

Title: *Effects of Terms of Trade Gains and Tariff Changes on the Measurement of U.S. Productivity Growth*

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Productivity growth in the United States accelerated dramatically after 1995. Many studies have identified higher productivity growth in the information technology (IT) sector as directly or indirectly causing much of this acceleration. A key piece of evidence for the acceleration of productivity in IT producing industries has been faster declines since 1995 of the prices for these IT goods. In this paper we investigate an alternative explanation for some of these IT price movements: gains in the U.S. terms of trade, especially for IT products. The global engagement of the IT sector deepened with the move to global free trade in IT products via the WTO's 1996 Information Technology Agreement (ITA). Further reductions in prices by US buyers of imported IT products occurred because of the dollar appreciation in the wake of the 1997 Asian financial crisis. Gains from price declines for imported intermediate goods can be mistaken for higher labor productivity and higher multifactor productivity if they are not properly measured and accounted for. Price declines for imported capital goods can have a similar effect on measured multifactor productivity if they lead to underestimation of fixed investment. To investigate one possible source of overstatement of US productivity growth, we substitute Törnqvist indexes of import and export prices, which include the effects on measured productivity of item substitution, for the official Laspeyres indexes, which exclude these effects. Sharp declines in price of some imported products led to usually large substitution effects for imports after 1995, which would be measured as a productivity speedup if official indexes are used. Second, we next consider alternative indexes that incorporate hedonic quality adjustments for some imported high-tech inputs, such as semi-conductors. Contrary to the usual case of output price measurement, in this case larger quality adjustments imply *slower* productivity growth. In addition to performing these two analyses at an aggregate level with data from the National Income and Product Accounts, we use input-output table data to trace the effects on industry contributions to business sector productivity growth.

Prices of traded goods can also have genuine effects on productivity. We estimate the effects of the ITA free trade agreement and exchange rate developments on import prices for IT products, and the possible effect of the price-induced changes in the intensity of intermediate input use and capital services on official measures of US labor productivity. Our final analysis uses trade and input-output data to investigate the role of international trade in industry reallocation effects that have helped to raise aggregate labor productivity. We ask whether imported commodities have differentially displaced domestic producers with below-average productivity.