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Robustness Report on “Coercive Contract Enforcement: Law and the Labor Market in Nineteenth Century Industrial Britain”, by Suresh Naidu and Noam Yuchtman (2013)*

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Abstract

[Naidu and Yuchtman \(2013\)](#) find that labor demand shocks in 19th-century Britain had an impact on master and servant prosecutions, as breaking an employee contract was a criminal offense until 1875. We first reproduce all regression tables in [Naidu and Yuchtman \(2013\)](#) and then test for robustness by using a triple difference where we compare the impact of labor demand shocks on master and servant prosecutions relative to other prosecutions, changing the functional form of key variables, including region*year interactive fixed effects, and conducting influential analysis. We find that the results are sensitive to the triple difference specification and to region*year FEs, and otherwise robust. Overall, we find the results are robust in 50% of the checks we ran, and the t/z scores were on average 74% as large as the original study.

JEL Classification: J31, J41, K12, K31, N33, N43

Keywords: Labor Law, Contract Law, Labor Contracts, Labor Market Institutions, Economic History

*This robustness report was written as part of a meta-robustness project entitled “The robustness reproducibility of the American Economic Review”. See [Campbell, Brodeur, Dreber, Johannesson, Kopecky, Lusher and Tsoy \(2024\)](#) for more information.

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1 Introduction

In the 19th century, British Master and Servant law made it a criminal offense to break an employee contract. [Naidu and Yuchtman \(2013\)](#) – hereafter, NY – study the impact of coercive labor market institutions, and find that positive exogenous labor demand shocks during this period increased master and servant prosecutions. Running a panel difference-in-difference, NY find that counties with initially higher levels of cotton textiles production experienced rather more master and servant prosecutions when the textile price to cotton ratio was high.

We first replicate all the regression tables in NY exactly using the data and code provided by the authors on the AER website. We then run several robustness checks on what we view as the key identified result. These include adopting a triple difference, normalizing master and servant prosecutions at the county level by other prosecutions, controlling for other prosecutions instead, including region*year interactive fixed effects (FEs), using textile prices instead of the price ratio, and conducting influential analysis via a quantile regression and omitting influential observations with large calculated dfbeta statistics.

We find that the results are sensitive to adopting a triple difference, and to including region*year interactive FEs. In addition, we find the results are robust to controlling for other prosecutions, influential analysis and using textile prices in place of the textile price ratio. Overall, 50% of the 12 robustness checks we ran were significant at the 5% level with a coefficient in the same direction as the original study. On average, we find that t/z-scores are 74% of the benchmark, ranging from 31.6% to 124% (that is, in one case our t-values were 24% larger than what the original authors found). Of the various robustness checks we ran, we prefer those that either use a triple difference or control for non-master and servant prosecutions, and also have a weak preference for those that include region*year FEs. The significance of these four fairly similar specifications varies wildly, as we find the results are (1) highly robust when we control for other prosecutions and

omit region*year FEs, (2) borderline insignificant at 10% when we control for other prosecutions and include region*year FEs, and (3) not robust when we use the triple difference, with or without the additional FEs. These myriad results are somewhat puzzling but point to how finicky statistical results can be when one makes slight changes to a regression specification with real data.

2 Replication

2.1 Regression model

We chose NY Table 3, column (6) as the main benchmark result we will test robustness for.¹ We adopt the same empirical specification as NY, using an identical difference-in-difference approach at the county level.

$$\ln(\text{Prosecutions}/\text{Population})_{ct} = \beta_1 \text{Industry}_c * \log(\text{IndustryPrice}_t) + \delta_c + \delta_t + \sum_{t=1858}^{1875} \beta_t X_{c,1851} + \epsilon_{ct} \quad (1)$$

Where the prosecutions are master and servant prosecutions for 52 counties c at time t (from 1858 to 1875). We focus here on the cotton textile industry, so the Industry_c variable is the fraction of men who were in the textile industry in the 1851 census, and the price is the ratio of the price of cotton textiles to the price of raw cotton. There are also controls for year and county fixed effects, and also time-varying controls interacted with initial economic conditions in 1851. These include 1851 income, 1851 population density, 1851 proportion urban and a dummy for Wales interacted with year.

We also add in a triple difference, using county-level master and servant prose-

¹We chose this regression because it (a) is at the county level, which is preferable since we do not have district-level data on population and employment patterns, (b) normalizes prosecutions by population, which is also preferable, (c) includes other time-varying controls, and (d) uses a log transformation, which might make it slightly preferable to column (4) in Table 3, although either could have been used. We chose the interaction term “Fraction textiles*log(cotton price ratio)” as the key variable because the iron and coal interactions were not significant at a 95% level of confidence in this regression.

cutions relative to other non-master and servant prosecutions:

$$\ln(RelativeProsecutions)_{ct} = \beta_1 Industry_c * \log(IndustryPrice_t) + \delta_c + \delta_t + \sum_{t=1858}^{1875} \beta_t X_{c,1851} + \epsilon_{ct} \quad (2)$$

Note that NY do an exercise where they used non-master and servant prosecutions as the dependent variable in a placebo test, albeit it was done at the district level. Here we focus on the county level because the prosecution data is at the county level.

2.2 Computational Reproduction

We first completed computational reproduction for all the regression tables in this paper, and, using the author-provided data and code, were able to reproduce the coefficients from the original result exactly.² In this note, we show the replicated results of NY Table 3, column (6) in our [Table 1](#), column (1). For example, the original paper estimated a coefficient of 1.67 with a t-value of 2.21 on the interaction term between fraction textiles in 1851 and the log cotton price ratio. Note that the other two key variables in this regression reflecting labor demand shocks, including the coal county*log(coal price) and iron county*log(iron price) variables are already not statistically significant at the 5% level.

2.3 Robustness Results

2.3.1 A Triple Difference and Regional Fixed Effects

First we adopted our triple difference in [Equation 2](#) and report the results in [Table 1](#) column (2). We find that the coefficient on the interaction term of fraction textiles in 1851*log(cotton price ratio) drops from 1.67 to .7, and the t-value also falls to

²Note that this study was not pre-registered. We implemented the computational replication before designing the robustness plan, and our study gives full leeway to the replicators to add more robustness checks after coming in contact with the data and even after beginning to run robustness checks. All robustness checks run on the paper's key results are recorded here.

.7 and is no longer statistically significant at conventional levels. In column (3), we add region*year FEs to Equation 1 and find that a coefficient of 1.13, with a t-value of 1.03, and thus also not statistically significant at conventional levels.³ In column (4), we replace the log cotton price ratio with the cotton price. The coefficient and standard errors are little changed from the benchmark regression. In column (5), we use the log cotton price in place of the log cotton price ratio, and we find that the t-value increases.

Table 1: Impact of Sectoral Shocks on Master & Servant Prosecutions: Robustness

	(1)	(2)	(3)	(4)	(5)
	b/se/t/p	b/se/t/p	b/se/t/p	b/se/t/p	b/se/t/p
Frac. textiles 1851*					
ln(cotton price ratio)	1.670 (0.75) [2.21] {0.032}	0.702 (1.00) [0.70] {0.487}	1.129 (1.10) [1.03] {0.309}		
Coal county*log(coal price)	0.248 (0.16) [1.52] {0.136}	0.134 (0.31) [0.44] {0.665}	0.252 (0.21) [1.20] {0.237}	0.246 (0.16) [1.49] {0.142}	0.242 (0.16) [1.47] {0.148}
Iron county*log(iron price)	0.320 (0.18) [1.79] {0.079}	0.215 (0.26) [0.83] {0.409}	-0.120 (0.47) [-0.25] {0.801}	0.320 (0.18) [1.80] {0.078}	0.319 (0.18) [1.79] {0.079}
Frac. textiles 1851*cotton price				1.678 (0.76) [2.20] {0.032}	
Frac. textiles 1851*ln(cotton price)					0.880 (0.39) [2.25] {0.029}
Observations	930	925	930	930	930
Notes	Bench.	Δ Dep.Var.	+FEs	Δ Var.	$\Delta Var.$

Notes: This table first replicates Table 3, column (6) of NY in the first column. Other controls from NY are omitted for space (these include year interacted with 1851 population density, income, and urbanization rates, and year interacted with a Wales dummy). Each regression includes county and year FEs. The dependent variable in columns (1), and (3)-(5) is county-level log master and servant prosecutions per capita. Column (2) uses master and servant prosecutions relative to vagrancy prosecutions. Columns (4) and (5) use a slightly different functional form of prices for the variable of interest. The panel includes 52 counties from 1858 to 1875.

³We included 8 regions total including Wales as a separate region. Traditionally, England is divided into 8 regions but we included Yorkshire as part of the neighboring northeast and London as part of the neighboring southeast.

2.3.2 Additional Robustness

Next, in [Table 2](#), instead of a triple difference, we control for log non-master and servant prosecutions instead. We find that other prosecutions are hardly correlated with master and servant prosecutions in this regression, but that the fraction textile*price interaction term is. To us, this difference is slightly puzzling, as these would seem to be two similar ways of controlling for the same concern. Note that the raw correlation between master and servant prosecutions per capita and non-master and servant prosecutions at the county level is only 0.12, and the latter variable is not significant when we control for it here. In column (2), we additionally add in fixed effects, and once again find that the coefficient on fraction textiles in 1851 interacted with the log cotton price ratio is not a statistically significant predictor of master and servant prosecutions, with a t-value of 1.58 and a p-value of 0.12. In column (3), we run our triple difference with region*year FEs, and get a large coefficient but with large errors, and a t-value of 0.76, insignificant at conventional levels. In column (4), we try removing the controls created by interacting initial period economic conditions with year dummies, and our results get slightly stronger. Lastly, we run the triple difference without the interactive controls, and once again this renders our key variable of interest insignificant at conventional levels.

Table 2: Additional Robustness: Control Variables

	(1)	(2)	(3)	(4)	(5)
	b/se/t/p	b/se/t/p	b/se/t/p	b/se/t/p	b/se/t/p
Frac.text.1851*ln(cotton price rat.)	1.683 (0.75) [2.23] {0.030}	1.642 (1.04) [1.58] {0.121}	1.697 (2.24) [0.76] {0.453}	1.780 (0.65) [2.75] {0.008}	0.909 (0.95) [0.96] {0.340}
ln(Other prosecutions)	0.0164 (0.055) [0.30] {0.767}	-0.0197 (0.044) [-0.45] {0.657}			
Coal county*ln(coal price)	0.247 (0.16) [1.50] {0.140}	0.255 (0.21) [1.21] {0.232}	0.195 (0.34) [0.57] {0.572}	0.296 (0.14) [2.07] {0.044}	0.257 (0.24) [1.07] {0.290}
Iron county*ln(iron price)	0.321 (0.18) [1.80] {0.079}	-0.104 (0.46) [-0.23] {0.822}	0.752 (0.42) [1.80] {0.078}	0.360 (0.18) [1.95] {0.056}	0.620 (0.29) [2.17] {0.035}
Observations	925	925	925	930	925
Notes	+Control	+FEs	Δ Dep.Var.	-Controls	Δ Dep.Var.

Notes: The dependent variable is county-level log master and servant prosecutions per capita for columns (1), (2), and (4). In columns (3) and (5), it is master and servant prosecutions relative to vagrancy prosecutions. County and year FEs are included in all regressions. Other controls from NY (year interacted with 1851 population density, income, and urbanization rates, and year interacted with a Wales dummy) are omitted for space in columns (1)-(3), and omitted altogether in columns (4) and (5). The panel spans from 1858 to 1875.

2.3.3 Influential Analysis

Next, we conduct influential analysis in [Table 3](#). First, we run the original specification from NY Table 3, column (6) using a quantile regression. The key coefficient increases from 1.67 to 2.05, and the t-value increases slightly. In column (2), we compute dfbeta statistics for each observation using our benchmark regression, and then purge outliers with a dfbeta statistic with an absolute value higher than the (standard) cutoff of $2/\sqrt{N} = 2/\sqrt{930} = .065$.⁴ The coefficient on labor demand shocks in the textile industry remains significant at 5%, although the coefficient and t-value decrease slightly. In column (3), we compute dfbeta statistics for the triple difference, and once again find that the various labor demand shocks do not have an impact on master and servant prosecutions.

⁴We use the dfbeta command in Stata.

Table 3: Dropping Control Variables & Influential Analysis

	(1)	(2)	(3)
	b/se/t/p	b/se/t/p	b/se/t/p
Frac.text.1851*ln(cotton price rat.)	2.049 (0.92) [2.22] {0.027}	1.504 (0.72) [2.08] {0.043}	0.760 (0.95) [0.80] {0.426}
Coal county*ln(coal price)	0.258 (0.19) [1.35] {0.178}	0.160 (0.15) [1.05] {0.297}	0.0910 (0.29) [0.31] {0.755}
Iron county*ln(iron price)	0.314 (0.17) [1.86] {0.064}	0.329 (0.17) [1.90] {0.064}	0.256 (0.25) [1.03] {0.308}
Observations	930	885	894
Notes	Quantile	-Outliers	Δ Dep.Var.

Notes: Column (1) re-runs the benchmark specification using a quantile regression. Columns (2) and (3) drop outliers with large absolute dfbeta statistics. Column (3) is a triple difference using master and servant prosecutions relative to vagrancy prosecutions. County and year FEs are included in all regressions. The panel spans from 1858 to 1875.

3 Conclusion

Overall, we find that the positive impact of textile price shocks on master and servant prosecutions in counties with more workers in textile manufacturing is robust at the 5% significance level in 50% of the 12 regressions we ran. On average, we find that t/z-scores were 74% of the original study, ranging from .34 to 1.24. We conclude that the apparent positive impact of labor demand shocks on prosecutions can be sensitive in some specifications, and is robust in others.

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