

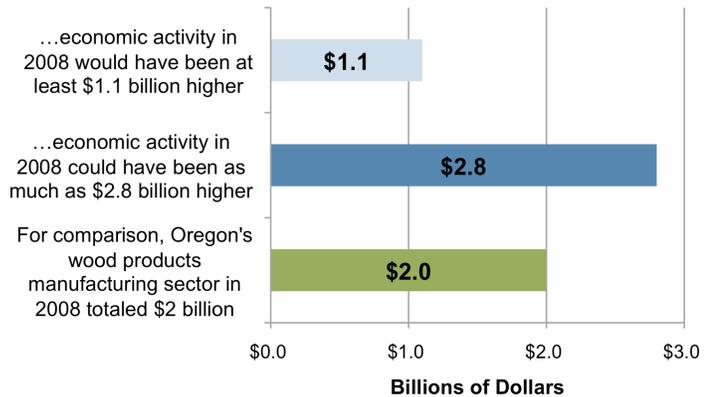
THE ECONOMIC IMPACTS OF OREGON'S STUDENT ACHIEVEMENT GAP

OCTOBER 2010

KEY FINDINGS

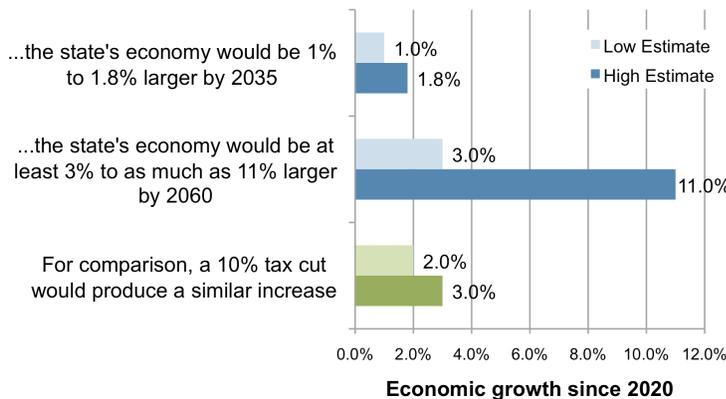
If Oregon had eliminated the achievement gaps throughout its adult population by 1998, economic activity in Oregon would have been between \$1.1 and \$2.8 billion higher in 2008. The higher estimate (\$2.8 billion) is approximately 1.4 times the size of Oregon's wood products manufacturing sector.

If Oregon had eliminated the achievement gap in 1998...



Source: ECONorthwest

If Oregon eliminated the achievement gap in the next 10 years...



Source: ECONorthwest

Starting a program today that eliminates the achievement gap in Oregon's schools over the next 10 years would boost the total size of Oregon's economy by between 1.0 and 1.8 percent in 2035 and between 3.0 and 11 percent in 2060. By comparison, economists expect that a 10 to 20 percent decline in state taxes (holding government services constant) would produce a similar change in long-run economic growth.



In-migration, out-migration, and demographic changes among minority groups are important factors affecting the magnitude of the achievement gap's impact over time. While these changes may mute the effects of policies designed to eliminate the achievement gap, Oregon will still benefit from eliminating the achievement gap in the long term.

OVERVIEW

Researchers in Oregon and throughout the U.S. have extensively documented the fact that, relative to white students, non-white students have lower test scores (an achievement gap) and complete fewer years of education (an attainment gap). For instance, black and Hispanic students in Oregon score seven standardized points (RIT points) below whites on the 8th grade statewide mathematics assessment test, and these groups are between 14 and 22 percentage points less likely to enroll in post-secondary education within three years of expected high school completion.¹

Achievement and attainment gaps are bad for the individuals who lag behind, and they are bad for the economy. Gaps in achievement and attainment between whites and minority groups suggest the presence of untapped human potential (or human capital) that Oregon could harness for the benefit of both individuals and society. The academic literature documents many ways that

education improves individual outcomes. Increases in the amount and quality of education generate higher incomes, reduced unemployment, and better health outcomes for individuals.² The academic literature also suggests that education improves regional economic outcomes. A more educated population may increase local economic growth, increase regional incomes, improve quality of life, and reduce crime.³

In this policy brief, we describe the results of a “back of the envelope” calculation designed to estimate the impact of Oregon’s achievement and attainment gaps on Oregon’s economy.⁴ While not precise, our calculations provide a reasonable estimate of the benefits that economists expect Oregon to enjoy from eliminating the achievement gaps. For simplicity, we condense the two gaps—achievement and attainment—and refer to them as the “achievement gap” throughout most of this report. Table 1 illustrates our basic calculations and results. Three factors determine the economic impact

Table 1: Methods, assumptions, and results of primary calculations

Equation (1)	Achievement gap	X	Share of adult population affected by change	=	Change in education levels
Backward looking	0.43-0.68 s.d.	X	13.5%	=	0.06-0.09 s.d.
Forward looking	0.42-0.67 s.d.	X	3.6-23.0%	=	0.01-0.16 s.d.
Equation (2)	Change in education levels	X	Impact of education on economic growth	=	Impact of achievement gap
Backward looking	0.01-0.09 s.d.	X	1.27-2.0 percentage points per s.d.	=	Add'l 0.07-0.18 percentage points of growth per year
Forward looking	0.01-0.16 s.d.	X	1.27-2.0 percentage points per s.d.	=	Add'l 0.01-0.31 percentage points of growth per year

Notes: 1. s.d. = standard deviations from the mean. 2. We present additional description of the sources and assumptions for these calculations in the text. Source: ECONorthwest

of achievement gaps: the magnitude of the achievement gaps, the size of the population affected by them, and the relationship between education levels and economic outcomes. Multiplying the change in the achievement gap by the share of the population affected by this change yields the marginal change in Oregon's education level. Multiplying the marginal change in education level by the measure of the relationship between education and the economy produces our estimate of the total impact of the achievement gap on Oregon's economy.

Specifically, we base our key findings on two types of calculations – one looking backward and one looking forward. The backward-looking calculation addresses the question, "How much does Oregon's achievement gap currently cost our economy?" As shown in the second "backward-looking" row of Table 1, we estimate that Oregon's annual economic growth rate would be between 0.07 and 0.18 percentage points higher in the absence of an achievement gap in Oregon schools.

By itself, this range is not easily interpreted. To provide context, we assume that the achievement gap was eliminated by a certain year and calculate the additional growth that would have occurred between that year and the present. Following the assumptions used by McKinsey & Co. for an analysis of the economic impacts of achievement gaps in the U.S., we assume that the achievement gap was eliminated simultaneously for all adults in 1998.⁵ This assumption is unrealistic because the elimination of the achievement gap would entail a long process that slowly eliminates the gap among Oregon students and then, even more slowly, eliminates the gap in

Oregon's adult population as younger, better educated students replace older, less educated adults. Furthermore, many Oregon students will move out of Oregon and be replaced by individuals educated in places where achievement gaps persist. As such, completely eliminating Oregon's achievement gaps may be impossible. We adopt McKinsey's assumptions to provide a number comparable to their well-publicized study (and because a more complete analysis would only increase our estimated impacts).

Employing these assumptions, we estimate that if Oregon had succeeded in eliminating its achievement gaps by 1998, the gross state product would have been between \$1.1 and \$2.8 billion (or between 0.7 and 1.8 percent) larger in 2008.⁶ To place these values in context, the smaller number is about the size of Oregon's machinery manufacturing sector. The larger number is 1.4 times the size of Oregon's wood products manufacturing sector and about the size of Oregon's farm sector.⁷ The range between the low-end estimate and the high-end estimate demonstrates the sensitivity of our calculations to different assumptions.

The forward-looking approach addresses the question, "By how much will Oregon's economy benefit in the future from efforts that begin to successfully eliminate the achievement gap now?" To answer this question, we follow the analysis of economists Eric Hanushek and Ludgar Woessmann, and we adopt the assumption that Oregon eliminates achievement gaps among its students over 10 years and then these more highly educated students slowly replace less educated workers over 35 years.⁸ In these calculations, we

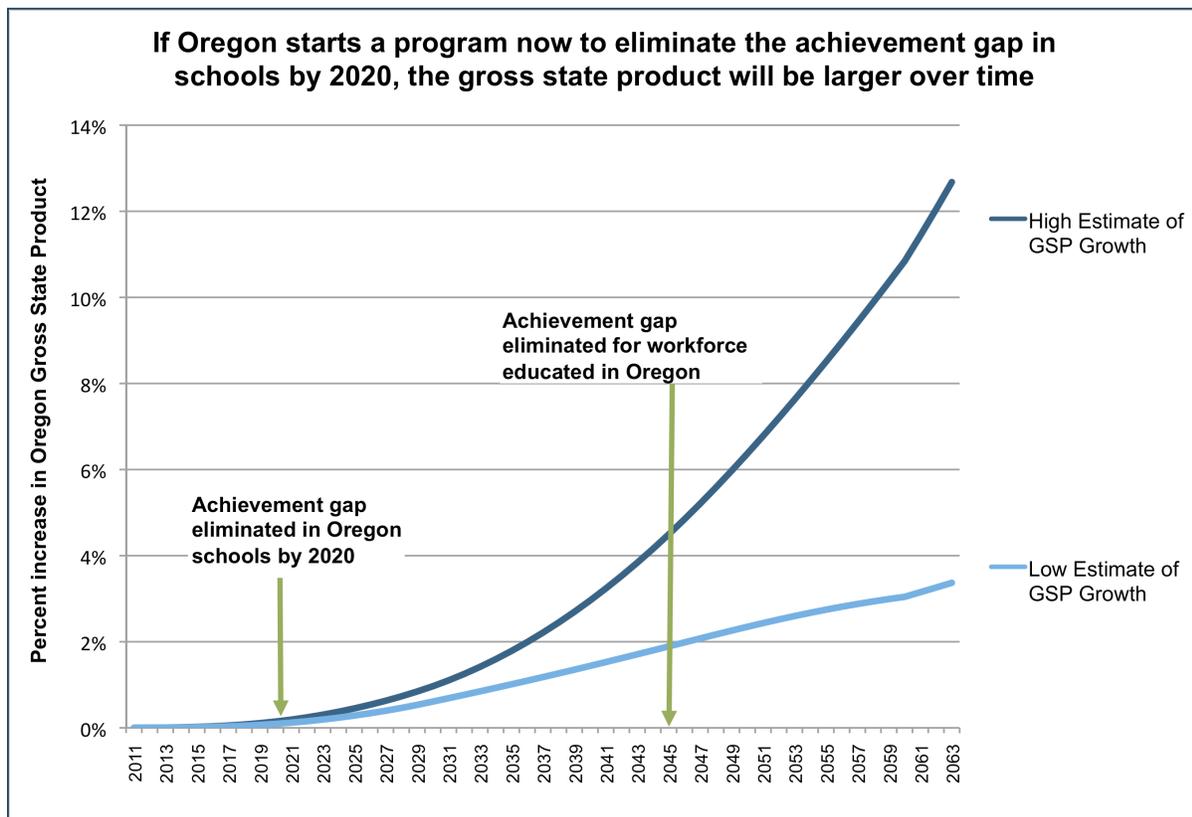
explicitly account for migration. Because migration may prevent Oregon from completely eliminating its achievement gaps, we include a range for the share of adults affected that reflects the share of adults who benefited from the effort to eliminate the achievement gap in Oregon. In our calculations, this value reflects the share of minority groups in which the achievement gaps are successfully eliminated. As shown in the second “forward-looking” row of Table 1, we estimate that, in the long-run, eliminating the achievement gap in Oregon schools will increase economic growth in Oregon by between 0.01 and 0.31 percentage points.

Figure 1 provides a visual representation of the impact on Oregon’s economy of a program that

eliminates Oregon’s achievement gap. The blue lines represent the percentage increase in the size of Oregon’s economy compared to the economy if the achievement gap persists. The darker blue line shows the high estimate, while the lighter blue line shows the low estimate of economic growth. The vertical arrows illustrate the time it takes for the program to fully eliminate the achievement gap among Oregon students and for the students who benefit from the program to fully replace the existing workforce.

As shown in Figure 1, we estimate that if Oregon implements a program that eliminates the achievement gap in Oregon schools over the next 10 years, Oregon’s economy will be between 1.0 and 1.8 percent larger in 2035, and

Figure 1: The impact of eliminating the achievement gap on Oregon’s economic growth



Source: ECONorthwest

between 3.0 and 11.0 percent larger in 2060 than it would be in the absence of this program. To place this value in context, this is roughly equivalent to the effect of a 10 to 20 percent reduction in state and local taxes (holding public services constant).⁹ The smaller values (and range) for the earlier period reflect the time it takes to fully eliminate the achievement gap in Oregon schools (10 years) and the fact that even in 2035 a significant share of the workforce completed their education prior to the implementation of the program.

In the remainder of this document, we detail the assumptions that underlie our calculations. We discuss potential weaknesses in our assumptions, and we present alternative calculations that demonstrate how modifications to our assumptions change our estimates.

HOW LARGE ARE ACHIEVEMENT AND ATTAINMENT GAPS IN OREGON?

The first element of our calculation is the size of the achievement gap. The impact of the achievement gap on Oregon's economy is directly proportional to the size of the achievement gap: Larger gaps have larger potential impacts.

Table 2 presents estimates, drawn from several sources, of the magnitude of the achievement and attainment gaps in Oregon. The top section of the table presents evidence of the achievement gap from two standardized tests – Oregon's statewide assessment test (the OAKS test) and the National Assessment of Educational Progress (NAEP). We present the achievement gap (measured as the number of standard deviations from the mean) for

Table 2: Selected measures of achievement and attainment gaps in Oregon

	Black-White	Hispanic-White	Native American-White	Mixed-White	Asian-White
I. Achievement Gaps (differences in standard deviations)					
OAKS 8th Grade Math (2004/05 -- 2008/09)	-0.62	-0.63	-0.46	-0.09	0.33
NAEP 8th Grade Math (2009)	-0.72	-0.72			
II. Attainment Gaps					
a. Percent differences in share of OR high school students attending post-secondary education within 3 years of expected graduation	-14%	-22%	-19%	2%	5%
b. Percent differences in share of OR residents aged 25-64 with at least a bachelor's degree	-12%	-21%	-17%	-6%	15%
c. Differences in average years of schooling 25-64	-0.61	-3.66	-1.01	-0.35	0.26

Notes: 1. OAKS achievement gap calculated by ECONorthwest using Oregon Department of Education (ODE) data. 2. NAEP achievement gap. 3. Post-secondary attendance gap calculated by ECONorthwest using ODE and National Student Clearinghouse data. 4. Share college graduates calculated by ECONorthwest using American Community Survey (2006-08) data. 5. Average schooling gap calculated by ECONorthwest using American Community Survey (2006-08) data.

8th grade math tests. The gaps for other subjects (e.g., reading) and other grades are comparable.¹⁰ On both tests, the gaps between black students and white students and the gaps between Hispanic students and white students are in the -0.62 to -0.72 standard deviation range. This gap is roughly the equivalent of 1.5 years of learning on the OAKS and 2.5 years of learning on the NAEP. The gap between Native Americans and whites (only available for the OAKS test) is -0.46 standard deviations (or approximately 1 year of learning). Mixed-race students score almost equal to white students, and Asian students substantially outperform white students. Throughout our analysis, we assume that these current achievement gaps accurately reflect the achievement gaps for all age groups and time periods.

The second part of Table 2 describes the college attendance and school completion gaps. The top row presents the share of Oregon high school students who enroll in some type of post-secondary education within three years of completing high school. As expected, we observe a gap. Fourteen percent fewer black students enroll in college than white students, and 22 percent fewer Hispanic students enroll. Not surprisingly, a higher share of whites have a college degree than do blacks and Hispanics. The next row describes the difference in college completion for Oregonians aged 25 to 64. The share of blacks who complete college is 12 percent lower than the share of whites, and the share of Hispanics who complete college is 21 percent lower than the share of whites.

The last row presents average schooling (measured as number of years

completed) for Oregonians' aged 25 to 64, by race and ethnicity.¹¹ The pattern in this row resembles the pattern in the other rows. On average, blacks, Hispanics, and Native Americans complete fewer years of schooling than do whites. In particular, Hispanics complete 3.66 fewer years of schooling than whites. As we discuss below, the majority of this gap reflects fewer years of school among Hispanic immigrants.

HOW MUCH WOULD ELIMINATING THE ACHIEVEMENT GAP INCREASE TOTAL EDUCATION IN OREGON?

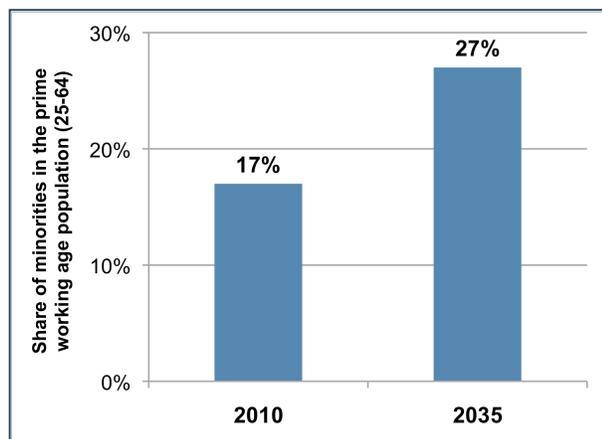
The second element of our calculation is the population shares for the affected groups. The impact of Oregon's achievement and attainment gaps on the total level of education in Oregon depends on the size of the relevant populations. For example, a very large achievement gap may have a trivial impact on the economy if the affected group comprises only a small share of the total population.

However, when estimating the economic impact of achievement gaps on Oregon's current and future economy, we must consider more than the current population shares of the relevant groups. In particular, we must address two issues. First, we must consider how minority group shares change over time. As the share of the population in minority groups grows, achievement gaps become more important. Second, we must address the migration of students and adults into and out of Oregon. In particular, we must account for migration as we address the expected benefits of policies designed to eliminate the achievement gaps. Even if Oregon eliminates the achievement gap for students educated

in Oregon schools, migration may prevent the complete elimination of the achievement gap among Oregon's adult population.

Figure 2 illustrates the importance of the change in minority group shares over time. At present, the share of Oregon's working-age population affected by achievement gaps is relatively small. Oregon's prime working-age population (ages 25-64) is approximately 17 percent minority. However, demographers expect a dramatic shift in this population by 2035. Even if the share of non-whites in each age range remains constant over the next 25 years (a conservative assumption), Oregon's prime working-age population will comprise approximately 27 percent minorities by 2035, a 53 percent increase. Because the growing minority populations are disproportionately affected by Oregon's achievement gaps, the economic impact of the gaps will grow substantially even if the gaps themselves remain at current levels. In other words, we are multiplying the economic impact by an increasing number of affected people.

Figure 2: Expected change in Oregon's working-age minority population



Source: ECONorthwest

The second concern, migration, poses a more difficult problem for our analysis. If we want to understand the impact of eliminating achievement gaps, we must acknowledge that policy in Oregon may not affect education in other places, and we know that not everyone educated in Oregon (and thus directly affected if Oregon eliminates its achievement gaps) will reside in Oregon as adults. Education in other places affects the size of Oregon's achievement gaps.

Historically, approximately 60 percent of working-age adults born (and presumably educated) in Oregon live in Oregon. However, several groups, including blacks, Hispanics, and the college-educated, traditionally have higher migration rates. Among these groups, approximately 50 percent of those born in Oregon live in Oregon as adults. Thus, at least some of the benefits of eliminating the achievement gap in Oregon will accrue to places outside of Oregon.

The other side of out-migration is in-migration. Currently, nearly two thirds of adult Oregonians were born outside of Oregon. Many of these individuals obtained their education outside of Oregon. Unless achievement gaps also disappear in other states and countries (or Oregon implements programs to eradicate skill or education gaps among adult in-migrants), eliminating the achievement gap in Oregon schools cannot, alone, eliminate education gaps in Oregon's adult population. If Oregon eliminates its achievement gaps, other states could adopt Oregon's policies and eliminate their achievement gaps. Thus, domestic migration may not have significant effects on our calculation. However, the chances that Oregon's immigrant population will arrive with the

Table 3: Impact of immigration on estimates of average schooling

Difference in average years of schooling for 25-64 year olds Oregonians	Black-White	Hispanic-White	Native American-White	Mixed-White	Asian-White
All Oregonians ages 25-64	-0.61	-3.66	-1.01	-0.35	0.26
Born in Oregon	-0.32	-0.76	-0.93	-0.36	1.01
Born in U.S.	-0.63	-0.84	-0.99	-0.37	0.89

Source: ECONorthwest analysis of American Community Survey (2006-08)

same quality and quantity of education as native Oregonians seems remote. As such, the share of the adult achievement gap that stems from immigrants will likely persist.

The education level of immigrants contributes significantly to Oregon's achievement gap. Table 3 illustrates how immigrants, particularly Hispanic immigrants, contribute to Oregon's attainment gaps. The table shows the average number of years of education for (1) all Oregonians aged 25 to 64, (2) all Oregonians born in Oregon, and (3) all Oregonians born in the U.S.

Particularly for Hispanics, the top row (which includes immigrants) differs significantly from the other two rows (which do not). The Hispanic-white schooling gap falls from -3.66 to -0.76 years when we exclude immigrants. In light of these differences, our preferred estimates assume that the elimination of the achievement gaps only applies to Oregonians born in the U.S. or born in Oregon.

In Table 4, we illustrate the marginal impact of eliminating Oregon's achievement gaps on the average achievement of current Oregon workers.

Table 4: Impact on current total achievement in Oregon from eliminating achievement gaps

	Achievement Gap	Current Share of Adult Population	Share of adult population affected by elimination of achievement gap in Oregon schools	Change in Oregon's educational level
Hispanics	-0.50 to -0.75 s.d.	9.0%	7% to 100%	0.003-0.068 s.d.
Mixed	-0.05 to -0.15 s.d.	2.0%	35% to 100%	0.0004-0.003 s.d.
Blacks	-0.50 to -0.75 s.d.	1.5%	31% to 100%	0.002-0.011 s.d.
Native Americans	-0.40 to -0.50 s.d.	1.0%	45% to 100%	0.002-0.005 s.d.
			Total	0.008-0.087 s.d.

Note: s.d.=standard deviations from the mean.

Source: ECONorthwest

The table contains four elements. The first column contains a range of estimates for the achievement gap for each group based on Table 2 and our analysis of OAKS and NAEP achievement gaps in recent years. The second column presents each group's current share of the adult population. The third column represents our attempt to account for migration. This column presents a range of possible assumptions for the share of each group's population that could feasibly eliminate their achievement gaps. The low end of the range is the share of the current population born in Oregon. The high end is 100 percent (i.e., we assume that the achievement gap disappears for all Oregonians, including immigrants). Finally, the fourth column presents a range of estimates of the change in human capital (measured as standard deviations from the mean) obtained by multiplying the first three columns.

At the bottom of the fourth column, we sum the impact for all minority groups. Depending on the assumptions about the size of the achievement gap and the share of population for which the gap could feasibly be eliminated, we find that closing the achievement gap in the current population would increase the average achievement of Oregon's working age population by between 0.01 and 0.09 standard deviations. This is a wide range. Clearly, the assumptions used in our calculations have a significant impact.

WHAT ARE THE ECONOMIC IMPACTS OF ELIMINATING OREGON'S ACHIEVEMENT GAPS?

Finally, we obtain estimates of the economic impact of Oregon's achievement gap by multiplying values

like those found in Table 2 (the impact of the achievement gap on Oregon's aggregate education levels) with estimates of the relationship between education and economic performance (particularly economic growth) taken from the academic literature.

Before presenting our results, we offer a few additional caveats. We drew the estimates used in the analyses below from a much larger literature. While some of the estimates presented below reflect well-established consensus estimates, many do not. Attempts to estimate the effect of education on economic outcomes suffer from a number of empirical challenges that are frequently difficult to overcome completely. Thus, many studies contain at least a few potential flaws that may compromise their results. Furthermore, even if the results we rely on present the "true" relationship between education and economic outcomes in the specific populations examined, these results may not describe the relationship between education and economic outcomes in Oregon during the periods examined.

For instance, many studies employ cross-country data. The average relationship between education and growth across a sample of countries may not reflect the relationship between education and the economy in Oregon. Alternatively, many authors argue that the relationship between education and the economy varies with economic conditions.¹² For example, the impact of education on economic outcomes may vary with the quality of local economic institutions or technology. At present, we have no reason to expect that these concerns will lead us to systematically over- or under-state the impact of

achievement or attainment gaps on Oregon's economy.

Furthermore, we do not have precise estimates for each element in our calculation. Instead, each element could fall anywhere within a range. Given the magnitudes of the range for each element and the power of multiplication, the range of potential outcomes is large. When we examine the expected effects of eliminating the achievement gap and assume that the share of the population affected varies, the high estimate is nearly 20 times (or 2000 percent of) the low estimate (see Figure 3).

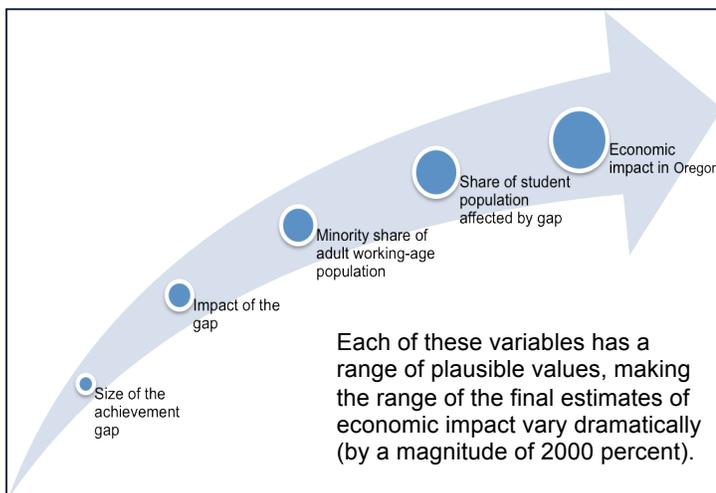
We present the entire range for each variable because an honest researcher could support a position at either extreme (or any point in between), given the available information. Supporters of the low estimates believe that achievement gaps are smaller, that the relationship between education and economic performance is weak, and that migration and immigration eliminate the majority of the benefits from policies that eliminate achievement gaps in schools. Supporters of the high estimates believe

that achievement gaps are larger, that the relationship between education and economic performance is stronger, and that achievement gaps can be eliminated even among migrants and immigrants.

We fall somewhere between these extremes. First, we believe that achievement gaps are closer to the high end of the range of estimates. Second, we believe that the relationship between education and economic performance probably falls between the low and middle parts of the range of estimates (although we would not be surprised if the relationship were stronger). Finally, we believe that efforts that successfully eliminate achievement gaps in Oregon would likely reduce them elsewhere. As such, the benefits to Oregon of eliminating the achievement gap in Oregon schools would stem not only from adults who attended Oregon schools but also from adults in Oregon who attended schools in other states that may have adopted Oregon's methods of eliminating the achievement gap. However, we do not expect achievement gaps to disappear for Oregon's immigrant populations because most immigrants moving to Oregon continue to be less educated than non-immigrants. Combined, our assumptions support estimates close to the middle (or slightly below the middle) of the range we report.

Table 5 presents the expected impact of eliminating achievement gaps in Oregon's current adult population on a number of economic outcomes. We produce the estimates in Table 5 by multiplying the change in education level (following the method used in Table 4) by the relationships between

Figure 3: Range of uncertainty affecting the magnitude of economic impact estimates



Source: ECONorthwest

education and different outcomes found by various researchers.

Each row of Table 5 describes the impact on economic growth of eliminating a particular achievement gap for that minority group. The bottom row shows the sums of the columns, or the economic impacts of eliminating each gap. We note that, as expected, much of the gap between the high and low estimates stems from the achievement gap among Hispanics (and our assumption about the share of Hispanics for whom the gap is eliminated over time).

The first set of columns presents the impact of eliminating the test score gap among the current adult population: economic growth in Oregon would increase by between 0.01 and 0.184 percentage points. These are the results we described in Table 1. The second set of columns shows the effect of eliminating the years-of-schooling gap. Using this alternative measure of the achievement gap (or, more precisely,

the attainment gap) yields similar results.¹³

The third set of columns in Table 5 presents the relationship between college completion and employment growth. Economist Jesse Shapiro found that a 10 percent increase in an area's share of college graduates produces a 0.8 percentage point increase in employment growth.¹⁴ Eliminating the college attainment gap in Oregon's current adult population would boost the share of Oregonians with college degrees by between 0.2 and 2.4 percentage points (or between 0.7 and 8 percent), which implies an increase in the employment growth rate of between 0.065 and 0.629 percentage points.

The final set of columns presents the relationship between college completion and average wages. Many economists believe that everyone benefits from having more educated neighbors. That is, economists have found that the social returns to education exceed the private returns. Economists have

Table 5: Impacts from eliminating achievement gaps in Oregon's current adult population

	(1) Impact of reducing test score gap on economic growth		(2) Impact of reducing years of schooling gap on economic growth		(3) Impact of 10 percent increase in BA share on employment growth		(4) Impact of 1 percentage point increase in BA share on average wages	
	Low Estimate	High estimate	Low Estimate	High estimate	Low Estimate	High estimate	Low Estimate	High estimate
Hispanic	0.004	0.144	0.001	0.191	0.017	0.504	0.038	2.268
Mixed	0.000	0.006	0.001	0.004	0.011	0.032	0.025	0.144
Black	0.003	0.024	0.001	0.005	0.016	0.048	0.036	0.216
Native American	0.002	0.010	0.001	0.006	0.020	0.045	0.046	0.204
Impact from elimination of gap	0.010 percentage points	0.184 percentage points	0.004 percentage points	0.206 percentage points	0.065 percentage points	0.629 percentage points	0.145 percent	2.832 percent

Notes: Impacts of education on outcomes taken from Hanushek and Woessmann (2007b) (first two sections), Shapiro (2006) (third section), and Moretti (2004) (fourth column)

identified two potential reasons for this: productivity spillovers (people with more skills increase the productivity of those around them) and consumption spillovers (people with more education improve the quality of life around them by spurring the growth of consumption amenities [e.g., bars, restaurants] or committing fewer crimes). Shapiro argues that 40 percent of the employment growth effect discussed in the previous paragraph stems from consumption spillovers and the remaining 60 percent reflects productivity spillovers.

If living near more educated neighbors increased an individual’s productivity, economists would expect that individual to earn higher wages even without obtaining additional education. Economist Enrico Moretti examines the spillover between more educated neighbors and average wages and finds that a one percentage point increase in the share of the population with a bachelor’s degree increases average wages throughout the area by 0.6 to 1.2 percent.¹⁵ As discussed above, eliminating the college completion gap

in Oregon’s current adult population would increase Oregon’s college graduate share by 0.2 to 2.4 percentage points. If Moretti’s results apply to Oregon, eliminating the college attainment gap would increase the average wage for all Oregonians by between 0.2 and 2.8 percent.¹⁶

The relationships we present in Table 6 present the impacts of eliminating achievement and attainment gaps in Oregon’s current population. Given the anticipated demographic changes described in Figure 2, the potential impacts of the achievement gap on Oregon’s economy will grow in the future.

In Table 6, we demonstrate how the achievement gap will have a larger impact on the economy in the future because of demographic changes (Figure 2). Table 6 repeats Table 5 but assumes that the minority group’s population shares resemble the distribution of Oregonians currently aged 0-40 (and not aged 25-64 as in Table 5). The total impacts in the table are approximately 50 percent larger

Table 6: Impacts from eliminating achievement gaps in Oregon’s adult population in 25 years

	Impact of reducing test score gap on economic growth		Impact of reducing years of schooling gap on economic growth		Impact of 10 percent increase in BA share on employment growth		Impact of 1 percentage point increase in BA share on average wages	
	Low Estimate	High estimate	Low Estimate	High estimate	Low Estimate	High estimate	Low Estimate	High estimate
Hispanic	0.007	0.256	0.002	0.340	0.030	0.896	0.067	4.032
Mixed	0.001	0.012	0.001	0.008	0.022	0.064	0.050	0.288
Black	0.004	0.032	0.001	0.007	0.021	0.064	0.048	0.288
Native American	0.002	0.010	0.001	0.006	0.020	0.045	0.046	0.204
Total	0.014 percentage points	0.310 percentage points	0.006 percentage points	0.360 percentage points	0.094 percentage points	1.069 percentage points	0.212 percent	4.812 percent

Notes: Impacts of education on outcomes taken from Hanushek and Woessmann (2007b) (first two sections), Shapiro (2006) (third section), and Moretti (2004) (fourth column)

than those in Table 5. Thus, if achievement gaps remain the same size, demographic changes will increase the impact of the achievement gap by nearly 50 percent.

The results in Table 6 represent a snapshot of how Oregon's economy might be different in 25 years if we eliminate achievement gaps by then. However, as noted in the first section of the paper and in Figure 1, it may take a long time (more than 25 years) to purge Oregon's economy of achievement gaps. Thus, the actual differences in Oregon's economy in 25 years will depend on how quickly and successfully Oregon can eliminate its achievement gaps.

SUMMARY

The achievement gap significantly affects Oregon's economy. If Oregon could magically eliminate the achievement gap throughout its adult population, the economy would grow faster and incomes would rise. If we had eradicated the gap 10 years ago, economic output would be between 0.7 and 1.8 percent (or approximately \$1.1 to \$2.8 billion) higher than it is now. The higher estimate is equivalent to Oregon's farm sector or to 1.4 times the size of its wood products manufacturing sector. Given that Oregon's minority populations are growing at faster rates than its white population, the impacts of the achievement gap on Oregon's economy will only increase in the future (e.g., in 25 years the impacts may be 50 percent larger).

Unfortunately, we cannot magically eliminate the achievement gaps among Oregon's adult population. We can implement policies that eliminate the

gaps over time. However, these policies may not completely eliminate Oregon's achievement gaps because of migration. While migration may mute the effects of policies designed to eliminate achievement gaps, Oregon will still benefit from eliminating the achievement gaps in the long term. Even assuming migration will reduce the benefits of eliminating the achievement gaps, total output might increase by three percentage points over 50 years. Economists expect that reducing state taxes by 10 percent would generate a similar effect.

CONTACT INFORMATION

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ECONorthwest specializes in the economic and financial analysis of public policy. ECO has analyzed the economics of resource-management, land-use development, and growth-management issues for municipalities, state and federal agencies, and private clients for more than 30 years.

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Endnotes

¹ ECONorthwest analysis of Oregon Department of Education and National Student Clearinghouse data.

² Philip Oreopoulos & Kjell G. Salvanes, 2009. "How large are returns to schooling? Hint: Money isn't everything," NBER Working Papers 15339.

³ Moretti, Enrico, 2004a. "Human capital externalities in cities," Handbook of Regional and Urban Economics, in: J. V. Henderson & J. F. Thisse (ed.), *Handbook of Regional and Urban Economics*, edition 1, volume 4, chapter 51, pages 2243-2291; Lange, Fabian & Topel, Robert, 2006. "The Social Value of Education and Human Capital," *Handbook of the Economics of Education*, Elsevier; Shapiro, Jesse M. "Smart Cities: Quality Of Life, Productivity, And The Growth Effects Of Human Capital," *Review of Economics and Statistics*, 2006, v88(2,May), 324-335; Moretti, Enrico, 2004b. "Estimating the social return to higher education: evidence from longitudinal and repeated cross-sectional data," *Journal of Econometrics*, Elsevier, vol. 121(1-2), pages 175-212; Lance Lochner & Enrico Moretti, 2004. "The Effect of Education on Crime: Evidence from Prison Inmates, Arrests, and Self-Reports," *American Economic Review*, *American Economic Association*, vol. 94(1), pages 155-189, March; Daron Acemoglu & Joshua Angrist, 1999. "How Large are the Social Returns to Education? Evidence from Compulsory Schooling Laws," *NBER Working Papers 7444*; Hanushek, E.A. and L. Woessmann 2007a *Education quality and economic growth*. Washington: World Bank.

⁴ We describe our calculation as "back of the envelope" in order to acknowledge the imprecision of our estimates. While our estimates rely on the best available data and research, we cannot estimate the precise impact of the achievement and attainment gaps on Oregon's economy given the data and empirical methods currently available. The elimination of the achievement gap (and the dramatic changes to Oregon's schools and workforce that would accompany it) would prompt a chain reaction that would ripple throughout the economy in thousands of ways. Accounting for all of these different ripples is impossible. Thus, the only way to envision Oregon's economy without achievement (or attainment) gaps is to make a series of assumptions and hope that the natural evolution of the economy and the process of eliminating these gaps does not render these assumptions invalid.

⁵ McKinsey & Company, Social Sector Office, 2009. "The economic impact of the achievement gap in America's schools."

⁶ Specifically, we assume the following. The achievement gap in Oregon's current adult population equals the achievement gap in Oregon's current (or recent) student population. Minority group shares throughout the 1998-2008 period equal the shares in the 2006-08 American Community Surveys. Eliminating the achievement gap consistently adds 0.073 or 0.184 percentage points to Oregon's actual gross state product growth rates each year between 1998 and 2008.

⁷ Bureau of Economic Analysis, Gross Domestic Product by State

⁸ Hanushek, E.A. and L. Woessmann, 2007b. "The role of education quality in economic growth." World Bank Policy Research Paper 4122.

⁹ The consensus estimate in the economics literature suggests that a 10 percent reduction in effective state and local business tax rates, *with state and local public services held constant*, will increase the long-run level of local business activity by 2 or 3 percentage points over the long run. The impact of eliminating the achievement gap is not constant over time in this example, but the estimates at 25 years are slightly below this value and the estimates at 50 years exceed it. See Bartik, Timothy J. (1991) *Who Benefits from State and Local Economic Development Policies?* Kalamazoo, MI: W.E. Upjohn Institute for Employment Research; Bartik, Timothy J. (1992) "The Effects of State and Local Taxes on Economic Development: A Review of Recent Research." *Economic Development Quarterly* 6(1): 102-110; Wasylenko, Michael (1997) "Taxation and Economic Development: The State of the Literature" *New England Economic Review*. March/April.

¹⁰ The black-white gap on the 8th grade math NAEP ranged between 0.5 and 0.8 standard deviations on the last four tests, the 8th grade reading gap ranged between 0.4 and 0.6 standard deviations. The Hispanic-white gap on the 8th grade tests ranged between 0.7 and 0.83 on math and 0.5 and 0.75 on reading. The gaps for the 8th grade OAKS reading test are 0.55 for blacks, 0.76 for Hispanics, 0.45 for Native Americans, 0.1 for mixed race, and 0.03 for Asians.

¹¹ We coded the school variable in the American Community Survey to approximate the number of years of schooling reflected by each category in this variable, e.g., a college degree is equal to 16 years of schooling, or a PhD is equal to 20 years of schooling. When the category in the ACS included a range of grades or years, we assigned the highest value in the range.

¹² Aghion, P, L. Boustan, C. Hoxby, and J. Vandenbussche (2009) "The Causal Impact of Education on Economic Growth: Evidence from the United States" *Brookings Papers on Economic Activity*

¹³ We use coefficients for the relationship between schooling and economic growth described in Hanushek and Woessmann 2007b.

¹⁴ Shapiro, Jesse M. "Smart Cities: Quality Of Life, Productivity, And The Growth Effects Of Human Capital," *Review of Economics and Statistics*, 2006, v88(2,May), 324-335.

¹⁵ Moretti, Enrico, 2004b. "Estimating the social return to higher education: evidence from longitudinal and repeated cross-sectional data," *Journal of Econometrics*, Elsevier, vol. 121(1-2), pages 175-212.

¹⁶ We note that Moretti's and Shapiro's analyses focused on cities. It is possible that their results do not generalize to entire state populations.