

THE SOCIAL BACKGROUND OF NINETEENTH-CENTURY INNOVATORS IN THE AMERICAN IRON AND STEEL INDUSTRY

Robert P. Rogers
Ashland University

ABSTRACT

A standard folk tale is of the immigrant who rose from poverty to a place of wealth in American business by ability and hard work. Some historians have questioned this story. They have found that most notable businessmen were native born of upper-middle class backgrounds. An examination of nineteenth century steel industry innovators, however, demonstrates that the rags-to-riches story is not totally irrelevant. A statistical analysis shows that the proportion of immigrants and men from working class and farming backgrounds among a sample of steel industry innovators is significantly greater than those in the samples of the other writers.

Introduction

A standard folk tale of American history is that of the immigrant who rose from obscurity to a place of wealth and prominence in business by ability and hard work. This rag-to-riches story actually fits many of the great business magnates of the nineteenth century: one example being the steel tycoon, Andrew Carnegie. In studying the history and economics of the steel industry, this writer was struck by the number of Carnegie-type figures who played major roles in the industry.

Many historians, however, have cast doubt on the relevance of the rags-to-riches model.¹ Collecting data on the characteristics of the major leaders in American business, they have found that most notable businessmen were native born of British ancestry -- usually English -- and that they came from upper-middle class backgrounds -- usually from the families of wealthy businessmen. To these scholars, then, people such as Andrew Carnegie were not typical of the nineteenth century businessman.

Nevertheless, an examination of the major innovators in the steel industry demonstrates that the rags-to-riches story is not totally irrelevant. The *Encyclopedia of American Business History and Biography: Iron and Steel in the Nineteenth Century* (Paskoff 1989) compiled short biographies of the major leaders and innovators of the nineteenth century iron and steel industry. Many of the people in this sample were technical experts or mineral explorers, but a majority were business leaders who carried out innovations that permanently changed the industry. This sample which is called below the steel innovator sample lends credence to this writer's initial impression: that a great many important steel leaders came from humble backgrounds.

To resolve this contradiction, a simple statistical analysis is performed to compare the social backgrounds of the major steel innovators in the nineteenth century with the more conventional executives found in the earlier samples. The first step in this process is to discuss the previous literature on the social characteristic of American businessmen. After this review, the statistical methodology is explained, and the results are reported. This is followed by a conclusion in which the two possible explanations for these findings are examined.

Past Work

The stereotype of the nineteenth century businessman as a person rising from rags to riches has been supported by many historians.² Empirical work in the middle of the 20th century, however, contradicts the rags-to-riches theme. Most of these papers find a disproportionate part of their samples of businessmen to be native-born from British backgrounds and from families where the father was either a businessman or a professional. The earliest work contradicting the rags-to-riches myth is that of Taussig and Joslyn (1932). Their analysis reveals, first, that more educated men had higher positions in business and, second, that men from the elite background tended to be more successful. Germane to this study is the distribution of the occupations of the father for these men which is displayed in Table 1.

William Miller in two studies (1952a and 1952b) uses the same methodology as Taussig and Joslyn. With a disproportionate part of his sample being native-born from elite families, Miller's findings again contradict the image of the poor immigrant working his way up from the bottom.

Using a sample randomly drawn from the period between 1771 and 1920, Bendix and Howton (1963) find that the American Business elite has recruited its members from the same native elite social groups throughout the nineteenth century. For comparison's sake, the occupation distribution of the fathers of the Bendix and Howton sample for the late nineteenth century is displayed in Table 1.

Gregory and Neu (1952) examine a sample of men who were either the head of or very high up in large business organizations in the 1870s. Their sample comes from the following industries: textiles, iron and steel, and railroads. Most of the sample were natives of the United States from upper or upper-middle class backgrounds.

Of particular interest, here, is the steel sub-sample. While most of these businessmen's fathers had obviously upper and upper-middle class jobs, the proportions differ somewhat from the other works and the Gregory and Neu Total sample. Table 1 shows the distribution of these men by these two characteristics.

In two works, Ingham (1978 and 1976) concentrates on people who were prominent in the late nineteenth century American steel industry. His sample consists of 696 men from the American steel industry. Consistent with the other authors, he finds the steel industry leaders to come from native-born British backgrounds and from families with fathers who were either businessmen or professionals.

THE SOCIAL BACKGROUND OF NINETEENTH-CENTURY INNOVATORS

Important differences, however, existed between the steel leadership in the six cities from which Ingham draws his sample. In Philadelphia, Pittsburgh, and Cleveland, most steel executives were recruited from the old Anglo-Saxon aristocracy (with a large dose of Scot-Irish and German in Pittsburgh).³ Wheeling, West Virginia and Youngstown, Ohio tended to be more open than the other cities. Table 2 compares three of the characteristics of the steel leaders between the cities in the Ingham (1978) study: birth-place, occupation of father, and ethnic background. Other important data from the Ingham papers are compared to those of the other samples in Table 1.

While most studies denigrate the rags-to-riches story, two papers support it. Gutman (1969) hypothesizes that the rags-to-riches prototype was much more common than the above studies imply. He cites and describes a number of Paterson, New Jersey manufacturers who came from working class backgrounds. He does not, however, present any statistical breakdowns on the backgrounds of his sample.

Peterson (c1991) profiles the lives of 50 important western mining magnates. He shows that the western mining leaders came more often from working class and farming backgrounds than the leaders in the other studies. Table 1 displays the breakdown of Peterson's sample of mining magnates by place of birth and occupation of fathers.

Using the data compiled by Taussig and Joslyn, Bendix and Howton, Gregory and Neu, Ingham, and, surprisingly, Peterson, one can make meaningful comparisons with the steel innovator sample developed below. Thus, tests can be made of interesting hypotheses about the background of businessmen and social mobility in nineteenth century America.

Statistical Analysis

This section of the paper examines the steel innovator sample and makes statistical comparisons between it and the samples of the other researchers on the social backgrounds of American businessmen. This paper focuses on two aspects of a businessman's social background: the country of birth and the occupation of the person's father.

These two variables show much about social mobility in America. The country of birth concerns the likelihood that poor immigrants such as Carnegie could become wealthy in the United States. The occupation of one's father is a very good indicator of the position and wealth of one's family. Knowing these characteristics for the steel innovators can help one understand social mobility in nineteenth century America.

The steel innovator sample consists of the people listed in the *Encyclopedia of American Business History and Biography: Iron and Steel in the Nineteenth Century* (Paskoff 1989) for which the relevant information is available. A group of historians developed this sample choosing the people whom they considered important in the history of the nineteenth century iron and steel industry. The bulk of the people in the sample "built and maintained going concerns in the iron and steel industry and helped to shape its development ..." (Paskoff 1989, xxxiii). Others were major players in the development of the huge corporations that arose at the end of century such as Andrew Carnegie,

Henry Frick, and John W. Gates. Still others were experts who developed the technology of the industry and the sources of iron ore such as Alexander Holley and Frederick Overman. In the judgement of a panel of twentieth-century historians, these people made major contributions to the iron and steel sector in the nineteenth century. Information on place of birth and father's occupation for the members in the steel industry innovator sample is usually drawn from the *Encyclopedia*, but other historical and biographical sources are used when needed.⁴

Two simple statistical tests are used to determine whether it is likely that real differences existed between the innovator sample and the other samples.⁵ The first, the Chi-Square procedure, tests whether the distributions of given samples over multiple categories (such as paternal occupation) are apt to be different. The second, the z test, indicates whether proportions of two samples for a given characteristic are likely to be different. Essentially these two tests indicate the likelihood of two samples being drawn from populations that proportionately have the same characteristic or characteristics or, for that matter, from the same population. The probability value or the significance level of the test indicates this likelihood. If two samples are likely to be drawn from populations with the same characteristics, then, one can infer that they are not different. If the samples are likely to be drawn from different populations, then, they are likely to be different. Below the term 'equivalent populations' will refer to populations that have equal proportions of members with the same characteristic.

For instance, if the Chi-Square probability value (or significance level) for the difference between the distributions in two samples as to the occupations of fathers is 0.01, then, the chances are 99 to one against the two samples coming from equivalent populations. This implies that the distributions of paternal occupations in the two samples are different.

Additionally, if the z test for a difference in the proportions of foreign born between two samples is significant at the 0.01 level, then, the chances are 99 to one against the samples coming from equivalent populations as to country of birth. If the significance level is 0.05, then, the chances against the two samples coming from equivalent populations are 19 to one. In these cases, it is unlikely that the two samples came from equivalent populations as to proportion of the foreign born.

Before examining the steel innovator sample, these tests are used to compare the samples from the previous literature as to the two studied characteristics, foreign birth, and father's occupation. In regards to birth, the z tests indicate Gregory and Neu Total and Steel sample and the Ingham sample came from equivalent populations.⁶ The z tests, however, indicate that the Peterson Mining Magnate sample has significantly more foreign born members than any of the other samples. Thus, the Peterson sample very likely came from a quite different set of men than the other groups.

In regards to the occupation of the sample member's father, the Chi Square test is used to compare the general distribution of the following samples: Married Employed Men in 1880 (found in Taussig and Joslyn), Taussig and Joslyn, Bendix and Howton, the Gregory and Neu Steel sample, Ingham, and Peterson (the Mining Magnates). Given that these samples cover different sets of people at different time, it is not surprising that

THE SOCIAL BACKGROUND OF NINETEENTH-CENTURY INNOVATORS

the Chi Square tests usually indicate that the samples do not come from equivalent populations as to paternal occupations. The tests indicate that all the samples come from different parts of the population than the Married Men of 1880. These results support the assertions in the literature that businessmen in the nineteenth century did not arise randomly from the population as a whole, implying that not many of them came from the lower classes.

Additionally, the Chi Square test indicates that the Gregory and Neu Steel and Peterson samples may have come from equivalent populations. This is especially interesting since the tests indicate that the Gregory and Neu Steel and the Ingham (steel) sample could not very well have come from the equivalent populations as to paternal occupation.

The z tests are used to see if the different proportions of the samples have fathers from the same occupations. When the z tests are made for the proportion of sample members coming farming and working class families, the results are very much the same. All the samples differ from the 1880 married men population, and they tend to differ from each other. The z test, however, indicates that the Gregory and Neu Steel sample and the Peterson sample could have come equivalent populations.

Now that the earlier samples have been compared with each other, they are now compared with the steel innovator sample. For place of birth, Table 3 compares the proportion of men born abroad in the steel innovator sample with the proportions in the Gregory and Neu Total Sample, Gregory and Neu Steel sub-sample, the Ingham sample, and the Peterson sample. A far higher proportion of the men in the innovator sample were born abroad than in any other sample except Peterson's.

Over 24 per cent of the steel innovator sample were born abroad as opposed to only 10 per cent of the Gregory and Neu Total sample. This difference cannot be explained by the iron and steel industry recruiting a higher proportion of leaders from immigrants. Only 14 per cent of the Gregory and Neu Steel sub-sample, and only 12 per cent of the large Ingham all-steel sample were immigrants.

Statistical tests are made to see if these differences were significant. For the differences with, first, the Gregory and Neu Total sample and, second, the Ingham sample, the z values are significant at the 0.01 level. This test indicates that the probability of the innovator group and the Gregory and Neu Total sample being drawn from equivalent populations is 1 per cent. The same value holds for the probability that the innovator and Ingham samples are drawn from equivalent populations. For the differences with the Gregory and Neu Steel sample, the z value is significant at the 0.05 level. The probability that the innovator and the Gregory and Neu Steel sample come from the same population is somewhat higher, 5 per cent, but still low.

These data and the statistical tests suggest that a steel innovator was more likely to be an immigrant than the typical steel business leader. This might be due to the need in this industry for advanced European technology. An examination of the careers of the immigrant innovators suggests that European technological expertise does not explain the difference. When the sample is divided into two sub-samples by whether the main contribution of the member was technical or organizational, the proportion of technical

experts born abroad is lower than that of the business and organizational contributors (15 per cent as opposed to 28 per cent).

Another possible difference between the innovators and the other sample is the difference in the time in which the men were prominent. To see if this was the case, the steel innovator sample is split between the men born before and after 1830.⁷ There is no significant difference between the before and after 1830 samples, and thus the dates of prominence cannot explain the differences between the steel innovator and other samples.⁸ Consequently, it is unlikely the time period of the innovator sample explains the difference between it and the other samples as to country of birth.

Geography might explain the difference between the innovator sample and the other samples. Perhaps, the innovators work in a particular locality that was conducive to immigrant success. With the by-city breakdown of the Ingham sample, it is possible to test part of this hypothesis. Table 2 displays the distribution of the five Ingham city samples by birth. The z tests for the differences between the proportion of immigrants in the innovator sample and that in each of the five cities are significant at the 0.01 level for every city sub-sample except for Cleveland and Youngstown, and even the Youngstown result is significant at the 0.10 level. Thus, with the exception of Cleveland, it is unlikely that the innovators are drawn from equivalent populations as the steel executives in the various cities. Consequently, European technological expertise and geographic locality do not explain the larger proportion of immigrants in the steel innovator sample.

A possible reason for the larger number of immigrants among the innovators may be seen in the comparison between this paper's steel sample and Peterson's sample of Western mining magnates. There is no significant difference between the proportions of immigrants in the steel innovator sample and the Peterson sample. In fact, the number of immigrants among the Western mining leaders (30 per cent) is actually greater than that among the innovators (24.3 per cent).

While static firms and/or industries were not all that open to immigrants, economic sectors and situations where conditions were changing may have given immigrants a chance to use their talents. The same type of energetic and innovative men were needed on the Western mining frontier as in the dynamic parts of the American iron and steel sector. Thus, possibly situations where change was prevalent gave immigrants a better chance to use their talents and rise to high positions. That may be why they were more prevalent among the iron and steel innovators than among the ordinary run of iron and steel executives.

The second social characteristic of the steel innovators examined here is family background; the best available indication of the social class from which the innovators came is the occupation of their fathers. The first column of Table 4 shows the percentages of the steel innovators whose fathers were of four general occupational classes: businessmen, professionals, farmers, and workers. These divisions do not necessarily represent the exact social classes of the family. For instance, often businessmen were not all that rich, and sometimes farmers were quite wealthy. Nevertheless, the division does give a

THE SOCIAL BACKGROUND OF NINETEENTH-CENTURY INNOVATORS

general picture of the social background from which the innovators and other businessmen came.

The second column shows the occupational distribution of married males in the United States in 1880. It gives one a rough idea of the actual distribution of jobs in the nineteenth century economy. A quick perusal of the table confirms the assertion that the steel innovator's fathers did not make up a representative sample of the working population. The Chi-Square test and the z tests support this statement; it indicates that the distribution of paternal jobs is not likely to be the same as that of the whole male population. Consistent with the other studies, the bulk of the men in the steel innovator sample was from upper and upper-middle class background.

When one compares the steel innovator sample to the very large Taussig and Joslyn sample, the Chi-Square test indicates that the hypothesis that the two samples were drawn from equivalent populations cannot be rejected. The z tests for the differences in the proportion of the samples drawn from farmers and workers also indicates that the hypothesis that the two samples are drawn from the equivalent populations cannot be rejected.

These results so far are consistent with the writers who discount the rags-to-riches model of the nineteenth century business success, but the steel innovators are statistically different from most of the other samples. When the innovator sample is compared to the Bendix and Howton sample of nineteenth century business leaders, the Chi-Square test implies that the two samples are unlikely to be from equivalent populations. The z tests indicate first that the steel innovators are more likely to come from farming and working class families than the members of the Bendix and Howton samples and that they are less likely to come from business families.

The steel innovator sample is also compared to the Gregory and Neu Steel and Ingham groups. Since these two samples come from the steel industry, the results are very interesting. According to the Chi-Square test, one cannot eliminate the possibility that the steel innovator and Gregory and Neu Steel samples are drawn from equivalent populations.

In contrast, all the statistical tests indicate that the steel innovator sample and the Ingham sample are different. According to the Chi-Square test, the two samples are very unlikely to have come from equivalent populations, meaning as a group the steel innovators are probably different from the general run of steel executives in the Ingham sample. According to the z tests, the steel innovators are significantly more likely to come from farming and working class families than the Ingham sample members (32 vs. 16 per cent).

There is an interesting difference between the results for the Gregory and Neu sample and the Ingham sample. Some of the differences can be attributed to the differences in the sample coverage. The Gregory and Neu sample is smaller with only 57 members in contrast to the 568 members for the Ingham sample. Both earlier samples are drawn from men who held high positions in the iron and steel firms, while the steel innovators

are chosen because they made great contributions (in the eyes of later historians). Some of the innovators held high positions in their companies, and some did not.

The Ingham sample is concentrated on only six steelmaking cities, Pittsburgh, Philadelphia, Bethlehem, Cleveland, Youngstown, and Wheeling (West Virginia). This sampling leaves out some important locations such as Chicago, Baltimore, and Johnstown (Pennsylvania). Still, many of the innovators came from Ingham's cities: people like Andrew Carnegie and Henry Frick from Pittsburgh, and Henry Chisholm from Cleveland. Thus, it is not very likely that the other cities were disproportionately innovative.

A reasonable explanation for the difference is that the Gregory and Neu sample are concentrated in the 1870s while the Ingham sample covered the officers in steel companies over the last 26 years of the nineteenth century. The 1870s was an especially fecund period for innovation in the iron and steel sector. In that decade, the Bessemer converter was diffused to a large number of firms, and many changes and improvements were introduced in the other parts of the iron and steel process to accommodate the Bessemer technology (Temin 1964). In that period, then, one would expect that the people managing iron and steel firms had to be especially attuned to innovation. Consequently, the people in charge of iron and steel firms in that period may have come from the same pool of intelligent and creative people as the steel innovators. That ten of the steel innovator sample (composed of 70 people) appear in the Gregory and Neu Steel sample (57 people) supports this argument.

In contrast, the Ingham sample is drawn from all the high officers in the major steel firms of the last quarter of the nineteenth century. To merely run a steel firm or carry out the function of a given office in such a firm may not have required the same talent as it took to develop a major technological or organizational innovation. Consequently, it is likely that the innovative people in the industry arose from a much wider social stratum than did the people who routinely operated the large companies. This is an explanation consistent with the results.

Finally the innovator sample is compared to Peterson's sample of Western mining tycoons. The Chi-Square test indicates that the steel innovators did not come from the same population as the mining magnates as to occupation of father. The z tests, however, indicate that one cannot rule out the possibility that the two samples came from populations with the same proportion of men whose fathers were either working men, farmers, or businessmen. Thus, in regard to these categories, the samples are very similar.

Summary and Conclusion.

To summarize, the number of immigrants and men from working class and farming backgrounds among the important innovators is significantly greater than in the Ingham sample of prominent but not necessarily innovative steel executives. Regarding place of birth, the hypotheses that the steel innovators, the Gregory and Neu Total sample, and the Ingham samples came from equivalent populations are rejected at very high levels of significance. As for the paternal occupation, the best indication of social class, the Chi-

THE SOCIAL BACKGROUND OF NINETEENTH-CENTURY INNOVATORS

Square and z tests indicate that the steel innovator, the Bendix and Howton, and Ingham samples do not come from equivalent populations. The innovator and the Gregory and Neu Steel samples, however, may come from equivalent populations. The latter is drawn from a particularly innovative period in the industry history. Thus, immigrants and people from the working and farming backgrounds were more prevalent among the steel innovators than among men regularly running the iron and steel firms.

There are two likely explanations for these differences: one can be termed the social class hypothesis, and the other is best called the labor market theory. The social class theory maintains that wealthy people form a cohesive group that does not ordinarily welcome people from other classes to positions of prestige and wealth.⁹ Consequently, it would be difficult for either a working class person, farmer's son, or an immigrant to come into a high position in a steel company. In contrast, if the person has a great deal to contribute to the industry or firm, it may be in the interest of the dominant social class to foment this person's career. Consequently, when they make a large contribution, people such as Carnegie can rise to the top.

The second possible explanation for the differences between the innovator and the other samples is the labor market theory.¹⁰ This theory posits that different jobs call for different sets of talents, and labor markets work to match the jobs to the attributes of the individuals who fill them. Many of the positions at the top of large organizations call for the set of attributes that come disproportionately from people in the wealthier classes. To be the treasurer of an iron and steel firm calls for an educational attainment that is more easily obtained by affluent people. Other positions at the top of companies call for social skills and personal connections that might be more easily developed by people from wealthy families. Given these characteristics, the distribution found in the Ingham sample of steel executives is not surprising.

In contrast, the ability and talent needed to make great changes in an economic sector may call for a more diffuse set of people. The independent vision, original thinking, risk taking attitude, and focused passion needed to develop great new organizations open sectors of this sort to immigrants like Andrew Carnegie. Similarly, people from working class trades such as millwrights and blacksmiths were more attuned to the possibilities of technological change than people from the traditional elites.¹¹ Thus, to find the talents needed to make great change, one would have to rely on a larger pool of people than to find individuals able to merely run steel firms.

This argument is supported by the similarity of the steel innovator sample to the Western mining sample of Peterson (c1991). Both the situations faced by the developers of Western mining and the people trying to transform the iron and steel sector called for a group of innovative, entrepreneurial, and risk taking individuals; this opened these industries to those outside the dominant socio-economic and ethnic groups. Thus, the labor market for innovators was different from that for the run-of-the-mill steel executives, and it had to be supplied by a wider set of people which included more immigrants and sons of working class and farm families.

ESSAYS IN ECONOMIC AND BUSINESS HISTORY (2004)

To determine whether the social class or the labor market theory best explains the differences between the steel innovators and more ordinary run of steel executives requires more work. This paper, however, does document an apparent real difference between social backgrounds of the two sets of people. The greater incidence of men from foreign countries and the less wealthy classes among the innovators, then, helps explain the persistence of belief in the rags-to-riches story in the face of the statistical work of the earlier writers to the contrary.

Table 1

The Breakdown of the Business Leaders in the Gregory and Neu, Ingham, and Bendix and Howton Samples by Country of Origin and Occupation of Father.

Characteristic	Percentage and Size of Sample				
	Taussig and Joslyn The 1920s	Bendix and Howton Late 19 th Century ¹	Gregory and Neu Steel Sample ²	Ingham ²	Peterson's Western Mining Magnates
Birthplace					
United States			86	88	70
Foreign			14	12	30
Size of Sample			80	693	50
Occupation of Father					
Businessman	60	70	47	72	41
Professional	15	14	16	12	15
Farmer	12	10	26	6	39
Worker	13	6	11	10	5
Size of Sample	8398	225	57	568	41

¹ The Bendix and Howton paper categorizes wealthy farmers as businessmen, while government workers are categorized under professionals and white collar workers are put in the worker category in the percent breakdown of the sample. Here the original sample percentages totaled 99; since this writer did not have the raw data, the percentages were re-calibrated by the ratio of 100 to 99.

² Here the original sample percentages totaled 102; since this writer did not have the raw data, the percentages were re-calibrated by the ratio of 100 to 102.

Source: Taussig and Joslyn 1932, Bendix and Howton 1963, Gregory and Neu 1952, Ingham 1976, and Peterson c1991.

THE SOCIAL BACKGROUND OF NINETEENTH-CENTURY INNOVATORS

Table 2

The Breakdown of the Ingham Sample of Steel Industry Leaders from Different Cities by Place of Birth, Occupation of Father, and Ethnic Group.

Characteristic	Percentage and Size of Sample					
	Total	Pittsburgh	Philadelphia	Cleveland	Youngstown	Wheeling
Birthplace						
United States	88	88	94	78	86	92
Foreign	12	12	6	22	14	8
Size of Sample	693	357	118	80	70	62
Occupation of Father						
Businessman	72	71	78	75	59	63
Professional	12	14	11	3	20	15
Farmer	6	6	2	9	14	2
Worker	10	9	9	12	7	20
Size of Sample	568	339	118	86	70	62
Ethnic Group						
English and Welch	53	37	75	76	55	39
Scot and Scot-Irish	30	42	4	17	26	26
Irish	2	2	3	—	3	0
German	13	17	10	6	10	8
Other and/or Unknown	2	2	10	1	11	28
Size of Sample	624	325	118	81	70	62

Source: Ingham 1978.

Table 3

Comparisons of the Steel Industry Innovators with the two Gregory and Neu Samples, the Ingham Sample, and the Peterson Sample by Country of Birth.

Characteristic	Percentage and Size of Sample				
	19 th Century Steel Innovator Sample	Gregory and Neu Total Sample	Gregory And Neu Steel Sample	Ingham	Peterson's Western Mining Magnates
Birthplace					
United States	75.7	90	86	88	70
Foreign	24.3	10	14	12	30
Size of Sample	70	247	80	693	50
z Value for the Difference with Steel Innovator Sample		2.61	1.60	2.33	-0.69
Probability Value for z value		0.01	0.05	0.01	0.24

Source: Gregory and Neu 1952, Ingham 1976, and Peterson c1991.

ESSAYS IN ECONOMIC AND BUSINESS HISTORY (2004)

TABLE 4
Comparisons of the Steel Industry Innovators with Other Samples by
Occupation of Father.

Characteristic	Percentage and Size of Sample						
	Steel Innovator Sample 1800s	Married Male Working Population 1880	Taussig and Joslyn The 1920s	Bendix and Howton Late 19 th Century	Gregory And Neu Steel Sample ¹	Ingham ²	Peterson Western Mining Magnates
Occupation Of Father							
Businessman	50	10	60	70	47	72	41
Professional	18	3	15	14	16	12	15
Farmer	13	41	12	10	26	6	39
Worker	19	46	13	6	11	10	5
Size of Sample	56	8.1 million	8398	225	57	568	41
Chi-Square Test for the Difference Distribution of Father's Occupation		151.18**	2.87	20.12**	7.15	12.57**	13.09*
z Test for Difference in Proportion of Fathers who were Either Farmers or Workers		-8.82**	-1.12	2.39**	-0.56	2.49**	-1.21
z Test for Difference in Proportion of Fathers who were Workers		-5.15**	1.14	2.37*	1.20	1.67*	2.24*

Notes

1. W. Miller, "The Recruitment of the American Business Elite" in W. Miller, *Men in Business; Essays in the History of Entrepreneurship*, 329-337, Cambridge: Harvard University Press, 1952a, W. Miller, "American Historians and the Business Elite" in W. Miller, *Men in Business; Essays in the History of Entrepreneurship*, 309-328, Cambridge: Harvard University Press, 1952b, J. N. Ingham, *The Iron Barons: a Social Analysis of an American Urban Elite, 1874-1965*, Westport, CT: Greenwood Press 1978, and F. Gregory, and I. D. Neu, "The American Industrial Elite in the 1870's: Their Social Origins" in W. Miller, *Men in Business; Essays in the History of Entrepreneurship*, 193-211, Cambridge: Harvard University Press, 1952.

2. S. E. Morrison and H. S. Commager *The Growth of the American Republic*, II, New York: Oxford University Press, 1950 and M. Josephson, *The Robber Barons: The Great American Capitalists, 1861-1901*, New York: Harcourt, Brace & World, c1962.

3. The prominence of the Scots-Irish and Germans in Pittsburgh may have helped originate the rag-to-riches idea. Pittsburgh deviated from the rest of the sample in that there were a higher proportion of leaders in these ethnic groups. Many early writers had seen Pittsburgh as the center of the self-made businessman. Nevertheless, while these men's families were relatively new to the American upper class, they were not necessarily poor.

4. J. H. Bridge, *The Inside History of the Carnegie Steel Company; a Romance of Millions*, New York: Arno Press, 1972[1903], H. Bridges, *Iron Millionaire: Life of Charlemagne Tower*, Philadelphia: University of Pennsylvania Press, 1952, C. B. Dew, *Ironmaker to the Confederacy: Joseph R. Anderson and the Tredegar Iron Works*, New Haven: Yale University Press, 1966, L. M. Hacker, *The World of Andrew Carnegie: 1865-1901*, Philadelphia: Lippincott, 1978, G. E. Lester, *Life and Character of Peter Cooper*, New York: John B. Alden, Publisher, 1883, H. C. Livesay, *Andrew Carnegie and the Rise of Big Business*, Boston: Little, Brown, 1975, J. McHugh, *Alexander Holley and the Makers of Steel* Baltimore: Johns Hopkins University Press, 1980, P. F. Paskoff, *Industrial Evolution: Organization, Structure, and Growth of the Pennsylvania Iron Industry, 1750-1860*, Baltimore: Johns Hopkins University Press, c1983, M. F. S. Sanger, *Henry Clay Frick: an Intimate Portrait*, New York: Abbeville Press Publishers, 1998, J. F. Wall, *Andrew Carnegie*, New York: Oxford University Press, 1970, and L. Wendt, and H. Kogan *Bet a Million!: The Story of John W. Gates*, New York: Arno Press, 1981[c1948].

THE SOCIAL BACKGROUND OF NINETEENTH-CENTURY INNOVATORS

5. See W. W. Daniel, and J. C. Terrill, *Business Statistics for Management and Economics*, Boston: Houghton Mifflin Company, 1995.

6. The results of these tests and the others on the literature can be found in an Appendix available on request from the author.

7. The year, 1830, is used because many of the men important in the last half of the nineteenth century such as Andrew Carnegie, Alexander Holley, and William Jones were born in the 1830's.

8. When the sample is split at 1820 and 1840, the results are the same, there are still no significant differences between parts of the sample.

9. For discussions and applications of these ideas, see K. Stone, "The Origin of Job Structures in the Steel Industry," *The Review of Radical Political Economics*, no. 6 (1974): 61-97 and R. A. Wallace, and A. Wolf, *Contemporary Sociological Theory: Expanding the Classical Tradition*, 5th Edition, Upper Saddle River, N.J.: Prentice Hall, 1999.

10. For discussions and applications of these ideas, see P. Osterman, *Internal Labor Markets*, Cambridge: MIT Press, 1984 and O. E. Williamson, M. L. Wachter, and J. E. Harris "Understanding the Employment Relation: the Analysis of Idiosyncratic Exchange," *The Bell Journal of Economics*, Vol 6, No. 1 (1975): 250-278.

11. That does not mean that some people from upper class backgrounds did not become innovators.

References

Bendix, R. and F. W. Howton "Social Mobility and the American Business Elite" in Lipset, S. M. and R. Bendix (eds.), *Social Mobility in Industrial Society*, 114-143, Berkeley and Los Angeles: University of California Press, 1963.

Bridge, J. H. *The Inside History of the Carnegie Steel Company; a Romance of Millions*, New York: Arno Press, 1972[1903].

Bridges, H. *Iron Millionaire: Life of Charlemagne Tower*, Philadelphia: University of Pennsylvania Press, 1952.

Daniel, W. W. and J. C. Terrill, *Business Statistics for Management and Economics*, Boston: Houghton Mifflin Company, 1995.

Dew, C. B. *Ironmaker to the Confederacy: Joseph R. Anderson and the Tredegar Iron Works*, New Haven: Yale University Press, 1966.

Gregory, F. and Neu, I. D. "The American Industrial Elite in the 1870's: Their Social Origins" in Miller, W., *Men in Business; Essays in the History of Entrepreneurship*, 193-211, Cambridge: Harvard University Press, 1952.

Gutman, H. G. "The Reality of the Rags-to-Riches "Myth": the Case of the Paterson, New Jersey, Locomotive, Iron, and Machinery Manufacturers, 1830-1880," in Stephan Thernstrom, S. and R. Sennett, *Nineteenth-Century Cities; Essays in the New Urban History*, 98-124, New Haven: Yale University Press, 1969.

Hacker, L. M. *The World of Andrew Carnegie: 1865-1901*, Philadelphia: Lippincott, 1978.

Ingham, J. N. *The Iron Barons: a Social Analysis of an American Urban Elite, 1874-1965*, Westport, CT: Greenwood Press 1978.

Ingham, J. N. "Rags to Riches: The Effect of City Size and Related Factors in the Recruitment of Business Leaders," *Journal of American History*, LXIII, no. 3 (1976): 615-637.

Josephson, M. *The Robber Barons: The Great American Capitalists, 1861-1901*, New York: Harcourt, Brace & World, c1962.

Lester, G. E. *Life and Character of Peter Cooper*, New York: John B. Alden, Publisher, 1883.

Livesay, H. C. *Andrew Carnegie and the Rise of Big Business*, Boston: Little, Brown, 1975.

McHugh, J. *Alexander Holley and the Makers of Steel* Baltimore: Johns Hopkins University Press, 1980. Miller, W. "The Recruitment of the American Business Elite" in Miller, W., *Men in Business; Essays in the History of Entrepreneurship*, 329-337, Cambridge: Harvard University Press, 1952a.

Miller, W. "American Historians and the Business Elite" in Miller, W., *Men in Business; Essays in the History of Entrepreneurship*, 309-328, Cambridge: Harvard University Press, 1952b.

Morrison, S. E. and H. S. Commager *The Growth of the American Republic*, II, New York: Oxford University Press, 1950.

ESSAYS IN ECONOMIC AND BUSINESS HISTORY (2004)

- Osterman, P. *Internal Labor Markets*, Cambridge: MIT Press, 1984.
- Paskoff, P. F. *Encyclopedia of American Business History and Biography: Iron and Steel in the Nineteenth Century*, New York: Facts on File, 1989.
- Paskoff, P. F. *Industrial Evolution: Organization, Structure, and Growth of the Pennsylvania Iron Industry, 1750-1860*, Baltimore: Johns Hopkins University Press, c1983.
- Peterson, R. H. *The Bonanza Kings: the Social Origins and Business Behavior of Western Mining Entrepreneurs, 1870-1900*, Norman: University of Oklahoma Press, c1991.
- Sanger, M. F. S. *Henry Clay Frick: an Intimate Portrait*, New York: Abbeville Press Publishers, 1998.
- Stone, K. "The Origin of Job Structures in the Steel Industry," *The Review of Radical Political Economics*, no. 6 (1974): 61-97.
- Taussig, F. W. and C. S. Joslyn *American Business Leaders: A Study in Social Origins and Social Stratification*, New York: The Macmillan Company, 1932.
- Temin, P. *Iron and Steel in Nineteenth-Century America, an Economic Inquiry*, Cambridge: M.I.T. Press, 1964.
- Wallace, R. A., and A. Wolf *Contemporary Sociological Theory: Expanding the Classical Tradition*, 5th Edition, Upper Saddle River, N.J.: Prentice Hall, 1999.
- Wall, J. F. *Andrew Carnegie*, New York: Oxford University Press, 1970.
- Wendt, L. and H. Kogan *Bet a Million!: The Story of John W. Gates*, New York: Arno Press, 1981[c1948].
- Williamson, O. E., M. L. Wachter, and J. E. Harris "Understanding the Employment Relation: the Analysis of Idiosyncratic Exchange," *The Bell Journal of Economics*, Vol 6, No. 1 (1975): 250-278.