Supplemental Appendix

The Effect of Noncompete Enforceability on Productivity: Evidence from a New State-Level Manufacturing Dataset

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A Data Construction

Variable	*Manufacturing*	*All Sectors*
Number of Establishments		✓
Revenue (Value of shipments)	✓	
Value added	✓	✓
Materials costs	✓	
Employment (*all employees*)	✓	✓
Employment (*production workers*)	✓	
Hours (*production workers*)	✓	
Payroll (*all employees*)	✓	✓
Payroll (*production workers*)	✓	
Investment	✓	
Capital stock†	✓	
Output per worker†	✓	✓
Labor share of income†	✓	✓

Table 1: Variable Summary by Dataset
†constructed variable

A.1 Manufacturing

We construct a state-year panel dataset for manufacturing covering all U.S. states from 1987-2021 using data from historical records for the Annual Survey of Manufactures (ASM) and the Census of Manufactures (CMF). The most granular division of manufacturing industries is available at 3-digit SIC (1987-1996) and 4-digit NAICS (1997-2021) levels; data is also reported at higher aggregations for 2-digit SIC/3-digit NAICS levels and across all manufacturing (SIC 20-39/NAICS 31-33).

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This dataset includes outputs (`value added, revenue`) and inputs (`employment, payroll, hours, materials costs, investment`). To facilitate estimation of total factor productivity, we deflate nominal values of all variables to 1997 dollars and compute `capital stocks` using a perpetual inventory method. We also include `value added per worker` as a productivity measure, computed using both `all employees` and `production workers`. Finally, we compute the `labor share of income` as `payroll` divided by `value added`, also for both `all employees` and `production workers` separately.

A.1.1 Sources

We obtain state-level manufacturing data (1987-2021) from historical records of the ASM and CMF. Source variables include `employment` (*all employees* and *production workers*), `payroll` (*all employees* and *production workers*), `hours` (*production workers*), `value added`, `materials costs`, `revenue`, and `investment`. From 1987-1996, since only *new* `investment` was reported at the state-level, we additionally collect `capital investment` (*new* and *old*) for the United States.

To adjust nominal variables to 1997 dollars, we use price indices from the BEA National GDP by Industry (for `value added`, `material costs`, and `sales`) and the NBER-CES Manufacturing Industry Database (for `capital investment`). To construct state-level `capital stock`, we estimate the depreciation rate using national values for `depreciation` and `capital stock` from the BEA National Fixed Assets database; we initialize the construction with state-level `capital stock` for *all manufactures* from the Chirinko-Wilson State Manufacturing Database (Chirinko and Wilson, 2009).

Crosswalk designations: To facilitate a consistent time-series across the classification system change in 1997, we identify approximate SIC/NAICS industry crosswalks for manufacturing subgroups as follows:

> *Non-durable goods.* Food, beverage, and tobacco products (NAICS 311-312; SIC 20-21); Textile mill products (NAICS 313-314; SIC 22); Apparel and leather products (NAICS 315-316; SIC 23 and 31); Paper products (NAICS 322; SIC 26); Printing and related activities (NAICS 323; SIC 27); Petroleum and coal products (NAICS 325; SIC 28); Plastics and rubber products (NAICS 326; SIC 30);
>
> *Durable goods.* Wood products (NAICS 321; SIC 24); Nonmetallic products (NAICS 327; SIC 32); Primary metal industries (NAICS 331; SIC 33); Fabricated metal products (NAICS 332; SIC 34); Machinery and computer products (NAICS 333-334; SIC 35); Electronic equipment, appliances, and components (NAICS 335; SIC 36); Motor vehicles and other transportation equipment (NAICS 336; SIC 37); Furniture and fixtures (NAICS 337; SIC 25); Miscellaneous (NAICS 339; SIC 38-39).
>
> *Note: Crosswalks are imperfect, and some sub-industries may cross industry lines between NAICS and SIC years.*

A.2 All Sectors

We compile a supplemental state-year dataset for all industrial sectors covering all U.S. states from 1975-2023 using data from the Bureau of Economic Analysis (BEA) and Bureau of Labor Statistics (BLS). This dataset classifies `establishments`, `employment`, `payroll`, and `value added` across all industries divided into broader industry groupings: approximately 2-digit SIC (1975-2000) and 3-digit NAICS (1997-2023) divisions. This data does not include capital inputs. We again construct a productivity measure as `value added per worker` for `all employees`, and the `labor share of income` as `payroll` divided by `value added`.

A.2.1 Sources

We obtain state-level broader industry data (1975-2023) from the BEA Regional Economic Accounts and BLS Quarterly Census of Employment and Wages. From the BEA, we obtain nominal GDP (`value added`) and real GDP in 2017$ (NAICS)/1997$ (SIC) for broader industry groupings. To match BEA industry classifications and complete the panel, we aggregate across granular sub-industries for BLS variables (`establishments`, `employment`, and `payroll` for *all employees*).[1]

Crosswalk designations: To facilitate a consistent time-series across the classification system change in 1997, we identify approximate SIC/NAICS industry crosswalks for industry sectors as follows:

> Agriculture, Forestry, Fishing, and Hunting (NAICS 11; SIC 01-09); Mining, Oil, and Gas (NAICS 21; SIC 10-14); Utilities (NAICS 22; SIC 49); Construction (NAICS 23; SIC 15-17); Manufacturing (NAICS 31-33; SIC 20-39); Wholesale Trade (NAICS 42; SIC 50-51); Retail Trade and Services (NAICS 44-45, 56, 61, 62, 71, and 72; SIC 52-59 and 70-89); Transportation and Warehousing (NAICS 48-49; SIC 40-42 and 44-47); Finance, Insurance, and Real Estate (NAICS 52-53; SIC 60-67).
>
> *Note: Crosswalks are imperfect, and some sub-industries may cross industry lines between NAICS and SIC years.*

Years	*Classification*	*Original Source*	*Mfg.*	*All.*
2018-2021	2017 NAICS	Census Table `ASMAREA2017.AM1831BASIC01`	✓	
2017	2017 NAICS	Census Table `ECNBASIC2017.EC1731BASIC`		
2003-2016	2012 NAICS	ASM API for Statistics by State		
2002	1997 NAICS	Census directory `econ2022/EC/Sector31` Table `EC0231A1` (State) and Table `EC0231SG102` (U.S.)		
1998-2001	1997 NAICS	Stats Indiana interface for ASM		
1997	1997 NAICS	Census directory `econ1997/EC/sector31` Table `E9731A1` (State) and Table `E9731G1B` (U.S.)		
1996	1992 SIC	ASM publication *Geographic Area Statistics* Table 2 (State) and *Statistics for Industry Groups* Table 5 (U.S.)		
1987-1995	1992 SIC	Census directory `econ1992/SURVEYS/ASM` Table `ASM A2` (State) and Table `ASM I3` (U.S.)		
1947-2023	*Linecode* NAICS	BEA *Industry Economic Accounts Data*	✓	
1947-1997	*Linecode* SIC	BEA Historical Industry Accounts: *GDP by Industry*		
1947-2023	*Linecode* NAICS	BEA *Fixed Assets* Table `Section3`	✓	
1947-2001	*Linecode* SIC	BEA Data Archive (2001): *Fixed Asset* Table `FASection3`		
1997-2023	*Linecode* NAICS	BEA *Regional Economic Accounts* Table `SAGDP`		✓
1947-2001	*Linecode* SIC	Table `SAGDP SIC`		
1998-2023	*Linecode* NAICS	BEA *Regional Economic Accounts* Table `SAINC N`		✓
1958-2001	*Linecode* SIC	Table `SAINC S`		
1990-2024	2012 NAICS	BLS *Quarterly Census for Employment and Wages*		✓
1975-2000	1987 SIC			
1963-2006	*All Manufactures*	Chirinko-Wilson State Manufacturing Database	✓	
1958-2018	2012 NAICS	NBER-CES Manufacturing Industry Database	✓	
	1987 SIC			

Table 2: Data Sources by Dataset: Manufacturing (*Mfg.*) and All Sectors (*All.*)

[1] We use `payroll` from the BLS QCEW in the paper to measure labor costs and wages, but we also collect data on `payroll` and `compensation` from the BEA Regional Economic Accounts.

A.3 Variable Construction

In this section, we define variable constructions for the Manufacturing and Broader Industry datasets. **Unless specified, let all variables be defined in terms of state s, year t, and industry n.** Notationally, we denote values for the United States as $s = 0$ and values for all manufacturing as $n = \text{mfg}$.

A.3.1 Nominal adjustment

We normalize price deflators ($p : year = any$) to ($p : 1997 = 1.00$) for year t as

$$p_t^{1997=1.00} = \frac{p_t^{year=any}}{p_{1997}^{year=any}}.$$

For any nominal variable V, real variable Υ in $year$ dollars, and respective price deflator ($p^V : year = 1.00$):

$$p^{V,\, year=1.00} = \frac{V}{\Upsilon^{year\$}}.$$

Assumptions: Given nominal variable V and price deflators p^V for sub-industries $n \in \{m_j\}_j$, let the unknown price deflator for super-industry $n = \cup\{m_j\}_j$ be

$$p^V_{n=\cup\{m_j\}_j} = \frac{V_{\cup\{m_j\}_j}}{\upsilon_{\cup\{m_j\}_j}} = \frac{\sum_j V_{m_j}}{\sum_j \upsilon_{m_j}} = \frac{\sum_j V_{m_j}}{\sum_j (\frac{V_{m_j}}{p^V_{m_j}})}.$$

For sub-industry $n = m_j$ with an *unknown* price deflator, assume its price deflator takes the value from its closest super-industry $n = \cup\{m_j\}_j$ with a known price deflator s.t. $p^V_{n=m_j} := p^V_{n=\cup\{m_j\}_j}$. Additionally, assume price deflators are consistent across all states s.t. $p^V_s := p^V_{s=0}$.

Relevant variables: `value added, materials costs, sales, capital investment`

A.3.2 Capital investment

Given new investment I^{NEW} and used investment I^{USED}, define total capital investment I for state s as

$$I_s = I_s^{NEW}\left(\frac{I_{s=0}^{USED} + I_{s=0}^{NEW}}{I_{s=0}^{NEW}}\right).$$

A.3.3 Capital stock

Following the perpetual inventory method: given real capital investment ι and real capital stock κ of state s with depreciation rate δ in year t, iteratively compute capital stock for the following year as

$$\kappa_{s,t+1} = \kappa_{s,t}(1 - \delta_{s=0,t}) + \iota_{s,t}.$$

Assumptions: Initialize real capital stock $\kappa_{t=\tau}$ in year $t = \tau$ for industry n and state s as the proportionally scaled capital stock with respect to all manufacturing in state s, or $\forall s, t = \tau :$

$$\kappa_n = \kappa_{n=\text{mfg}} * \frac{\hat{\kappa}_n}{\hat{\kappa}_{n=\text{mfg}}}$$

where $\hat{\kappa}_{s,t=\tau}$ is a five-year average of the overall capital stock for that industry scaled by the share of nationwide investment for industry n in state s, or

$$\hat{\kappa}_{s,t=\tau} = \frac{1}{5}\sum_{t=\tau}^{\tau+4}(\kappa_{s=0,t} * \frac{\iota_{s,t}}{\iota_{s=0,t}}).$$

Depreciation rate. For depreciation D and nominal capital stock K, compute the depreciation rate δ in year t for industry n as

$$\delta_t = \frac{D_t}{K_{t-1}}.$$

Assumptions: For sub-industry $n = m_j$ with *unknown* `depreciation` or `capital stock`, given its closest super-industry $n = \cup\{m_j\}_j$ with known depreciation or capital stock (respectively), let the unknown value V for the sub-industry be that of the super-industry scaled by investment I, or

$$V_{n=m_j} = V_{\cup\{m_j\}_j} * \frac{I_{m_j}}{I_{\cup\{m_j\}_j}}$$

Additionally, assume the depreciation rate is consistent across all states s.t. $\delta_s := \delta_{s=0}$.

A.3.4 Productivity

We estimate productivity Φ as output per worker:

$$\Phi = \frac{output}{workers}$$

Output: `value added`
Workers: `employment (all)`, `employment (production workers)`

A.3.5 Labor share of income

We estimate the labor share of income Λ as income divided by output:

$$\Lambda = \frac{income}{output}$$

Income: `payroll (all)`, `payroll (production workers)`
Output: `value added`

B Data Cleaning

We take two further steps to avoid missing or erroneous data: first, we omit any state-industry-subexperiment (or state-subexperiment, in the regional accounts data) for which wages are reported as zero or missing in any year in the subexperiment. Wages may be reported as zero for privacy protection purposes if sample sizes are low. Therefore, changes from a positive wage to a zero wage year-over-year do not reflect large wage decreases; rather, they simple reflect the number of workers being pushed over a relevant privacy threshold. Second, in the manufacturing data, we omit any industries for which value added is reported as negative in any year. Large negative values likely represent errors in the underlying Census data or unrelated underlying business cycle dynamics. This issue affects six four-digit NAICS industries (3252, 3312, 3313, 3321, 3334, and 3336). Since the issue is not widespread, we omit these industries out of an abundance of caution.