PRODUCTIVITY RACES II:
The Issue of Capital Measurement

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Abstract:

This paper explores the role of capital measurement in determining the productivity of individual textile plants. In addition to gross book value of capital, we experiment with a perpetual inventory measure of capital and an implicit (estimated) deflator associated with the age of the plant. Following the methodology of the earlier paper (Productivity Races I), we find that measures of productivity constructed from different measures of capital are highly correlated. Further, their association with alternative measures of economic performance is approximately the same. Nevertheless, the perpetual inventory measure of capital -- the most desirable measure from a theoretical perspective -- does consistently outperform the other two measures.

***William M. Mercer Incorporated, 1166 Avenue of the Americas, New York, NY 10036 2708. Send E-mail to dwd4@columbia.edu or dd18@is6.nyu.edu.** **This paper is part of an ongoing project of Mercer's Productivity Team to investigate the link between Human Capital StrategyÔ and productivity. The author thanks Steven Blader, Gigi Foster, Robert McGuckin, Lalith Munasinghe, Haig Nalbantian, Katie Noonan, Arnie Reznek, Bruce Wang and Wei Zheng for their comments, questions and assistance. The opinions expressed in this paper are those of the author and not necessarily those of William M. Mercer Inc. or the US Census Bureau.**

I. Introduction

In the study of productivity, measuring capital has long been a problematic issue, both from a theoretical as well as empirical standpoint: Should measures of capital be constructed on basis of economic or physical depreciation? How does one measure the rate of physical depreciation? How does one account for quality improvements in constructing a price index?

Rather attempting to solve the problem of how to measure capital, this paper looks at cross-sectional productivity differentials measured at the plant-level based on three different measures of productivity and asks: how much difference does the measure of capital make? We follow the methodology of the first part of this paper (Productivity Races I: Are Some Productivity Measures Better Than Others?) and evaluate the measures of productivity on basis of how closely correlated are they with profits, plant growth, and plant closures.

We find that plant-level measures of productivity that are based on different measures of capital are highly correlated. Further, we find that they are equally well associated with alternative measures of plant performance. Nevertheless, the perpetual inventory based measure of productivity -- the theoretically most desirable measure -- appears to be more highly correlated with alternative measures of plant performance than the other capital measures that are evaluated.

This paper is organized as follows. The next section defines the three different measures of capital that are employed in the analysis. Section III examines the correlations among productivity measures that are based on different measures of capital. Sections IV and V explore the association of productivity measures that are based on different measures of capital with plant growth and survival. Concluding remarks are made in Section VI.

II. Capital Measures

When measuring the productivity of a plant, the theoretically desirable measure of a plant's capital stock is the replacement cost of the capital that is actually in use.[1] In practice, one uses what was paid for the capital, which may be adjusted to take into account inflation and depreciation. In "Productivity Races I: Are Some Measures of Productivity Better than Others?" (1996), we measured capital as gross book value, that is, the sum of the nominal value of investments less retirements. This is the simplest measure of capital and it places the least structure on the data. Nevertheless, this measure is potentially rather problematic. It overstates the stock of capital, to the extent that capital goods are increasing in price (i.e., a dollar of investment went further ten years ago). It understates the stock of capital, to the extent that machines depreciate over time. In order for gross book value to actually equal the replacement cost of the capital, these two effects must exactly cancel each other out, which is unlikely.

This paper evaluates the extent to which plant-level productivity measurement is sensitive to the measurement of capital by repeating the procedure from "Productivity Races I" for two different measures of capital. The first measure computes an implicit deflator: it estimates the extent to which the vintage of the plant impacts output and it adjusts the productivity measure accordingly. The second measure uses Bureau of

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[1] **Even if one took an inventory of the capital in use and determined its replacement cost, there would still be issues. How many hours of the day does the capital have to be in use in order to be consider utilized? How does one determine the replacement cost of a piece of machinery if there is no market for it? and so forth. For a review of these issues see Hulten, 1990.**

Economic Analysis (BEA) depreciation rates and price indices to compute a perpetual inventory measure of the capital stock. Each measure is described in turn.

Implicit Deflator

The idea behind the implicit deflator method is as follows. It is hypothesized that a large portion of the measurement error in the gross book value measure of capital will be associated with when the plant came on line, that is, the plant vintage. The capital that a plant brings on line at its birth is of a certain vintage, which is not accurately reflected in the capital's cost. Further, this unobserved vintage component is hypothesized to stay with the plant throughout its life. One way to test this hypothesis is to estimate the vintage component: to incorporate a set of dummy variables that represent the vintage of the plant and treat them as an input into the production process when estimating the production function. One then uses these estimates to purge the measures of productivity of vintage effects.[2]

Define

$$VI_{i67} = \begin{cases} 1 & \text{if plant } i \text{ was born before 68,} \\ 0 & \text{otherwise,} \end{cases}$$

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[2] **The mathematical relationship between the coefficient estimated and the missing vintage deflator in the capital stock variable can be shown easily.   Suppose you have a Cobb-Douglas Production Function:**

where vt_j is the deflator associated with the plant vintage. Taking logs yields:

Therefore, the coefficients on the vintage dummy variables estimate blog(vt_i).

$VI_{i72} = 1$ if plant i was born between 67-73,

0 otherwise,

$VI_{i92} = 1$ if plant i was born after 87,

0 otherwise.

The logic behind this partition stems from how the Census Bureau samples plants. In census years all plants are sampled with probability one. The above partition labels plants on the basis of the census year in which the plant was first observed and therefore avoids sample selection issues. We then re-estimate the value added and total value of shipments productions functions including the indicator variables:

Further, we remove vintage effects from the factor share based productivity measures by regressing them onto the indicator variables:

and

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for each four-digit industry. The results for these regressions are reported in Tables II.1-4. The measures of productivity are then computed by removing the vintage effects:

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; and

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Here the coefficients are taken from the corresponding regression results, with the exception of the factor shares in *STFP* and *STTFP* which are computed following the methodology in "Productivity Races I." These measures of productivity have effectively been purged of vintage effects. Productivity differentials between plants that are associated with plant age have been removed.

There are two hypotheses regarding how purging the productivity measures of vintage effects will alter the information content of the measure. First, if the vintage effects are best thought of as canceling out measurement error, then the vintage-free measures of productivity will be more closely associated with alternative measures of performance. Alternatively, if the vintage effects are real, that is reflecting actual quality differences across plants, then the vintage-free measures of productivity will be less closely associated with alternative measures of performance.

The results of these regressions are reported in Table II.1-4. The estimates of the elasticities of output with respect to the different inputs are essentially the same in both the value added and total value of shipments production function. The vintage dummy variables are significant as a group; the null hypothesis that they all equal zero is always rejected via an F-test. Individually, however, the vintage dummies are frequently insignificant and there is no clear pattern in how their magnitudes change over time: a plant of a younger vintage is not necessarily more productive. Furthermore, the R^2 of the regressions are only marginally larger when the vintage variables are added. This suggests that while vintage effects do matter, they are not that important an element in explaining the dispersion in productivity.

Table II.1: Estimates of value added production function, allowing for vintage effects

SIC	a	b	a+b	R^2
2211	0.854	0.150	1.004	0.89
	(0.0154)	(0.0117)	(0.0094)	
2221	0.818	0.169	0.987	0.86
	(0.0113)	(0.0085)	(0.0073)	
2231	0.699	0.254	0.953*	0.87
	(0.0254)	(0.0200)	(0.0154)	
2241	0.787	0.179	0.967*	0.85
	(0.0174)	(0.0123)	(0.0118)	
2251	0.870	0.169	1.039*	0.86
	(0.0210)	(0.0173)	(0.0137)	
2252	0.877	0.179	1.056*	0.85
	(0.0170)	(0.0121)	(0.0108)	
2253	0.632	0.320	0.952*	0.84
	(0.0107)	(0.0084)	(0.0076)	
2254	0.872	0.121	0.993	0.85
	(0.0344)	(0.0254)	(0.0191)	
2257	0.768	0.172	0.941*	0.81
	(0.0137)	(0.0105)	(0.0088)	
2258	0.778	0.239	1.018	0.83
	(0.0195)	(0.0142)	(0.0123)	
2259	0.579	0.382	0.961	0.89
	(0.0395)	(0.0324)	(0.0226)	
2261	0.842	0.141	0.983	0.89
	(0.0236)	(0.0177)	(0.0148)	
2262	0.822	0.166	0.987	0.88
	(0.0188)	(0.0139)	(0.0113)	
2269	0.865	0.157	1.022	0.82
	(0.0269)	(0.0202)	(0.0167)	
2273	0.783	0.232	1.015	0.82
	(0.0180)	(0.0139)	(0.0101)	
2282	0.794	0.198	0.991	0.83
	(0.0205)	(0.0151)	(0.0126)	
2283	0.876	0.138	1.015	0.81
	(0.0116)	(0.0083)	(0.0079)	
2295	0.841	0.179	1.020	0.83
	(0.0233)	(0.0169)	(0.0143)	
2296	0.928	0.197	1.124*	0.72
	(0.0800)	(0.0704)	(0.0520)	
2297	0.766	0.245	1.011	0.83
	(0.0282)	(0.0172)	(0.0186)	
2298	0.812	0.186	0.998	0.86
	(0.0256)	(0.0201)	-(0.0149)	
2299	0.718	0.269	0.988	0.85
	(0.0157)	(0.0119)	-(0.0100)	

Table II.1 (Cont.): Estimate of a value added production function with vintage effects

	Vintage 67	Vintage 72	Vintage 77	Vintage 82	Vintage 87	Vintage 92
2211	0.026	0.118 *	0.086 *	-0.084 *	0.039	-0.095
	(0.021)	(0.021)	(0.032)	(0.031)	(0.054)	(0.062)
2221	0.023	0.163 *	0.030	-0.025	0.024	0.000
	(0.013)	(0.012)	(0.022)	(0.023)	(0.035)	(0.069)
2231	0.106	-0.096 *	-0.071	-0.098	-0.027	-0.058
	(0.065)	(0.044)	(0.051)	(0.053)	(0.116)	(0.240)
2241	0.026	0.071 *	0.025	-0.005	0.006	0.005
	(0.022)	(0.021)	(0.034)	(0.033)	(0.046)	(0.065)
2251	0.083 *	0.029	0.137 *	0.232 *	0.043	0.034
	(0.040)	(0.024)	(0.044)	(0.047)	(0.070)	(0.111)
2252	0.081 *	0.047 *	0.009	0.046 *	0.031	0.090 *
	(0.020)	(0.015)	(0.021)	(0.023)	(0.032)	(0.043)
2253	0.003	0.034	0.035	0.009	0.024	-0.083
	(0.021)	(0.018)	(0.022)	(0.025)	(0.032)	(0.051)
2254	-0.181 *	-0.062	-0.065	-0.089	-0.036	-0.114
	(0.047)	(0.035)	(0.079)	(0.057)	(0.101)	(0.131)
2257	0.051 *	0.011	0.023	-0.004	-0.016	-0.041
	(0.021)	(0.015)	(0.024)	(0.035)	(0.046)	(0.069)
2258	0.056 *	0.096 *	0.039	0.000	-0.012	0.228 *
	(0.024)	(0.023)	(0.031)	(0.035)	(0.045)	(0.083)
2259	-0.115	0.014	-0.063	-0.029	0.079	0.341 *
	(0.064)	(0.050)	(0.053)	(0.070)	(0.112)	(0.139)
2261	-0.034	-0.059	-0.077	-0.122 *	-0.143*	0.016
	(0.038)	(0.034)	(0.048)	(0.048)	(0.057)	(0.085)
2262	-0.055 *	-0.050 *	0.068 *	-0.040	-0.135*	-0.166 *
	(0.026)	(0.022)	(0.031)	(0.037)	(0.051)	(0.079)
2269	0.042	0.082 *	0.042	0.035	-0.054	0.020
	(0.038)	(0.026)	(0.043)	(0.046)	(0.064)	(0.089)
2273	-0.011	0.036 *	0.055 *	0.031	0.042	-0.064
	(0.017)	(0.014)	(0.018)	(0.023)	(0.031)	(0.066)
2282	0.129 *	0.094 *	0.047	-0.009	0.154*	-0.012
	(0.025)	(0.017)	(0.029)	(0.034)	(0.053)	(0.104)
2283	0.056 *	0.038 *	0.036	0.091 *	0.096*	0.097
	(0.012)	(0.008)	(0.020)	(0.023)	(0.022)	(0.053)
2295	-0.059 *	-0.001	-0.020	-0.020	-0.025	-0.668 *
	(0.027)	(0.022)	(0.035)	(0.045)	(0.054)	(0.093)
2296	0.065	0.077	0.329 *	-0.287	-0.060	-0.191
	(0.072)	(0.048)	(0.161)	(0.173)	(0.272)	(0.359)
2297	0.036	0.110 *	0.053	0.042	0.097*	0.086
	(0.052)	(0.024)	(0.034)	(0.036)	(0.047)	(0.084)
2298	-0.066	-0.035	-0.025	0.086 *	-0.015	-0.033
	(0.036)	(0.026)	(0.030)	(0.038)	(0.048)	(0.073)
2299	-0.019	-0.032	-0.098	-0.056	-0.059	0.028

Table II.2: Estimates of a tvs production function allowing for vintage Effects

SIC	b	a	g	a+b+g	R^2
2211	0.3836	0.0452	0.5609	0.9897*	0.96
	(0.0101)	(0.0064)	(0.0080)	(0.0050)	
2221	0.3489	0.0949	0.5233	0.9671*	0.96
	(0.0069)	(0.0047)	(0.0051)	(0.0038)	
2231	0.4318	0.1479	0.3681	0.9478*	0.95
	(0.0194)	(0.0137)	(0.0118)	(0.0103)	
2241	0.4337	0.0919	0.4421	0.9677*	0.94
	(0.0119)	(0.0078)	(0.0089)	(0.0071)	
2251	0.4023	0.0569	0.5492	1.0084	0.95
	(0.0149)	(0.0101)	(0.0117)	(0.0078)	
2252	0.4499	0.0760	0.4856	1.0114*	0.95
	(0.0102)	(0.0060)	(0.0074)	(0.0052)	
2253	0.3840	0.1669	0.3997	0.9505*	0.93
	(0.0074)	(0.0062)	(0.0044)	(0.0051)	
2254	0.4482	0.0913	0.4264	0.9659*	0.94
	(0.0235)	(0.0159)	(0.0153)	(0.0115)	
2257	0.3755	0.0961	0.4725	0.9442*	0.94
	(0.0088)	(0.0064)	(0.0045)	(0.0053)	
2258	0.4249	0.1170	0.4488	0.9908	0.95
	(0.0121)	(0.0089)	(0.0061)	(0.0073)	
2259	0.3065	0.2148	0.4425	0.9638*	0.95
	(0.0265)	(0.0211)	(0.0212)	(0.0135)	
2261	0.4109	0.0855	0.4821	0.9785*	0.96
	(0.0168)	(0.0114)	(0.0109)	(0.0091)	
2262	0.3601	0.0554	0.5688	0.9844*	0.96
	(0.0128)	(0.0089)	(0.0075)	(0.0069)	
2269	0.4450	0.0698	0.5014	1.0162	0.95
	(0.0160)	(0.0110)	(0.0092)	(0.0090)	
2273	0.2647	0.0629	0.6668	0.9944	0.97
	(0.0085)	(0.0061)	(0.0059)	(0.0042)	
2282	0.4089	0.1268	0.4403	0.9759*	0.96
	(0.0110)	(0.0082)	(0.0055)	(0.0064)	
2283	0.4060	0.0617	0.5192	0.9868*	0.95
	(0.0065)	(0.0040)	(0.0045)	(0.0037)	
2295	0.3513	0.0732	0.5719	0.9964	0.95
	(0.0159)	(0.0092)	(0.0114)	(0.0076)	
2296	0.1953	0.0876	0.6523	0.9351*	0.95
	(0.0278)	(0.0226)	(0.0188)	(0.0171)	
2297	0.3261	0.1115	0.5454	0.9829	0.95
	(0.0162)	(0.0093)	(0.0120)	(0.0093)	
2298	0.3610	0.0676	0.5699	0.9985	0.95
	(0.0169)	(0.0112)	(0.0146)	(0.0078)	

2299	0.3640 (0.0098)	0.1284 (0.0069)	0.5082 (0.0071)	1.0007 (0.0056)	0.95

Table II.2 (Cont.): Estimates of a tvs production function with vintage effects

	Vintage 67	Vintage 72	Vintage 77	Vintage 82	Vintage 87	Vintage 92
2211	0.0257	0.1185*	0.0862*	-0.0839*	0.0385	-0.0948
	(0.0210)	(0.0214)	(0.0322)	(0.0314)	(0.0537)	(0.0621)
2221	0.0226	0.1629*	0.0300	-0.0248	0.0236	-0.0005
	(0.0130)	(0.0123)	(0.0218)	(0.0230)	(0.0348)	(0.0690)
2231	0.1063	-0.0960*	-0.0707	-0.0976	-0.0269	-0.0583
	(0.0646)	(0.0442)	(0.0511)	(0.0526)	(0.1165)	(0.2399)
2241	0.0261	0.0709*	0.0252	-0.0053	0.0063	0.0048
	(0.0217)	(0.0214)	(0.0339)	(0.0332)	(0.0464)	(0.0651)
2251	0.0832*	0.0289	0.1367*	0.2323*	0.0428	0.0341
	(0.0404)	(0.0236)	(0.0441)	(0.0472)	(0.0700)	(0.1112)
2252	0.0815*	0.0470*	0.0091	0.0463*	0.0310	0.0898*
	(0.0196)	(0.0155)	(0.0206)	(0.0227)	(0.0319)	(0.0432)
2253	0.0032	0.0344	0.0350	0.0094	0.0243	-0.0830
	(0.0209)	(0.0179)	(0.0220)	(0.0246)	(0.0319)	(0.0512)
2254	-0.1815*	-0.0620	-0.0651	-0.0893	-0.0364	-0.1139
	(0.0471)	(0.0348)	(0.0789)	(0.0565)	(0.1014)	(0.1306)
2257	0.0514*	0.0105	0.0232	-0.0043	-0.0159	-0.0411
	(0.0212)	(0.0153)	(0.0238)	(0.0347)	(0.0459)	(0.0694)
2258	0.0560*	0.0958*	0.0393	0.0004	-0.0124	0.2277*
	(0.0240)	(0.0225)	(0.0311)	(0.0354)	(0.0449)	(0.0826)
2259	-0.1154	0.0138	-0.0627	-0.0287	0.0789	0.3411*
	(0.0640)	(0.0495)	(0.0527)	(0.0697)	(0.1120)	(0.1386)
2261	-0.0339	-0.0589	-0.0768	-0.1222*	-0.1426*	0.0160
	(0.0380)	(0.0339)	(0.0476)	(0.0477)	(0.0568)	(0.0853)
2262	-0.0554*	-0.0500*	0.0676*	-0.0400	-0.1354*	-0.1661*
	(0.0259)	(0.0218)	(0.0307)	(0.0371)	(0.0513)	(0.0794)
2269	0.0417	0.0822*	0.0423	0.0345	-0.0537	0.0197
	(0.0378)	(0.0260)	(0.0428)	(0.0460)	(0.0636)	(0.0888)
2273	-0.0107	0.0360*	0.0554*	0.0310	0.0421	-0.0643
	(0.0172)	(0.0139)	(0.0177)	(0.0231)	(0.0310)	(0.0661)
2282	0.1289*	0.0943*	0.0467	-0.0086	0.1536*	-0.0123
	(0.0252)	(0.0173)	(0.0292)	(0.0335)	(0.0525)	(0.1043)
2283	0.0556*	0.0379*	0.0358	0.0908*	0.0957*	0.0973
	(0.0125)	(0.0084)	(0.0199)	(0.0231)	(0.0217)	(0.0528)
2295	-0.0592*	-0.0010	-0.0203	-0.0196	-0.0254	-0.6677*
	(0.0268)	(0.0218)	(0.0351)	(0.0454)	(0.0536)	(0.0932)
2296	0.0649	0.0771	0.3294*	-0.2865	-0.0598	-0.1910
	(0.0716)	(0.0477)	(0.1605)	(0.1726)	(0.2720)	(0.3590)
2297	0.0360	0.1100*	0.0534	0.0415	0.0973*	0.0864
	(0.0520)	(0.0240)	(0.0336)	(0.0364)	(0.0467)	(0.0841)
2298	-0.0663	-0.0351	-0.0251	0.0856*	-0.0149	-0.0325
	(0.0356)	(0.0256)	(0.0301)	(0.0381)	(0.0481)	(0.0733)

2299	-0.0191	-0.0320	-0.0984	-0.0556	-0.0589	0.0281

Table II.3: *STFP* regressed onto vintage dummies

	Vint67	Vint72	Vint77	Vint82	Vint87	Vint92
2211	0.0651	0.0626	0.2146*	0.0241	0.3433*	0.4462*
	(0.0431)	(0.0409)	(0.0638)	(0.0629)	(0.1100)	(0.1236)
2221	0.0456	0.1361*	0.1682*	-0.0126	0.1862*	0.1687
	(0.0263)	(0.0242)	(0.0431)	(0.0458)	(0.0707)	(0.1372)
2231	0.0940	-0.0414	0.0324	-0.0276	0.1629	0.6486
	(0.0984)	(0.0644)	(0.0799)	(0.0801)	(0.1838)	(0.3791)
2241	0.0554	0.0383	0.0875	0.0403	0.0448	0.1651
	(0.0404)	(0.0388)	(0.0614)	(0.0613)	(0.0860)	(0.1222)
2251	0.1107	-0.0029	0.2567*	0.3888*	0.0602	0.1192
	(0.0784)	(0.0467)	(0.0857)	(0.0921)	(0.1372)	(0.2185)
2252	0.1234*	0.0759*	-0.0594	0.0484	0.1078	0.2846*
	(0.0433)	(0.0330)	(0.0428)	(0.0486)	(0.0689)	(0.0938)
2253	0.0354	0.0568*	0.1157*	0.0569	0.0752	0.0938
	(0.0318)	(0.0265)	(0.0326)	(0.0363)	(0.0486)	(0.0784)
2254	-0.1236	0.0297	0.1450	-0.0765	-0.0100	-0.4152
	(0.0837)	(0.0601)	(0.1371)	(0.0968)	(0.1811)	(0.2319)
2257	0.0253	-0.0684*	0.0991*	0.0716	0.1381	0.1579
	(0.0391)	(0.0273)	(0.0433)	(0.0627)	(0.0838)	(0.1285)
2258	0.0719	0.0785*	0.0617	0.1184	0.0790	0.1582
	(0.0434)	(0.0394)	(0.0544)	(0.0621)	(0.0813)	(0.1411)
2259	-0.1683	0.0705	-0.0610	-0.1080	0.1713	0.6045*
	(0.1070)	(0.0813)	(0.0870)	(0.1137)	(0.1860)	(0.2278)
2261	-0.1800*	-0.1646*	-0.0146	-0.0339	-0.1631	0.1858
	(0.0676)	(0.0580)	(0.0829)	(0.0816)	(0.0988)	(0.1519)
2262	-0.0748	-0.0447	0.1390*	0.0648	-0.1596	0.2380
	(0.0471)	(0.0378)	(0.0541)	(0.0639)	(0.0934)	(0.1393)
2269	-0.1328	0.0095	0.0008	0.1029	-0.1412	0.0949
	(0.0762)	(0.0521)	(0.0856)	(0.0916)	(0.1293)	(0.1781)
2273	-0.0323	-0.0599	0.1797*	-0.0470	0.1789*	0.1957
	(0.0454)	(0.0348)	(0.0443)	(0.0586)	(0.0798)	(0.1695)
2282	0.1914*	0.0726*	0.0328	0.0566	0.0670	0.1450
	(0.0527)	(0.0364)	(0.0601)	(0.0689)	(0.1103)	(0.2113)
2283	0.0677*	0.0369	0.0234	0.1711*	0.0743	0.0804
	(0.0285)	(0.0189)	(0.0453)	(0.0526)	(0.0496)	(0.1212)
2295	-0.1941*	-0.0444	-0.0884	-0.0994	-0.0973	0.1839
	(0.0538)	(0.0425)	(0.0701)	(0.0899)	(0.1048)	(0.2038)
2296	0.4203	-0.4342*	0.4033	-0.5423	0.2815	0.4113
	(0.2218)	(0.1381)	(0.5053)	(0.5570)	(0.8921)	(1.1722)
2297	0.1960	0.0334	0.0508	0.0083	0.1335	0.4471*
	(0.1169)	(0.0523)	(0.0750)	(0.0796)	(0.1027)	(0.1821)
2298	-0.0837	-0.0323	0.0622	0.0649	-0.0546	-0.0055
	(0.0736)	(0.0534)	(0.0626)	(0.0775)	(0.0982)	(0.1544)
2299	-0.1295*	-0.0668	-0.1318*	-0.0530	0.0079	0.3057*
	(0.0485)	(0.0344)	(0.0452)	(0.0492)	(0.0634)	(0.0855)

Table II.4: *STTFP* regressed onto vintage dummies

	Vint67	Vint72	Vint77	Vint82	Vint87	Vint92
2211	0.0220	0.1309*	0.1021*	0.0120	0.1575*	0.2541*
	(0.0234)	(0.0224)	(0.0351)	(0.0344)	(0.0599)	(0.0673)
2221	0.0306*	0.1472*	0.1056*	0.0188	0.0890*	0.2327*
	(0.0137)	(0.0127)	(0.0227)	(0.0239)	(0.0369)	(0.0735)
2231	0.1407*	0.0466	-0.0259	0.0387	0.1384	0.2827
	(0.0687)	(0.0457)	(0.0551)	(0.0555)	(0.1260)	(0.2592)
2241	0.0726*	0.0581*	0.0805*	0.0311	0.0519	0.0939
	(0.0253)	(0.0242)	(0.0391)	(0.0383)	(0.0540)	(0.0761)
2251	0.1279*	0.0431	0.2260*	0.2638*	0.0787	0.1721
	(0.0489)	(0.0291)	(0.0536)	(0.0570)	(0.0861)	(0.1355)
2252	0.0875*	0.0629*	0.0109	0.0673*	0.0777*	0.1789*
	(0.0224)	(0.0172)	(0.0222)	(0.0252)	(0.0357)	(0.0486)
2253	0.0315	0.1055*	0.1235*	0.0765*	0.0966*	0.0769
	(0.0218)	(0.0182)	(0.0224)	(0.0252)	(0.0331)	(0.0530)
2254	-0.1239*	0.0256	0.1183	-0.1415*	0.0335	-0.1177
	(0.0505)	(0.0366)	(0.0828)	(0.0595)	(0.1093)	(0.1399)
2257	0.0658*	0.0593*	0.1230*	0.1171*	0.1165*	0.1142
	(0.0232)	(0.0162)	(0.0257)	(0.0376)	(0.0500)	(0.0760)
2258	0.0341	0.0686*	0.0846*	0.0268	0.0098	0.3760*
	(0.0269)	(0.0245)	(0.0340)	(0.0382)	(0.0501)	(0.0920)
2259	-0.1349*	0.0202	-0.0427	-0.0188	0.1316	0.4350*
	(0.0641)	(0.0487)	(0.0522)	(0.0689)	(0.1115)	(0.1365)
2261	-0.0419	-0.0002	-0.0201	-0.0375	-0.0478	0.1564
	(0.0416)	(0.0356)	(0.0505)	(0.0499)	(0.0601)	(0.0921)
2262	-0.0480	-0.0237	0.1033*	0.0245	-0.0899	0.1928*
	(0.0291)	(0.0234)	(0.0335)	(0.0396)	(0.0579)	(0.0881)
2269	-0.0461	0.0285	0.0178	0.0372	-0.0791	0.0641
	(0.0414)	(0.0284)	(0.0468)	(0.0502)	(0.0704)	(0.0993)
2273	-0.0024	0.0277	0.1012*	0.0448	0.0971*	0.0807
	(0.0191)	(0.0147)	(0.0187)	(0.0247)	(0.0337)	(0.0726)
2282	0.0541	0.1106*	0.1021*	0.0998*	0.1136	0.0631
	(0.0311)	(0.0215)	(0.0358)	(0.0406)	(0.0650)	(0.1297)
2283	0.0383*	0.0445*	0.0501*	0.0911*	0.0847*	0.1718*
	(0.0138)	(0.0092)	(0.0220)	(0.0254)	(0.0239)	(0.0586)
2295	-0.0898*	0.0186	-0.0236	-0.0370	-0.0381	-0.5013*
	(0.0287)	(0.0227)	(0.0371)	(0.0480)	(0.0559)	(0.0997)
2296	0.1149	-0.0055	0.3721*	-0.2173	0.1144	0.2738
	(0.0739)	(0.0461)	(0.1686)	(0.1858)	(0.2963)	(0.3901)
2297	0.1374*	0.0588*	0.0584	0.0556	0.0760	0.2930*
	(0.0638)	(0.0283)	(0.0409)	(0.0428)	(0.0554)	(0.1024)
2298	0.0160	0.0032	0.0295	0.1042*	0.0191	0.0619
	(0.0431)	(0.0313)	(0.0367)	(0.0465)	(0.0587)	(0.0892)
2299	0.0071	-0.0542*	-0.1082*	-0.0416	-0.0163	0.1856*

	(0.0283)	(0.0203)	(0.0264)	(0.0288)	(0.0369)	(0.0498)

Perpetual Inventory

When constructing a perpetual inventory measure of capital, one takes into account the fact that the price of capital is non-constant through time and that capital depreciates and becomes obsolete. One converts investment into real terms through a price deflator and depreciates the capital stock according to a depreciation rate:

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where d_t is the depreciation rate and $PINV_t$ is the investment price deflator. In order to use this formula to recursively construct a measure of capital, an initial value of capital is required. One method is to take the gross book value of capital of the plant and divide it by the ratio of gross nominal capital to real net capital in the industry, for the initial year in which the plant appears. This assumes that the ratio of gross nominal capital to net real capital for the plant is the same as for the industry average.

This is the methodology we use, only we compute a perpetual inventory measure of machines and structures separately and then add them together, along with the capitalized rents. We use the Gray-Bartelsman productivity database for the capital stock deflators, Jim Adam's BEA based capital stock measures for the depreciation rates and gross to net converters, and, finally, Duan Wang's user cost of capital. This methodology follows that used by Caballero, Engel, and Haltiwanger (1995), with the following deviations. In contrast to their sample, our sample includes several years (1986,1988 - 1991) in which data on retirements are not available. Therefore, we do not use the retirement data or construct the "in use" depreciation rates in computing our measure of capital. Because we are working with an unbalanced panel, whenever there is a gap in the time series of a plant's observations, we start the recursion over again with the initial value being constructed from the gross book value of capital. And finally, we include a capitalized value of the rents paid for building and machinery.

In order to re-compute the measures of productivity on the basis of this capital measure, the production functions must be re-estimated. The results are reported in Tables 5 and 6. It is important to note that in both the value added and total value of shipments production function models, both the R^2's and the elasticity of output with respect to capital are lower than in the corresponding regression based on the gross book value of capital measure. This suggests that by omitting the retirement information from the computation of capital stock, which was necessary to construct a theoretically consistent measure of capital, the information content of the capital measure has decreased, (i.e., it has more, not less, measurement error). Omitting the retirement information lowers the R^2 of the regression and the estimate of the elasticity of output with respect to capital. The fact that the estimates of the output elasticities with respect to capital have become smaller, results in the production function based measures of productivity placing a larger weight on labor productivity.

These two measures of capital allow us to create four new measures of productivity. In the rest of the paper the prefix V will denote the vintage-free measure, and the prefix P will denote that the measures are based on the perpetual inventory measure of capital. *VTFP*, *VSTFP*, *VTTFP*, *VSTTFP* are four new measures of productivity that have been purged of vintage effects. And *PTFP*, *PSTFP*, *PTTFP*, *PSTTFP* are the four new measures of productivity that are based on the perpetual inventory measure of capital.

Table II.5: Estimates of value added production function based on a perpetual inventory measure of capital

SIC	a	b	a+b	R^2
2211	0.8416	0.1540	0.9956	0.8786
	(0.0155)	(0.0124)	(0.0083)	
2221	0.7921	0.1856	0.9777*	0.8495
	(0.0110)	(0.0091)	(0.0067)	
2231	0.7500	0.2103	0.9602*	0.8620
	(0.0244)	(0.0191)	(0.0139)	
2241	0.7988	0.1655	0.9643*	0.8372
	(0.0173)	(0.0127)	(0.0113)	
2251	0.8878	0.1324	1.0202	0.8526
	(0.0212)	(0.0175)	(0.0132)	
2252	0.8838	0.1608	1.0446*	0.8364
	(0.0166)	(0.0119)	(0.0098)	
2253	0.6516	0.3036	0.9552*	0.8288
	(0.0105)	(0.0084)	(0.0071)	
2254	0.9128	0.0890	1.0018	0.8341
	(0.0321)	(0.0231)	(0.0188)	
2257	0.8047	0.1463	0.9511*	0.8019
	(0.0134)	(0.0107)	(0.0085)	
2258	0.7975	0.2223	1.0197	0.8253
	(0.0181)	(0.0136)	(0.0116)	
2259	0.6472	0.3093	0.6807	0.8612
	(0.0399)	(0.0335)	(0.1659)	
2261	0.8417	0.1678	1.0095	0.8850
	(0.0246)	(0.0187)	(0.0133)	
2262	0.8655	0.1312	0.9966	0.8759
	(0.0181)	(0.0140)	(0.0101)	
2269	0.8686	0.1540	1.0226	0.8143
	(0.0249)	(0.0195)	(0.0155)	
2273	0.8067	0.2014	1.0082	0.8074
	(0.0169)	(0.0133)	(0.0092)	
2282	0.8676	0.1311	0.9986	0.8118
	(0.0200)	(0.0153)	(0.0125)	
2283	0.8989	0.1060	1.0049	0.7812
	(0.0117)	(0.0087)	(0.0076)	
2295	0.8836	0.1458	1.0294*	0.8231
	(0.0223)	(0.0165)	(0.0133)	
2296	0.9470	0.0707	1.0177	0.6706
	(0.0690)	(0.0725)	(0.0543)	
2297	0.7864	0.2074	0.9939	0.8138
	(0.0273)	(0.0179)	(0.0172)	
2298	0.8250	0.1802	1.0053	0.8469

	(0.0246)	(0.0191)	(0.0145)	
2299	0.7405	0.2545	0.9950	0.8407
	(0.0154)	(0.0118)	-(0.0094)	

Table II.6: Estimates of a tvs production function based on a perpetual inventory measure of capital

SIC	a	b	g	a+b+ g	R^2
2211	0.3656	0.0631	0.5494	0.9781*	0.9677
	(0.0099)	(0.0066)	(0.0078)	(0.0042)	
2221	0.3325	0.1064	0.5219	0.9608*	0.9562
	(0.0068)	(0.0051)	(0.0051)	(0.0035)	
2231	0.4533	0.1192	0.3779	0.9504*	0.9471
	(0.0188)	(0.0129)	(0.0116)	(0.0092)	
2241	0.4298	0.0876	0.4469	0.9643*	0.9385
	(0.0117)	(0.0080)	(0.0089)	(0.0068)	
2251	0.4065	0.0499	0.5374	0.9938	0.9526
	(0.0144)	(0.0098)	(0.0112)	(0.0072)	
2252	0.4391	0.0735	0.4928	1.0055	0.9564
	(0.0098)	(0.0058)	(0.0074)	(0.0046)	
2253	0.3912	0.1553	0.4023	0.9488*	0.9330
	(0.0073)	(0.0062)	(0.0044)	(0.0047)	
2254	0.4627	0.0680	0.4426	0.9733*	0.9402
	(0.0224)	(0.0146)	(0.0155)	(0.0112)	
2257	0.3870	0.0823	0.4752	0.9445*	0.9414
	(0.0087)	(0.0065)	(0.0045)	(0.0050)	
2258	0.4288	0.1096	0.4525	0.9910	0.9486
	(0.0114)	(0.0085)	(0.0061)	(0.0068)	
2259	0.3179	0.1766	0.4646	0.9591*	0.9506
	(0.0269)	(0.0209)	(0.0212)	(0.0132)	
2261	0.4135	0.1007	0.4767	0.9909	0.9582
	(0.0168)	(0.0120)	(0.0107)	(0.0080)	
2262	0.3781	0.0387	0.5717	0.9885	0.9651
	(0.0119)	(0.0086)	(0.0072)	(0.0059)	
2269	0.4311	0.0768	0.5048	1.0128	0.9517
	(0.0152)	(0.0108)	(0.0093)	(0.0084)	
2273	0.2638	0.0596	0.6638	0.9872*	0.9684
	(0.0080)	(0.0059)	(0.0058)	(0.0038)	
2282	0.4313	0.0959	0.4517	0.9789*	0.9592
	(0.0110)	(0.0081)	(0.0056)	(0.0064)	
2283	0.4092	0.0454	0.5241	0.9787*	0.9492
	(0.0065)	(0.0042)	(0.0045)	(0.0036)	
2295	0.3724	0.0721	0.5485	0.9930	0.9628
	(0.0135)	(0.0077)	(0.0099)	(0.0061)	
2296	0.1841	0.0793	0.6566	0.9200*	0.9503
	(0.0241)	(0.0243)	(0.0169)	(0.0177)	
2297	0.3156	0.0986	0.5586	0.9727*	0.9506
	(0.0161)	(0.0095)	(0.0120)	(0.0085)	

2298	0.3601	0.0700	0.5693	0.9994	0.9527
	(0.0167)	(0.0106)	(0.0143)	(0.0077)	
2299	0.3752	0.1218	0.5094	1.0064	0.9511
	(0.0097)	(0.0068)	(0.0072)	(0.0052)	

III. How correlated are measures of productivity that are based on different measures of productivity?

Table III.1 presents the correlation coefficients between the measures of productivity constructed from the three different measures of capital. The measures are highly correlated. The vintage-based measures of productivity are always more highly correlated with the book value measures of productivity than are the perpetual inventory measure. In comparing the measures based on gross book value of capital (*TFP*, *TTFP*, *STFP*, *STTFP*) to the corresponding perpetual inventory measures of capital (*PTFP*, *PTTFP*,. *PSTFP*, *PSTTFP*), the econometric-based measures of productivity are more highly correlated, as is to be expected given that they place a smaller weight on capital productivity. For the econometric-based measures of productivity at least 97 percent ($.983^2$) of the variation in one measure of productivity can be explained by the other measure. For the factor share based measures, at least 84 percent ($.915^2$) of the variation in the one measure can be explained by the other measure. The high correlations suggest that the issue of capital measurement may be of second order importance when measuring plant-level productivity.

Table III.1: The correlation between measures of productivity based on different measures of capital

Regression-based productivity measures

A. Value-added based measure

	TFP	*VTFP*	*PTFP*
TFP	1.000	0.996	0.983
VTFP	0.996	1.000	0.979
PTFP	0.983	0.979	1.000

B. Total value of shipments

	TTFP	*VTTFP*	*PTTFP*
TTFP	1.000	0.994	0.985
VTTP	0.994	1.000	0.979
PTTFP	0.985	0.979	1.000

Factor Share Based Productivity Measures

C. Value-added based measure

	STFP	*VSTFP*	*PSTFP*
STFP	1.000	0.996	0.923
VSTFP	0.996	1.000	0.919
PSTFP	0.923	0.919	1.000

D. Total value of shipments

	STTFP	*VSTTFP*	*PSTTFP*
STTFP	1.000	0.993	0.915
VSTTP	0.993	1.000	0.908
PSTTFP	0.915	0.908	1.000

IV. Associations with exit rates

Following the methodology developed in Productivity Races I, we compute exit rates by productivity deciles when the plants are ranked according to the different measures of productivity. Tables IV.1 through IV.4 report the exit rates for the measures VTTFP, VSTFP, PTTFP, PSTFP. The results are analogous to those for TTFP and STTFP in Productivity Races I. Therefore, in order to compare which measures are better at predicting exit rates we need to go to the R^2 of the corresponding regressions. The R^2's of these regressions are reported in Table IV.5. Vintage-free measures perform almost identically, while the measures that are based on a perpetual inventory measure of capital tend to perform somewhat better.

Table VI.1 Exit rates for deciles when ranked according to VTTFP

VSTFP	Full Sample		Pre-1988	
Decile	exit rate	standard error	exit rate	standard error
1	0.42	(0.012)	0.44	(0.013)
2	0.36	(0.011)	0.36	(0.013)
3	0.30	(0.011)	0.30	(0.012)
4	0.27	(0.010)	0.26	(0.012)
5	0.26	(0.010)	0.25	(0.012)
6	0.20	(0.009)	0.20	(0.011)
7	0.22	(0.010)	0.22	(0.011)
8	0.20	(0.009)	0.20	(0.011)
9	0.20	(0.009)	0.21	(0.011)
10	0.27	(0.011)	0.28	(0.012)

Table VI.2 Exit rates for deciles when ranked according to VTTFP

VSTFP	Full Sample		Pre-1988	
Decile	exit rate	standard error	exit rate	standard error
1	0.355	(0.011)	0.370	(0.013)
2	0.314	(0.011)	0.313	(0.012)
3	0.327	(0.011)	0.328	(0.012)
4	0.280	(0.011)	0.280	(0.012)
5	0.276	(0.010)	0.284	(0.012)
6	0.237	(0.010)	0.241	(0.011)
7	0.237	(0.010)	0.226	(0.011)
8	0.222	(0.010)	0.226	(0.011)
9	0.211	(0.010)	0.213	(0.011)
10	0.266	(0.010)	0.268	(0.012)

Table IV.5 Ability of Productivity Measures to Predict Exit Rates

Measure	R^2 i.e., percent of variation in exit rates explained by the decile groupings.	
	Full Sample	Pre-1988
TTFP	.0244	.0281
VTTFP	.0244	.0278
PTTFP	.0266	.0295
STTFP	.0084	.0090
VSTTFP	.0111	.0120
PSTTFP	.0129	.0138
TFP	.0162	.0187
VTFP	.0160	.0182
PTFP	.0187	.0211
STFP	.0103	.0116
VSTFP	.0103	.0116
PSTFP	.0128	.0148

V. Association with plant growth

Following the methodology in Productivity Races I, we examine the extent to which plants that are ranked in the higher end of the distribution expand faster in terms of real value added, employment, and the real book value of capital. Tables V.1-4 present the growth rates by decile for VTFP, PTFP, VSTFP, and PSTFP. For productivity measures that are based on the perpetual inventory measure of capital, the growth rates of real value added, total employment, and capital stock are all increasing in productivity (with the exception of GBOOK for PSTFP). This contrasts with the productivity measures that are purged of vintage effects and the productivity measures that are based on the gross book value of capital, where relationship between growth and productivity is less clear (see Productivity Races I). These results suggest that the perpetual inventory measure of capital is the preferable measure.

Table V.1: The Association of VTFP with the Growth of Inputs and Outputs

VTFP	GRVA		GTE		GBOOK	
1	-0.091	(0.029)	-0.045	(0.018)	0.009	(0.028)
2	-0.058	(0.021)	-0.055	(0.016)	-0.008	(0.026)
3	-0.050	(0.019)	-0.032	(0.014)	0.003	(0.026)
4	0.008	(0.020)	-0.018	(0.016)	0.020	(0.026)
5	0.005	(0.019)	0.012	(0.015)	-0.016	(0.027)
6	-0.016	(0.019)	-0.001	(0.015)	-0.032	(0.028)
7	0.040	(0.019)	0.028	(0.016)	0.031	(0.027)
8	0.054	(0.019)	0.039	(0.015)	0.030	(0.029)
9	0.031	(0.021)	0.023	(0.015)	-0.013	(0.032)
10	0.084	(0.025)	0.053	(0.018)	0.015	(0.034)

Table V.3: The association of VSTFP with the growth of inputs and outputs

VSTFP	GRVA		GTE		GBOOK	
1	-0.066	(0.029)	-0.031	(0.018)	0.058	(0.024)
2	-0.075	(0.022)	-0.063	(0.016)	0.051	(0.024)
3	0.019	(0.020)	-0.014	(0.015)	0.076	(0.023)
4	-0.003	(0.019)	-0.004	(0.015)	0.047	(0.024)
5	-0.007	(0.019)	-0.004	(0.015)	0.037	(0.023)
6	0.027	(0.019)	0.014	(0.014)	0.030	(0.025)
7	0.015	(0.019)	0.016	(0.015)	0.015	(0.026)
8	0.036	(0.021)	0.049	(0.016)	-0.018	(0.030)
9	0.028	(0.021)	0.043	(0.017)	-0.057	(0.034)
10	0.031	(0.024)	-0.005	(0.018)	-0.207	(0.043)

Table V.3: The Association of PTFP with the Growth of Inputs and Outputs

PTFP	GRVA		GTE		GBOOK	
1	-0.139	(.029)	-0.0822	(.0188)	-0.080	(.029)
2	-0.064	(.021)	-0.0632	(.0160)	-0.055	(.027)
3	-0.035	(.019)	-0.0244	(.0148)	-0.022	(.026)
4	-0.037	(.018)	-0.0265	(.0148)	-0.010	(.025)
5	0.028	(.019)	0.0069	(.0152)	-0.0011	(.026)
6	0.008	(.018)	0.0177	(.0151)	0.0073	(.026)
7	0.036	(.018)	0.0179	(.0155)	-0.013	(.027)
8	0.060	(.019)	0.0474	(.0152)	0.053	(.027)
9	0.023	(.020)	0.0364	(.0154)	0.068	(.029)
10	0.119	(.024)	0.0677	(.0176)	0.072	(.030)

Table V.4: The Association of PSTFP with the Growth of Inputs and Outputs

PSTFP	GRVA		GTE		GBOOK	
1	-0.148	(.029)	-0.099	(.018)	-0.077	(.028)
2	-0.078	(.021)	-0.052	(.015)	-0.026	(.025)
3	-0.024	(.019)	-0.042	(.015)	0.00017	(.024)
4	-0.019	(.019)	-0.025	(.015)	0.0090	(.024)
5	0.007	(.018)	0.0064	(.014)	0.042	(.023)
6	0.034	(.018)	0.024	(.014)	0.022	(.023)

7	0.040	(.019)	0.054	(.015)	0.077	(.024)
8	0.032	(.019)	0.036	(.015)	0.032	(.027)
9	0.077	(.021)	0.057	(.016)	-0.027	(.032)
10	0.074	(.024)	0.034	(.017)	-0.037	(.039)

Table V.5 presents the R^2 from the non-parametric regressions of growth rates onto the twelve different measures of productivity (four measures of productivity and three measures of capital), following the methodology in Productivity Races I. The R^2's associated with the vintage-free measures tend to be lower, and the R^2's associated with the perpetual inventory measure of capital are consistently larger. Once again, these results suggest the perpetual inventory measure of capital is the preferable measure.

Table V.5 Predictive Power of Productivity Measures

Measure	Growth of Real Value Added		Growth of Total Employment		Growth of Book Value of Capital	
	Increas-ing?	R^2	Increas-ing?	R^2	Increa s-ing?	R^2
TFP	+	.0079	+	.0062	?	.0008
VTFP	+	.0063	+	.0051	-	.0006
PTFP	+	.0109	+	.0088	+	.0032
STFP	+	.0035	+	.0044	-	.0079
VSTFP	+	.0039	+	.0043	-	.0082
PSTFP	+	.0104	+	.0103	?	.0026
TTFP	+	.0052	+	.0067	+	.0015
VTTFP	-	.0041	+	.0047	-	.0005
PTTFP	+	.0091	+	.0081	?	.0013
STTFP	+	.0032	+?	.0049	-	.0032
VSTTFP	+	.0028	+	.0030	-	.0045
PSTTFP	+	.0090	+	.0106	?	.0007

VI. Conclusion

This paper demonstrates that the contentious issue of how to measure capital when measuring aggregate productivity growth is almost a non-issue when measuring plant-level productivity. The crudest measure of capital (gross book value of capital) and the state-of-the-art measure of capital (a perpetual inventory based measure) yield measures of plant-level productivity that are highly correlated. Nevertheless, the productivity measures computed from the perpetual inventory measure of capital do outperform the other measures.

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VI. Moving Average Measures of Productivity

This section computes a moving average measure of productivity, which is a forecast of productivity in the next period on the basis of the three most recent observations. The moving average measure of productivity is computed as follows:

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where x is the relevant measure of productivity.[3] The idea behind this measure is to average out the transitory component of productivity that should not be influencing a plant's decision making. As in productivity Races I, moving average based measures do not outperform the measures that are based on only the plant's performance in the most recent year, regardless of the capital measure.

What is striking, however, is that when working with this smaller database (it only includes plants that are present in the same industry three years in a row) is that the perpetual inventory measure of assets now does much better at predicting exit rates. This suggests that the perpetual inventory measure of capital works better in a sample that is a more *balanced* panel, that is, plants that are observed more consistently over time**.** The perpetual inventory measure of capital works by accumulating investment over time, which requires continuous observations for each plant. Therefore, a more balanced sample will lead to a more meaningful perpetual inventory measure of capital. This may explain why productivity measures constructed from the perpetual inventory based measure of capital are now consistently better at predicting exit rates and employment growth rates.

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[3] This moving average is a forecast of the sustainable component of productivity in the next period. It is based on the methodology presented in Dwyer 1995d and utilizes the parameter estimates taken from the entire textile industry.

Table VI.1 Ability of Productivity Measures to Predict Exit Rates vs. Moving Average Based Measures

Measure	Full Sample	Pre-1988
TFP	0.0211	0.0257
MTFP	0.0211	0.0219
STFP	0.0174	0.0231
MSTFP	0.0140	0.0182
TTFP	0.0241	0.0280
MTTFP	0.0213	0.0210
STTFP	0.0157	0.0218
MSTFP	0.0126	0.0133

Table VI.2 Ability of Productivity Measures (Net of Vintage Effects) to Predict Exit Rates vs. Moving Average Based Measures

Measure	Full Sample	Pre-1988
VTFP	0.0210	0.0249
VMTFP	0.0187	0.0188
VSTFP	0.0162	0.0225
VMSTFP	0.0125	0.0158
VTTFP	0.0223	0.0262
VMTTFP	0.0218	0.0215
VSTTFP	0.0161	0.0223
VMSTFP	0.0109	0.0131

Table VI.3 Ability of Productivity Measures--Based on A Perpetual Inventory Measure of Assets?-- to Predict Exit Rates vs. Moving Average Based Measures

Measure	Full Sample	Pre-1988
PTFP	.0318	.0350
PMTFP	.0266	.0299
PSTFP	.0291	.0347
PMSTFP	.0230	.0265
PTTFP	.031	.032
PMTTF	.0277	.0266
PSTTFP	.0260	.0298
PMSTP	.0191	.0212