Business cycles and investment in human capital: international evidence on higher education
A comment

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1   Introduction

Sakellaris and Spilimbergo ask whether university enrollment is procyclical or countercyclical. This question has already been addressed for the United States, where Dellas and Sakellaris (1995) found that the propensity to enroll in college is procyclical. Sakellaris and Spilimbergo are now asking the same question for over 70 countries. They argue that one of the main problems in answering their question for such a wide set of different countries is that the definition of university attendance and the features of universities vary considerably across countries. This is why the main part of their paper focuses on students who decide to go to the United States to obtain their university education. Thus, the main part of their paper ends up looking at the relationship between foreign enrollment in US universities and the business cycle in the countries where students come from. The business cycle in the countries where students come from is quantified using yearly PPP-adjusted GDP data spanning a 30-year period.

Determining whether university enrollment is procyclical or countercyclical is a potentially important issue for business-cycle research. For example, if students out of high school are more likely to postpone their college education in recessions, then both the unemployment rate and aggregate production are likely to be higher than otherwise. As a result, fluctuations of the unemployment rate may be amplified and fluctuations of aggregate production may be

dampened by procyclical college enrollment. On the other hand, if students are more likely to go on to college in recessions, then both the unemployment rate and aggregate production are likely to be lower than otherwise. Countercyclical college enrollment may therefore dampen fluctuations of the unemployment rate but amplify fluctuations of aggregate production.

Sakellaris and Spilimbergo argue that, theoretically, the behavior of university enrollment over the business cycle is ambiguous. Cost considerations imply countercyclical university enrollment, as enrollment should be high when the (opportunity) cost of schooling is low. The (opportunity) cost of enrollment is procyclical because tuition is acyclical, the unemployment rate is countercyclical, and real wages are (slightly) procyclical. Ability-to-pay considerations, on the other hand, suggest procyclical university enrollment, as enrollment should be higher, the higher the net worth of students (or their parents).

The main result of Sakellaris and Spilimbergo is that enrollment of foreign students in U.S. universities is procyclical when they pool the data across all countries in their sample. When they allow the response in OECD countries to differ from the response in non-OECD countries, however, they find that enrollment in U.S. universities is countercyclical for foreign students from OECD countries but procyclical for foreign students from non-OECD countries. Sakellaris and Spilimbergo suggest that this may indicate that credit constraints are more important in non-OECD countries than in OECD countries.

The point I would like to make in this comment is that university enrollment may be procyclical even if the schooling decision is made according to (opportunity) cost considerations. In other words, university enrollment may be procyclical even if ability-to-pay considerations are irrelevant. This will be the case when shocks to GDP are very persistent. Procyclical university enrollment is therefore not necessarily an indication of the importance of ability-to-pay considerations (credit constraints). Before making my main point, I would like to present a simple model where the decision to go to a university is discrete.

2   A model with a discrete schooling decision

Suppose that earnings depend on GDP Y and on education. Suppose also that there are two periods, and that individuals have to decide whether or not to go to school in the first period. If they do not go to school, then they earn aY_1 in the first period and aY_2 in the second period. If they go to school, then they earn nothing in the first period and $a(1 + h_i)Y_2$ in the second period. It is assumed that $h_i > 0$ in order to capture that individuals earn more in the second period if they went to school in the first period.

Furthermore, it is also assumed that h_i varies across individuals i to capture heterogeneity. Finally, suppose also that capital markets are perfect and that individuals can save and borrow at gross interest rate r.

Who will decide to go to school in the first period and who will work instead? The answer is that all individuals i with a return to schooling R_i,

$$R_i = h_i Y_2 / Y_1,$$

greater than the gross interest rate r will go to school. Individuals with returns to schooling below the gross interest rate will work in the first period, and individuals with $R_i = r$ are indifferent between school and work in the first period.

The result that all individuals i with

$$R_i > r$$

go to school in the first period immediately yields that the number of individuals going to school increases with the growth-rate of GDP g,

$$g = Y_2 / Y_1 - 1.$$

In particular, holding GDP in the second period constant, the number of people going to school in the first period is higher the *lower* is GDP in the first period. In other words, a "temporary" decrease of GDP will increase the number of people going to school. This reflects opportunity-cost considerations of the schooling decision. The lower first-period GDP, the lower foregone earnings of individuals who go to school, and the higher the return to schooling.

The model so far assumes that individuals know with certainty what GDP in the second period will be. This is why a "temporary" decrease in GDP—interpreted as a business-cycle downturn—translates into higher school enrollment. More generally, individuals will have to form expectations about second period GDP. These expectations will depend on the stochastic process of GDP and on current (and possibly past) GDP. The next section deals with the issue of how expectations are formed.

3   The opportunity-cost argument revisited

Let me first assume that GDP follows a level-stationary, first-order autoregressive stochastic process:

$$lnY_t = \theta lnY_{t-1} + u_t$$

where $E_{t-1}u_t = 0$ and $0 < \theta < 1$. In this case, at time $t - 1$, the expected growth rate of GDP between period $t - 1$ and t is approximately equal (for small growth rates) to

$$E_{t-1}g_t = E_{t-1}ln(Y_t/Y_{t-1}) = -(1 - \theta)lnY_{t-1}.$$

Hence, the expected growth rate is higher, the lower current GDP. The reason is that GDP has a tendency to revert to the mean in this case. This tendency implies that an unexpected business-cycle downturn increases the expected growth rate of GDP. The model in the previous section illustrates that the business-cycle downturn, and the resulting increase in the expected growth rate, may translate into a higher expected return to schooling and therefore higher school enrollment. This is the opportunity-cost argument in a model with uncertainty about future GDP when GDP has a tendency to revert to its mean.

However, many contemporary business-cycle papers find that shocks to GDP are very persistent and that GDP is therefore better described by a difference-stationary stochastic process than by a level-stationary stochastic process (around a deterministic trend). Sakellaris and Spilimbergo follow this approach. It is therefore interesting to see how expected GDP growth is determined in this case.

Suppose that the stochastic process for GDP is

$$\Delta lnY_t = \theta\Delta lnY_{t-1} + u_t$$

where $E_{t-1}u_t = 0$ and $0 < \theta < 1$. In this case, at time $t - 1$, the expected growth rate of GDP between period $t - 1$ and t is approximately equal (again for small growth rates) to

$$E_{t-1}g_t = E_{t-1}ln(Y_t/Y_{t-1}) = \theta E_{t-1}ln(Y_{t-1}/Y_{t-2}).$$

The expected future growth rate of GDP is therefore increasing in the past growth rate of GDP. An unexpected business-cycle downturn will therefore decrease the expected growth rate of GDP. The model in the previous section illustrates that the unexpected business-cycle downturn, and the resulting decrease in the expected growth rate, may translate into a lower expected return to schooling and therefore lower school enrollment. Analogously, an unexpected business-cycle upturn will translate into more school enrollment. Opportunity-cost considerations may therefore imply that school enrollment is procyclical if GDP is difference-stationary instead of level-stationary. This is the reason why procyclical school enrollment does not necessarily indicate that ability-to-pay considerations (credit constraints) dominate over opportunity-cost considerations.

These results imply that there are different explanations for why university enrollment may be procyclical in one country and countercyclical in another. First, GDP fluctuations may be level-stationary in both countries but ability-to-pay considerations may be more important in the country with procyclical university enrollment than in the other. Second, ability-to-pay considerations may be irrelevant in both countries, but GDP fluctuations may be difference-stationary in the country with procyclical university enrollment and level-stationary (around a deterministic trend) in the other country.

4 Other issues

Procyclical scholarships are another, obvious and probably less important, reason why private cost considerations alone imply that the enrollment of foreign students in U.S. universities may depend positively on the business cycle in the country where students come from. To see why, consider the model of schooling developed above and suppose that students receive a scholarship G if they go to school in the first period. The *private* return to schooling will in this case be equal to

$$R_i = ah_i Y_2 / (aY_1 - G).$$

It seems likely that scholarships in the countries students come from are more readily available in booms than in recessions. A simple way of capturing procyclical scholarships in the model of schooling developed above is by assuming that G is an decreasing function of Y_1. If the positive effect of income on scholarships is strong enough, then a "temporary" decrease in GDP—modeled as a decrease in Y_1 holding Y_2 constant—may decrease the return to schooling and hence school enrollment. This will be the case whenever

$$aY_1 - G(Y_1)$$

is a decreasing function of Y_1. Thus, university enrollment may be procyclical although prospective students are not credit-constraint.

5 Conclusions

Suppose that GDP is level-stationary and that GDP this year is unexpectedly low. Then the expectation of the future growth rate of GDP will be revised upwards. In other words, the fact that current GDP is lower than previously expected implies that current GDP relative to expected future GDP is also lower than previously expected. People who make the decision of attending a university according to opportunity-cost considerations will therefore find that the opportunity cost of university attendance this year is relatively lower

than previously expected. It becomes therefore more likely that they choose to attend a university. University enrollment will be countercyclical as a result.

Now suppose that GDP is difference-stationary and that GDP this year is unexpectedly low. Then the expectation of the future growth rate of GDP will be revised downwards. In other words, although current GDP is lower than previously expected, current GDP relative to expected future GDP is higher than previously expected. People who make the decision of attending a university according to opportunity-cost considerations will therefore find that the opportunity-cost of a university attendance this year is relatively higher than they expected. They are therefore less likely to choose to attend a university. This implies that university enrollment will be procyclical even if cost considerations only are relevant. Procyclical university attendance is therefore not necessarily an indication of the importance of ability-to-pay considerations (credit constraints). Instead, it may suggest that GDP-fluctuations are very persistent.