Regional Convergence and Technological Progress in American Manufacturing before World War II

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1 Introduction

This proposal presents five facts about income and productivity convergence within the manufacturing economy of the United States between 1900-1940 that follow from applying existing economic theory to new data from the US Census of Manufactures.

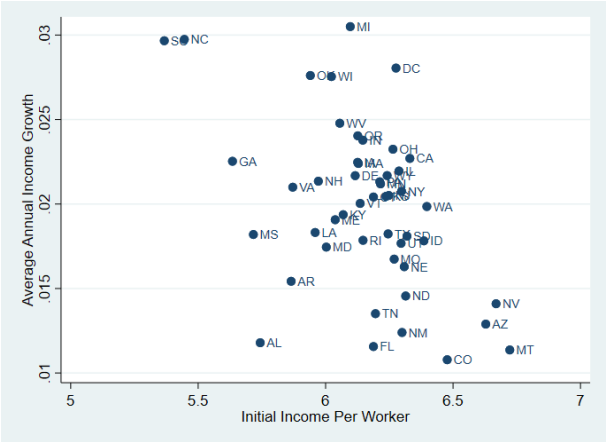
These new data allow for tests of convergence along the dimensions of states (cities), industry groups (2 or 3 digit SIC), time, and worker type that directly contribute to the extensive literature on income and productivity convergence in the United States. The first three dimensions have been exploited by others (Evans and Karras, 1996b; Higgins et al., 2006; Bernard and Jones, 1996), but this paper will be the first to use a new data set to exploit the first three dimensions and is the first to measure convergence for different worker types. These new insights demonstrate that regional differences were less pronounced in manufacturing than in all economic sectors and that these differences were even smaller for skilled workers (Barro and i Martin, 1991, 1992; Evans, 1997).

The results regarding regional differences in manufacturing also contribute to a broader literature on economic integration taking place in the United States during this period (Kim, 1995, 1998; Mitchener and McLean, 1999; Wright, 1999; Rosenbloom, 2002). As I show in other work, manufacturing was more similar across regions than other parts of the economy. Additionally, labor markets for highly skilled industrial workers were particularly well integrated.

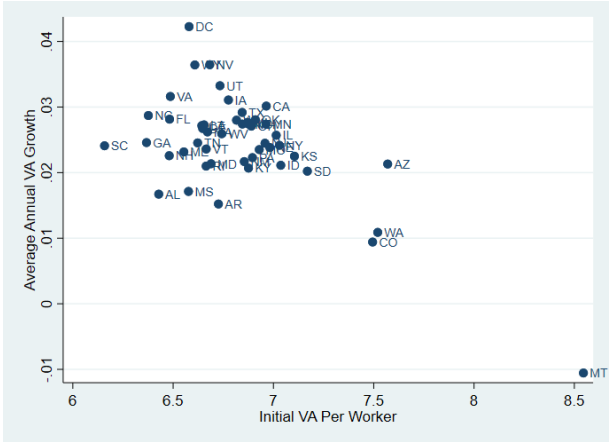
Figure 1 presents a scatter plot of manufacturing income per worker (income) or value added per worker (productivity) in 1900 against the average annual growth in either variable between 1900 and 1940 for each of the continental United States and the District of Columbia. In both cases a strong negative relationship indicates that states in 1900 with larger income or productivity grew at a slower rate than states with lower initial values. Additionally, states with higher income tended to have higher productivity.

Figure 1a is comparable to Figure 1 from Barro and i Martin (1992) while Figure 1b is comparable to Figure 3 from Rodrik (2013). Figure 1a covers a shorter time period, 1900-1940 instead of 1880-1988 and only includes activity recorded by the US Census of Manufactures instead of income estimates for multiple sectors of the economy. The later period, focus only on industrial activity,

Figure 1: Convergence in Income Per Worker and Value Added Per Worker



(a) This figure scatters the average annual growth rate in income per worker between 1900-1940 against 1900 log income per worker using data from the US Census of Manufactures.



(b) This figure scatters the average annual growth rate in value added per worker between 1900-1940 against 1900 value added per worker using data from the US Census of Manufactures.

and use of income per worker instead of income per capita, all explain why the log of initial income per worker is so much larger. Growth rates also tended to be larger than in previous work, likely because growth in industry exceeded growth in the entire economy.

In Rodrik (2013) the emphasis is on convergence in value added per worker, a measure of worker productivity. The premise of the paper is that convergence in income may not take place when convergence in productivity does if the manufacturing economy is small relative to the rest of the economy or if other sectors of the economy are significantly divergent. Historically, the United States experienced convergence in manufacturing income and productivity. This paper performs no causal analysis arguing that productivity drove income convergence or the reverse, but the association is useful to highlight, particularly if the trajectory of this growth is comparable to the experience of any developing nations today.

To formally measure convergence this paper uses the estimation strategy employed by Rodrik (2013). The estimating equation involves regressing the change in log income per worker or log value added per worker on the initial value of either outcome at the state-industry group-year triple level. While there is an extensive literature debating best practices when it comes to estimating convergence rates (Kremer et al., 2021; Durlauf et al., 2005; Acemoglu et al., 2005; Evans and

Karras, 1996a) the (Rodrik 2013) approach is the most appropriate for the type of data used in this paper since historical price data at the state industry group do not exist. The following sections of the paper all use versions of this estimation strategy and yield results that are consistent with the existing literature.

2 Data

The data used in this paper come from reports in the United States Census of Manufactures for each decade end year between 1900-1940. These reports include the number of establishments, wage earners, salaried workers, along with wage bills for wage earners and salaried workers, as well as value, and value added for all sizable industrial activity within each state. The industrial activity is then aggregated to an industry group level. In this paper the industry group level is equivalent to SIC-2 classifications, but the results are robust to using a finer SIC-3 classification.

In each year there are 49 states and twenty industry groups so that the total number of state-industry group pairs in any given year is 980. Growth rates of each relevant variable are computed by taking the difference in natural logs of the relevant variable between two years. Growth rates are computed for 1900 to 1910, 1910 to 1920, 1920 to 1930, and 1930 to 1940. Thus the final number of total possible observations used in the baseline analysis is 3920. However, there are states that did not engage in some industrial activity so there are null values in the data.

Income per worker is computed by summing the wage bill for salaried workers and wage earners for each state industry group pair and dividing it by the sum of salaried workers and wage earners. Value added is computed by dividing value added by the sum of wage earners and salaried workers for each state industry group pair. The 1900 Census did not record value added so these values are imputed using value added per worker from the 1910 Census of Manufactures from the state three-digit SIC industry group level.

3 Estimation Strategy

The main estimating equation for this paper is equation 1. In the equation i indexes industry groups, j indexes states, and t indexes year pairs. $\hat{Y}_{ijt} = 0.1(ln(Y_{ijt+1}) - ln(Y_{ijt}))$. Y_{ijt} is either income per worker or value added per worker. An observation on the left hand side is the outcome variable for a given state-industry group-year triple. An observation on the right hand side is the annualized growth rate of the left hand side variable.

Because historical price data do not exist to reliably measure differences in price levels between state-industry groups, let alone states, this estimation strategy includes D_{it} fixed effects which control for potential differences in price levels between industry groups. It only requires that inflation did not differ across industry groups. The fixed effects also control for the fact that some industry groups in some years may be associated with faster convergence. D_j are included in some specifications when the test is of convergence conditional on time-invariant features of each state. β measures the speed of convergence with a larger β indicating a faster rate of convergence.

$$\hat{Y}_{ijt} = -\beta ln(Y_{ijt}) + D_{it} + D_j + \epsilon_{ijt} \tag{1}$$

4 Results

4.1 Convergence in Income was Faster in Manufacturing, Convergence in Value Added was Faster Still

Table 1 highlights the first key fact: convergence in productivity outpaced convergence in income. This is the first paper that estimates both rates of convergence using the same data so it is not possible to identify if this an American phenomena or generally true. One implication of this trend is that firms may have been able to adopt best practices and techniques to improve worker efficiency while also having enough monopsony power to at least slow worker income growth.

The first estimate -0.046 for unconditional income per worker convergence is similar to the

findings of (Barro et al. 1991) for the industrial sector. The stronger value of -0.07 for conditional convergence is consistent with the literature where convergence rates are faster when state/county fixed effects are included (Rodrik 2013).

Table 1: Convergence in Income Per Worker and Productivity

	Growth Rate			
	(1)	(2)	(3)	(4)
ln_Inc_Worker	-0.0460***		-0.0705***	
	(0.00361)		(0.00426)	
ln_VA_Worker		-0.0710***		-0.0820***
		(0.00442)		(0.00433)
State FE	No	No	Yes	Yes
Observations	2,889	2,866	2,889	2,866
R-squared	0.743	0.712	0.772	0.748

Note: This table includes baseline estimates of (1) using data on income per worker and value added per worker found in the US Census of Manufactures for the years 1900-1940. 1900 value added is imputed using 1910 value added. The year pairs included are 1900-1910, 1910-1920, 1920-1930, and 1930-1940.

The values for productivity convergence in the United States are substantially greater than those found for cross-country comparisons. The equivalent values from Rodrik (2013) were -0.03 for unconditional convergence and -0.05 for conditional convergence in the baseline specification for countries. The stronger rate of convergence in productivity for US states and the smaller gap between the unconditional and conditional elasticities are expected if states share more time invariant features than countries do.

The smaller gap between conditional and unconditional estimates in productivity make sense if the time invariant features of states that lead to different rates of convergence are less meaningful than the time invariant features of countries. The smaller increase in convergence in productivity due to the inclusion of state fixed effects compared to convergence in income per worker also implies that time invariant features of states are less important for worker productivity than for income.

To understand the implications of these two sets of results it is worth clarifying exactly what (1) is estimating with and without the state fixed effects. When only industry-year fixed effects are included β is estimated using variation across states within each industry-year group. The addition

of state fixed effects now uses variation within each state across time while still controlling for the industrial composition of each state in each time period.

4.2 Convergence by Industry Group Different for Income and Productivity

Table 2 presents the second key fact: convergence in income and productivity were present in virtually all industry groups, but the degree of convergence varied substantially by industry group. For many industry groups this simple growth regression has more explanatory power than the baseline specification.

$$\hat{Y}_{jt} = -\beta ln(Y_{jt}) + D_t + \epsilon_{jt} \tag{2}$$

Table 2 is also useful for identifying industry groups that were the most and least conducive to income and productivity convergence. Excluding the miscellaneous category, the industries with the fastest convergence in income are in rubber and scientific instruments. The next tier of industry groups with convergence above -0.06 in magnitude are electronic machinery and the more representative fabricated metals and leather groups. The groups least conducive to convergence in income were highly representative ones like food, lumber, apparel, and transportation.

The groups with the fastest productivity convergence were instruments, leather, miscellaneous, textiles, lumber, and electronic machinery. The groups with the slowest productivity convergence were industrial machinery, rubber, and tobacco. That some of the industry groups with the faster rates of convergence in productivity had the slowest rates of convergence in income merits further study.

4.3 Southern Divisions Similar to National Average

Table 3 presents the third key fact: the three Southern divisions are not substantially different from national averages. Like in Table 2 convergence in income and productivity is present in all

Table 2: Convergence by Industry Group

	Food	Tobacco	Textile	Apparel	Lumber	Furniture
ln_Inc_Worker	-0.0257***	-0.0521***	-0.0391***	-0.0294***	-0.0159***	-0.0504***
	(0.00520)	(0.00734)	(0.00500)	(0.00706)	(0.00586)	(0.00652)
ln_VA_Worker	-0.0449***	-0.0202**	-0.0845***	-0.0712***	-0.0835***	-0.0550***
	(0.00568)	(0.0101)	(0.00943)	(0.0181)	(0.00899)	(0.00693)
Observations	194	134	128	161	191	178
R-squared	0.886	0.672	0.902	0.805	0.860	0.848

Paper	Printing	Chemicals	Petroleum	Rubber	Leather	Stone
-0.0469***	-0.0514***	-0.0404***	-0.0393***	-0.0870***	-0.0683***	-0.0337***
(0.0101)	(0.00684)	(0.00752)	(0.00942)	(0.00876)	(0.0149)	(0.00519)
-0.0653***	-0.0492***	-0.0650***	-0.0547***	-0.104***	-0.0869***	-0.0570***
(0.00580)	(0.00914)	(0.00701)	(0.0110)	(0.00409)	(0.0116)	(0.0103)
117	194	169	66	54	147	191
0.899	0.921	0.753	0.800	0.741	0.769	0.886

Primary Metals	Fabricated Metals	Industrial Machinery	Electronic Machinery	Transportation	Instruments	Miscellaneous
-0.0461***	-0.0631***	-0.0444**	-0.0627***	-0.0246	-0.0810***	-0.0809***
(0.00769)	(0.00925)	(0.0205)	(0.0116)	(0.0178)	(0.0181)	(0.0152)
-0.0708***	-0.0753***	-0.102***	-0.0844***	-0.0333**	-0.0950***	-0.0851***
(0.00629)	(0.0117)	(0.0146)	(0.00870)	(0.0168)	(0.0107)	(0.00897)
185	124	106	94	176	91	189
0.864	0.841	0.443	0.829	0.571	0.562	0.781

Note: This table includes estimates of (2) estimated separately for each industry group using data on income per worker and value added per worker found in the US Census of Manufactures for the years 1900-1940. 1900 value added is imputed using 1910 value added. The year pairs included are 1900-1910, 1910-1920, 1920-1930, and 1930-1940.

regions though there is variation in the speed of convergence. In general, divisions with faster income convergence also experienced faster productivity convergence. If firm monopsony power explains differences in convergence between income and productivity then the results of Tables 2 and 3 indicate that this phenomena should be studied at the industry group level rather than the regional labor market level.

Most papers that have analyzed regional income convergence in the United States have not estimated separate rates of convergence by geographic region. Barro et al (1991) is the exception and the results of this paper stand in stark contrast to their findings though there are several plausible explanations for the differences. They find rates of income per capita convergence are highest in the South with a magnitude of 2.4%, while they are lowest in the West with a magnitude of 1.2%. These results fit within a dominant narrative in economic history which is that the South was poorer and poorly integrated with the rest of the United States (Rosenbloom, 2002; Wright, 1999).

Because their work studied a longer time period, 1880-1988, and used estimates of income per

Table 3: Convergence by Census Division

	Northeast	Middle Atlantic	East North Central	West North Central
ln_Inc_Worker	-0.0494***	-0.0133***	-0.0190***	-0.0376***
	(0.00676)	(0.00509)	(0.00693)	(0.00872)
ln_VA_Worker	-0.0572***	-0.0249***	-0.0334***	-0.0606***
	(0.00694)	(0.00694)	(0.00566)	(0.00722)
Observations	416	236	390	417
R-squared	0.652	0.906	0.833	0.720

South Atlantic	East South Central	West South Central	Mountain	Pacific
-0.0480***	-0.0382***	-0.0312***	-0.0397***	-0.0452***
(0.00773)	(0.00684)	(0.00620)	(0.00774)	(0.00824)
-0.0564***	-0.0633***	-0.0481***	-0.0602***	-0.0786***
(0.00756)	(0.0190)	(0.00701)	(0.00571)	(0.00937)
516	235	217	285	177
0.657	0.693	0.767	0.558	0.786

Note: This table includes estimates of (1) estimated separately for each census division using data on income per worker and value added per worker found in the US Census of Manufactures for the years 1900-1940. 1900 value added is imputed using 1910 value added. The year pairs included are 1900-1910, 1910-1920, 1920-1930, and 1930-1940.

capita across many sectors some differences in outcomes are to be expected. However, this paper finds that within manufacturing rates of convergence were lowest in the Middle Atlantic and East North Central, areas that had the most industrial activity by total employment and wage bills. The region with the highest rate of income convergence was the Northeast, a region with substantial manufacturing activity. The South Atlantic, and Pacific regions also experienced faster rates of income convergence.. For productivity the Pacific division exhibits the fastest rate of convergence with the East South Central, West North Central, and Mountain divisions clustered nearby. Once again the Middle Atlantic and East North Central divisions exhibit the slowest rates of convergence.

The South, defined as the South Atlantic, East South Central, and West South Central never includes a division with either the fastest or slowest rate of convergence in either income or productivity. Only one of the three divisions had an income convergence rate above the national average of 4.6% and none had a productivity convergence rate above the national average of 7.1%. Southern divisions were undeniably different from some census divisions, but the same appears to apply to

any of the census divisions. This table presents no evidence of a unique Southern experience in manufacturing income or productivity convergence.

4.4 Conditioning on States Matters More for Wage Earners

Table 4: Convergence by Worker Type

	Growth Rate			
	(1)	(2)	(3)	(4)
ln_Wage	-0.0496***	-0.0749***		
	(0.00570)	(0.00570)		
ln_Salary			-0.0715***	-0.0780***
			(0.00314)	(0.00292)
State FE	No	Yes	No	Yes
Observations	2,889	2,889	2,818	2,818
R-squared	0.713	0.751	0.687	0.701

Note: This table includes estimates of equation (1) estimated separately for wage earners and salaried workers using data on income per worker and value added per worker found in the US Census of Manufactures for the years 1900-1940. The year pairs included are 1900-1910, 1910-1920, 1920-1930, and 1930-1940.

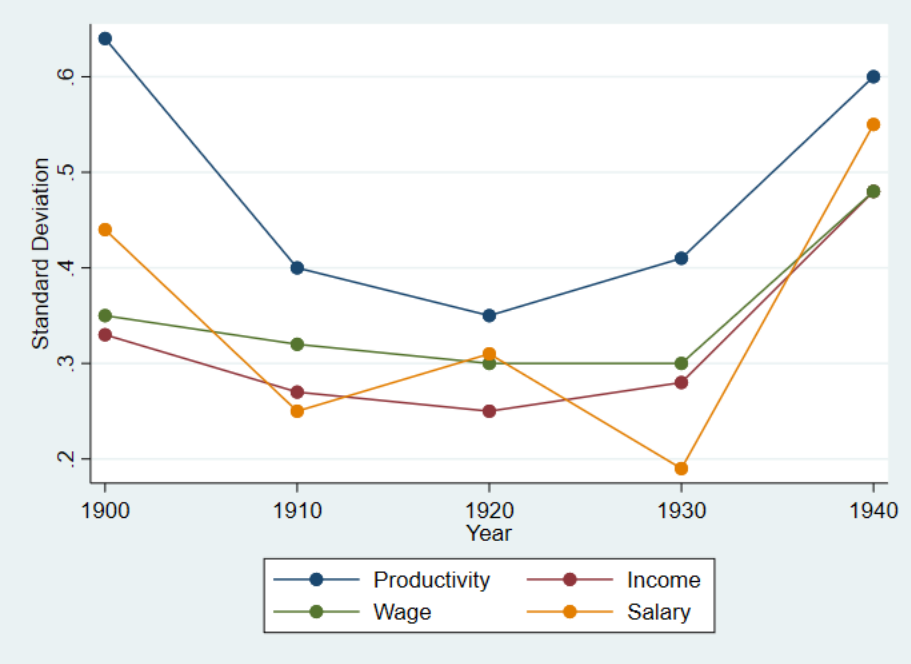
Table 4 presents the fourth fact: convergence in income was faster for salaried workers than wage earners. Because value added is not attributed to worker types the same way that wage bills are it is only possible to study the differences in income convergence between worker type. In theory it is ambiguous whether higher skilled workers should experience faster rates of convergence. In practice income convergence is faster for salaried workers, although including state fixed effects causes the differences to largely vanish.

This striking result merits further study since it implies that time invariant features of states matter more for income convergence for wage earners. One explanation for this result is that the work done by salaried workers was more similar across states and thus there were fewer frictions associated with salaried workers changing locations.

4.5 Sigma Convergence

The last result is that sigma convergence decreased through 1920 and increased in 1930 and 1940. This pattern holds for income, productivity and income by worker type. While beta convergence measures the relationship between growth in a variable and its initial value, sigma convergence refers to time convergence in the standard deviation of the outcome variables. One might expect that beta convergence should drive sigma convergence since the presence of beta convergence means that smaller economies grow faster, but it has been shown that beta convergence is not a necessary condition for sigma convergence (Young et al., 2008).

Figure 2: Sigma Convergence for Four Outcomes



Note: This figure presents the standard deviation of state-industry group pairs for each of the four outcome variables.

Figure 2 plots the standard deviation of the log of each of the four outcome variables computed using all state-industry group values for each year. The results show a pattern of increasing sigma convergence between 1900 and 1920 as three of the four series have their nadirs in 1920, but a decrease in sigma convergence thereafter. While this could be a meaningful trend, if these results are compared to Figure 4 from Barro and i Martin (1991) they may actually part of a broader

increase in sigma convergence that took place between 1800 and 1980 for the entire economy where the observed u-shape is a counter-trend anomaly.

Even if the manufacturing experience fits the experience of the general economy, the decline in sigma convergence between 1920 and 1940 may still be related to important events in American history. Additionally, the timing of this episode is consistent with an increase labor market integration studied in another paper that was observed using these same data between 1920 and 1930. An increase in labor market integration (a decline in labor market switching costs) should facilitate an increase in sigma convergence if it encourages workers in low income areas to migrate to high income areas which makes this preliminary result worth further evaluation.

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5 Appendix: Labor Force Weighted Results

This section estimates convergence coefficients after including labor force weights for each state industry group pair. Performing labor force weighted analysis shifts the interpretation of the results. A regression of initial income per worker and value added per worker against the share of the national labor force reveal positive and highly significant relationships for both variables. While not the case in cross-country analysis, for the United States between 1900-1940 the states with the largest manufacturing labor force also had the highest manufacturing income and productivity per worker.

Because manufacturing was consistently concentrated in several Northeastern and Great Lakes states the convergence estimates in this appendix are less representative of national trends, but more representative of trends within manufacturing. To the extent that the analysis in this paper treats the manufacturing economy as an entity separate from the aggregate economy a labor force weighted approach is more revealing.

Appendix Table 1: Convergence in Income Per Worker and Productivity

	Growth Rate			
	(1)	(2)	(3)	(4)
ln_Inc_Worker	-0.0332***	-0.0655***		
	(0.00455)	(0.00573)		
ln_VA_Worker			-0.0445***	-0.0617***
			(0.00506)	(0.00545)
State FE	No	Yes	No	Yes
Observations	2,889	2,889	2,866	2,866
R-squared	0.853	0.875	0.824	0.847

Note: This table includes labor force weighted estimates of eqn. (1) using data on income per worker and value added per worker found in the US Census of Manufactures for the years 1900-1940. 1900 value added is imputed using 1910 value added. The year pairs included are 1900-1910, 1910-1920, 1920-1930, and 1930-1940.

Appendix Table 1 shows that there was faster convergence in productivity than income when state fixed effects are not included. When included, the magnitude of convergence is greater for both, but income convergence is faster. Comparing these results to Table 1 the population weighting

caused the magnitude of all estimates to decrease. The lower magnitude in estimates is expected if convergence is less powerful in state industry group pairs with more mature industrial sectors.

This difference between the two tables regarding income and productivity means that convergence in income and productivity was more similar amongst state industry groups with more developed industrial sectors. It seems likely that the reason adding state fixed effects eliminates many of the differences between income and productivity convergence is because among the most mature industry group state pairs productivity gains were passed through to income. In the base sample this was not the case and potential evidence of firm monopsony power. If this explanation holds it means that firms had less monopsony power in states with more developed industrial sectors.

Appendix Table 2: Convergence by Industry Group

	Food	Tobacco	Textile	Apparel	Lumber	Furniture
ln_Inc_Worker	-0.0213***	-0.0475***	-0.0353***	-0.00332	-0.0154*	-0.0364***
	(0.00672)	(0.00867)	(0.00499)	(0.00608)	(0.00781)	(0.00749)
ln_VA_Worker	-0.0477***	-0.00336	-0.0485***	-0.0303**	-0.0455***	-0.0407***
	(0.00657)	(0.00921)	(0.00682)	(0.0129)	(0.0136)	(0.00615)
Observations	194	134	128	161	191	178
R-squared	0.934	0.862	0.947	0.964	0.893	0.918

Paper	Printing	Chemicals	Petroleum	Rubber	Leather	Stone
-0.0507***	-0.0463***	-0.0262***	-0.0396***	-0.0681***	-0.0582***	-0.0502***
(0.00878)	(0.0101)	(0.00775)	(0.0118)	(0.0169)	(0.00900)	(0.00807)
-0.0558***	-0.0318***	-0.0396***	-0.0521***	-0.103***	-0.0519***	-0.0591***
(0.00663)	(0.00829)	(0.00863)	(0.0124)	(0.00509)	(0.00855)	(0.00666)
117	194	169	66	54	147	191
0.970	0.945	0.825	0.905	0.755	0.964	0.946

Primary Metals	Fabricated Metals	Industrial Machinery	Electronic Machinery	Transportation	Instruments	Miscellaneous
-0.0679***	-0.0308**	-0.0767***	-0.0655***	0.0260	-0.0684	-0.0612***
(0.0165)	(0.0154)	(0.0201)	(0.0117)	(0.0456)	(0.0431)	(0.00889)
-0.0749***	-0.0600***	-0.0959***	-0.0844***	0.00420	-0.0802***	-0.0555***
(0.00718)	(0.0159)	(0.0145)	(0.00997)	(0.0229)	(0.0159)	(0.00662)
185	124	106	94	176	91	189
0.925	0.951	0.864	0.925	0.525	0.649	0.889

Note: This table includes labor force weighted estimates of eqn. (2) estimated separately for each industry group using data on income per worker and value added per worker found in the US Census of Manufactures for the years 1900-1940. 1900 value added is imputed using 1910 value added. The year pairs included are 1900-1910, 1910-1920, 1920-1930, and 1930-1940.

In Appendix Table 2 the industry groups with the fastest rates of convergence in income that are precisely estimated are Industrial Machinery, Rubber, Primary Metals, and Electronic Machinery. It is more difficult to identify the set of industry groups with the slowest rates of convergence since the point estimates of several groups are not statistically distinct from zero.

For productivity the industry groups with the fastest rates of convergence are Industrial Machinery, Electronic Machinery, Instruments, and Primary Metals. Productivity estimates tended to be more precisely estimated. Of those groups the point estimate for rubber is dramatically lower than the other industry groups and for thirteen of the twenty groups convergence in productivity outpaced convergence in income.

Unlike in the previous comparison, the labor force weighted point estimates are not universally smaller in magnitude than the point estimates from the unweighted results. There are differences between which industry groups exhibited the fastest rates of convergence in income and productivity which likely reflect the change in weighting of industrial activity across region industry groups.

For example, leather exhibited relatively rapid income and productivity growth in the unweighted analysis, but was merely above average in the weighted analysis. In this case, this difference is driven by Massachusetts dominance in the leather industry. While often thought of as a leader in textiles by 1900 Massachusetts accounted for 10% of the industrial labor force, but 29% of the labor force in leather. Between 1900 and 1940 Massachusetts overall share of the industrial labor force would shrink to less than 6%, while still accounting for over 20% of the industrial labor force in leather.

Since Massachusetts started with high levels of income and productivity and exhibited relatively little income and productivity growth the estimates for both will be smaller in the labor force weighted analysis. Many of the differences between the two tables are likely due to these types of deviations. While they generate valuable anecdotes to support case study analysis, this paper will likely not be a collection of these kinds of exceptional state concentrations in industry.

In Appendix Table 3 six of the nine divisions exhibit faster productivity growth than income growth. Of the three with faster income growth, two are southern divisions. The only division with an imprecise estimate is for income convergence in the West South Central. This is the first evidence in this paper of some unique Southern characteristic. Income growth tended to outpace productivity growth in Southern manufacturing.

As expected income and productivity growth also tended to be lower in regions with the largest

Appendix Table 3: Convergence by Census Division

	Northeast	Middle Atlantic	East North Central	West North Central
ln_Inc_Worker	-0.0573***	-0.0146***	-0.0173***	-0.0446***
	(0.0149)	(0.00538)	(0.00610)	(0.0107)
ln_VA_Worker	-0.0601***	-0.0206***	-0.0285***	-0.0363***
	(0.00809)	(0.00548)	(0.00594)	(0.00646)
Observations	416	236	390	417
R-squared	0.859	0.950	0.903	0.813

South Atlantic	East South Central	West South Central	Mountain	Pacific
-0.0451***	-0.0469***	-0.0137	-0.0349***	-0.0546***
(0.0118)	(0.0128)	(0.00833)	(0.0103)	(0.0176)
-0.0346***	-0.0405***	-0.0211***	-0.0710***	-0.0653***
(0.00750)	(0.0120)	(0.00808)	(0.00663)	(0.0130)
516	235	217	285	177
0.661	0.671	0.849	0.837	0.835

Note: This table includes labor force weighted estimates of eqn. (1) estimated separately for each census division using data on income per worker and value added per worker found in the US Census of Manufactures for the years 1900-1940. 1900 value added is imputed using 1910 value added. The year pairs included are 1900-1910, 1910-1920, 1920-1930, and 1930-1940.

initial levels of manufacturing income and productivity. The largest gap between the two types of convergence is in the Mountain division where the point estimate for productivity growth was double the estimate for income growth.

Comparisons to Table 3 are unlikely to yield any insights unless the focus is on only one division. Some divisions saw point estimates for both decline, others saw both point estimates increase and still others saw different results between income and productivity convergence. There are no obvious cross-regional differences between the tables either.

Appendix Table 4 shows that convergence in income was always faster for salaried workers, that controlling for state fixed effects causes convergence to speed up, and the addition of state fixed effects is more important for wage earners than salary earners. This was also the cause in Table 4. Point estimates were lower except for the estimate of convergence for salaried workers with state fixed effects included. Since this is one of the more interesting results in this paper its robustness to labor force weighting is reassuring.

Appendix Table 4: Convergence by Worker Type

	Growth Rate			
	(1)	(2)	(3)	(4)
ln_Wage	-0.0355***	-0.0671***		
	(0.00398)	(0.00424)		
ln_Salary			-0.0679***	-0.0800***
			(0.00351)	(0.00353)
State FE	No	Yes	No	Yes
Observations	2,889	2,889	2,818	2,818
R-squared	0.834	0.860	0.837	0.851

Note: This table includes labor force weighted estimates of equation eqn. (1) estimated separately for wage earners and salaried workers using data on income per worker and value added per worker found in the US Census of Manufactures for the years 1900-1940. The year pairs included are 1900-1910, 1910-1920, 1920-1930, and 1930-1940.