

How It's Made: A General Theory of the Labor Implications of Technological Change*

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Abstract

A general theory describing the implications of technology on skill demand is presented. The theory is capable of rationalizing a variety of different technological developments observed in the last 200 years from the introduction of the assembly line to additive manufacturing. Performers (human or machine) face stochastic issues that must be solved in a given time to complete tasks. Firms choose how production is broken up into tasks and the speed (intensity) at which tasks need to be completed. Performers differ in the breadth of issues they can solve (generality) and in the dis-utility of intensity. Human performers tend to be generalists: solving a variety of issues with low intensity. Machine performers tend to be specialists: solving a narrow set of issues with high intensity. Additional key ingredients of the theory are the costs associated with splitting production into tasks assigned to multiple performers and the cost associated in splitting a performer across multiple tasks. Conditions for the optimality of division of labor are derived. We show the following: the assembly line is skill downgrading; automation is skill polarizing at lower production volumes and skill upgrading at higher volumes; and that consolidation converges the demand for skill. The paper uses operations data across a range of industries and time periods to validate key assumptions and predictions of the theory.

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