Abstract

In was only in the 1990s, with the seminal work of Gordon (1990), that the highly disputed idea of technological progress being embodied in new capital vintages with streams of new capital equipment continuously replacing obsolete ones gained new momentum and its decisive role became apparent: embodied technological change is a major driver of long-term economic growth and of short-term business cycles. The question as to how much of observed post World War II business cycles of the small and very open economy of Austria can be attributed to embodied, or synonymously, investment specific technological change and to neutral technological change is subject to the analysis pursued in the second chapter. Recent productivity improvements paired with its extremely high outward orientation and the dominance of high-technology products in its trade portfolio are suggestive of a strong role of technology for macroeconomic performance and therefore render Austria an interesting case to study. To avoid adverse and spurious effects of filtering but to also look beyond mere business cycle frequencies, a density analysis is applied. The results confirm the decisive but differential role technology plays and highlight its stronger significance for output as compared to hours worked. The results also emphasize the dominance of neutral technology shocks in shaping Austrian business cycles which is partly traced back to an imperfect proxy for investment specific technology shocks and to the relatively sluggish diffusion of leading-edge technologies in Austria. Finally, investment specific and neutral technology shocks play different roles depending on the time frequencies considered. A stronger medium to long term role of neutral technology shocks indicates that learning effects of how to efficiently exploit productivity-enhancing new technologies unfold over time.

In the light of the identified crucial role of investment specific technological change for macroeconomic performance, investments as carriers of embodied technology become the key transition mechanism from technology to productivity and output changes and a thorough and profound understanding of investment strategies and patterns becomes vital. The third chapter therefore identifies general patterns of equipment investment activities in a sample of Austrian manufacturing firms available for the period 1982 to 1991 and of complementary labor related factors like employment, production and non-production. The analysis demonstrates that input adjustments are highly erratic and lumpy and that all input factors considered are strongly intertemporally interrelated. Furthermore, lumpy investment activities are found to necessitate preparatory training activities of production labor ahead of the implementation of technologically more sophisticated machinery and to result in the expansion of non-production labor due to increased organizational and administrative complexity. There is also evidence of significant temporary and asymmetric productivity and profitability disruptions in the course of drastic input adjustments. No support is provided for the hypothesis of a potential temporary disruptive effect of newly implemented machinery and equipment on labor productivity during periods of retooling and reorganization while important productivity-enhancing learning-by-doing dynamics surface. The analysis also identifies firm characteristics conducive for input adjustments and demonstrates that wage increases do not result in major employment reductions of non-production labor. Both, relatively restrictive firing rules characteristic of the Austrian labor market and

significant profitability losses in the wake of drastic non-production labor cuts are compatible with this pattern. Finally, lumpy input adjustment patterns turn out to be procyclical, invalidating the idea that recessions are optimal periods for replacing inefficient, outdated or malfunctioning machinery and equipment.

Finally, chapter four starts from the assumption that the lumpy and erratic equipment investment patterns in Austrian manufacturing highlighted in chapter three arise from non-negligible adjustment frictions. It seeks to identify the nature of underlying adjustment costs in terms of convex and non-convex adjustment costs in the light of irreversible equipment investments. To estimate underlying structural cost parameters, the simulated method of moments is applied that rests on the idea that structural parameters of interest can be identified by matching moments of simulated data with observed key moments of actual data. The relevant moments are chosen to best capture the very specific characteristics of observed investment behavior. The analysis shows that for machinery and equipment non-negligible adjustment frictions prevail in Austrian manufacturing since on average, for each investment activity, a firm has to bear fixed costs of 10.5 percent of its installed capital and convex costs of 18 percent of its installed capital.