

Youth Bulges and Youth Unemployment

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Abstract

The transition from age structures dominated by children to age structures concentrated in working ages may have mixed economic consequences. The “demographic dividend” may be an important contributor to economic growth. But the path to the demographic dividend must pass through the “youth bulge,” with increases in the proportion of younger workers potentially increasing youth unemployment and social unrest. We analyze the economics and demography of the youth bulge –how youth demography is changing and how it affects youth unemployment – using data for 154 countries. We show that the simple relationship between youth bulges and youth unemployment across countries and within countries over time is very weak. Estimating regressions including year fixed effects and country fixed effects, however, we find a strong positive relationship between the growth rate of the working-age population and youth unemployment. This suggests that the youth bulge may be an important factor in youth unemployment, with the growth rate of the youth population being more important than the youth share of the working-age population.

Introduction

The changes in age structure that have accompanied the dramatic demographic changes of the last fifty years have a number of economic implications. One of the most important demographic changes is the shift toward an older age structure as a result of rapid declines in fertility in most developing countries. Discussions of the economic consequences of this population aging are not entirely consistent. On the one hand, the shift toward an older age structure has been identified as a “demographic dividend,” with a concentration of population in the working ages potentially contributing to faster economic growth (Bloom and Williamson 1998, Bloom et al. 2000, Lee and Mason 2011). On the other hand, the increasing share of young workers as a share of the working-age population, another dimension of the same demographic shift, has been cited as potentially contributing to youth unemployment and social unrest (Urdal 2006, Assaad and Levison 2013).

The links between youth demography and youth unemployment are worthy of analysis, given the importance of youth unemployment as a policy issue throughout the world. The ILO’s 2013 analysis of youth employment trends estimated a global youth unemployment rate of 12.6%, with an estimated 73 million young people unemployed (ILO 2013a). Youth unemployment tends to be substantially higher than adult unemployment in all countries. The ratio of youth unemployment to overall adult unemployment is estimated at 2.7, (ILO 2013a). Many discussions of youth unemployment talk about the demography of youth populations. The rapid population growth experienced by many developing countries in the 1960s and 1970s produced very young populations (Lee 2003, Lam and Marteleto 2008, Lam 2011). Many developing countries are currently experiencing a peak in their youth populations (Assaad and Levison 2013). It is important to consider the potential impact of large and growing youth populations on youth unemployment and other labor market outcomes.

This paper explores the demography and economics of the “youth bulge,” with particular focus on the links between youth bulges and youth unemployment. We begin by reviewing some of the previous research on cohort size and labor market outcomes, most of which has been done in high-income countries. We then provide an overview of the demography of youth populations. In order to understand the economics of changes in youth demography, it is important to understand the forces that have produced today’s large youth cohorts. We look at trends in youth demography for major regions and countries, and discuss how these trends can be related to alternative definitions of the youth bulge. We then discuss what dimensions of youth demography are likely to be important from the perspective of the youth labor market. We then look empirically at the relationship between youth unemployment and the most widely used measure of

the youth bulge – the proportion of 15-24 year-olds in the working-age population. As we will see, the empirical relationship is quite weak when we compare countries in the cross-section. Youth demography *per se* explains very little of the large differences across countries in youth unemployment rates. Youth demography also cannot explain recent trends in youth unemployment within countries. The overall trend has been for unemployment to increase at the same time that the youth share of the working-age population has been declining in most countries. When we estimate regressions that include year fixed effects and country fixed effects, this picture changes markedly. Now, we estimate a relatively strong positive relationship between the youth share of the working-age population and the youth unemployment rate. This is true when the high income and developing countries are pooled and also when the regressions are run for developing countries only.

Previous Research

The “youth bulge” has often been cited as a factor affecting political unrest (Cincotta 2005, Urdal 2006). Urdal (2006), for example, finds that countries with relatively large youth populations are more likely to experience domestic armed conflict and terrorism. The youth bulge has frequently been mentioned in discussions of the “Arab Spring” (LaGraffe 2012). One of the mechanisms frequently mentioned for a link between the youth bulge and political unrest is that large youth cohorts may contribute to high youth unemployment. Direct evidence on a link between the relative size of the youth population and youth unemployment is quite limited, however, especially in developing countries.

Studies on the relationship between cohort size and labor market outcomes in high-income countries have often found that larger cohorts experience worse labor market outcomes. A large literature focused on the early labor market experience of the large baby boom cohorts that entered the labor market in the 1960s and 1970s in North America and Europe (e.g. Welch 1979, Berger 1985, Bloom et al. 1987, Zimmermann 1991). The broad consensus of these studies was that larger cohort size was associated with some combination of lower entry-level wages and higher unemployment relative to older workers, with differences across countries in the extent to which wages or unemployment showed the largest effects of cohort size.

Korenman and Neumark (2000) used data for 15 OECD countries from 1970-94 to combine variation across countries with variation across time to look at the impact of “cohort crowding” on youth labor markets. Their estimates suggest that a higher youth share of the working-age population leads to higher youth unemployment relative to adult unemployment. Shimer (2001), using state-level data for the United States, found the surprising result that an increase in the youth share of the working-age population reduces both the youth unemployment rate and the

prime-age adult unemployment rate. Drawing on predictions from a search model of the labor market, he attributed this result to the fact that high fractions of young people in the labor force lead to increased labor market flexibility.

There has been relatively little research analyzing the impact of cohort size on labor market outcomes in developing countries. Behrman and Birdsall (1988) found that being in a large cohort had negative effects on labor market outcomes of unskilled men in Brazil. Lam (2006) and Assaad and Levison (2013) showed that the youth proportion of the working-age population has declined in many developing countries, the result of rapid fertility declines. Fares et al. (2006) analyzed data for 93 countries and found little evidence that larger youth cohorts had worse labor market outcomes. This paper explores these issues in greater detail, using more recent data for a larger set of countries.

Data and definitions

Our demographic estimates are based on estimates and projections in the U.N.'s *World Population Prospects: 2010 Revision* (United Nations Population Division 2011). The youth unemployment data are taken from the International Labour Organization's Key Indicators of Labour Markets (KILM) online database, 8th Editiona (ILO 2014), covering the period 1991-2012. We use only the observations for which the ILO has data actually reported by countries, typically based on a labor market survey. Coverage of the unemployment data varies substantially across countries. We have unemployment data for 43 developed countries and 139 developing countries.¹ The definition of unemployment follows the standard ILO guidelines, indicating those who were not working and looking for work in some reference period. The unemployment rate is the number of unemployed divided by the number in the labor force (the sum of the employed and unemployed). Most of our analysis focuses on the unemployment rate for males in order to avoid the more complicated issues that affect female labor force participation rates, especially in developing countries with high fertility rates. We also draw on aggregate economic indicators from the Penn World Tables 7.1 (Heston, Summers and Aten 2012). The Penn Tables only cover the period to 2010, so our regression analysis will mainly be restricted to the 1991-2010 period. We use age 15-24 as the definition of the youth labor force age, following most international literature.

¹ We use the classifications used in the UN population data, classifying developing countries as all countries other than those classified as "More Developed" in the UN data.

Measures of the youth bulge

Figure 1 shows three different measures of the youth labor force for five countries – Brazil, Egypt, India, Indonesia, and Nigeria. The left panels show the absolute size of the 15-24 age group. The middle panels show the annual growth rate of this group, while the right panels show the 15-24 age group as a proportion of the working-age population (15-64).

As seen in the left panel of Figure 1, the population aged 15-24 recently hit a peak in Brazil and Indonesia, a pattern that is typical of many countries that have already experienced rapid fertility decline (World Bank 2006, Lam 2006). This is one sense in which there is a “youth bulge” – the absolute number of young people is at a peak and starting to go down in many countries. India has not quite hit this peak, but it is close to a peak and is projected to have very low growth of the youth population in the next 20 years.

From an economic perspective the growth rate of the youth labor force is probably more important than the absolute size, since it is rapid entry of young workers that is most likely to put pressure on the labor market. Looking at the middle panels in Figure 1, Brazil, Egypt, India, and Indonesia all have much slower growth of the youth labor force today (close to zero) than they did in the 1970s, when the youth labor force grew at over 4% per year.

As seen in the right column of Figure 1, the population aged 15-24 as a proportion of the working-age population (15-64) has also been falling in all five of the countries shown. In Brazil, India, Indonesia, and Egypt, the proportion has fallen from around 35% in the 1970s to around 25% today. Egypt, where the youth bulge has been linked to unemployment and political unrest, looks similar to the Asian and Latin American examples, with roughly zero growth of the youth labor force after 2005 and with steady declines in youth’s share of the working-age population since the 1970s. In many ways it is hard to see evidence of a current youth bulge in the first four countries in Figure 1. While the youth populations are large, they were growing much faster and were a larger share of the labor force (and population) 30-40 years ago. Most other Latin American and Asian countries look quite similar to these four countries (Lam, 2006).

Sub-Saharan Africa, represented in Figure 1 by Nigeria, looks much different than the rest of the world. While the other countries in Figure 1 will have little or no growth in the youth labor force in coming decades, Nigeria’s youth labor force will grow from 35 million in 2015 to 63 million in 2040. The growth rate has fallen from its 1995 peak of 3.4%, but will stay around 2% until 2030. The youth share of the working-age population is falling, but at a much slower rate than in the other countries. Youth will still be above 1/3 of the labor force in 2040.

It is important to note that neither the growth rate of the youth labor force nor the youth share of the working-age population that we see in Nigeria are out of the ordinary. Similarly high rates

can be seen in the other four countries in Figure 4 in the 1970s and 1980s. We would find similar patterns if we looked at a wide range of other countries in the world. The unusual thing about the African case is that these rates show very little decline. While they have dropped from their peak levels, they are still very high and are projected to remain high for the next several decades. This is because of the slow pace of fertility decline in Africa (Bongaarts 2008).

Figure 2 shows the youth proportion of the working-age population for all countries with a projected population exceeding 40 million in 2015. Looking at the youth ratios in 2015, the range across countries is very large. The highest ratio among countries with population over 40 million is the Democratic Republic of the Congo, where almost 40% of the working-age population will be 15-24. At the other extreme, the lowest ratio in 2015 among countries with population over 40 million is Spain, where youth will be less than 15% of the working-age population.

Comparing the youth ratios for 1975 and 2015 in Figure 2, we see that many developing countries have experienced large declines. Vietnam, for example, went from having one of the highest youth ratios in the world in 1975 – 38% -- to the relatively low ratio of 24% in 2015. Brazil, China, Indonesia, and Thailand had similar large declines, reflecting the rapid declines in fertility in these countries in the 1970s and 1980s (Lam and Leibbrandt 2013). In high-income, low-fertility countries such as Spain, Russia, Italy, Germany, and Japan, youth are only around 15% of the working-age population, with large declines in the youth ratio between 1975 and 2015.

A number of sub-Saharan African countries have had slow declines in fertility (Bongaarts 2008). These continuing high fertility rates create very young age structures, and youth continue to be a very high proportion of the working-age population. In Nigeria, Tanzania, Ethiopia, and Democratic Republic of Congo, the youth ratio was already at a high level of around 35% in 1975, and has increased since then.

Figure 3 shows the annual growth rate of the youth population in 1975 and 2015 for the same set of countries (ranked by the growth rate in 2015). The DRC has the fastest growth in 2015 at 3% per year. While this is a high rate of growth (implying a doubling in 23 years if it remained constant), we see in the figure that many countries that are currently middle income countries experienced growth rates even higher than this in 1975. Many developing countries currently have close to zero growth rate of the population 15-24.

Youth demography and youth unemployment

We now turn to the question of whether there is an empirical relationship between youth bulges and youth unemployment. It is important to point out that data on youth unemployment is much less extensive and less reliable than data on youth demography. While there are many assumptions and modeling decisions involved in the U.N.'s population estimates and projections,

there is a great deal more structure and temporal smoothness to rely on in estimating the growth rate of the 15-24 year-old population than there is in estimating unemployment rates in countries that only have occasional labor market surveys. Measuring unemployment is also difficult, even with good labor market survey data.

We begin by looking at the cross-sectional relationship between the male youth unemployment and the youth proportion of the working-age population. Figure 4 shows scatterplots of youth unemployment against the youth ratio (the population aged 15-24 as a proportion of the population aged 15-64), using the most recent measure of youth unemployment available for a wide range of countries. We limit the analysis to countries with measures after 2000; most of the measures are from 2008, 2009, or 2010. As is clear from Figure 4, there is no strong evidence from simple cross-sectional evidence that countries with a higher youth ratio have higher youth unemployment. The relationship is actually negative in Africa, Latin America, and in the more developed countries as a group. Looking at Africa, which has the highest youth ratios in the world, the high youth ratios in countries like Burkina Faso, Benin, and Sierra Leone are associated with relatively low rates of youth unemployment, at least as measured in the surveys used in the ILO data. Of course there are many difficult methodological issues in estimating youth unemployment in these highly rural agrarian countries. But taken at face value the youth bulge would seem to be a poor candidate for explaining cross-country differences in unemployment in Africa. Note that the North Africa countries of Algeria, Tunisia, Morocco, and Egypt have some of the lowest youth ratios in Africa. South Africa, with its very high youth unemployment, also has one of the lowest youth ratios on the continent.

In addition to uncertainty about the data, there are other reasons why we should not make too much of the patterns shown in Figure 4. Many factors affect youth unemployment, and the simple cross-sectional relationship may be misleading. A better way to look at the issue is to analyze whether increases in the youth ratio in a given country are associated with increases or decreases in youth unemployment in that country. Most of the countries shown in Figure 4 have multiple observations of unemployment in the ILO data. Figure 5 looks at how the youth ratio and youth unemployment changed between the 1990s and 2000s. The figure shows the difference between the average 2000-09 youth unemployment and the average 1990-99 youth unemployment, plotted against the difference between the average 2000-09 youth ratio and the average 1990-99 youth ratio (35 more developed countries and 53 developing countries have unemployment data for at least one year in both the 1990s and 2000s in the ILO KILM series).

Figure 5 shows that there is a slight negative relationship between the change in the youth ratio and the change in youth unemployment. The OLS regression line has a negative slope,

implying that countries that had larger increases in the youth ratio had larger increases in unemployment, although the slope is close to zero and is not statistically significant.

It is clear from Figure 5 that in most countries the youth share of the working-age population decreased between the 1990s and the 2000s. This is the result of rapid fertility decline in developing countries and of population aging generated by low fertility in high-income countries. Slightly more than half of those countries that experienced declining youth ratios experienced increases in youth unemployment. For the most part Figure 5 shows only a weak relationship between changes in youth ratios and changes in youth unemployment.

Figure 6 shows the relationship between the change in unemployment rates between 1990-99 and 2000-2009 (the same outcome shown in Figure 5) and the change in the growth rate of the youth population over the same period. The regression line is essentially flat, with no clear relationship between changes in the youth growth rate and changes in youth unemployment. Many developing countries experienced declines in the growth rate of the youth population, but an increase in youth unemployment, between the 1990s and the 2000s.

Regression Analysis

The graphical analysis in Figure 4 and Figure 5 suggest that the proportion of youth in the working-age population does not in and of itself do much to explain differences in youth unemployment across countries or changes in youth unemployment over time. This does not necessarily mean that the youth ratios or the growth rate of the youth population are not having an impact on youth unemployment, however. A more complete view can be provided by using regression analysis to look at the relationship between youth demography and youth unemployment while controlling for other important factors such as the overall growth rate of the economy. We might be concerned, for example, that the decline in youth ratios in recent years coincided with a period of global recession, weakening what might otherwise have been a larger decline in youth unemployment in response to the proportion of youth in the working-age population.

Table 1 presents results of regressions using a number of different specifications, for all countries for which we have data on youth unemployment. Following previous literature such as Shimer (2001), our first dependent variable is the natural logarithm of the male youth unemployment rate and our main independent variable is the natural logarithm of the population aged 15-24 as a proportion of the population aged 15-64 (the youth ratio). The coefficient on the log of the youth ratio can thus be interpreted as an elasticity.

We begin with a simple regression for a cross-section of countries, using only the most recent observation for each of 154 countries. We estimate a negative elasticity of -0.840, implying that a

10% higher proportion of youth in the labor force is associated with 8.4% *lower* youth unemployment. This negative relationship is not surprising given the patterns shown in Figure 4. Regression 2 adds the growth rate of GDP to the regression as a way to control for whether the country is in an economic expansion or contraction. This slightly increases the absolute value of the elasticity.

Regression 3 uses all of the observations for every country and adds country fixed effects to the regression. The KILM data have multiple observations for most countries. Including country fixed effects means that we are looking at how changes in the youth ratio are associated with changes in youth unemployment within countries. Differences across countries in characteristics that are constant over time, such as the usual level of unemployment, the nature of labor market institutions, the role of agriculture, etc., will be swept away in the fixed effect. Using country fixed effects the point estimate falls to -0.05 and is not statistically significant.

Regression 4 leaves out the country fixed effects but adds year fixed effects. The year fixed effects will pick up the fact that some years have higher (or lower) youth unemployment for all countries, as, for example, in the recent global economic crisis. In other words, we are comparing differences across countries after having removed the year-to-year fluctuations that affect all countries. Interestingly, the estimated elasticity is now positive (and statistically significant at the 10% level), implying that a 10% increase in the youth ratio will lead to a 1.4% increase in youth unemployment. Note that this regression is identified from cross-country differences, similar to Regressions 1 and 2 that used only the most recent observation for each country.

Regression 5 includes both year and country fixed effects. This is our preferred specification, and means that we are looking at deviations in a given year from the overall unemployment level in that year (taking account, for example, of a global recession or expansion) and are also looking at deviations from a country's overall average unemployment rate (taking account of the fact that some countries have persistently higher or lower unemployment rates). This is the approach taken in Shimer (2001). We now estimate a positive relationship between the youth ratio and youth unemployment, although it is not statistically significant. The elasticity of 0.226 implies that a 10% increase in youth's share of the working-age population is associated with a 2.3% increase in the youth unemployment rate.

In Regressions 6-10 we use the annual growth rate of the youth population as our independent variable instead of the logarithm of the youth ratio. As in Regressions 1 and 2, we estimate a negative relationship between the youth growth rate and the youth unemployment rate when we analyze a cross-section of countries using the most recent year available in the data. The coefficient in Regression 2 implies that a one percentage point increase in the annual growth rate

of the youth population is associated with a 13% decrease ($-12.8 \times .01$) decrease in the youth unemployment rate.

Looking at Regressions 8 and 9, the impact of controlling separately for county and year fixed effects differs from the patterns in Regressions 3 and 4. Using the growth rate of the youth population as a dependent variable, we get a positive coefficient when we include country year effects and a negative coefficient when we include year fixed effects. The opposite was the case when we used the log of the youth ratio as the independent variable. While we don't have a good explanation for this pattern, it is reassuring that we get a positive coefficient on the growth rate variable when we include both year effects and cohort fixed effects, our preferred specification. The coefficient of 2.0, which is statistically different from zero at the 0.01 level, implies that a one percentage point increase in the growth rate of the youth population is associated with a 2% increase in the youth unemployment rate.

The last five regressions use both measures of youth population – the log of the ratio of the population 15-24 over the population 15-59 and the growth rate of the population 15-24 – in the same regression. Although these two variables tend to move together for a given country over time and across countries at a given point in time, there is enough independent variation in the two variables to allow us to estimate significant effects of the two variables separately (the correlation in the two variables in the full set of 1,410 pooled cross-section and time-series observations is 0.45). Looking at Regression 15, our preferred specification with both country and year fixed effects, the coefficients on the two youth population variables are fairly similar to the coefficients when we use the variables separately in Regressions 5 and 10. The point estimate for the elasticity of youth unemployment with respect to the youth ratio is 0.13, but is not statistically significant. The coefficient on the growth rate of the youth population is highly significant, however, implying that a one percentage point increase in the growth rate of the youth population is associated with a 1.9% increase in youth unemployment (the mean of the male youth unemployment rate is 0.18, so a 1.9% increase is roughly an increase of 0.0034). To put this in perspective, many countries have experienced declines in the growth rate of the youth population from about 4% per year to 0% per year. The coefficient on the growth rate in Regression 15 in Table 1 implies that this decline of four percentage points would translate into a 7.6% decline, or roughly a 1.4 percentage point decline, in the male youth unemployment rate. While a decrease of 1.4 percentage points in the youth unemployment rate would always be a good thing, it is a fairly modest decrease relative to the large differences observed across countries and across time.

Regressions for developing countries

Table 2 repeats the analysis in Table 1 using only the developing countries (that is excluding the countries classified as “more developed” in the United Nations population data). The sample includes 95 countries with 701 country-year observations. The ILO data provide far from complete coverage of countries or years for developing countries, but with 701 country-year observations the coverage should be good enough to estimate the relationship between youth ratios and youth unemployment, especially given the large changes in youth ratios in recent decades in developing countries.

Many of the patterns in Table 2 are similar to the patterns for the full set of countries in Table 1. We continue to see a negative relationship between the youth ratio and youth unemployment in the cross-section of countries using the most recent observation, although the coefficient is not statistically significant. We estimate a statistically insignificant positive coefficient when we include year fixed effects (Regression 4), and the coefficient becomes smaller and remains statistically insignificant when we include both year and country fixed effects (Regression 5).

As in Table 1, we get more statistically significant relationships using the growth rate of the youth population as the independent variable (Regressions 6-10). These have the “wrong” sign in the simple cross-section, implying that countries with faster-growing youth populations have lower youth unemployment. In our preferred Regression 10 with both year and country fixed effects, the impact of a one percentage point increase in the growth rate of the youth population is a 4.8% decrease in youth unemployment, larger than the impact estimated in Table 1 for all countries. In Regression 15 we see that we estimate a similar effect of the youth growth rate when we include the youth ratio as an additional regressor. In Regression 15 we estimate a negative coefficient on the log youth ratio, but it is close to zero and is not statistically significant. The 4.8 coefficient on the youth growth rate in Regression 15 is statistically significant at the 0.01 level, implying that a one percentage point increase in the growth rate would lead to a 4.8% decrease in male youth unemployment. This implies that a decline from a growth rate of 4% per year to 0% per year would reduce youth unemployment by 19%, or about 3.5 percentage points at the mean unemployment rate of 18%. This is a substantial decline, though still fairly modest relative to the large differences in youth unemployment across time and countries.

One pattern emerging from the results in Tables 1 and 2 is that the growth rate of the youth population appears to be more strongly associated with youth unemployment than is the ratio of the youth population to the total working-age population. While the latter variable has been most commonly used in the previous empirical research on the impact of youth demography on youth unemployment, our results suggest that the growth rate is the more important variable. This is a

reasonable result from an economic perspective. It seems plausible that it is rapid increases in the number of young people in the labor market that create the most difficult problems of labor market adjustment. Our results would also be consistent with a relatively high level of substitutability of younger and older workers. If older and younger workers were perfect substitutes, then only the total size of the labor force would affect employment levels, with no impact of the relative proportion of young people.

Regressions for female youth unemployment

The analysis above focused on unemployment of males aged 15-24. This avoids a number of potential problems related to endogeneity of fertility and employment for women. Declining fertility, for example, is likely to be associated with rising labor force participation of women, whatever causal factors are responsible for the two outcomes. Increasing proportions of women in the labor force could potentially increase female unemployment, even as declines in fertility lead to slower growth of the youth population. The relationship between youth demography and female unemployment may therefore be more contaminated by endogenous links between the two than is the case for men. It is nonetheless interesting to do the same analysis for women as we have done for men. Table 3 presents our preferred specification, including country and year fixed effects, where the outcomes are defined for women aged 15-24.

Regression 1 in Table 3 uses the sample of all countries, and can be compared to the results for men in Regression 15 in Table 1. The coefficient on the log of the youth ratio is 0.397 and is significant at the 0.05 level. This is a considerably higher elasticity than was estimated for men, implying that a 10% increase in the youth ratio leads to a 4% increase in female youth unemployment. The coefficient on the youth growth rate of 1.71 is only slightly smaller than the 1.92 for men. Regression 2 uses the sample of only developing countries, and can be compared to the results for men in Regression 15 in Table 2. The coefficient on the log youth ratio is now negative and statistically insignificant, similar to the result for men. The coefficient on the youth growth rate of 4.40 is quite similar to the coefficient of 4.77 for men. In general, then, the results for women are quite similar to the results for men, implying that increases in the growth rate of the youth population are associated with increases in youth unemployment. The magnitudes of these effects are economically meaningful, although they are relatively modest in comparison to the large differences in unemployment rates across countries.

Conclusions

The youth bulge has been widely cited as an explanation for youth unemployment in low-income and middle-income countries. There has been little direct empirical analysis of the youth bulge and its relationship to youth unemployment. Our results suggest that the youth bulge is

unlikely to play a major role in understanding the current challenges in youth unemployment. If it is the youth fraction of the working-age population that creates pressure on youth labor markets, then most developing countries have much lower pressure today than they did 30-40 years ago. We get a similar picture if we look at the growth rate of the youth population. Many developing countries have already reached a peak in the youth population, with current growth rates either below zero or rapidly heading there. The important exception to these patterns is Sub-Saharan Africa, where the growth rate of the youth labor force is projected to remain high for at least two more decades.

Looking at ILO data on youth unemployment, we find very little relationship between youth's share of the working-age population and the youth unemployment rate when we look across countries. Our regression estimate of this cross-section estimate is actually negative and highly significant. We also estimate a negative relationship between youth ratios and youth unemployment when we look at the change over time within countries. When we include country and year fixed effects we get estimates that are close to zero and are usually statistically insignificant.

We get a somewhat different picture when we look at the growth rate of the youth population as a determinant of youth unemployment. For the growth rate we also find a negative relationship to youth unemployment in the cross-section. When we include both year fixed effects and country fixed effects, however, we estimate a statistically significant positive effect of the youth growth rate on the youth unemployment rate. This is true in both the full set of countries and in developing countries, and it is true for both male and female unemployment. The estimated impact of the youth growth rate is higher in developing countries. For males we estimate that an increase in the growth rate of one percentage point would increase youth unemployment by 4.7%. Since many countries have experienced declines of 3 or 4 percentage points in the growth rate of the youth labor force, this is a potentially important effect. If there has been such an impact on youth unemployment it unfortunately seems to have been offset by other factors. The pattern for most of the world has been declines in the growth rate of the youth labor force coinciding with increases in youth unemployment.

Most countries that are well through the demographic transition now have growth rates of the youth labor force that are close to zero, and these growth rates can be expected to stay around zero in the coming decades. For these countries the growth rate of the youth labor force will play little role in youth unemployment in the short and medium run. In the case of Africa many countries still have growth rates of the youth population that are around 3% per year. The slow pace of fertility decline means that these growth rates will decline only slightly in coming decades. Our

results suggest that faster decline in the growth of the youth labor force could help lower youth unemployment. The countries with the fastest growth rates are estimated to have quite low youth unemployment, however, a characteristic of poor agrarian economies. Changes in youth demography may therefore play only a modest role in influencing the dynamics of youth unemployment in Africa in coming decades.

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Figure 1. Youth population (age 15-24), 1960-2040
 Size, annual growth rate, and proportion of working-age population (15-64)

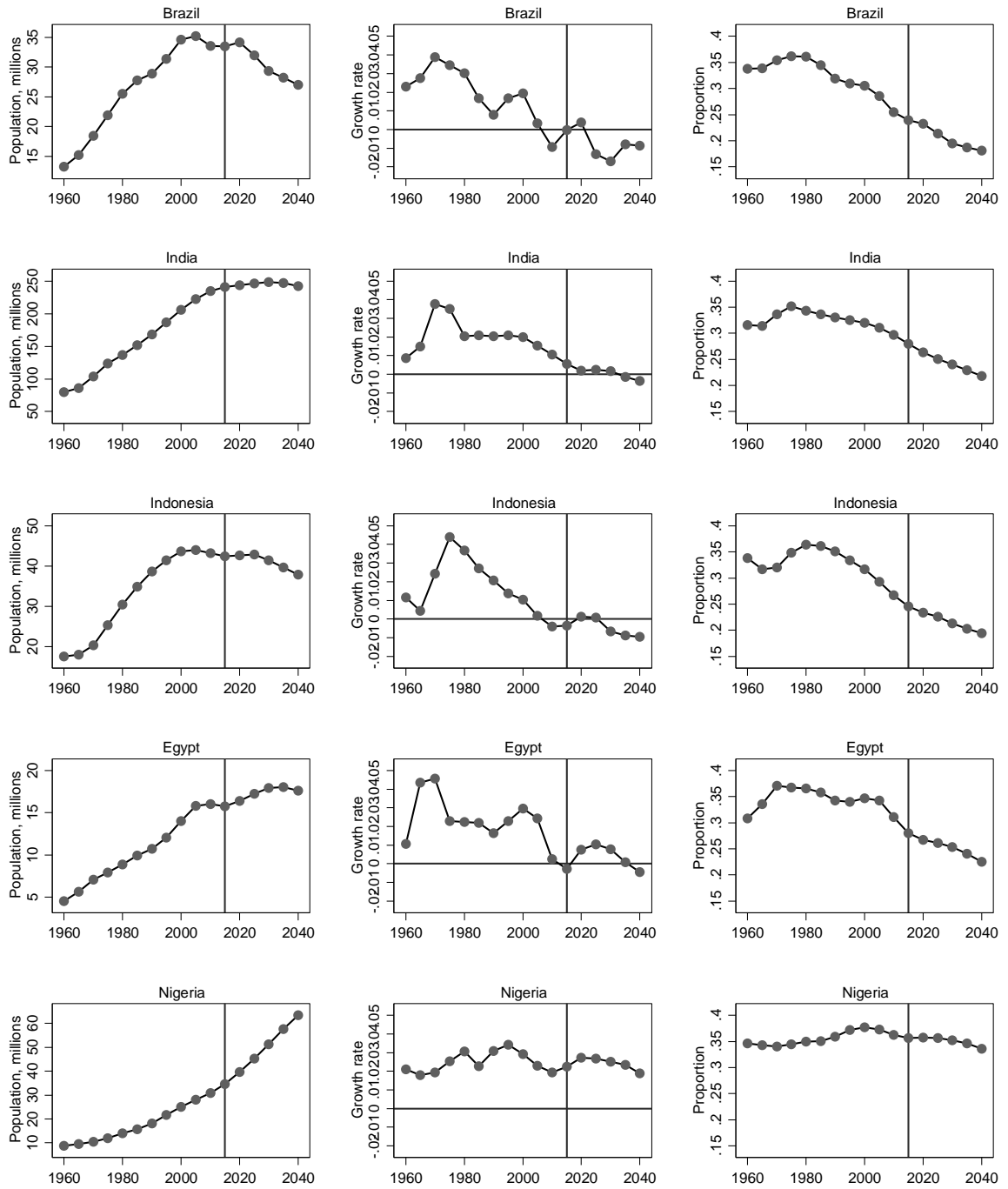


Figure 2. Population 15-24 as proportion of population 15-64, 1975 and 2015

Countries with population over 40 million in 2015

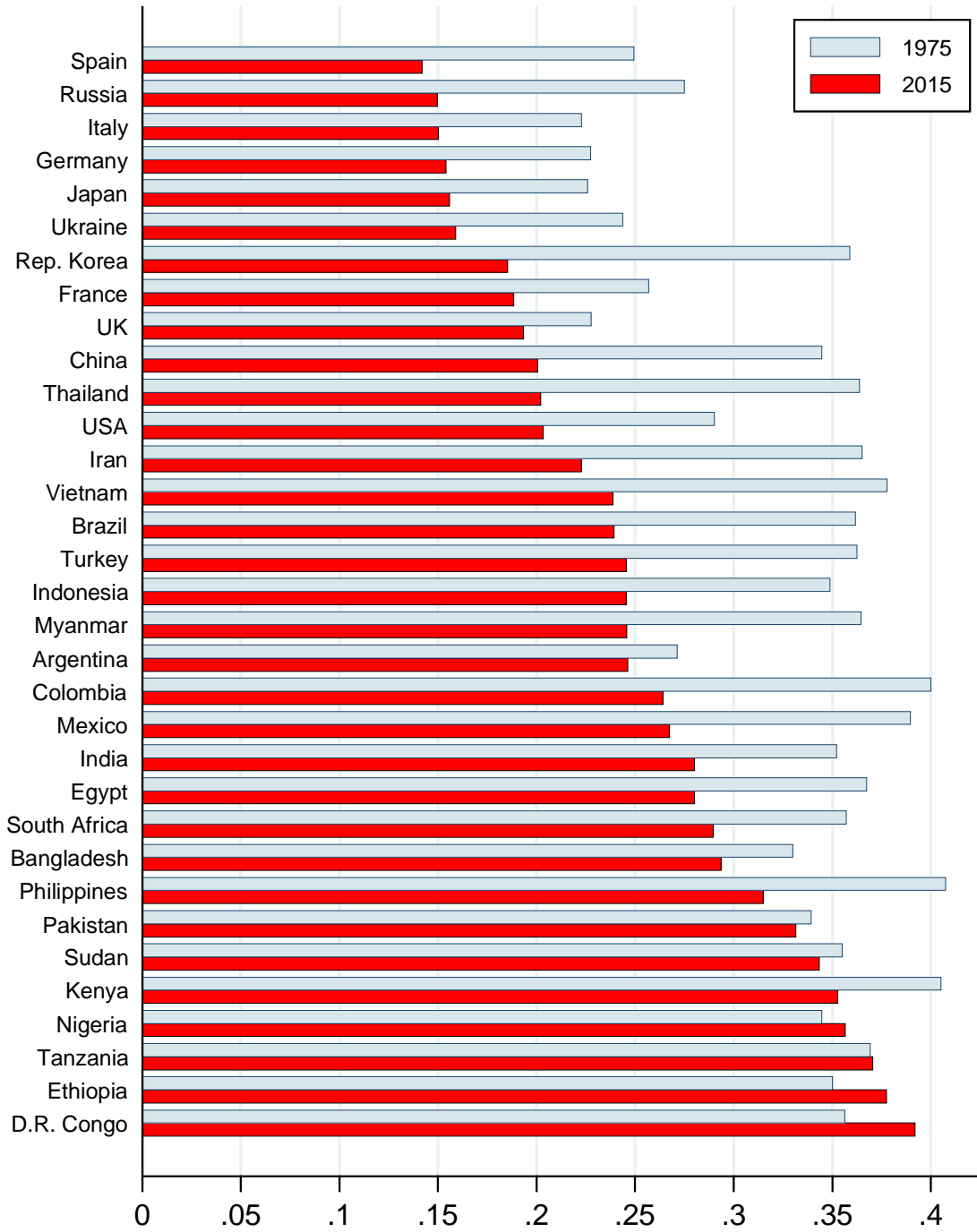


Figure 3. Annual growth rate of population 15-24, 1975 and 2015
 Countries with population over 40 million in 2015

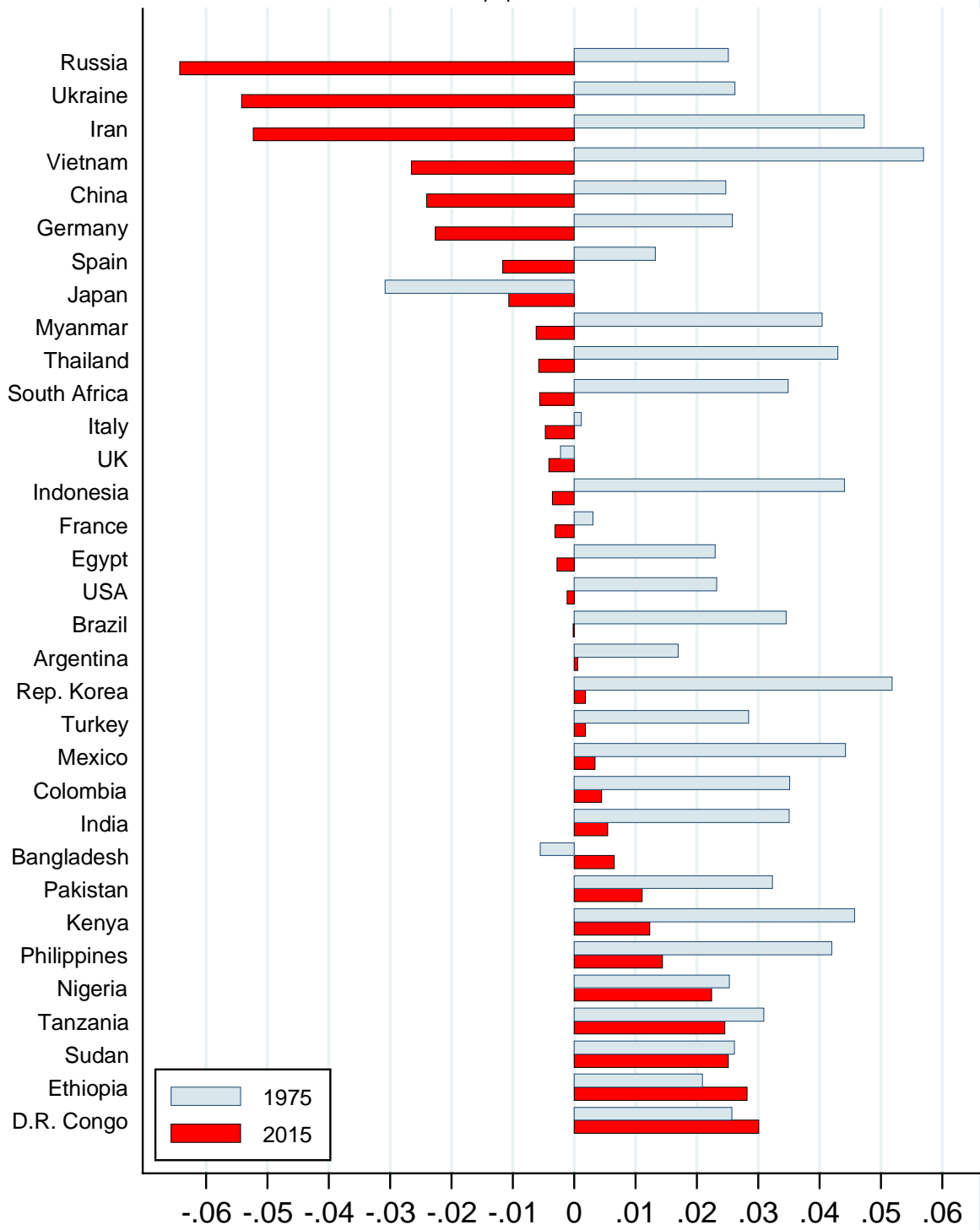


Figure 4. Male youth unemployment by youth ratio (Prop. 15-24/Pop. 15-64)
 Year with most recent data, 2000-2010

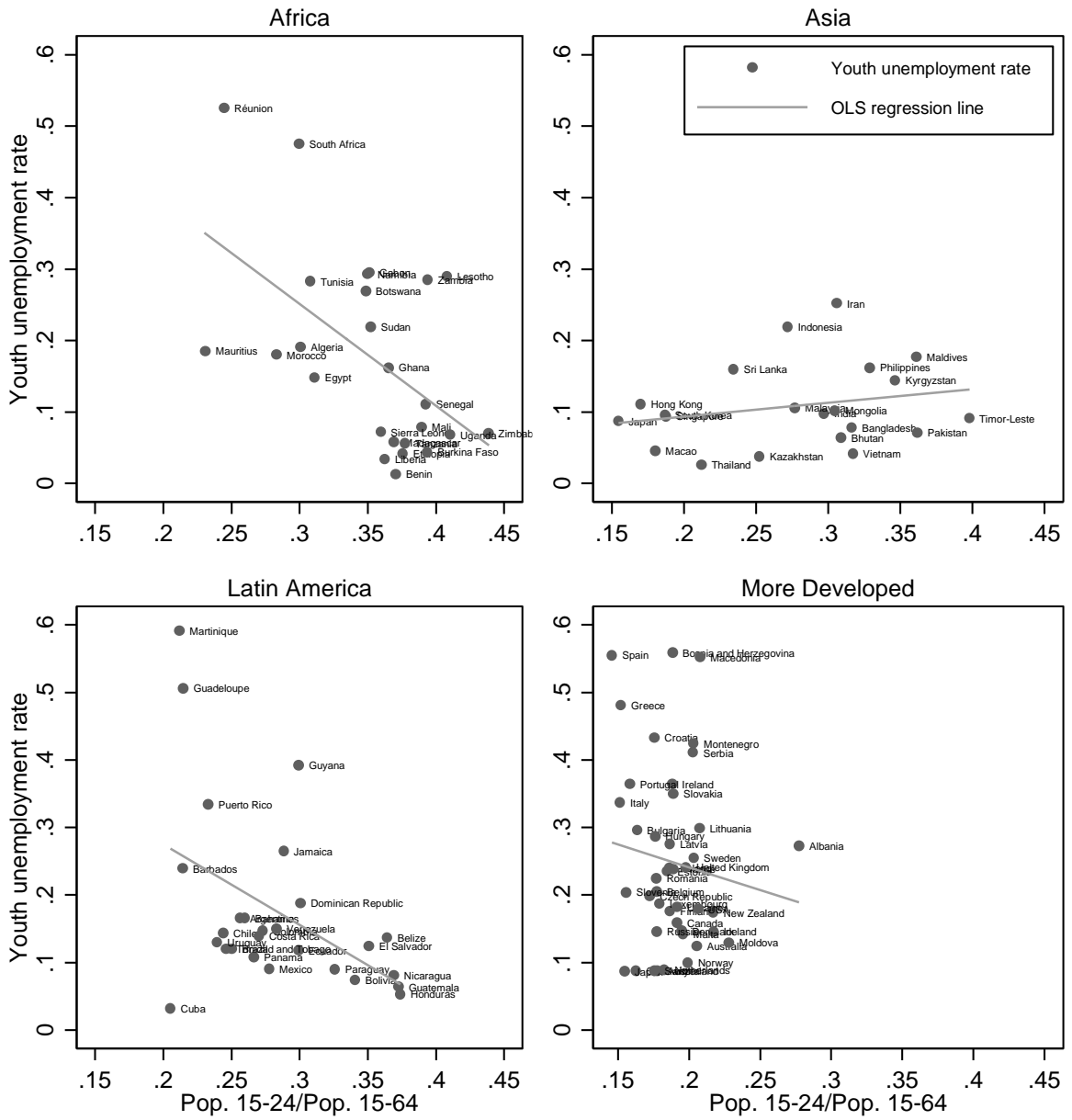


Figure 5. Change in youth unemployment rate by change in youth ratio
Mean for 2000-2009 minus mean for 1990-1999

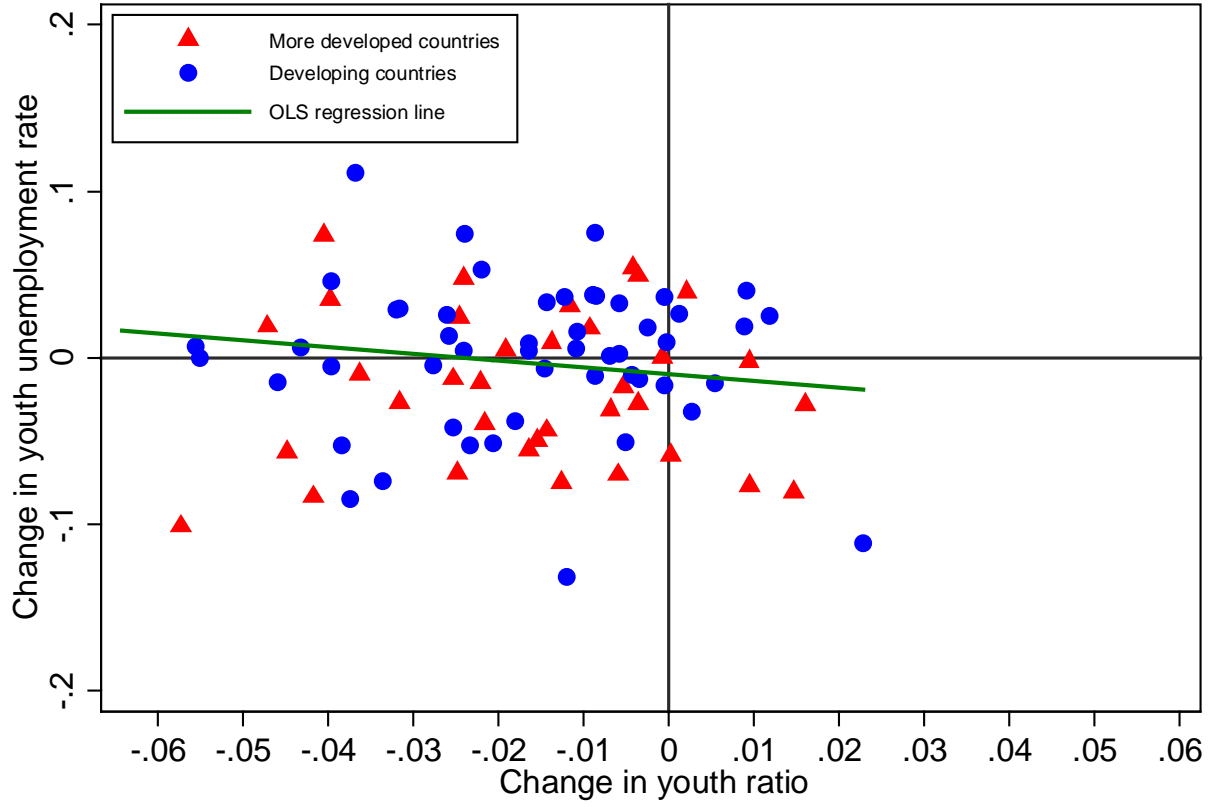


Figure 6. Change in youth unemployment rate by change in youth growth rate
Mean for 2000-2009 minus mean for 1990-1999

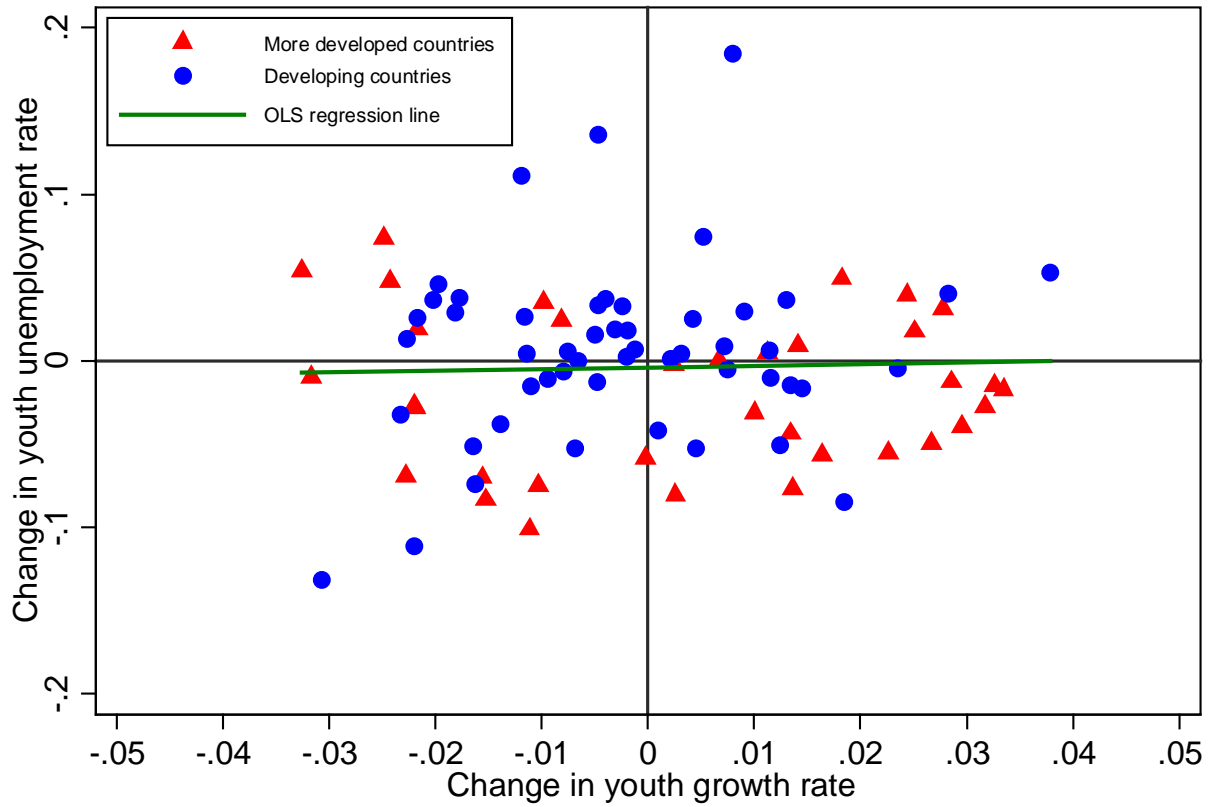


Table 1. OLS Regressions: Dependent variable is log of male youth unemployment rate, all countries, 1991-2010

	Log (P1524/P1559)	Annual growth rate P1524	Annual growth rate of GDP	Fixed effects		N	R ²	Years
				Country	Year			
1	-0.840 [0.232]***					138	0.09	Most recent
2	-0.888 [0.225]***		-3.79 [1.609]**			134	0.16	Most recent
3	-0.053 [0.132]		-1.16 [0.251]***	X		1410	0.81	All
4	0.144 [0.074]*		-0.46 [0.461]		X	1410	0.02	All
5	0.226 [0.175]		-1.21 [0.276]***	X	X	1410	0.82	All
6		-12.80 [1.595]***				138	0.28	Most recent
7		-12.60 [1.889]***	-1.59 [0.865]*			134	0.33	Most recent
8		1.90 [0.663]***	-1.18 [0.253]***	X		1410	0.81	All
9		-4.24 [1.212]***	-0.37 [0.421]		X	1410	0.04	All
10		2.00 [0.648]***	-1.15 [0.278]***	X	X	1410	0.82	All
11	-0.346 [0.204]*	-11.66 [1.277]***				138	0.29	Most recent
12	-0.393 [0.198]**	-11.20 [1.396]***	-1.96 [0.812]**			134	0.35	Most recent
13	-0.110 [0.133]	1.98 [0.667]***	-1.16 [0.253]***	X		1410	0.81	All
14	0.380 [0.080]***	-6.29 [1.196]***	-0.42 [0.414]		X	1410	0.06	All
15	0.129 [0.176]	1.92 [0.657]***	-1.17 [0.277]***	X	X	1410	0.82	All

Robust standard errors in brackets

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

Table 2. OLS Regressions: Dependent variable is log of male youth unemployment rate, developing countries, 1991-2010

	Log (P1524/P1559)	Annual growth rate P1524	Annual growth rate of GDP	Fixed effects		N	R²	Years
				Country	Year			
1	-0.655 [0.455]					95	0.03	Most recent
2	-0.717 [0.408]*		-3.537 [1.636]**			91	0.08	Most recent
3	-0.224 [0.207]		-0.849 [0.307]***	X		701	0.86	All
4	0.135 [0.132]		-1.232 [0.588]**		X	701	0.02	All
5	0.050 [0.306]		-0.884 [0.338]***	X	X	701	0.87	All
6		-11.708 [1.668]***				95	0.22	Most recent
7		-11.164 [1.856]***	-1.380 [0.898]			91	0.26	Most recent
8		5.087 [0.873]***	-0.862 [0.282]***	X		701	0.87	All
9		-5.133 [1.965]***	-1.139 [0.517]**		X	701	0.05	All
10		4.760 [0.866]***	-0.924 [0.321]***	X	X	701	0.88	All
11	-0.428 [0.383]	-11.342 [1.536]***				95	0.23	Most recent
12	-0.398 [0.365]	-10.697 [1.556]***	-1.821 [0.890]**			91	0.27	Most recent
13	-0.399 [0.196]**	5.373 [0.890]***	-0.852 [0.286]***	X		701	0.87	All
14	0.337 [0.130]***	-6.120 [1.860]***	-0.937 [0.511]*		X	701	0.06	All
15	-0.056 [0.290]	4.772 [0.876]***	-0.921 [0.323]***	X	X	701	0.88	All

Robust standard errors in brackets

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

Table 3. OLS Regressions: Dependent variable is log of female youth unemployment rate, 1991-2010

	Log (P1524/P1559)	Annual growth rate P1524	Annual growth rate of GDP	Fixed effects		N	R²	Years
				Country	Year			
<i>All countries:</i>								
1	0.397 [0.166]**	1.706 [0.684]**	-0.63 [0.276]**	X	X	1410	0.87	All
<i>Developing countries:</i>								
2	-0.115 [0.319]	4.396 [1.001]***	-0.82 [0.322]**	X	X	701	0.90	All

Robust standard errors in brackets

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