

Selection and Agglomeration Impact on Firm Productivity: A Study of Taiwan's Manufacturing Sector

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Significance of TFP Estimation

- Importance of Technology vs Capital in economic growth
- Abramovitz (1956)-Measure of our ignorance
- Solow (1957)
- Melitz (2003)-Survival and scope of the firm in the market-heterogeneous firms (and heterogeneity is thought of in terms of productivity)

Regional Productivity

- Rosenthal and Strange (2003)-Firms in large cities have high productivity
- Ciccone and Hall (1996)-Positive relation between density of economic activity and firm's productivity
- Large City- Above median employment density
- Clusters/Science Park-Public-private partnership that fosters knowledge flows among firms and contributes to regional economic growth
- Market failure- Innovations

Research Motivation

- To compare the relative productivity distributions of firms located in clusters to those located in large cities and small cities
- To compare industry level productivity distribution within the cluster
- What drives the productivity-Agglomeration or Selection
- Policy Implications- Do they deliver

Research Methodology

- TFP Estimation
- Methods
 - OLS
 - Fixed effects
 - IV
- Sources of Bias
 - Simultaneity
 - Selectivity

Production Function

$$y_{it} = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + \varepsilon_{it}$$

$$y_{it} = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + v_{it} + u_{it}$$

$$\omega_{it} = \beta_0 + v_{it}$$

$$E(x_{it}\omega_{it}) = 0$$

Semi-Parametric Estimation

Olley and Pakes(1996)-

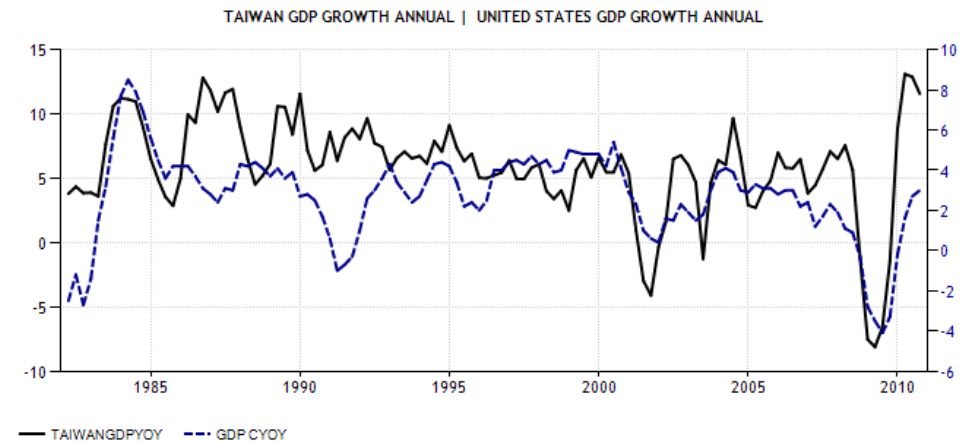
semi-parametric method,

based on proxy variables-

- i) the identification of a proxy variable, which is function of TFP, and
- ii) the definition of the conditions under which this function can be inverted in order to express TFP as a function of the proxy variable itself

Why Taiwan?

Taiwan is now the home of many of the world's largest makers of computers and associated hardware. Its firms produce more than 50% of all chips, nearly 70% of computer displays and more than 90% of all portable computers (Economist, 2010).



Results-TFP Estimates

Data:

Emerging Markets Information Services, firm level, income statement and balance sheet. Industry classification at 3-digit NAICS level.

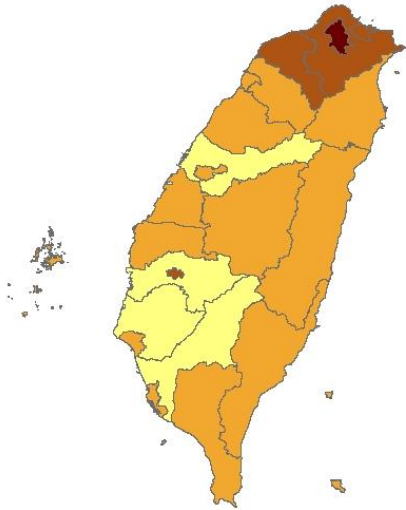
	OLS	IV	OP
β_k	0.37***	0.56***	0.29**
β_l	0.56***	0.21***	0.47**

- Deflate sales
- Remove outliers
- Data limitations
 - Materials
 - Energy
 - Firm prices
- Multi-Product Bias

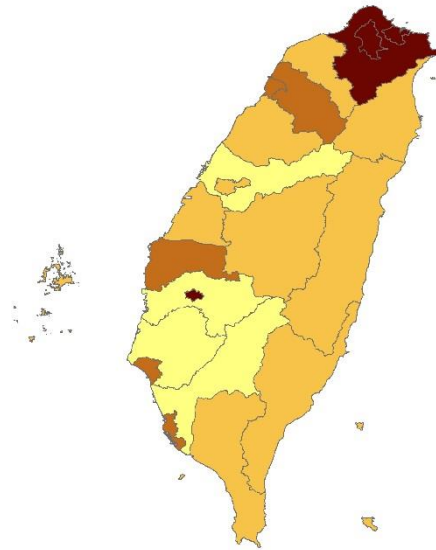
When products have bigger technological -give up some product lines. Moreover, multi-product plants are shown to exit markets where production technologies are farthest away from their primary products.

Regional TFPs

POPULATION DENSITY

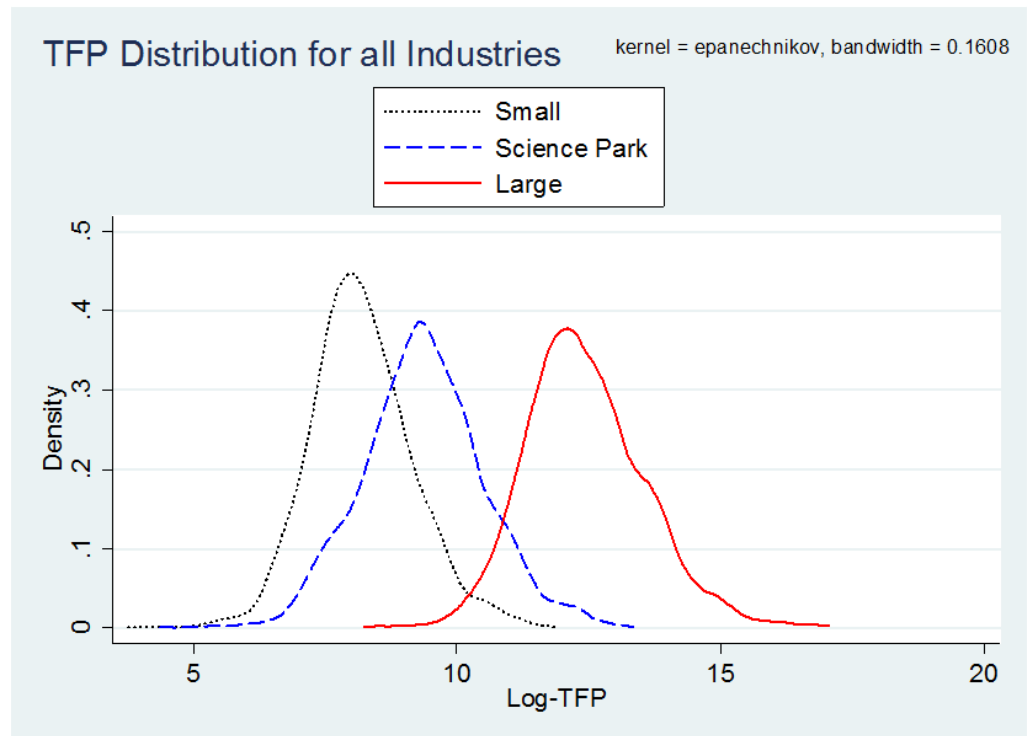


TFP-COUNTY MARKET



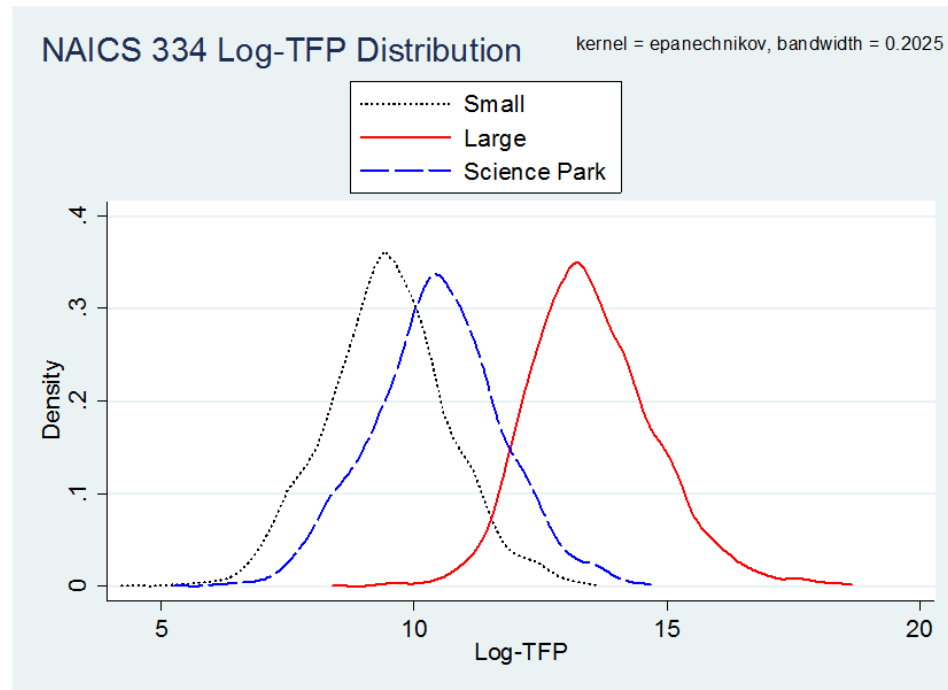
Summary Stats-Log TFP

Stats	BM	SP	AM
N	840	1427	2388
mean	4.10692	8.32283	11.7669
max	8.70842	12.1029	17.0863
min	-2.4334	1.00501	4.60511
IQR	1.23055	1.3496	1.41828

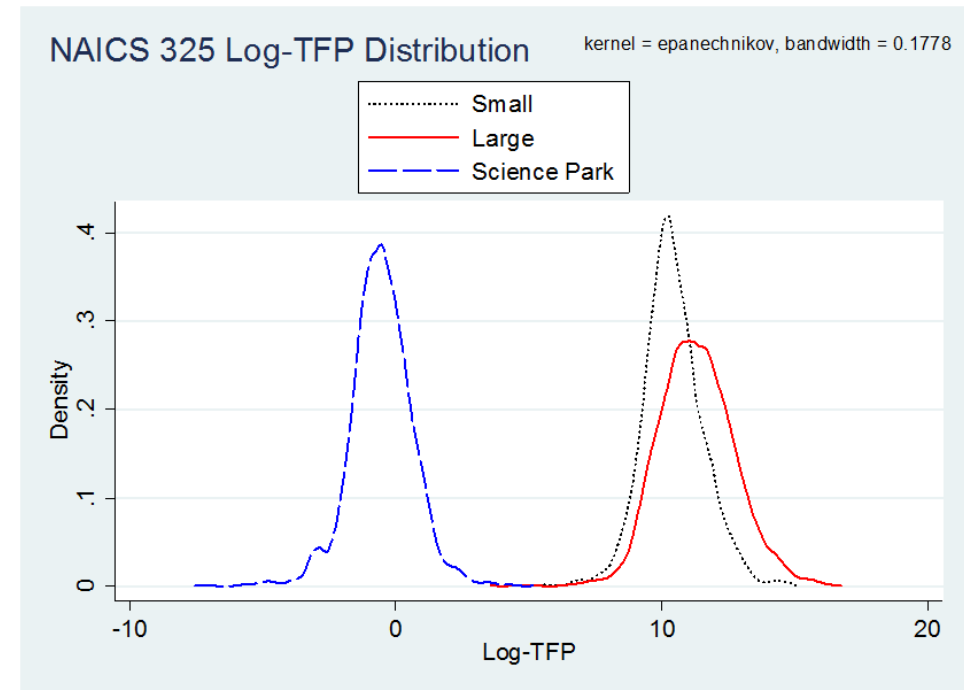


Inter-Industry comparison-Technology intensive levels

COMPUTER AND ELECTRONICS



CHEMICAL MANUFACTURING



Agglomeration and Selection

Localization-Henderson et al(1995)- Regional employment share of the specific industry

Urbanization- Herfindahl-Hirschman Index which is computed as $\sum_j s_{jrt}^2$ where s is the employment share of two digit manufacturing industry j

Competition-Population density; diseconomies of scale or local demand

Self Selection

Baldwin and Okubo (2006) show that high productivity firms self-select into large markets

Heckman two-step estimator for selection models (Heckman, 1976; 1979)

Robustness Checks

Dummy variable for location

Instrument the endogenous variable

$$z_{it}^* = \alpha_0 + \alpha C_{it} + \varepsilon_{it} \quad z_{it}^* \quad z_{it} = 1$$

$$S_{prt} = \beta_0 + \beta_a A_{rt} + \beta_c X_{rt} + v_{prt}$$

where S_{prt} is the p -th percentile of region r at time t , A_{rt} are industry specific agglomeration variables for region r at time t , X_{rt} are the region-time specific control variables and v_{prt} is the error term.

Agglomeration OR Selection

Following Syverson (2004) and Combes *et al*
(2012)

- i. Mean (median)-to check for relative shift
- ii. IQR -for dispersion
- iii. 10th percentile - for truncation/cut-off

Agglomeration and Selection in Science Park

IQR			MED			10-TILE		
LOC	URB	Lab Den	LOC	URB	Lab Den	LOC	URB	Lab Den
1.89***	-3.47***	-.07**	0.48***	-0.35***	0.31***	-.70***	1.84***	.04***
(.10)	(0.16)	(.02)	(0.01)	(.06)	(.00)	(.06)	(.09)	(.01)

Simulations-To be done

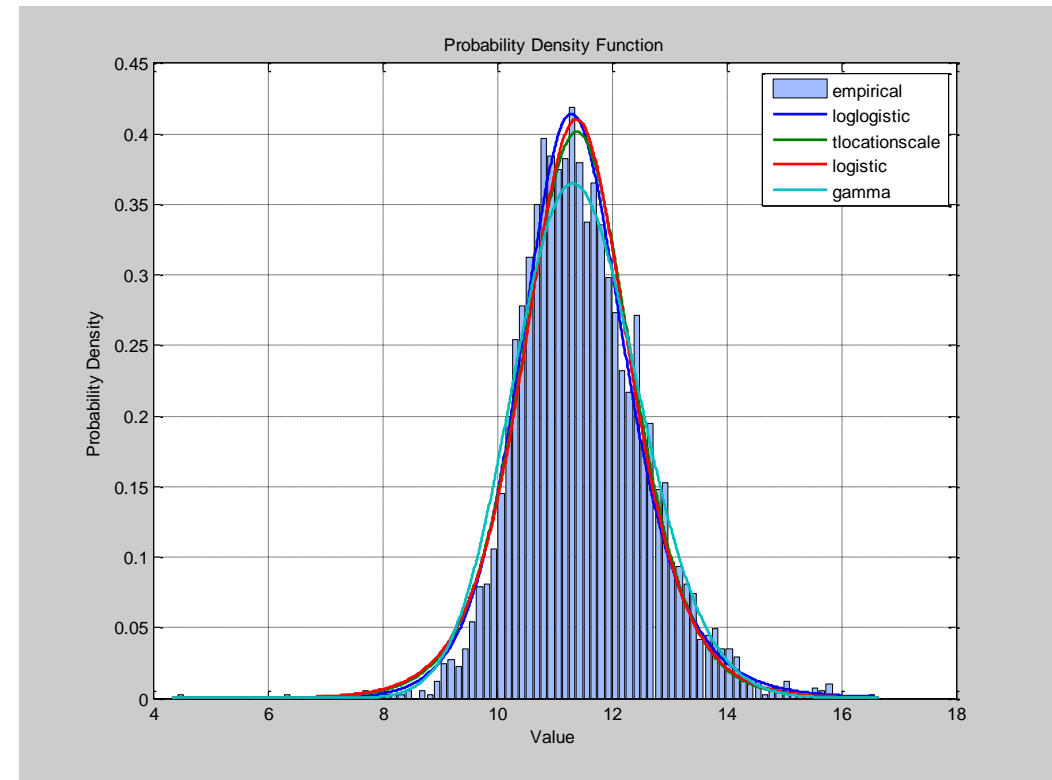
Simulations to suppress noise in TFP estimation

TFP Distribution of empirical data

Combes(2012) and Melitz & Ottaviano (2008)

Normal – Quantile Plots

ML estimates



Results

Firms in large cities have the highest level of productivity

Firms located in Science parks usually have intermediate productivity levels –in between large and small cities

Firms productivity in Science parks may depend on the technology intensity of the production process

Conclusion

- Policy Implications
- Creating clusters may enhance productivity of technology intensive industry
- Clusters may turn out to be protective shields against competition in some cases

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