time.

Keywords: Education, Income, Ambition, Educational Achievement, Wages

Introduction

The societal value of an educated populace has long been understood. However, a precise measurement of this value has often proved problematic since a significant portion of these benefits stem from externalities. While society at large may benefit from the education of its citizenry, policy makers often found it difficult to provide motivation at the individual level. Positive externalities did not translate well in the altering of individual incentives. A number of studies bypassed this quandary by examining the individual benefits of education, particularly those derived from enhanced income potential. While these studies focused on the individual and not the whole (thereby ignoring a portion of the benefits), policy makers hoped the individual incentives were sufficient to alter incentive structures and push the population toward increased levels of education. Policy makers emphasized the positives of education at the individual level while craving for the benefits of the whole.

Research on the potential income effects of education are not without pitfalls, most notably the implicit implication that the value of education is only derived through wage adjustment. A great number of people seek additional education for reasons of self-fulfillment which may in many cases actually reduce future earnings. Linking education and earning potential must be handled carefully, as the benefits of education, even at the individual level, exceed simple wage adjustment most notably at the doctoral level.

An important issue arises in this line of research, the concern of correlation and causation. Studies often examine cohorts of individuals and compare income growth over time separated by educational achievement. While these studies achieve success in showing a correlation between education and income, they only suggest a causal link. One is left to wonder if the drive and wage ambition required of an individual to complete the degree is partly or wholly responsible for the increase in income. Is educational achievement simply an indicator for personal wage ambition, or is the education itself responsible for wage adjustment over time. A method is developed in an attempt to partially parse the differences between wage ambition and education in wage growth.

Literature Review

This study attempts to link education as a potential pathway to higher earnings. Community college researchers, Prince and Jenkins (2005) found that individuals who took at least one year of college and obtained a credential earned substantially more than those that did not meet this threshold. Their work resulted in the development of an integrated education and skills training program geared to increase the number of their students who would achieve the tipping point, thus increasing their potential wage.

Jacobson and Mokher (2009) determined that two-year community colleges certificates could lead to higher-paying careers even for low-performing students, especially when the academic concentration was in a professional or health-related field. However, in further analyzing the data, researchers determined that while traditional college-students (ages 18-24 yrs.) typically experienced economic gains from their postsecondary studies, the economic benefits for older students were

negligible as noted by Bailey and Marcotte (2004). A need for further research into the possible variables affecting wage advantage was indicated.

Career pathways were realigned by occupations (instead of industries), which created strategic economic development challenges for governments at all levels per Carnevale, Smith and Strohl (2010). Their research proposed that educational programs needed to undergo a paradigm shift in the alignment of their career pathways from an industry-wide focus to one aimed at individual occupations. In 2011, Carnevale, Rose and Cheah found that although the level of educational attainment mattered in higher potential earnings, the choice of an occupation could offset that wage advantage.

Although sub-baccalaureate education did provide economic benefits, the degree of benefit varied by sex, race and actual degree or credential completion as found by Bailey and Marcotte (2004). In fact, in a study done by Carnevale, Rose and Cheah (2011), race, ethnicity and gender were identified as being more influential in determining earnings than education or occupation.

Another variable linking education and income is the actual completion rate of higher education credentials and/or degrees. The National Center for Higher Education Management Systems (2008) found that although adult Hoosiers with educational need slightly outpaced the national average, participation and completion rates for the state's postsecondary schools were below the national average. The researchers argued that their findings supported the need for improved policy better integrating and aligning the educational needs of adult Hoosiers and the types of available jobs.

High school preparation and performance were found (Jacobson and Mokher, 2009) to be solid predictors of academic persistence and credential attainment. Income was linked to high school performance, with income variances up to one-third dependent upon high school completion, college attendance and persistence, academic concentration and credential attainment for students coming from low-income families (Jacobson and Mokher, 2009).

Significant policy changes in participating states resulted from a study on how best to improve access and postsecondary completion rates of working adults conducted by National Governors Association Center for Best Practices. Their research pointed to the need to rely more on labor market and education data. They highlighted the need to revise and develop career pathways in vital economic sectors while easing the transition into postsecondary education and improving the affordability of that education and training (NGA Center for Best Practices, 2009).

Data

Data for the study was largely provided by the IWIS (Indiana Workforce Intelligence System) data warehouse collected and maintained at the Indiana Department of Workforce Development (DWD) in partnership with the Indiana Business Research Center (IBRC), Commission for Higher Education (CHE), and Department of Education (DOE). Additionally, state gross domestic product (GDP) data were obtained from the Bureau of Economic Analysis website (www.bea.gov). It should be noted that while individual records were used, no identifier was extracted from the IWIS system. A random identifier was

created with each record and anonymity maintained. Furthermore, only aggregate results were shared outside of Indiana DWD.

The study examines wage and educational records from 2001 through 2010 in a time series panel. Only individuals with wage data throughout the entire time span are included in the data set. The wage data is in nominal terms, and a yearly variable is created to account for potential wage inflation and other yearly effects. Given the autoregressive tendencies of wages in a time series, a lagged wage variable is created to capture these influences. As wages likely follow the success of the firm/industry, a variable is used to capture this effect. Real GDP for the state of Indiana is used as the proxy for the economic health of companies within the state.

Demographics and race are incorporated into the model to the extent the data allowed. A binary gender variable is used with positive being an indication of male and negative of female. Race binary variables are created, but complete separation is limited with data. The data provides for three options which are African American, Other, and White. Limited with this selection, the designations are likely to be more blurry than would have been afforded a more robust option set. While the majority of records are those relating to Indiana, 3 percent are from states other than Indiana. A binary variable is used to segregate those observations outside of Indiana. Finally, an age variable is created which reflects the difference between the study year and the birth year of each individual.

Variables are created to ascertain the influence of educational attainment. Binary variables are created for the following levels of achievement:

- High School Graduate or Equivalent
- 1 yr College / Tech / Vocational School
- 2 yrs College or Associate Degree / Technical School
- 3 yrs College / Tech / Vocational School
- Bachelor's Degree
- Master's Degree
- Doctorate Degree

Finally, the purpose of the study is to ascertain the importance of education after accounting for individual wage ambition. In this manner, the true value of education will be more readily understood and properly assessed by policy makers and those desiring self improvement through education. This study attempts to solve this by creating a wage ambition variable. Given the size of the dataset, the first three years of data are expended in creating the wage ambition variable. Without examining the influence of other factors, the growth of wages from 2001 to 2003 is used to create the wage ambition variable:

Figure 1

$$\text{Wage ambition} = 1 + [(Wages (2001) - Wages (2003))/Wages (2001)]$$

There are obvious limitations of this variable. The variable is time independent and thus does not allow for changes in behavior as the result of maturation or other influence. As it is not possible to filter out changes in education, the variable itself includes the impact of education. If the individual received their education during this three year period, the impact would be captured by the variable. Thus the impact of the wage ambition variable might be slightly overstated. However, if education is shown to be significant even when compensating for this wage ambition variable, it only further adds to the importance of education.

The individual drive, regardless of other considerations, to increase one's wages during the three-year quarantine period acts as a proxy for wage ambition. Obviously individual circumstances will incorrectly skew this on a case-by-case basis. However, because the sample size is large, the law of large numbers will equate this variable to a somewhat accurate reflection of personal wage ambition. Despite the limitations, the importance of drawing out the influence of wage ambition on education will prove a valuable addition to the research on education and its benefits to society and the individual.

The study included only records for individuals with wages throughout the entire period of 2001 through 2010. Observations for the first three years were quarantined in order to make the wage ambition variable. Observations were removed for ages below 21 and older than 65 to minimize the impact of part-time laborers in the sample. Those working part time (during school or retirement) were likely to have a wide percentage variation in wages from year to year and thus may skew results. Observations were also removed for those with the wage ambition variable being at or below 0.0 or above 10.0. These outliers were likely the result of incomplete or poor wage data.

To prevent linear dependency of the binary education variables, one variable must be dropped from the analysis and used as a reference. Ideally, a variable labeled "No High School/Other/No response" would be created as the reference. This would have allowed for an analysis of the value of high school education. However, the non responses and "other" responses were concerns. These responses could be from educated respondents who choose this option for a variety of reasons. Additionally, it could also be that the poorly educated simply did not provide this information. As it could not be determined which categories these responses properly fit, the observations were dropped, thus maintaining a dataset with no educational achievement ambiguity. High school education was the reference point by which the other categories are measured.

Finally, observations with incomplete or missing data were dropped. In total, between the creation of the wage ambition variable and the observation filtering, over one million observations were dropped from the analysis. The benefit was that the resulting sample which is still large (over 1.5 million observations) and robust in the detail afforded a complete dataset. A data summary can be found on Table 1.

Table 1				
Variable	Mean	Std. Dev.	Min.	Max.
Year (Year 2004 = 1)	4.00	2.00	1	7
Wage (Nominal Annual \$)	41,797.49	25,879.11	16.00	4,580,579.00
Indiana Real GDP (in million \$)	242,060	4,415	234,752	248,960
State (Indiana = 1)	0.98	0.14	0	1
Gender (Male = 1)	0.55	0.50	0	1
Race White	0.89	0.31	0	1
Race African American	0.08	0.26	0	1
Age	41.28	10.32	21	65
1 yr College / Tech. / Voc.	0.06	0.24	0	1
2 yrs College / Associate's	0.15	0.36	0	1
3 yrs College / Tech. / Voc.	0.01	0.11	0	1
Bachelor's	0.17	0.37	0	1
Master's	0.05	0.22	0	1
Doctorate	0.01	0.08	0	1
Wage Ambition	1.24	0.63	0.02	9.96
Observations	1,563,284			

The wage data is sorted and averaged by educational classification in Table 2 and Figure 2.

Table 2

Average Yearly Wages by Education
(in the sample)

	% of Total	Average Wage (\$/yr)	Compared to High School Degree		Wage Ambition
			\$	%	
Total	100.0	41,797.49			1.240
H.S. Graduate	48.6	37,668.26			1.176
1 yr College / Tech. / Voc.	6.8	39,615.51	1,947.25	5.2	1.258
2 yrs College / Associate's	17.7	42,712.24	5,043.98	13.4	1.280
3 yrs College / Tech. / Voc.	1.4	42,326.50	4,658.24	12.4	1.235
Bachelor's	19.0	47,848.46	10,180.20	27.0	1.400
Master's	5.6	61,919.02	24,250.76	64.4	1.209
Doctorate	0.8	59,059.35	21,391.09	56.8	1.211

Figure 2

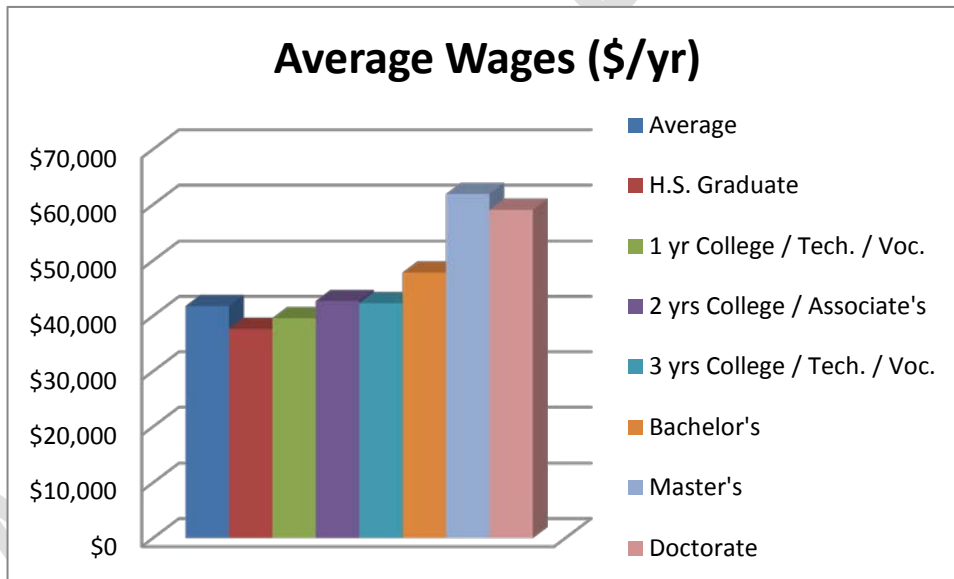


Table 2 illustrates the striking differences observed in the wage data by educational attainment. All steps along the educational path achieved income growth, outside of the third year of college and a doctorate. This wage difference is the focus of consideration by researchers and policy makers alike. Looking exclusively at these numbers can be somewhat misleading, given the number of factors that account for wage growth. One such fact is wage ambition. This variable is also segmented by education, and is also shown to be closely correlated to educational attainment. It is somewhat interesting to note that the link between wages and education is broken at the doctoral level and the linkage between wage ambition and education wanes at the master's level. The data suggest that

people pursue education for wage appreciation and beyond which that for a variety of other reasons. Attributing the difference in wages entirely to education must be empirically supported by data when controlling for additional factors. Additional research looking at the impact of industry, occupational codes, and work experience would also be beneficial. The data were not sufficient to include this analysis in the study.

Methodology:

A regression model helps in understanding the influences on wages. The analysis examines the impact on individuals (i) from 2004 to 2010 on a yearly basis (t). The individual's wages in a given year ($Wage_{i,t}$) is the dependent variable.

The independent variables include measures which are tested for influence. As wages are in nominal terms, a yearly variable ($Year_t$) is used to adjust not only for yearly influence, but for inflation as well. The first year of the study ($Year = 1$) is 2004 and the study concludes with 2010 ($Year = 7$). The yearly impact on wages is an important component of the study. It is for this reason that a yearly variable is applied to the Ordinary Least Squares (OLS) model rather than utilizing a fixed effects model.

As employees hold positions for multiple periods, with set salaries, it is likely that wages are inevitably going to exhibit autoregressive tendencies. A lagged wage variable is used to assess this impact. Wages are lagged on period ($Wage_{i,t-1}$). As wages are likely influenced by the health of the employer, a measure of the overall health of Indiana's economy is also included in the model. If the health of Indiana's economy is strong, firms will be experiencing growth and thus higher wages could be afforded. Indiana's yearly gross domestic product (GDP_t) is included in the study. A state binary is included to test for state influences on wages ($State_i$). This will test for the potential of statewide biases in the employment of each individual in the dataset.

Wages might also be influenced by demographics and race. Binary variables are included into the model to cover the individual's gender ($Gender_i$) and race ($RaceW_i$) ($RaceAA_i$). The gender variable is positive if male. On the race variables, the variable is positive if entered affirmatively.

Educational attainment binary variables are included. High school is the reference and it is excluded from the model to prevent dependency. Binaries exist for affirmative responses to one year of college ($Col1_{i,t}$), two years of college and/or associate ($Col2_{i,t}$), three years of college ($Col3_{i,t}$), bachelor's degree ($BS_{i,t}$), master's degree ($MS_{i,t}$), and doctoral degree ($Dr_{i,t}$). These variables are both individual and time dependent as they can change year to year as people work and some continue to move through the educational system.

Finally, the constructed wage ambition variable ($Wage\ ambition$) is added to the model to test for the influence of individual drive in wage performance and help to separate this impact from education. The full model is displayed in Figure 3.

Figure 3

$$Wage_{i,t} = \beta_0 + \beta_1(Year_t) + \beta_2(Wage_{i,t-1}) + \beta_4(State_i) + \beta_3(GDP_t) + \beta_5(Gender_i) + \beta_6(RaceW_i) + \beta_7(RaceAA_i) + \beta_8(Col1_{i,t}) + \beta_9(Col2_{i,t}) + \beta_{10}(Col3_{i,t}) + \beta_{11}(BS_{i,t}) + \beta_{12}(MS_{i,t}) + \beta_{13}(Dr_{i,t}) + \beta_{14}(Wage\ Ambition) + \epsilon_{i,t}$$

Results:

The results, shown in Table 3, reassert the importance of education in wage adjustment. While self determination assists in getting ahead in life, education plays a vital role as well.

Table 3				
		Number of Obs. =		1,563,284
		F(15,1563268) =		.
		Prob > F =		0.0000
		R-squared =		0.7374
		Adj. R-squared =		0.7374
		Root MSE =		13261
Wage	Coef.	Std. Error	t	P> t
Year	-118.181	5.534	-21.35	0.000
Wage (Lag , t-1)	0.861	0.000	1850.72	0.000
Indiana GDP	0.238	0.002	96.78	0.000
State	-265.448	73.593	-3.61	0.000
Gender	2286.360	22.682	100.80	0.000
Race (white)	41.716	58.204	0.72	0.474
Race (African American)	-333.758	69.026	-4.84	0.000
Age	-5.736	1.119	-5.12	0.000
1 yr College / Tech. / Voc.	829.431	45.896	18.07	0.000
2 yrs College / Associate's	1495.258	30.997	48.24	0.000
3 yrs College / Tech. / Voc.	851.103	97.354	8.74	0.000
Bachelor's	2803.602	31.066	90.25	0.000
Master's	5453.323	51.312	106.28	0.000
Doctorate	4454.882	126.846	35.12	0.000
Wage Ambition	53.241	17.601	3.02	0.002
Intercept	-52029.9600			

The year variable is significant and negative. Wages over the course of 2004 to 2010 are shown to be relatively stagnating and not sufficient to cover inflation. During the period studied, wages fell approximately \$118 on a yearly basis. As expected, wages show an autoregressive nature as the lagged variable is positive and highly significant. Prior wages are a good indication of current wages. Indiana

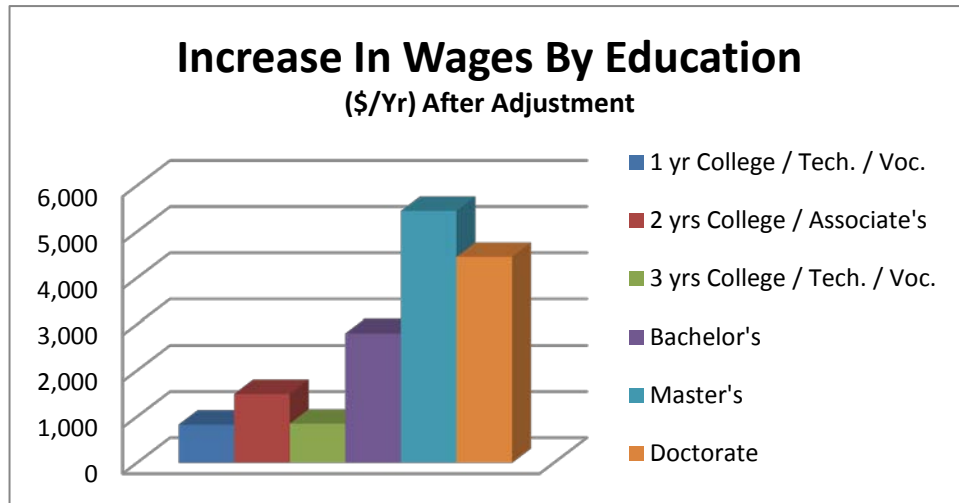
wages are also positive and significant in relation to Indiana growth as measured by GDP. As the economy of Indiana expands generally, wages are shown to expand.

While the vast majorities (over 97 percent) of the observations were employed in Indiana, some data was collected for residents employed outside the state. The data suggested a slight negative bias to Indiana employees. Indiana employees earned approximately \$265 less on a yearly basis (compared to the other states). The sample of non-Indiana employees was small increasing the chance of skewed data results. Also, \$265 was not viewed as a large number and could be attributed to the lower cost of living in Indiana and consistent with purchasing parity. The results on race were insignificant on white and showed a modest negative bias towards African Americans (approximately \$333 per year). The results also reveal a significant gender bias with male participants in the study earning in excess of \$2,286 per year over females counterparts. However, the findings on gender and race are limited by the fact that Standard Occupational Classification (SOC) codes are not available, and thus career choice is not controlled.

The results of the wage ambition and education variables are particularly interesting. One can get ahead in life through perseverance and hard work. This is indicated by the positive and significant wage ambition variable. However, the magnitude of the variable is small. Increases in wages resulting from a strong work ethic are relatively minor compared to other factors. An argument is often made that education is an indication of perseverance. Those willing to do the hard work get the degree. These individuals, however, would likely achieve income gains regardless of the degree because of their hard work ethic. The results indicate that work ethic is important in achieving success, but that education is also important even when controlling for wage ambition. The education results are highly significant and reveal the following yearly wage adjustment afforded education (Figure 3). The implications of the results of education on income are presented in Table 4 and Figure 4.

Table 4		
Yearly Wage Increases by Education (in the sample, compared to H.S. Degree) (after adjustment for other factors)		
	Average Wage (\$/yr)	Yearly Wage Increase (\$/yr)
H.S. Graduate	37,668	
1 yr College / Tech. / Voc.		829
2 yrs College / Associate's		1,495
3 yrs College / Tech. / Voc.		851
Bachelor's		2,804
Master's		5,453
Doctorate		4,455

Figure 4



Education is a significant contributor to an individual's ability to increase their yearly wages. All educational steps show increases over the reference of high school education. The data also suggests the importance of completing one's education. While all levels show positive benefits, there are bounces at each attainment level. There is a bump in wages from the first year of college to completing an associate degree (and/or acquiring the trade skill). Wages decline a bit in the third year before bouncing higher again for completion of a bachelor's degree and again with a master's degree. The wages for doctoral degrees are positive, but slightly less than a master's degree. This is likely the result of many of these graduates entering academic, public service or other lower paying sectors. Outside of the medical and a few specialty fields, the pursuit of doctorates is not an income generator. In total, the results suggest the importance of not only starting an education, but its completion. The magnitude of educational wage benefit might be somewhat muted by the inclusion of lagged wages. Some of the beneficial influence of education might be unintentionally caught by this variable.

Conclusion:

The individual drive required to complete a degree is a powerful predictor of a person's ability to increase future earnings. When trying to assess the value of education, it is possible that the educational attainment is simply a marker for an individual's work ethic, and this person would have likely succeeded in obtaining increased wages without education. For the benefit of policy makers, it would be helpful to split the influences of wage ambition and education. This study quarantines the first 3 years of a 10 year dataset to construct a wage ambition variable and control for this influence. While not perfect and subject to individual variation, the samples large size and the law of large numbers justifies its use.

The results indicate that work ethic is a predictor of future income potential. However, the impact of wage ambition is relatively small as an isolated variable. Combining this work ethic with other influences, such as education, is shown to be much more beneficial in wage adjustment. Education is still shown to be a key indicator of wage adjustment. The inclusion of additional wage adjustment influences reduces the impact of education from what is witnessed in a comparison of average wages by educational cohorts. However, the impact of education is still a strong indicator of potential wage adjustment. While all levels of education beyond high school provide a wage benefit, the data reveal the importance of both degree completion and continual educational advancement. Additional points of interest are the relatively stagnate wages over the study time period and the significance of demographic and racial characteristics of the individuals. Additional study should be undertaken to explore these results and adjust for potential mitigating factors including industry, occupation and work experience.

References:

Bailey, T., Kienzl, G. S., & Marcotte, D. E. (2004). *The Return To Sub-Baccalaureate Education: The Effects Of Schooling, Credentials, And Program Of Study On Economic Outcomes*. New York: Columbia University, Teachers College, Community College Research Center.

Bridges to Opportunity Initiative (2008). *Bridges to Opportunity for Underprepared Adults: A State Policy Guide for Community College Leaders*.

Bureau of Economic Analysis (BEA) website. www.bea.gov. Data extracted August 2011.

Carnevale, A., Rose, S. & Cheah, B. (2011). *The College Payoff: Education, Occupations, Lifetime Earning*. Washington, DC: Georgetown University Center on Education and the Workforce

Carnevale, A., Smith, N., & Strohl, J. (2010). *Help Wanted: Projections of Jobs and Education Requirements Through 2018*. Washington, DC: Georgetown University Center on Education and the Workforce.

Indiana Workforce Intelligence System (IWIS) Data System. Data extracted August 2011.

Jacobson, L. & Mokher, C. (2009). *Pathways to Boosting the Earnings of Low-Income Students by Increasing Their Educational Attainment*. Washington, DC: Hudson Institute Center for Employment Policy and CNA

National Center for Higher Education Management Systems (2008). *Indiana's Adult Education and Workforce Skills Performance Report: Preparing Adults for a Brighter Future*. Indianapolis, IN: Indiana Chamber of Commerce

NGA Center for Best Practices (2009). *Pathways to Advancement Project: How States Can Expand Postsecondary Educational Opportunities for Working Adults*: Washington, DC: National Governors Association

Prince, D. & Jenkins, D (2005). *Building Pathways to Success for Low-Skill Adult Students: Lessons for Community College Policy and Practice from a Statewide Longitudinal Tracking Study*. New York: Community College Research Center, Teachers College, Columbia University

The College Completion Agenda 2010 Progress Report (2010)