Projects and Proficiency: Effects of Public Works Administration Spending on Long-Run Skills in the Construction Industry

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Abstract

Programs like the Public Works Administration (PWA) provide economic and unemployment relief by providing government funds to the private construction industry. While it has been shown that other relief policies have difficulty maintaining worker skills, studies regarding the impact of private investment on skill distribution are few and far between. To this end, this paper uses longitudinal individual- and county-level data from 1930 and 1940 to determine how individuals who are already employed in the private construction industry are affected by government public works funding in terms of long-run occupational skill distribution, using the PWA as a backdrop. I find that the long-run skill outcomes of those previously employed in the construction industry are largely unaffected by the artificial increase in construction demand, although there does seem to be a slight positive effect in terms of skill advancement.

1 Introduction

Public works agencies, such as the Public Works Administration (PWA) of the New Deal, aim to create more long-term employment opportunities and stimulate the overall economy through the construction of infrastructure projects. These projects are frequently achieved through investments in the private construction industry. As such, those in the construction industry are regarded as the primary beneficiaries of government funds through public works spending. A significant secondary objective of these recovery-oriented programs, as emphasized by officials during the New Deal, is to prevent skill degradation as a result of unemployment. Despite their importance, analyses assessing the long-term impact of public works policies on skill outcomes and the private construction sector are few and far between. Nonetheless, exploring these topics may provide nuanced insights into the effectiveness of public works policies in supporting labor markets.

To this end, this paper evaluates the effect of PWA spending per capita at the county level on later occupational skill rankings and compares this effect between individuals who have already been employed in the construction industry and individuals who were employed in others. I also examine the effect of PWA spending on long-run financial outcomes between these individuals. Analyzing changes in long-run occupational skill and income uncovers the nature of the construction industry as a fund recipient and whether those in construction truly benefit from public works spending.

First I review previous literature related to public works spending, relief programs, and how they affect the labor market. The effectiveness of relief and public works programs are frequently debated, but studies largely conclude that those such programs from the New Deal era were predominantly economically beneficial. However, modern studies into the impact of relief and public works programs on labor skill distribution are rare. One such study concluded that relief programs were not associated with increases in skill, but public works programs may have been.

Then, for my study, I split occupational categories into skill rankings based on average

education achieved by individuals in those occupations. Following previous skill-related studies, I use three skill categories: low-skilled, semi-skilled, and high-skilled occupations.

Using these rankings, I show that the long-run occupational skill outcomes of those in construction are relatively resistant to differences in PWA spending, and I give my interpretations of these results. Following this analysis, I examine the effects of public works spending on long-run income, and come to a similar outcome. Finally, I conclude that, despite being the primary recipient of government public works spending, the construction industry seems to have only slight, positive results in terms of long-run outcomes of individuals due to its market resiliency and the nature of the sector.

2 Literature Review

The New Deal and the effectiveness of its programs have long been subjects of economic study. Fishback, Kantor, and Wallis (2003) examine the distribution of various New Deal funds across US counties by program to determine their level of alignment with Roosevelt's "relief, recovery, and reform" motives. They calculate elasticities for the spending of each New Deal program with respect to a number of county-level variables and interpret them in the context of Roosevelt's mantra. While they conclude that a large fraction of money in the New Deal did indeed promote relief, recovery, and reform to some degree, they argue that public works programs have limited relationships with relief in places with low income and sales. Instead, the authors argue that nearly every program, including the PWA, seemed to distribute funds with politics in mind; in particular, programs were used to turn swing states and rewarding Democratic supporters.

Fishback, Horrace, and Kantor (2005) specifically examine the effectiveness of New Deal spending on economic recovery. By using retail sales as a proxy for consumption of goods, they find that New Deal spending on public works does promote growth of both intra-county retail sales and retail sales in neighbor counties, and thus successfully increase purchasing

power and immediate overall economic activity.

Despite the frequent investigation into the economic effectiveness of the New Deal, modern quantitative analysis of the impact of its programs on skill distribution is uncommon. Shepherd and Bancroft (1937) conducted a study of job distribution by the Works Progress Administration (WPA) in 13 cities, just a couple years after its founding. They ultimately found that a certain amount of occupational "degrading" occurred. They claim that, although attempt was made to assign jobs that best utilized the workers' skills, the non-compete requirement with the private industry made it impossible to employ many workers at their usual occupations. Although only one-fifth of the workers had originally been in unskilled occupations, more than three-fifths of the available jobs were unskilled.

Liu and Fishback (2018) provide a more recent analysis on changes in skill levels that included public works programs. Using linked census data, they conducted a multinomial logit analysis connecting three skill rankings in 1930 to five such categories in 1940. They identified these ranking using occupation and industry. They found that per capita relief programs and the Agricultural Adjustment Act (AAA) were not associated with upward advancement to more skilled positions, but public work spending was, in general, slightly more positively associated with upward advancement.

This paper seeks to extend this analysis by distinctly examining public works spending via spending from the PWA. In particular, I focus on the effect of spending on skill advancement of those already in the construction industry, whom are arguably significant players in such policies.

3 Historical Background

In the wake of the Great Depression, the United States government set about a remarkable number of programs and administrations under the New Deal. These programs include public works agencies like the Civilian Conservation Corps, the WPA, and the PWA. Unlike many

of the other New Deal programs, agencies the PWA did not hire the unemployed directly; instead, it provided grants and contracts to private construction firms to complete public works projects themselves. These projects included the construction of highways, dams, bridges, hospitals, and schools (McJimsey, 2000). Merely by investing in these large-scale projects from the private industry, the PWA sought to create more jobs, inject money into the economy, and create infrastructure with lasting impacts on the economy.

Figure 1 illustrates the distribution of total PWA spending per capita on a county basis. PWA activity was distributed into three categories: federal PWA grants, non-federal PWA grants, and non-federal PWA loans. Federal agencies held a strong central control over federal grants, while non-federal grants and loans were made to state and local governments. The balance of priorities in this two-layer policy led the PWA to have an overall reputation for targeting projects with long-term value and avoiding political scandal.

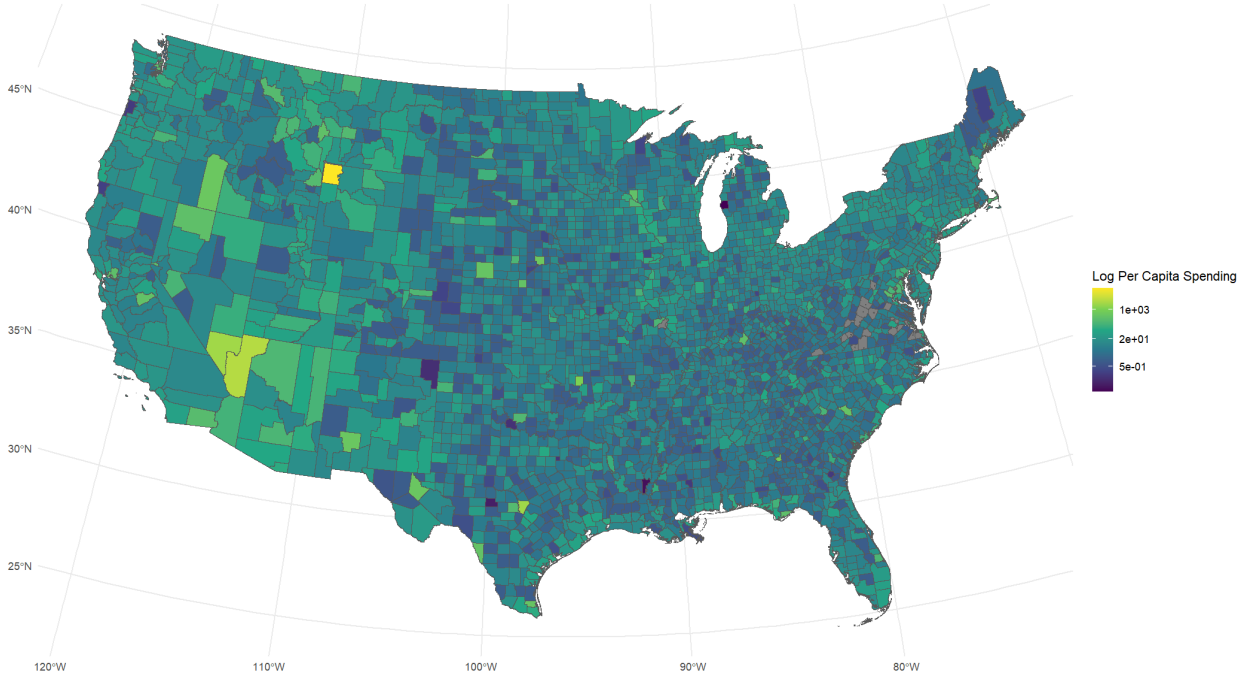

Figure 1: Logged PWA Spending Per Capita by County

Individuals working in the private construction industry were naturally primary stakeholders in public works spending. The construction industry sees substantial increases in

employment opportunities and demand following increases in construction spending, which include that from public works programs. Furthermore, since the PWA dealt with many projects of large scale and complexity, it follows that PWA activity likely leads to changes in demands for different construction-related skills. While other industries may also benefit from public works spending via indirect economic stimulation, these benefits evolved separately through dynamics between private sectors; the construction industry, on the other hand, experienced direct injection of government capital.

4 Empirical Strategy

To perform the analysis, I combined information from multiple sources. Individual information on industry, occupation, household county, number of children under five years old, marital status, race, age, educational attainment, and income come from a one percent longitudinal sample from the full count 1930 and 1940 USA Censuses (IPUMS, Ruggles et. al., 2021). County-level data on PWA federal grants, PWA non-federal grants, PWA non-federal loans, and 1930 population comes from data compiled by Fishback, Kantor, and Wallis (2003) from the U.S. Office of Government Reports.

I focus on male household heads of around working age (16 to 64 years old) throughout both 1930 and 1940. These individuals must also have a specified educational level and a household within a county with full data in the dataset collected by Fishback et. al. from the U.S. Office of Government Reports.

The output variable for this analysis is membership in each occupational skill ranking. I divided categories from the 1950 Census Bureau occupational classification system into three categories: low-skilled, semi-skilled, and high-skilled. This division is based on average higher education attainment rates by occupation in 1940. If a certain occupation is composed of people with a higher average education, it follows that that occupation likely has higher education requirements, compared to an occupation with a lower average achieved

educational level. More education required means an individual must have more knowledge and training for the job, and more knowledge and training translates to higher skill. Thus, occupations in "Professional, Technical", "Managers, officials, proprietors", and "Clerical and Kindred" are categorized as high-skilled, occupations in "Sales workers", "Craftsmen", "Operatives", and "Farmers" are semi-skilled, and occupations in "Laborers" and "Farm laborers" are low-skilled.

Using these individual and county level data, I estimate equations with the following correlates.

$$y_{ics} = \beta_0 + \beta_1 \log(PWA_c) + \beta_2 C_i + \beta_3 \log(PWA_c) \times C_i + X_i + \epsilon_{ic} \tag{1}$$

y_{ics} represents the probability of individual i being in occupational skill ranking s in 1940; i lived in county c in 1930, closer to when most of PWA spending occurred. Thus, this model was run three times, once for every skill ranking. PWA_c represents the total PWA spending per capita in county c. C_i is a binary variable indicating whether or not individual i was in the construction industry in 1930, as indicated by the industry code in the census data.

In this model, β_1 represents the increase in percent chance that this individual is in this skill group when total per-capita PWA spending in their home county increases by one percent, given that this individual is not in construction. β_2 represents the increase in chance if this individual was in the construction industry. The interaction coefficient, β_3, represents the change in increase in percent chance from PWA spending given that the individual is in construction.

X_i represents a vector of control variables taken from the 1940 census. This includes age, race, education, marital status, and number of children under five years old. Race is encoded as a binary variable indicating if the individual reported as white or not. I am looking solely at the impact of PWA spending and industry affiliation, and as age, race, and education are all likely factors determining someone's occupation during this time period, they act as

useful controls. Marital status is also encoded as a binary variable, indicating whether or not the individual is married. Marriage and number of dependent children likely change the individual's income needs, and thereby their occupational needs, and are therefore included as well.

5 Results

The results of this regression appears in Table 1.

Holding PWA spending constant, construction industry membership seems to be correlated with more low-skilled occupations. The chance of being in a high-skilled and semi-skilled occupation in 1940 is reduced by 1.810% and 2.697%, respectively, compared to those in other industries, resulting in a 4.508% increase in chance of ending in a low-skilled occupation. This means that construction workers tend to end up in low-skilled jobs more often than people employed in other industries, which reflects the industry's heavier reliance on manual labor.

In corroboration with the findings of Liu and Fishback (2018), it appears that PWA spending has a slight positive overall impact in terms of occupational skill advancement, but is also correlated with a general departure from semi-skilled occupations toward the extremes. A one-percent increase in PWA spending is associated with about a 0.03% decrease in chance of ending in a semi-skilled occupation in 1940. However, it is also associated with about a 0.2% increase in chance of resulting in high-skilled occupations, as opposed to a 0.01% increase in chance of being in a low-skilled occupation.

I find that PWA spending has a uniquely slight, positive effect in terms of occupational skill advancement for individuals in construction. Despite the larger probability of someone in the construction industry being in a low-skilled occupation as opposed to someone in a different industry, when considering the interaction term, an increase in PWA spending is associated with a slight decrease in probability of ending in a low-skilled occupation; the

Table 1: Occupational Skill Rating

	Low-skilled	Semi-skilled	High-skilled
	(1)	(2)	(3)
C	0.04508***	−0.02697***	−0.01810***
	(0.00463)	(0.00549)	(0.00365)
log(PWA)	0.01092***	−0.03328***	0.02236***
	(0.00039)	(0.00048)	(0.00035)
C:log(PWA)	−0.01763***	0.03255***	−0.01492***
	(0.00157)	(0.00187)	(0.00126)
NCHLT5	0.02882***	0.00279***	−0.03161***
	(0.00090)	(0.00102)	(0.00063)
AGE	0.00059***	−0.00185***	0.00126***
	(0.00005)	(0.00006)	(0.00005)
EDUC	−0.02667***	−0.03263***	0.05930***
	(0.00016)	(0.00025)	(0.00023)
MARRIED	−0.04280***	0.00672**	0.03608***
	(0.00244)	(0.00282)	(0.00196)
NONWHITE	0.21668***	−0.14787***	−0.06881***
	(0.00241)	(0.00242)	(0.00104)
Constant	0.23177***	0.88757***	−0.11934***
	(0.00384)	(0.00461)	(0.00335)
log(PWA) − C:log(PWA)	−0.00671	−0.00073	0.00744
Observations	881,507	881,507	881,507

Note: The entries report regression coefficients from 3 regressions, one for each skill ranking. The difference between log(PWA) and interaction term coefficients are included for ease of reference.

*p<0.1; **p<0.05; ***p<0.01

original coefficient of -0.01092 decreases by 0.01763 to -0.00671. The exodus from semi-skilled occupations is also less present for construction workers, as the interaction term almost mitigates the coefficient of PWA spending in the semi-skilled regression. The sign for the high-skilled interaction term is also opposing to the sign of PWA spending, reducing its effect for construction workers to a slight $\sim$0.007% increase in chance per percent increase in PWA spending. More PWA spending leads individuals in the construction industry to leave or avoid low-skilled occupations at a slightly higher rate and take on high-skilled occupations at a slightly higher rate. However, overall, it seems like PWA spending has a much smaller degree of impact on occupational skill rankings for construction workers than its impact on rankings for those in other industries.

From the smaller degree of change from PWA spending, it seems that, despite the construction industry being the principal recipient of government funds in public works programs, public works spending does little to change the long-run occupational skill outcomes of those workers. This could be due to the construction industry labor market being relatively resistant to shifts in supply and demand. Furthermore, public works programs like the PWA aim to create more jobs for the unemployed, rather than changing or improving the training of current construction employees, and those employees likely have a stable set of fundamental skills for the jobs that they have. The newly employed, however, had probably lost higher-ranked occupations in other industries. These explanations align with how those in other industries face a more volatile skill relationship with PWA spending, how there are more of those people from other industries in low-skilled occupations in areas with higher spending, and how the construction industry is composed of a larger amount of individuals with low-skilled occupations anyway.

Individuals in the same occupations may, however, have different economic standings. To further examine the impact of PWA spending on the construction industry, I regress logged 1940 wage and salary income on the same independent features. The result of this regression can be seen in Table 2.

Table 2: 1940 Income

	log(INCWAGE)	Exponentiated Coefficient
C	1.243***	3.467
	(0.038)	
log(PWA)	0.526***	
	(0.003)	
C:log(PWA)	−0.365***	
	(0.013)	
NCHLT5	−0.355***	0.701
	(0.007)	
AGE	−0.051***	0.950
	(0.0004)	
EDUC	0.126***	1.134
	(0.002)	
MARRIED	0.467***	1.596
	(0.019)	
NONWHITE	−0.685***	0.504
	(0.016)	
Constant	5.285***	197.391
	(0.031)	
log(PWA) − C:log(PWA)	0.161	
Observations	835,693	

Note: INCWAGE corresponds to the IPUMS variable of the same name, which measures pre-tax wage and salary income. Some exponentiated coefficients and the difference between log(PWA) and interaction coefficients are also included in this table for ease of reference.
*p<0.1; **p<0.05; ***p<0.01

It seems that the construction industry was well-off in terms of income, but once again was less impacted by PWA spending than other industries. Holding all else constant, construction membership is associated with a increase in wage by a factor of 3.467, which is a huge difference in income. However, each percent of PWA spending per capita is associated with only a 0.161% increase in income, as opposed to a 0.526% increase in income for other individuals.

This once again attests to the resistance and stability of the industry. The Great Depression and its economic contractions led to a fall in average incomes, but construction workers ended with extraordinarily high wages in 1940. Furthermore, construction wage is less influenced by PWA spending, indicating less dependency on the additionally demand from the government.

6 Conclusion

The Great Depression resulted in a number of public works programs designed to provide relief for high unemployment. The PWA, specifically, focused on investing in the private construction industry to produce valuable large-scale infrastructure projects. Despite the high unemployment of the Great depression and high relief funding, I find that both the long-run occupational skill outcomes and the long-run financial outcomes of individuals who were in the construction industry were less associated with differences in PWA spending compared to individuals who were not, and the individuals who were in the construction industry had relatively high incomes by 1940.

This appears to be due to relatively high resilience of the industry from market changes. Despite working in an industry with artificially higher demand from government programs, those who have been employed in construction in areas with high works spending end up in very similar skill distributions compared to those in areas with low public works spending. Furthermore, those who have been employed in construction are able to maintain and gain

relatively high wages compared to those employed elsewhere, in defiance of the economic downturns over the course of the Depression. Overall, it seems that, even though they may be able to create new jobs and employ more people into the industry, relatively short-term public works programs like the PWA impact those who are already working in the industry notably less than people who have not, specifically in terms of skill advancement and financial standing.

It is notable to examine the direction of the influence of PWA spending, however. Even if slight, PWA spending does lead to higher chances of ending in a higher-skilled occupation and a higher-wage job. Although it remains unclear from this analysis whether these mildly positive effects are direct results of industry demand or indirect results from economic leakage, they are encouraging to observe.

Further study will be necessary to evaluate questions like the one in the previous paragraph. Further study might also be helpful to determine to what degree those individuals in construction have actually switched to other industries, if the high long-run wage outcomes truly were maintained through the decade, and how the PWA and similar public works programs affected the long-run outcomes of the newly hired.

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Exhibits

Table A1: Average Educational Attainment Rates by Occupation, 1940, USA

	Prof./Mgr.	Farm	Cler./Sale	Craft/Op.	Service	Laborers	Total
8th grade	0.866	0.496	0.896	0.682	0.640	0.464	0.672
12th grade	0.555	0.0918	0.493	0.162	0.161	0.0747	0.240
4-year college	0.249	0.00901	0.0868	0.0128	0.0153	0.00575	0.0582

Notes: Data that loosely defined the educational/skill rankings by occupational category in this paper.
Sources: Calculated by Quincy (2023) from Ruggles et al. (2020). Data consists of men between 25 and 65 who report being employed in 1940.

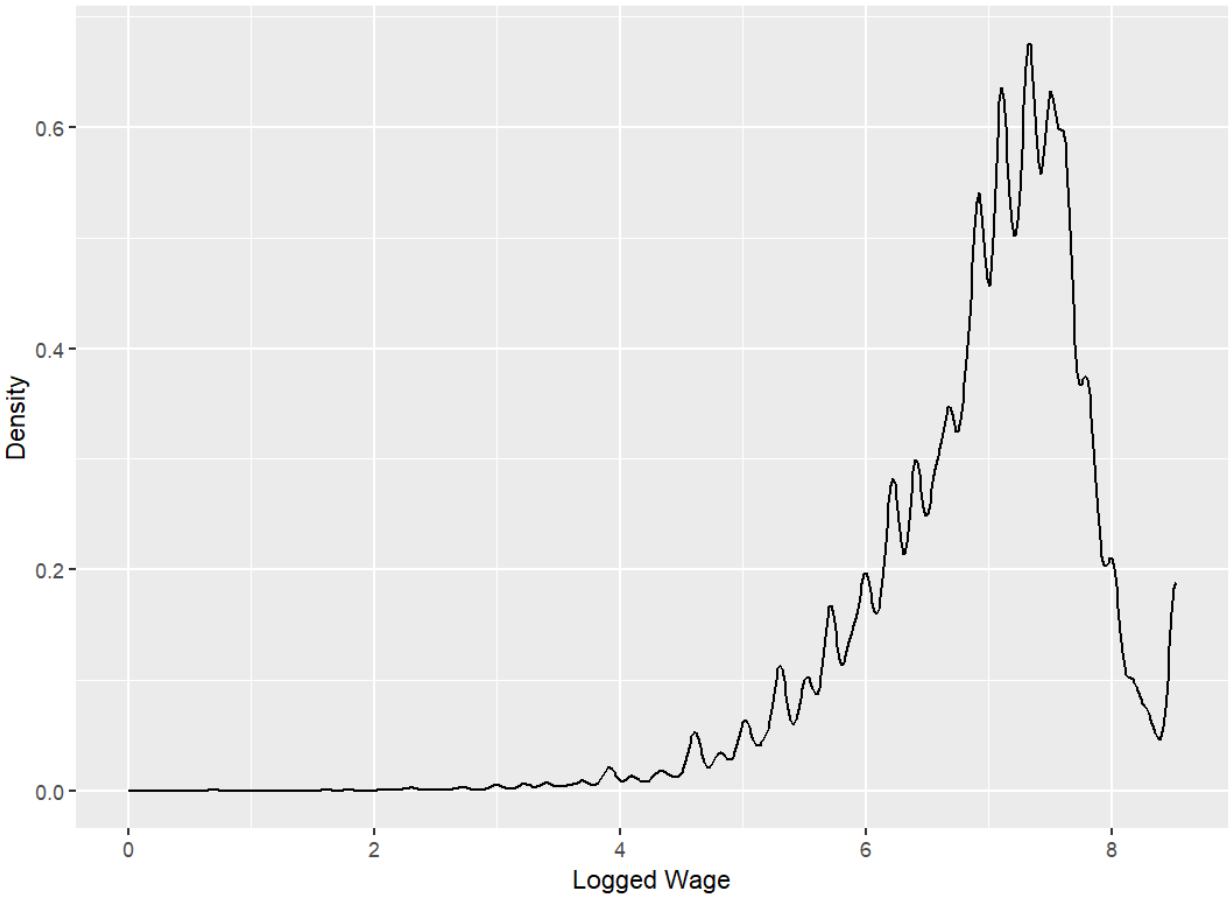

Figure A1: Logged Distribution of Income