

Vintage Effects in Human Capital: Europe versus the United States

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Following the growth accounting method, improvements in human capital have long been thought to contribute only modestly to economic growth. However, growth accounting relies on the assumption that an hour worked by a person of given type -distinguished by education, age and gender- delivers a constant quantity of labor services over time. Yet, this assumption is increasingly challenged on both theoretical and empirical grounds as the quality of education and post-education accumulation of human capital may change over time.

Bowlus and Robinson (2012) contribute to this literature by modifying the growth accounting method to accommodate vintage effects, whereby new graduates may differ from previous cohorts in terms of the quantity of labor services per hour worked they supply, for instance due to improved schooling or on-the-job training. Applying their method to data for the US between 1963 and 2008, they find that the quantity of labor services per hour worked by college-educated workers increased substantially. As a consequence, they argue that there is a larger role for human capital in accounting for US growth than based on the traditional 'constant quantity' assumption.

An important question is whether the Bowlus and Robinson (2012) results can be generalized to a broader set of countries. A comparison with European countries is especially interesting as productivity growth in the US accelerated in the mid-1990s, while European productivity lagged behind. Standard growth accounting shows no important role for differences in human capital improvements in accounting for these differences, but if vintage effects led to higher growth of (effective) labor input in the US but not in Europe, that could provide a more focused target for analysis and economic policy.

To address this question, this paper applies the Bowlus and Robinson (2012) method to a more recent period for the United States (1975-2014) using data from the Current Population Survey (CPS) and for six European countries -France, Germany, Italy, the Netherlands, Spain and the United Kingdom- (from the 1990s to 2013) using the Luxembourg Income Study (LIS) database. In standard growth accounting, the quantity of labor services provided by a given type of worker

is assumed to be constant over time. Observing an increase in workers' wages then automatically means that the price of that type of human capital has increased. The novelty of the Bowlus and Robinson (2012) method is that it drops the assumption that an hour worked by a worker of a given skill level delivers a constant amount of labor services over time and thus that increases in wages are increases in the price of human capital. The key assumption of Bowlus and Robinson (2012) is that changes in the price of human capital for a particular educational level can be identified only for workers at a late stage in their life cycle since these older workers no longer increase their productivity over time. Put differently, there is a period in a worker's life cycle during which worker productivity is constant, a so-called flat spot range. If wages of younger workers increase more rapidly than for older workers (of the same educational level) in this flat spot, then the conclusion should be that the labor services per hour worked of these younger workers has increased. The Bowlus and Robinson (2012) method provides a time series of prices per unit of labor services for each educational level that can be compared to wages by educational level to track changes in the quantity of labor services per hour worked.

The main finding in Bowlus and Robinson (2012) is that, starting around 1980, wages of highskilled workers in the United States increased relative to the price of high-skilled labor (i.e. the wages of workers in the flat-spot range), while the wages of medium-skilled and low-skilled workers declined relative to the price of each labor type. So labor services per hour worked by high-skilled workers increased, while labor services per hour worked by medium- and lowskilled workers declined. Combined with the increased share of high-skilled work, this implies that standard growth accounting substantially underestimates the contribution of improvements in human capital to US growth and overestimates the role of (multifactor) productivity growth, which is determined as a residual.

This paper finds that vintage effects continue to be important in the US in recent years. Between 1975 and 2014, labor services per hour worked of high-skilled workers have increased by 25 percent. By contrast, labor services per hour worked of medium-skilled workers have declined by 9 percent and those of low-skilled workers by 20 percent. The declines for medium- and lowskilled workers were concentrated in the first half of the period, until 1995. The increase for high-skilled workers was concentrated in the period 1995-2005, which coincides with the period during which US labor productivity growth was (temporarily) higher.

Within Europe, the United Kingdom's experience is most similar to that of the United States, with increases of labor services per hour worked by high-skilled workers between 1995 and 2005. The Continental European countries -France, Germany, Italy and the Netherlands- instead show declines of 10 to 14 percent in labor services per hour worked by high-skilled workers over this same period.

These differences suggest that human capital vintage effects were an important factor in accounting for the productivity growth difference between Europe and the United States between 1995 and 2005, the topic of a sizeable literature. Under standard growth accounting methods, the US and UK had a productivity growth advantage over the Continental European countries in our analysis -France, Germany, Italy, Netherlands, and Spain. Accounting for the increases in the quantity of labor services per hour worked in the UK and US and the decreases in the Continental European countries eliminates most of the differences. Rather than productivity growth advantage of the US and UK, the primary difference with Continental European countries was human capital vintage effects instead.

Bowlus, A.J. and Robinson, C. (2012), Human Capital Prices, Productivity, and Growth, *American Economic Review*, 102(7): 3483-3515.