TECHNOLOGY TRANSFER TO THE U.S.S.R AND THE
SHAPE OF THE PRODUCTION FUNCTION

BY

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1 INTRODUCTION

The impact of technology imports from the West on the Soviet economy has
interested both scholars and policymakers for some time. Although much of
the early discussion was based upon anecdotal evidence, the recent avail-
bility of aggregate data on Soviet capital stock of western and indigenous
origin raised hopes that the issue could be settled by appeal to econometric
estimates of an aggregate production function. In two papers Green and
Levine¹ claim to have shown that Western capital employed in Soviet indus-
dustry and in several branches of industry is more productive than is capital
of domestic origin. They then utilized an econometric model of the U.S.S.R.
to illustrate that this difference in productivity means that changes in imports
of machinery and equipment would have significant effects on the aggregate
economic performance of the Soviet economy.

However, recent work by Weitzman and Toda² casts doubt on this conclu-
sion. Utilizing the same data as do Green and Levine, but different specifi-
cations for the production function, they concluded that there is no sig-
nificant difference between the productivity of imported and domestic
capital. These conflicting results, based as they are on identical data sets,
are surprising and disturbing.

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¹ Donald W. Green and Herbert S. Levine, 'Implications of Technology Transfer for the
Economic Directorate, 1976) and Donald W. Green and Herbert S. Levine, 'Soviet
Machinery Imports,' Survey, 23 (1977-78), pp. 112-126.
² Martin L. Weitzman, 'Technology Transfers to the U.S.S.R.: An Econometric Analysis,'
Journal of Comparative Economics, 3 (1979), pp. 167-177, and Yasushi Toda, 'Technology
Transfer to the U.S.S.R.: The Marginal-Productivity Differential and the Elasticity
of Intra-Capital Substitution in Soviet Industry,' Journal of Comparative Economics, 3
The purpose of this paper is to put forward an alternative conceptual framework for the evaluation of the impact of technology imports on the Soviet economy. We then use this framework to estimate whether technology imports have some positive effect on output in the Soviet Union.

2 THE TRADITIONAL APPROACH

Green and Levine as well as their critics assume that the contribution of Western capital to the Soviet economy is the additional output which that capital produces. To estimate this contribution they estimate production functions of the form

\[ Y = f(t, K_D, K_I, L) \]

where \( Y \) is output, \( t \) is time, \( K_D \) and \( K_I \) are capital stocks of domestic and Western origin respectively and \( L \) is labor. The question then is whether in such a function the marginal product of \( K_I \) is significantly greater than that of \( K_D \).

It is our belief that, given the miniscule share of Western capital in the Soviet economy, its direct contribution to output is not likely to be of great importance. Rather, the important effect of Western capital on Soviet output, and therefore the effect which should be modelled and quantified, is the impact of Western capital on the productivity of the Soviet inputs with which it cooperates.

We base this thesis on the evidence provided by Western case studies of Soviet experiences in importing Western capital. These studies point to two important consequences of machinery imports from the West. The first of these, which is most fully documented and stressed by Sutton is that much of the technological progress in the design of Soviet machinery and equipment is the result of the duplicating, copying and 'reverse engineering' of equipment imported from the West. The consequences of such diffusion of Western technology will be to increase the productivity of Soviet capital and

3 Phillip Hanson, 'Technological Transfer to the U.S.S.R.,' Survey, 23 (1977-78), pp. 73-104, estimates that between 1955 and 1975 imports of Western machinery have accounted for from 0.8 to 2.4 or 1.6 to 4.8 percent of annual Soviet capital formation depending on the exchange rate chosen for converting foreign into domestic prices.