Flexible Supply of apprenticeship as the Cradle of the Industrial Revolution

Nadav Ben Zeev, Joel Mokyr and Karine van der Beek

In this paper we examine the responsiveness of apprenticeship supply during the British Industrial Revolution and show that it was flexible and therefore capable of providing the necessary "fuel", in terms of human capital, to the ongoing process of technological change that began taking place in mid eighteenth century England. This effectiveness and adaptability of the British economy in supplying highly skilled workers played an important role in the Industrial Revolution.

The paper first lays out a deterministic, dynamic partial equilibrium model that can establish a valuable conceptual framework upon which to build the discussion and interpretation of our empirical results. We then estimate the response of premiums to changes in the annual number of apprentices between 1710 and 1803 using annual information on apprentices in England from Stamp Tax registers. The estimation is performed employing two different methods. First, a two stage instrumental variable procedure to estimate a static market system. Since the tuition and the number of apprentices are observed in equilibrium and are simultaneously determined, the elasticities cannot be consistently estimated using OLS. To overcome this problem, we make use of the fact that changes in death rates were mostly characterized by an increase in the death of young children to instrument for changes in the demand side in the market for apprentice position.

Since the system is in fact a dynamic one and the capability of masters to respond to rising demand for apprentice positions clearly increased, we also employ a Vector Autoregression
(VAR) model to test the response of both the number of apprentices and the tuition to technological changes in the aggregate level, as well as in specific occupational categories. The VAR analysis has the additional advantage of allowing us to examine the effect of technological shocks accounting for the dynamic interaction between the variables since it involves jointly regressing all variables on their own lags. This analysis shows that both quantities and tuitions responded in a hump-shaped manner to technological shocks, increasing in response to the shock and gradually returning to their initial level in the long run.

The implied elasticities of the tuition, computed as the ratio of the tuition response to the quantity response in both studies show that the elasticity of prices was sufficiently low so as to allow for quantities to rise considerable following the technology shock. This implies that the apprenticeship system could absorb the significant demand shocks in the market for apprenticeship in this period, as was the case with highly skilled mechanical trades, and supply the skilled workers required to keep pace with technological changes. Furthermore, we find that this efficiency was characteristic of the system as a whole and not particular to specific trades.