Technological Advance and the "Military-Industrial Complex" in Early America

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Abstract: This essay discusses the rise of the "American System of Manufacturing", a term referring to manufacturing techniques that dramatically reduced labor requirements in the 19th century and allowed for the production of large quantities of standardized goods. The "System" is widely regarded as the predecessor of 20th century mass production technology, based on machine-produced interchangeable parts. Neoclassical theory, we argue, can account for neither the emergence nor the diffusion of the American System. We point to substantial evidence showing the US War Department was the key agent in stimulating the basic innovations and spreading knowledge about mass production technology throughout the American manufacturing sector.

The neoclassical approach—emphasizing consumer demand and factor endowments as key factors in the rise of the American System—can explain neither the emergence nor the diffusion of the basic machines and techniques of mass production. We point to substantial evidence showing that, rather than a response to "general" macroeconomic conditions favoring the use of capital-intensive techniques, the American System was the result of a State-directed effort to alter production techniques in a single manufacturing industry—firearms. After decades of refinement and improvement of mass production techniques through military sponsorship, markets in America grew sufficiently large to enable consumer durable producers to adopt the methods of "armory practice" more fully.

With regard to consumer demand, the neoclassical argument is simple: mass markets and greater income equality in America implied a greater homogeneity of consumer preferences. This created incentives for capitalists to produce large quantities of standardized goods. Mass production of standardized goods, in turn, favored mechanized productive processes and stimulated the search for machine innovations. Out of this search arose the machines and techniques of the American System. Concerning endowments, Habakkuk (1962) and, more recently, David (1975, 2001) claim labor scarcity and resource abundance induced American firms to adopt more capital-intensive techniques than their British counterparts. Through "learning-by-doing" (David, 2001) and other effects resulting from their greater experience with such techniques, American producers were more likely to invent critical mass production technologies such as automatic machine tools.

Neoclassical theories of 19th century technical change in America cannot come to terms with several key facts. One of these, discussed at length in the article, is that there is no evidence suggesting British manufacturing firms were less capital-intensive than American ones before 1880. In fact, there is strong evidence (Field, 1983, 1985) that the British economy had a higher overall capital-labor ratio throughout most of the 19th century, a result that holds even if we restrict the definition of "capital" to mean machines or machinery services. "British capital-labor

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ratios", Field observes, "were not lower than the corresponding American ratios in 1860. They were higher."

This is an important point, for virtually all of the key American innovations in specialized machine tools took place prior to 1850. As noted above, these innovations were highly concentrated in the firearms industry, above all in those firms producing guns and accessories for the federally-owned and operated weapons factories in Massachusetts and Virginia.

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