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Technology and Capital Adjustment Costs: Micro evidence of automobile electronics in the auto-parts suppliers

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Abstract

In order to make quantitative evaluations on the nature of capital adjustment costs, in the face of technological changes, we estimate capital adjustment cost functions, either convex, non-convex, or irreversible (Cooper and Haltiwanger, 2006). A simulated method of moments is applied to the Bellman equations at an establishment level of the Japanese auto parts suppliers (Census of Manufactures), where experiencing a technological change of automobile electronics, an application of general purpose technology (David, 1990; Jovanovic and Rousseau, 2005). Identifying when and where auto-electronics technologies have been embodied in the auto parts suppliers, we use patent acquisition data and plants' products items: electronically-controlled fuel injection; electric power steering; anti-lock brakes; airbags; navigation; wire harnesses; and lithium-ion batteries. For the overall auto parts suppliers, there are no adjustment costs in any form, neither convex, non-convex, nor irreversible. As for the sectoral plants with the automobile electronics embodied in the tangible capitals, we clearly detect a significant existence of the convex adjustment costs. Anomalously, auto-electronics also makes investment decisions reversible. Moreover, the fixed costs of plant restructuring, worker retraining, or organizational restructuring emerge, especially in a form of costs proportional to plant size rather than the opportunity cost of investment. The nature of adjustment costs implies economic policy measures to compensate for the output losses from the capital adjustment costs in the face of general purpose technologies.

Keywords: Capital adjustment cost; General purpose technology; Automobile electronics; Simulated method of moments.

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