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‘The rise of the engineer: Inventing the professional inventor during the Industrial Revolution’

Technological progress played the central role in the Industrial Revolution. Much of the research on innovation during the Industrial Revolution has focused on the factors that led to the burst of inventive activity that took place in Britain in second half of the 18th century. Yet, as Joel Mokyr has pointed out, short bursts of technological progress have occurred many times in history. "The true miracle" he argues, "is not that the classical Industrial Revolution happened, but that it did not peter out like so many earlier waves of innovation." One potential explanation for this miracle of sustained technological progress is that the system through which new technology was developed may have changed in a fundamental way during the Industrial Revolution. While promising, this explanation currently lacks strong empirical support.

This paper provides systematic evidence from Britain showing that the very nature of the innovation process did change in an important way during the Industrial Revolution. This change was characterized by the arrival of a new type of professional inventor: The Engineer. The engineer was a professional all-purpose mechanical problem-solver and designer, a generalist whose talents could be applied across a wide range of industries and technology types.

My empirical analysis draws on patent data covering thousands of inventors in Britain from 1700-1849. This data set includes rich details on the occupation of inventors, their coinventors, the types of inventions they generated, and more. Most importantly, I carefully manually link the 13,959 inventor-patent observations in the data in order to identify 8,997 unique inventors, allowing me to trace out the inventive career of each individual. Further, I match the patent data to inventor biographies from the Oxford Dictionary of National Biography, which provides additional information about each inventor.

Using these data, I document the rise of engineers as a key group of inventors. Prior to 1760, engineers are almost completely absent from the patent record, but they appear in growing numbers after that point. By the 1840s, engineers account for 20% of all new patented inventions and a higher fraction of high-quality patents. Next, I show that engineers were fundamentally different from other common types of inventors, such as wealthier "gentlemen," manufacturers, merchants, or professionals such as medical doctors. Among other differences, I document that they were more productive, generating more patents per decade than any other type of inventor, and patents of higher quality based on available patent quality indicators. Engineers also produced patents that involved more co-inventors, suggesting that they were producing more complex technologies. Most importantly, individual engineers patented across a substantially broader set of technology categories than any other type of inventor, an indication that they possessed a unique skill set that allowed them to produce useful new ideas in a wide range of technology types.

Finally, I discuss factors that contributed to the emergence of engineers and embed this change into an endogenous growth model to show how it could have acted as a catalyst for the onset of modern economic growth.