

# Referee Report for "Knowledge Spillovers and TFP Growth Rates"

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This paper studies the relationship between sectoral TFP growth and labor growth rate. The author interprets the correlation between TFP growth at each sector and within/cross sector labor growth rate as strength of knowledge spillovers. The empirical part uses sectoral input-output database developed by Dale Jorgenson for the period between 1948 – 1991. Using constrained OLS regression, this paper argues that manufacturing is the main source of knowledge flows to the overall economy. Finally, using the empirical estimates, the author calculates optimal employment in each sector by internalizing the benefit of externalities. Not surprisingly, the optimal employment in manufacturing needs to be higher.

I have two general comments and more specific suggestions follow.

First, this paper draws close similarity to early works by Caballero and Lyons (1990,1992). Although the scope of data is slightly different in the sense that CL focused on two-digit industries within U.S. manufacturing, while this paper looks at six larger macroeconomic sectors: manufacturing, mining, construction, services, trade and transportation, and agriculture. CL's finding of productive externalities depends crucially on the strong positive correlation between sectoral productivity and aggregate activity. In this paper, aggregate activity is replaced by within and cross sector labor growth rate, since the author argues for "labor-generated knowledge spillover". There are also several well-known empirical concerns that were indeed addressed in the work of CL which are not properly answered in this paper: (1) if there exists increasing returns, the constructed TFP growth using only cost-weighted input shares can be misleading.

Specifically, it is contaminated by including the growth of production factors such as labor and physical capital. I suggest the author to follow the suggestions of Hall (1990) to estimate a separate parameter of returns to scale for each sector in the data. (2) I don't believe the "labor-generated knowledge spillover" proxied by labor growth rate can fully explain sector-level TFP growth. So it is important to characterize the residual term in the empirical regression. If there are other factors that drive TFP growth and are correlated with labor growth, the OLS estimates can be inconsistent. I suggest the author to follow CL and Hall (1990) to adopt an IV estimation strategy.

Second, again similar to earlier works by Hall and CL, this paper uses data of value-added rather than total output. (Although the author models material use in the theoretical model, on p.9. he claims that value-added is used as sector output measure). Basu and Fernald (1995) in a series of paper show that using value-added measure to construct TFP could generate "apparent productive spillovers". The idea is simple: if there is increasing returns to scale and/or imperfect competition, marginal product of materials exceeds its factor payment. Thus value-added does not properly account for the productive contribution of intermediate inputs, which implies that again constructed "TFP growth" can very well be contaminated by omitted intermediate inputs. Since the growth of intermediate inputs by definition are correlated with aggregate and sectoral level inputs and outputs, this could very well lead to spurious finding of spillovers. I suggest the author to consult Basu and Fernald (1995) to adopt their methodology of checking the robustness of the finding of externality.

Some more minor and detailed suggestions follow:

#### I. Motivation

(1). The author shouldn't claim to be the "first" in terms of this type of empirical analysis. Proper reference to Cabellaro and Lyons (1990, 1992) in the introduction is suggested.

(2). It needs to be motivated more why focusing on "labor-generated spillover". Is it possible to separate the research workers from the production workers in the model framework?

(3). Try to make use of the industry input-output patterns to cross-validate and motivate the findings of the direction of knowledge spillovers. (Although I am not sure if there is information outside of manufacturing sector). Right now, these numbers don't mean much to the reader.

## II. Estimation

(1). Report the standard errors of the estimates of the strength of "spillovers"  $\gamma_{ijs}$ .

(2). The normalization of the  $q_i$  looks very arbitrary to me. More robustness check is needed to show that the estimates are not sensitive to small changes in  $q_i$  (while keeping the order same).