Early 20th Century Industrialization:

Equitable Income Growth Through Manufacturing Productivity Improvement

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ABSTRACT

- The rapid industrialization occurring from the late 19th century into the early 20th century provides the opportunity to study the impacts it brought for American life
- Specifically, this paper investigates how changes in labor productivity from the rise of industrialization impacted total, personal, and corporate income per capita at the state level
- The results showcase equitable income growth, where workers are benefiting more from labor productivity increases than corporations
- Our data is from the Statistics of Income Report and the Statistical Abstract of the United States which is used to collect information spanning from 1899-1940 across 49 U.S. States

CONCEPTUAL FRAMEWORK

Promoting Effect:

Positive Hypothesis Channels:

- Output Channel: Use economic reasoning to state that an increase in labor productivity will increase output, which subsequently increases income
- Human Capital Channel: Look at spillover effects such as an increase in skilled workers (Goldin and Katz, 1998) and continuous cycle of R&D with new technologies (Sokoloff and Khan, 1990)
- Economics of Scale Channel: Idea that firms larger in size have greater rates of productivity, resulting in higher wages paid (Miller, 1978)

Counteracting Effect:

Negative Hypothesis Channels:

- Mass Production Channel: Idea that mass production decreases the need for skilled labor, which may be reflected by lower incomes (Mitchell, 2001)

METHODS AND DATA

Regression Equations:

Total Income Per Capita:

$totincpc_{s,t} = \beta_0 + \beta_1 * labprod_{s,t} + \varepsilon_{s,t}$

$totincpc_{s,t} = \beta_0 + \beta_1 * labprod_{s,t} + \beta_2 * firmsize_{s,t} + \varepsilon_{s,t}$

$totincpc_{s,t} = \beta_0 + \beta_1 * labprod_{s,t} + \beta_2 * firmsize_{s,t} + \beta_3 * capint1_{s,t} + \varepsilon_{s,t}$

$totincpc_{s,t} = \beta_0 + \beta_1 * labprod_{s,t} + \beta_2 * firmsize_{s,t} + \beta_3 * capint2_{s,t} + \varepsilon_{s,t}$

$totincpc_{s,t} = \beta_0 + \beta_1 * labprod_{s,t} + \beta_2 * firmsize_{s,t} + \beta_3 * capint2_{s,t} + \beta_4 * urbanization_{s,t} + \varepsilon_{s,t}$

Personal Income Per Capita:

$personalincpc_{s,t} = \beta_0 + \beta_1 * labprod_{s,t} + \varepsilon_{s,t}$

$personalincpc_{s,t} = \beta_0 + \beta_1 * labprod_{s,t} + \beta_2 * firmsize_{s,t} + \varepsilon_{s,t}$

$personalincpc_{s,t} = \beta_0 + \beta_1 * labprod_{s,t} + \beta_2 * firmsize_{s,t} + \beta_3 * capint1_{s,t} + \varepsilon_{s,t}$

$personalincpc_{s,t} = \beta_0 + \beta_1 * labprod_{s,t} + \beta_2 * firmsize_{s,t} + \beta_3 * capint2_{s,t} + \varepsilon_{s,t}$

$personalincpc_{s,t} = \beta_0 + \beta_1 * labprod_{s,t} + \beta_2 * firmsize_{s,t} + \beta_3 * capint2_{s,t} + \beta_4 * urbanization_{s,t} + \varepsilon_{s,}$

Corporate Income Per Capita:

$corpincpc_{s,t} = \beta_0 + \beta_1 * labprod_{s,t} + \varepsilon_{s,t}$

$corpincpc_{s,t} = \beta_0 + \beta_1 * labprod_{s,t} + \beta_2 * firmsize_{s,t} + \varepsilon_{s,t}$

$corpincpc_{s,t} = \beta_0 + \beta_1 * labprod_{s,t} + \beta_2 * firmsize_{s,t} + \beta_3 * capint1_{s,t} + \varepsilon_{s,t}$

$corpincpc_{s,t} = \beta_0 + \beta_1 * labprod_{s,t} + \beta_2 * firmsize_{s,t} + \beta_3 * capint2_{s,t} + \varepsilon_{s,t}$

$corpincpc_{s,t} = \beta_0 + \beta_1 * labprod_{s,t} + \beta_2 * firmsize_{s,t} + \beta_3 * capint2_{s,t} + \beta_4 * urbanization_{s,t} + \varepsilon_{s,t}$

Table 1. Variable Summary Table

Variable	Number of Observations	Mean	Median	Std. Dev.	Min	Max
totincpc	1225	210	158	217	11.5	2744
personalincpc	1225	148	119	109	6.04	692
corpincpc	1225	62.2	34	142	0.123	2225
labprod	730	2.45	2.44	1.12	0.486	10.8
firmsize	734	202	188	132	10.5	943
capint1	98	13119	9909	9700	2772	53823
capint2	440	4.27	3.94	2.04	1.02	17.1
urbanization	735	44.3	39	22.1	6.2	100

SCATTERPLOTS

Figure 1. Total Income Per Capita Graph

Figure 2: Personal Income Per Capita Graph

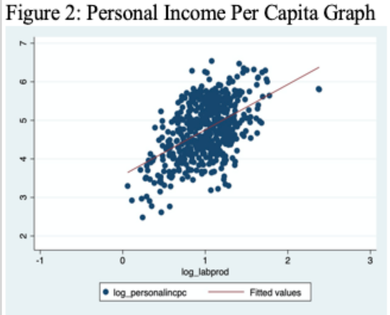
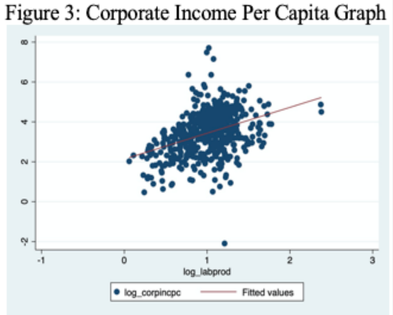


Figure 3: Corporate Income Per Capita Graph



RESULTS

Table 2: Regression results for total income per capita using our independent variables

	(1) log_totincpc	(2) log_totincpc	(3) log_totincpc	(4) log_totincpc	(5) log_totincpc
log_labprod	1.217***	1.068***	0.697**	1.037***	0.491***
	(12.93)	(11.26)	(2.49)	(7.14)	(4.47)
firmsize		0.00147***	0.00121*	0.00116***	0.000188
		(5.84)	(1.90)	(3.55)	(0.74)
capint1			0.00000942		
			(1.16)		
capint2				-0.0848***	0.00475
				(-4.88)	(0.35)
urbanization					0.0235***
					(16.41)
_cons	3.804***	3.581***	4.057***	4.277***	3.587***
	(38.41)	(34.61)	(20.49)	(27.36)	(29.31)
N	535	535	98	245	196
adj. R^2	0.237	0.282	0.247	0.280	0.709

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Regression results for personal income per capita using our independent variables

	(1) log_personalincpc	(2) log_personalincpc	(3) log_personalincpc	(4) log_personalincpc	(5) log_personalincpc
log_labprod	1.177***	1.089***	0.826***	1.059***	0.496***
	(13.53)	(12.19)	(2.94)	(7.45)	(4.84)
firmsize		0.000872***	0.000259	0.000628*	-0.000346
		(3.67)	(0.40)	(1.96)	(-1.45)
capint1			0.00000517		
			(0.63)		
capint2				-0.0703***	0.0180
				(-4.13)	(1.41)
urbanization					0.0238***
					(17.79)
_cons	3.578***	3.446***	3.971***	4.025***	3.355***
	(39.07)	(35.37)	(19.92)	(26.28)	(29.36)
N	535	535	98	245	196
adj. R^2	0.254	0.271	0.192	0.245	0.723

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Regression results for corporate income per capita using our independent variables

	(1) log_corpincpc	(2) log_corpincpc	(3) log_corpincpc	(4) log_corpincpc	(5) log_corpincpc
log_labprod	1.297***	0.933***	0.372	0.895***	0.398**
	(9.32)	(7.05)	(1.02)	(4.76)	(2.44)
firmsize		0.00359***	0.00448***	0.00261***	0.00172***
		(10.20)	(5.40)	(6.19)	(4.54)
capint1			0.0000124		
			(1.17)		
capint2				-0.133***	-0.0289
				(-5.90)	(-1.43)
urbanization					0.0242***
					(11.35)
_cons	2.135***	1.591***	1.850***	2.853***	1.936***
	(14.59)	(11.03)	(7.16)	(14.11)	(10.65)
N	535	535	98	245	196
adj. R^2	0.139	0.278	0.369	0.297	0.607

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

CONCLUSION

Our results show a statistically significant and positive relationship between labor productivity and total, personal, and corporate income per capita. Personal income per capita has the highest coefficient, showing that workers benefited more from the increase in labor productivity than corporations.