EC9C5: Replication Project

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The Growing Importance of Social Skills in the Labor Market

Deming, 2017, QJE

April 22, 2019

Abstract

Abstract This project is a partial replication of Deming (2017), with a brief suggestion for an extension. Deming (2017) combines data from the O*NET, NLSY97 and NLSY79 surveys to demonstrate how social skills, among other types of skills, have a positive impact on wages, and that these effects have grown between the 1979 and 1997 cohorts. This project focuses on the 1997 round to study the construction of measures to assess the task content of jobs, individual skill levels and how these relate to jobs. It also proposes an extension to study the impact of technology change on social skills, looking at how wages have changed for jobs that are more routine and hence, replaceable.

1 Introduction

This paper by David Deming is an examination of dynamics of social skills in the labour market in the USA. Recent examinations of the impact of technology on the labour market have studied the rising importance of non-cognitive and social skills, with routine jobs increasingly under being replaced by automation (Acemoglu and Restrepo, 2018). This study focus on social skills and develops a model of team production, modelling social skills as a reducer of costs for team work. Comparative advantage and relative prices decide the evolution of the importance of social skills in the labour market. Employing a Ricardian trade model, he derives and tests six key empirical predictions:

i. There are positive labour market returns to both cognitive and social skills.

ii. Cognitive and social skills are complementary to each other.

iii. There is sorting of more social workers into non-routine work.

iv. Workers earn more by switching into non-routine occupations, and the relative wage gain is proportional to their social skill.

v. Over time, there has been a growth in the importance of jobs requiring social skills.

vi. Over time, returns to social skills have increased.

For the purpose of this replication project, we focus on the part of the paper that deals with the construction of the score for measuring social skills for the 1979 data. That is, we limit the scope of this project to the importance of social skills in a cross-sectional sense, rather than examine the changes in its importance between 1979 and 1997 surveys.

To test his predictions, the author synthesises data from the following four data sources:

i. O*NET (Occupational Information Network): is a survey by the USA Department of Labor on the work being done by a sample of US workers. It collects information on the task content of jobs that is useful in identifying the skills being put to use. The author uses the first survey round, conducted in 1998, noting that later rounds have similar results.

ii. American Community Survey (ACS) Data: Deming follows Autor & Dorn (2013) and use data from the American Community Survey and the 1980-2000 Censuses to get additional information about occupations and industries.

iii. NLSY79 (1979 National Longitudinal Survey of Youth): This is the primary source of data on individual workers, their skills, incomes and demographic details. The NLSY is a panel of data on a nationally-representative sample of youth, collected every year between 1979-1993, and then every two years till 2012. The survey also administered psychometric tests to the respondents during some years, and the author uses these as measures of cognitive and non-cognitive skills. He uses a mapping of one such set of scores (Armed Forces Qualifying Test or AFQT) that has been previously generated by Altonji et al. (2012), to make it comparable across waves.

iv. NLSY97 (1997 National Longitudinal Survey of Youth): The NLSY was conducted with a new cohort in 1997, broadly following the same methodology and questionnaire. The author uses this survey to compare the importance of social skills for the 1979 and the 1997 cohorts. However, as mentioned earlier, in this project I will not explore this portion of the study in order to limit the scope.

2 Literature Review

This paper is closely connected to the existing literature on the examination of social, cognitive and non-cognitive skills and their contribution to labour market returns (Acemoglu and Autor, 2011; Altonji et al., 2012; Autor et al., 2003; Beaudry et al., 2016; Heckman et al., 2006; Yamaguchi, 2012). While the paper builds on a small, but robust foundation of studies, the manner in which social skills are defined has not been consistent across these approaches.

Below I discuss some other recent working papers in labour economics that deal with the impact of social skills on labour market outcomes. Given that Deming, 2017 is a recent paper itself, there are not (yet) many papers that build on his approach. However, the ones below offer alternative perspectives on the issue, often using the same data.

A sociological study by Wyant et al. (2018) examines the dimensions of social skills and how it accumulates across careers. The authors use principal component analysis on the O*NET database to break down the social skills into four main dimensions- emotion, communication, coordination and sales. They also use data from the Panel Study of Income Dynamics (PSID) to analyse the variability in social skill experience in early, middle and later career workers. They find evidence of significant group differences in the accumulation of skill experience, and also note the overlap of the skill dimensions across career paths.

Guvenen et al. (2015) approach the topic of social skills from a matching perspective. Based on a dynamic model of occupational choice, enhanced with accumulative skills and Bayesian learning about ones ability to gather such skills, they propose a measure of multi-dimensional skill mismatch. They build on the existing literature in psychology and education on multiple intelligences, and put their measure to test on data from the NLSY79 panel and O*NET. They find that moving from the lowest skilled decile to the highest can increase wages by 11% per year for workers. Piopiunik et al (2018) conduct an experimental study for the importance of social skills as signals that are valued by employers. They find that signals on cognitive and social skills, when added to fictitious resumes sent to German human-resource managers had a significant effect on their success.

A recent study in development economics has also examined the impact of social skills through a randomised control trial (RCT). Adhvaryu et al. (2018) study a program to impart on-the-job soft skills to female garment workers in India. They find significant positive effects on womens social skills and productivity. However, as compared to a 20% increase in productivity, the workers only experienced a 0.5% rise in wages, indicating strong frictions in the labour market. Other studies too, have focused on the gender differences in the labour

market impact of social skills. Jaimovich and Siu (2018), for instance, find that there has been an increase in the demand for female skills as a result of the increasing importance of social skills in occupations. Piopiunik et al. (2018) find that while employers place greater value on maturity in men, and look for IT and language skills in women, social skills are equally important for workers of either sex.

3 Replication

For this project, I replicate tables 1, 2 and 3. These three tables pertain to the first three empirical predictions made by the theoretical model. Hence, table 1 describes the labour market returns to cognitive and social skills in NLSY79; table 2 analyses occupational sorting effects on skills in the same survey, and table 3 describes the returns to skill based on task intensity. While these tables are based on relatively straightforward regressions, the bulk of the work for this project has been in understanding the datasets involved and how they are used together to generate variables for cognitive skills, non-cognitive skills, social skills and task content of workers jobs.

3.1 Data

I have carried this out the original data sources from NLSY, O*NET and ACS, and carrying out the procedure as mentioned in the text and the online data appendix provided by the author. I also used the replication data available online to get was used for some of the mapping tables that the author uses from other papers. primarily by attempting a replication of the estimation procedure described in the text.

O*NET

O*NET data is made publicly available by the US Dept of Labor. The first version, collected in 1998, is provided as an Access database (*.mdb file). Following the methodology of the paper, I saved the individual tables in the database as text (txt) files and then imported them into stata for linking them to each other. As per the data appendix, the author aggregates specific variables to create measures of skills required as a parts of tasks for jobs, which the author refers to as occupational task content. These are described here: i) Social Skills: This is the key measure of interest, and is constructed as the average of four ONET variables social perceptiveness, coordination, persuasion, negotiation ii) Non-routine Analytical Skills: This measure has been linked by the author to mathematical reasoning ability, knowledge and skill. iii) Routine Skills: creates an average of the level of automation of tasks, and

the importance of repeating physical or mental tasks. Except for the variable on repetition of tasks (which uses a 1 to 5 scale), all the other variables use an ordinal scale with values from 1 to 7. The data appendix notes that all the component variables are rescaled to be between 0 and 10 before being averaged to generate the measures of skills. Using the ONET code, these are linked to the 1990 Census Occupation Classification (COC) data, based on a crosswalk provided by ONET, to generate occupation codes that can be used in the NLSY79 data later. The ONET variables are later merged into the NLSY dataset, where they are converted into percentile scores and weighted by the 1980 labour supply as per ACS data. For the purpose of robustness checks the author creates more composite scores, but I will exclude them from the scope of this project.

NLSY79

The data from the NLSY79 is publicly available from their website. However, it contains a very large number of variables. As a part of the replication data, Deming provides the tagset, or the list of variables used from the survey. This allows the extraction of variables of interest from specific years. I used the same tagset to extract the dataset, and ran the auto-generated do-file to rename and label the variables. Next, I generated the controls and variables of interest used in the regressions.

Variables: *Demographic Variables*:Age, Sex, Race, Highest Level of Education (as a max across all years of survey), geographic variables, Income and Employment: Wage per hour (for those not enrolled in education, multiplied by price index as done in replication do-file, and winsorized at 3 and 200), employment status. *Social Skills*: I use the first measure of social skills, as defined in the paper. It is the average of the responses to the question How sociable are you today, How sociable were you at age 6 (both from the 1985 round), participation in athletics and high school sports, and the sum of the number of types of clubs and organisations the respondent participated in (types include youth organisations, hobby clubs, student government bodies, athletics and sports, performing arts groups). All the variables are standardised before averaging, and the summative score is again standardised before being used in regressions. The second measure, with only the first two components, is used for comparison between NLSY79 and NLSY97 which I shall not cover here. *Non-Cognitive Skills*: Deming uses a sum of the scores of two psychometric tests the Rotter test and the Rosenberg test, which check for an individuals locus of control and self-esteem. Similar to other variables, the two scores are standardised, added and then re-standardised.

Cognitive Skills: For cognitive skills, Deming relies on respondents scores in the Armed Forces Qualifying Test (AFQT). However, he uses the version provided by Altonji et al

(2009) which makes the scores comparable between NLSY79 and NLSY97. Even though I am excluding NLSY97 from this project, I will still use the 79 scores from this file to help in maintaining comparability of coefficients.

Crosswalks available in the replication dataset were used to import occupational details and industry classifications. The data was then reshaped to form a long panel to run the regressions.

3.2 Results

I ran the regressions for tables 1 to 3, following the methodology described in the paper. In the following section, I detail each of these and explain how the results I obtained differ from those in the paper. Broadly speaking, the results I get are in line with those in the paper.

I make two primary deviations I make from the original exercise. First, the original regressions weight the observations by the weightings used in Altonji et al. (2009). The weights provided in the crosswalk are meant to make the 1979 and 1997 surveys comparable. Since this project is only interested in the 1979 round, the weights can be done away with, however I keep them to facilitate comparison with the original results. I ran the tables both with and without these weights, with little changes to the results. Second, the author restricts the regressions to those observations where the respondent is employed, and all the variables are populated with values. To assess the robustness of these results, I also experimented with adding an additional restriction to focus the sample on prime age (between 25 and 60 years) respondents, and the results were robust to this too.

Table Labour Market Returns to Cognitive Skills and Social Skills in the NLSY79 In the original paper, Table 1 reports the findings of the baseline equation:

$$ln(wage_{ijt}) = \alpha + \beta_1 COG_i + \beta_2 SS_i + \beta_3 COG_i * SS_i + \gamma X_{ijt} + \delta_j + \zeta_t + \epsilon_{ijt}$$

Where Cog_i, SS_i are the scores for cognitive and social skills, respectively, X_{ijt} are the controls for race-by-gender, region, urbanicity with age and year fixed effects δ and ζ. The observations are clustered at the individual level. This is testing for the returns to skills in the labour market, which are predicted to be positive, and also test for the complementarity of social and cognitive skills, which are the first two predictions of the theoretical model. The results are presented in Table 2.

The replicated tables 3-5 largely corroborate with the original results. The main discrepancy is in the number of observations - the original results had 126,251 observations while my replications have approximately 20,000 fewer for each regression. I have investigated

this difference and it can be attributed to differences in the construction of the social skills measures and its treatment of observations with missing values. I discuss this further in the following section.

Given the differences in N, I will not run tests of statistical difference between the two results. However, the three replication tables all show a strong positive impact of social skills on the dependent variable (log wage). The coefficient remains positive and significant for all specifications- in the specification without any controls, for instance, social skills alone explain 10.6% of the variation in log wages. The effect of cognitive skills is also strongly positive. The introduction of the interaction term between cognitive and social skills absorbs some of these coefficients, but all the three remain significant, even when controls for education are added. These results are in the same direction as in the original, though the size of the coefficients is somewhat smaller. It should be noted that restricting the sample to prime age respondents in Table 5 reduces N by around 14,000 observations, indicating that this was not a trivial restriction to add.

Table 2:Occupational Sorting on Skills in the NLSY79

The original Table 2 in the paper reports the findings of the baseline equation:

$$y_{ijt} = \alpha + \beta_1 COG_i + \beta_2 SS_i + \beta_3 COG_i * SS_i + \gamma X_{ijt} + \delta_j + \zeta_t + \epsilon_{ijt}$$

Where the dependent variable y is a variable that checks for the task content of individual jobs, as described by O*NET data. Cog_i, SS_i are the scores for cognitive and social skills, respectively, X_{ijt} are the controls for race-by-gender, region, urbanicity with age and year fixed effects δ and ζ. The observations are clustered at the individual level.

This equation tests for occupational sorting on skills, that is, workers with higher social skills will be more likely to take up jobs that are non-routine and rely more on social skills.

In general, the nature of the results is similar to Table 1, with roughly 30,000 fewer observations in the replicated sample. This can be attributed to the differences in the construction of the skills measures. The results are in the same direction as the original tables, and the coefficients are smaller, for the replications with all the observations. Overall, these results provide support for the hypothesis that workers with higher social skills sort themselves into non-routine and social skill intensive jobs.

Restricting the pool to prime age respondents, however, increased the magnitude of the coefficients, indicating a more pronounced sorting effect for this age group.

Table 3:Returns to Skills by Occupation Task Intensity in NLSY79 The original Table 3 reports the findings of the baseline equation:

$$ln(wage_{ijt}) = \beta_1 COG_i * T_{ijt} + \beta_2 SS_i * T_{ijt} + \beta_3 COG_i * SS_i * T_{ijt} + \gamma X_{ijt} + \delta_j + \zeta_t + \epsilon_{ijt}$$

Where T_{ijt} is the task content of a workers occupation, η_i is a worker fixed effect, and the other symbols have the same meaning as in previous equations. Adding these two variables to the equation allows the estimation of returns to skills by occupation task intensity, that is, to see the effects interactions between individual skills and the nature of their occupations on wages.

Again, the results of the replication are similar to the original results, with a smaller set of obversations, and smaller coefficients that are in the same direction and significant. The interpretation is the same as described in the paper.

Fragility of SOC-NLSY measure The main driver of the discrepancy in the number of observations is the manner in which the social skill score is coded. The code provided in the replication dataset uses the "rowmean" function to generate the variable, which generates a mean for observations even when all the variables are not present. Given that the author's definition of social skill is the average of all four quantities, in case any of those are unavailable, the social skill score should not be calculated.

If this is replaced with a more restrictive mathematical average, the number of observations drops by 2,000. The two measures which should be identical have a correlation coefficient of 0.88. This creates rather different results from the ones reported in the paper. For instance, running the regression for Table 1 here (not reported) maintains the direction and significance of the coefficient for Social Skills, but all the other variables either lose significance or reverse direction. This is a potential weakness of the paper, in that the measure needs to clearly outline its strategy for dealing with missing values while constructing the index.

Table 1: Summary Statistics of RowMean and Average Measures of Social Skills

	Soc_NLSY_RowMean	Soc_NLSY_Avg
N	12,686	10,845
Mean	-0.009	0.0073
Std Dev	0.697	0.442

4 Extension

4.1 Research Question

In this extension of the project, I examine how wages have differentially evolved in the US for jobs with different levels of routine tasks and social skills. Specifically, the research question is- Do job with higher social skill and low-level of routine-ness lead to lower wage growth? Using the available data, we can test a prediction that jobs that are low on social skills and have more routine tasks are more likely to see lower growth in workers incomes.

4.2 Motivation and Literature Review

Acemoglu and Autor (2011), in their influential handbook chapter on skills and technical change, highlighted the heterogeneity of effects of automation on jobs. They build on previous models of skill-biased technical change Acemoglu (2002). They point out that the existing jobs that are complementary to the technology, are boosted by advancements to it. These include roles that are intensive in cognitive, analytical and socio-emotional skills and are non-routine. For instance, relationship management in banks, management of research in universities and creative design require advanced cognitive and social skills which cannot be replicated by automation. On the other hand, jobs that are routine and can be substituted by technology, such as manual labour, are easily displaced by automation.

Recent empirical studies have found support for this theory. Acemoglu and Restrepo (2018) study the impact of robot-related automation on US local labour markets and find large negative results of the introduction of robots on both employment and wages. They focus on the post-1990 changes and show that an additional robot per 1,000 workers reduces wages by 0.25-0.5%. Graetz and Michaels (2015) do a cross-country study on a similar topic. They instrument increased robot use in industries with worker replaceability by robots (similar to the O*NET routine variable used in this project), and find that robots increased wages, TFP and growth rates for countries. While the aggregate measures show an upward movement, they find that the working hours of low and middle skilled workers had dropped.

4.3 Data and Empirical Strategy

Deming (2017) uses O*NET data on tasks, and uses the questions to construct measures of task content. When combine with NLSY data, this can be used to study the growth of wages. Empirical Estimation: I use a fixed-effects equation to test for the interaction of social tasks

and routine tasks and look for their effect on the percentage year-on-year growth in the per-hour wage of respondents in the NLSY. I use the same controls as Deming (2017), and also add measures of other kinds of tasks in jobs- maths skills, coordination skills, reasoning skills and numerical ability.

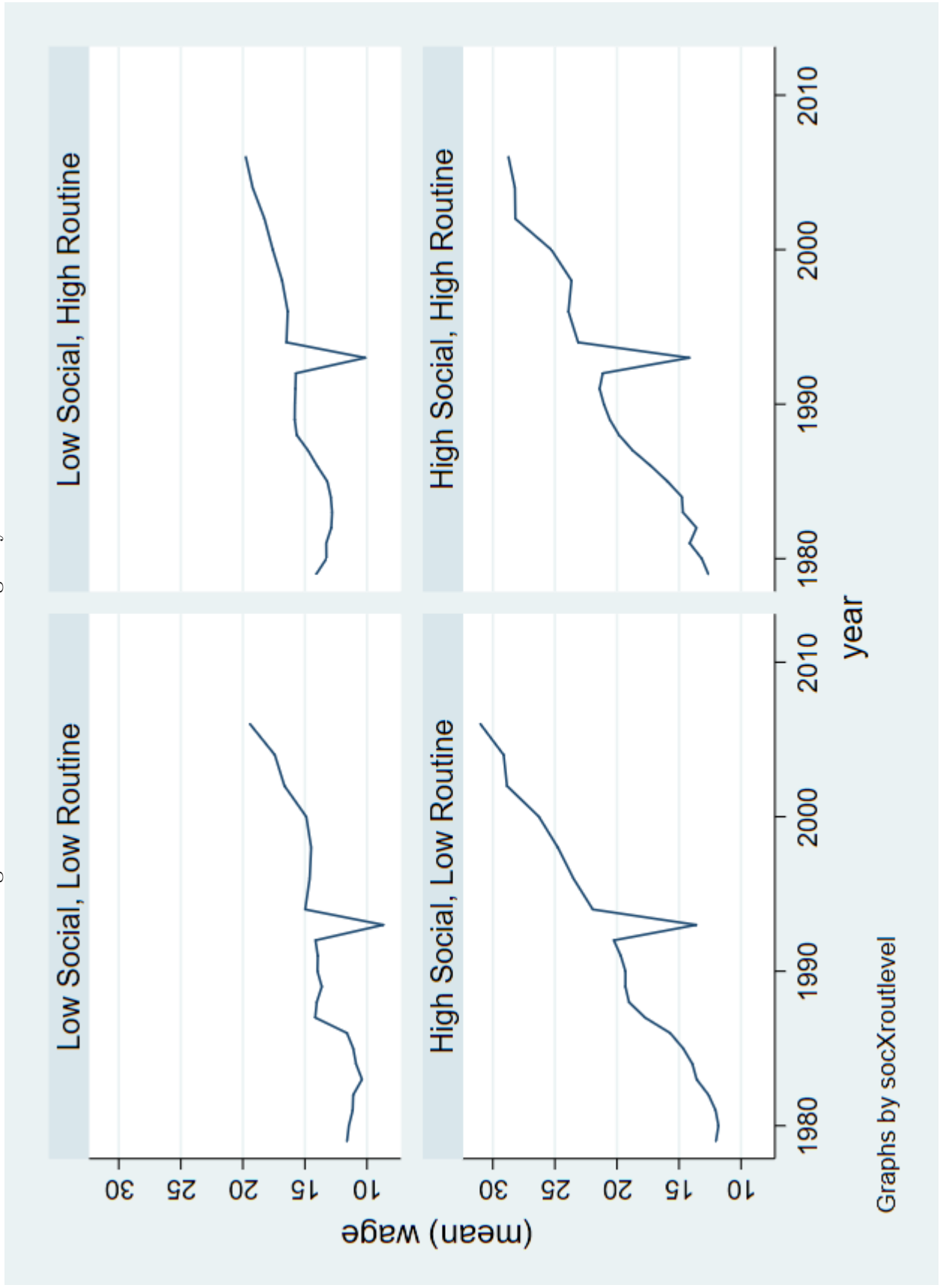
$$\Delta wage_{ijt} = \beta_1 SocialContent_j * Routine_j + \gamma X_{ijt} + \delta_j + \zeta_t + \epsilon_{ijt}$$

4.4 Discussion

Figure 1 shows how mean wages have evolved for different categories of jobs classified based on social-ness and routine-ness. The jobs were classified as low or high on social or routine content based on whether they were below or above the median level. The bottom-left quadrant are the jobs with high social skills and low levels of routine activity, and these jobs have seen the highest rise in wages since 1979. The two quadrants on the top have a low content of social tasks, and have seen a low rise in their wage levels. Jobs with high social and routine contents, have, however, seen a relatively large increase.

Putting the data to test for equation above, however, does not show any significant results. Table 13 shows the results of the three specifications of the tests, varying the inclusion of controls and the controls for interaction between social and routine task levels. However, I find no significant coefficients on any of the results. When the social and routine variables are included as separate variables, the coefficients on each are in the expected direction. Higher social, math, reasoning and numerical content in jobs leads to higher pay rises. On the other hand, jobs that are more routine or involve coordination have seen relatively smaller, but negative effects on wage growth. These results remain the same when controls are included. The interaction between social and routine skills, on which we would expect to see a negative coefficient, is statistically the same as zero.

Figure 1: Growth of Mean Wages by Task Content



These results do not support the hypothesis, but this is of course a basic treatment of the research question. It can be further developed by constructing a two-way model of demand and supply of labour for low skilled jobs. I foresee this model to generate predictions for decreasing incomes, as labour supply remains steady while demand falls.

Also, at the moment I have used per-hour wages, but these might not be able to capture any decrease in hours worked. So with a larger scope, I would increase more income variables, including hours worked, annual income as well as measures of promotion and career advancement, which are available in the NLSY79 data.

5 References

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Tables

Table 2: Labour Market Returns to Cognitive Skills and Social Skills in the NLSY79, Table 1 as per Deming (2017)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ln_wage	ln_wage	ln_wage	ln_wage	ln_wage	ln_wage	ln_wage
Cognitive Skills (AFQT)		0.206***	0.206***	0.189***	0.126***	0.190***	0.126***
		[0.007]	[0.007]	[0.007]	[0.008]	[0.007]	[0.008]
Social Skills (std)	0.107***	0.055***	0.049***	0.043***	0.029***	0.044***	0.029***
	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]
Cognitive*Social			0.019***	0.019***	0.011*	0.017***	0.010*
			[0.006]	[0.006]	[0.006]	[0.006]	[0.006]
Non-Cognitive Skills (std)				0.048***	0.040***	0.046***	0.040***
				[0.006]	[0.006]	[0.006]	[0.006]
Cognitive*Non-Cognitive						0.008	0.001
						[0.006]	[0.006]
Demographics & Age-Year FE		X	X	X	X	X	X
Years of Education					X		X
Observations	126,251	126,251	126,251	126,191	126,191	126,191	126,191
R-squared [1]	0.300	0.343	0.344	0.347	0.359	0.347	0.359

[1]Robust standard errors clustered at individual level, $***p \leq 0.01, **p \leq 0.05, *p \leq 0.10$. Remaining details same as in Deming, 2017 (adapted here): Each column reports results from an estimate of equation described in text , with real log hourly wages as the outcome and personyear as the unit of observation. The data source is the National Longitudinal Survey of Youth 1979 cohort (NLSY79). Cognitive skills are measured by each NLSY79 respondent's score on the Armed Forces Qualifying Test (AFQT), and are normalized to have a mean of zero and a standard deviation of one, used from the AFQT score crosswalk developed by Altonji, Bharadwaj and Lange (2012). Social skills is a standardized composite of four variables 1) sociability in childhood; 2) sociability in adulthood; 3) participation in high school clubs; and 4) participation in team sports. The measure of "noncognitive" skills is the normalized average of the Rotter and Rosenberg scores in the NLSY. The regression also controls for racebygender indicator variables, age, year, census region, and urbanicity fixed effects plus additional controls as indicated.

Table 3: Replication of Table 1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Cognitive Skills (AFQT)		0.194***	0.194***	0.176***	0.114***	0.176***	0.114***
		[0.006]	[0.006]	[0.007]	[0.008]	[0.007]	[0.008]
Social Skills (std)	0.106***	0.057***	0.049***	0.045***	0.032***	0.046***	0.032***
	[0.006]	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]
Cognitive*Social			0.020***	0.021***	0.013**	0.019***	0.012**
			[0.005]	[0.005]	[0.005]	[0.005]	[0.005]
Non-Cognitive Skills (std)				0.047***	0.039***	0.044***	0.038***
				[0.006]	[0.006]	[0.006]	[0.006]
Cognitive*Non-Cognitive						0.009*	0.002
						[0.005]	[0.005]
Demographics & Age-Year FE		X	X	X	X	X	X
Years of Education					X		X
Observations	109,404	109,404	109,404	105,722	105,722	105,722	105,722
R-squared [2]	0.209	0.271	0.272	0.276	0.295	0.276	0.295

[2]Refer to footnote 1

Table 4: Replication of Table 1 without Weights

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Cognitive Skills (AFQT)		0.201***	0.201***	0.183***	0.124***	0.183***	0.123***
		[0.005]	[0.005]	[0.005]	[0.006]	[0.005]	[0.006]
Social Skills (std)	0.098***	0.045***	0.044***	0.039***	0.024***	0.039***	0.024***
	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]
Cognitive*Social			0.013***	0.014***	0.006	0.013***	0.006
			[0.004]	[0.004]	[0.004]	[0.004]	[0.004]
Non-Cognitive Skills (std)				0.049***	0.041***	0.049***	0.041***
				[0.004]	[0.004]	[0.004]	[0.004]
Cognitive*Non-Cognitive						0.004	-0.002
						[0.004]	[0.004]
Demographics & Age-Year FE		X	X	X	X	X	X
Years of Education					X		X
Observations	109,404	109,404	109,404	105,722	105,722	105,722	105,722
R-squared [3]	0.200	0.272	0.272	0.278	0.296	0.278	0.296

[3]Refer to footnote 1

Table 5: Replication of Table 1 with Prime Age Respondents only

VARIABLES	(1) ln_wage	(2) ln_wage	(3) ln_wage	(4) ln_wage	(5) ln_wage	(6) ln_wage	(7) ln_wage
Cognitive Skills (AFQT)		0.202***	0.202***	0.184***	0.117***	0.185***	0.118***
		[0.007]	[0.007]	[0.007]	[0.008]	[0.007]	[0.008]
Social Skills (std)	0.110***	0.059***	0.051***	0.047***	0.032***	0.048***	0.033***
	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]
Cognitive*Social			0.022***	0.023***	0.013**	0.020***	0.013**
			[0.006]	[0.006]	[0.006]	[0.006]	[0.006]
Non-Cognitive Skills (std)				0.047***	0.038***	0.043***	0.037***
				[0.006]	[0.006]	[0.006]	[0.006]
Cognitive*Non-Cognitive						0.011*	0.002
						[0.006]	[0.006]
Demographics & Age-Year FE		X	X	X	X	X	X
Years of Education					X		X
Observations	94,867	94,867	94,867	91,671	91,671	91,671	91,671
R-squared [4]	0.207	0.271	0.272	0.276	0.297	0.276	0.297

[4]Refer to footnote 1

Table 6: Occupational Sorting on Skills in the NLSY79,Table 2 as per Deming (2017)

	(1) Routine	(2) Routine	(3) Socskills	(4) Socskills
Cognitive Skills (Std)	-0.055*	0.161***	0.345***	-0.044**
	[0.030]	[0.032]	[0.028]	[0.019]
Social Skills (std)	-0.188***	-0.149***	0.208***	0.119***
	[0.022]	[0.024]	[0.020]	[0.014]
Cognitive*Social	-0.058***	-0.054**	0.014	0.013
	[0.021]	[0.023]	[0.019]	[0.014]
Demographics, Age-Year, Education FE	X	X	X	X
O*NET Cognitive Tasks		X		X
Observations	133,599	133,599	133,599	133,599
R-squared [5]	0.204	0.237	0.305	0.668

[5]Robust standard errors clustered at individual level, $***p \leq 0.01, **p \leq 0.05, *p \leq 0.10$. Remaining details same as in Deming, 2017 (adapted here) : Each column reports results from an estimate of the equation described in the text, with the indicated 1998 O*NET task intensity of an occupation as the outcome and personyear as the unit of observation. The task measures are percentiles that range from 0 to 10 and are weighted by labor supply to conform to the 1980 occupation distribution. The additional O*NET cognitive task measures are Nonroutine Analytical, Number Facility, Inductive/Deductive Reasoning, and Analyze/Use Information. The data source is the National Longitudinal Survey of Youth 1979 cohort (NLSY79). Cognitive skills are measured by each NLSY79 respondent's score on the Armed Forces Qualifying Test (AFQT), and are normalized to have a mean of zero and a standard deviation of one, using the AFQT score crosswalk developed by Altonji, Bharadwaj and Lange (2012). Social skills is a standardized composite of four variables 1) sociability in childhood; 2)sociability in adulthood; 3) participation in high school clubs; and 4) participation in team sports. My measure of "noncognitive" skills is the normalized average of the Rotter and Rosenberg scores in the NLSY. The regression also controls for racebygender indicator variables, age, year, census region, and urbanicity fixed effects plus additional controls as indicated.

Table 7: Replication of Table 2

	(1)	(2)	(3)	(4)
	Routine	Routine	Socskills	Socskills
Cognitive Skills (Std)	-0.072**	0.151***	0.339***	-0.048**
	[0.030]	[0.033]	[0.028]	[0.020]
Social Skills (std)	-0.191***	-0.158***	0.206***	0.123***
	[0.022]	[0.025]	[0.020]	[0.014]
Cognitive*Social	-0.068***	-0.064***	0.019	0.014
	[0.022]	[0.024]	[0.019]	[0.014]
Demographics, Age-Year, Education FE	X	X	X	X
O*NET Cognitive Tasks		X		X
Observations	109,423	109,423	109,423	109,423
R-squared [6]	0.217	0.232	0.312	0.667

Table 8: Replication of Table 2 Without Weights

	(1)	(2)	(3)	(4)
	Routine	Routine	Socskills	Socskills
Cognitive Skills (Std)	-0.094***	0.143***	0.359***	-0.048***
	[0.024]	[0.026]	[0.021]	[0.015]
Social Skills (std)	-0.170***	-0.130***	0.169***	0.096***
	[0.018]	[0.020]	[0.016]	[0.011]
Cognitive*Social	-0.074***	-0.079***	0.036**	0.033***
	[0.017]	[0.019]	[0.015]	[0.011]
Demographics, Age-Year, Education FE	X	X	X	X
O*NET Cognitive Tasks		X		X
Observations	109,423	109,423	109,423	109,423
R-squared [7]	0.230	0.225	0.326	0.668

[6] Refer to footnote 5

[7] Refer to footnote 5

Table 9: Replication of Table 2 for Prime Age Respondents

	(1) Routine	(2) Routine	(3) Socskills	(4) Socskills
Cognitive Skills (Std)	-0.078**	0.151***	0.341***	-0.054**
	[0.032]	[0.034]	[0.031]	[0.021]
Social Skills (std)	-0.197***	-0.164***	0.211***	0.126***
	[0.024]	[0.026]	[0.022]	[0.015]
Cognitive*Social	-0.066***	-0.063**	0.014	0.012
	[0.023]	[0.025]	[0.020]	[0.015]
Demographics, Age-Year, Education FE	X	X	X	X
O*NET Cognitive Tasks		X		X
Observations	94,886	94,886	94,886	94,886
R-squared [8]	0.211	0.238	0.307	0.670

[8] Refer to footnote 5

Table 10: Returns to Skills by Occupation Task Intensity in NLSY79, Table 3 as per Deming (2017)

	(1) ln_wage	(2) ln_wage	(3) ln_wage
Routine Task Intensity	0.0136***		0.0212***
	[0.0012]		[0.0014]
Cognitive*Routine Task Intensity	-0.0034***		0.0005
	[0.0013]		[0.0015]
Social Skills* Routine Task Intensity	-0.0025**		-0.0008
	[0.0013]		[0.0015]
Cognitive*Social*Routine Task Intensity	-0.0008		-0.0011
	[0.0012]		[0.0014]
Social Skill Task Intensity		0.0039***	0.0176***
		[0.0013]	[0.0016]
Cognitive*Social Skill Task Intensity		0.0113***	0.0112***
		[0.0015]	[0.0018]
Social Skills* Social Skill Task Intensity		0.0050***	0.0041**
		[0.0015]	[0.0018]
Cognitive*Social*Social Skill Task Intensity		0.0021	0.0011
		[0.0015]	[0.0018]
Worker FE	X	X	X
Observations	126,251	126,251	126,251
R-squared [9]	0.3161	0.3159	0.3200

[9]Robust standard errors clustered at individual level, $***p \leq 0.01, **p \leq 0.05, *p \leq 0.10$. Remaining details same as in Deming, 2017 (adapted here): : Each column reports results from an estimate of the equation described in the text, with real log hourly wages as the outcome and personyear as the unit of observation. The data source is the National Longitudinal Survey of Youth 1979 cohort (NLSY79). Cognitive skills are measured by each NLSY79 respondent's score on the Armed Forces Qualifying Test (AFQT), and are normalized to have a mean of zero and a standard deviation of one using the AFQT score crosswalk developed by Altonji, Bharadwaj and Lange (2012). Social skills is a standardized composite of four variables 1) sociability in childhood; 2) sociability in adulthood; 3) participation in high school clubs; and 4) participation in team sports. The measure of "noncognitive" skills is the normalized average of the Rotter and Rosenberg scores in the NLSY. All models control for worker fixed effects, age, year, census region, and urbanicity fixed effects plus additional controls as indicated. The interactions between cognitive/social skills and 1998 O*NET task intensities measure whether the returns to skills vary with the task content of the worker's occupation. The task measures are percentiles that range from 0 to 10 and are weighted by labor supply to conform to the 1980 occupation distribution.

Table 11: Replication of Table 3

	(1) ln_wage	(2) ln_wage	(3) ln_wage
Routine Task Intensity	0.0085***		0.0146***
	[0.0010]		[0.0012]
Cognitive*Routine Task Intensity	-0.0021**		0.0016
	[0.0010]		[0.0012]
Social Skills* Routine Task Intensity	-0.0017*		-0.0007
	[0.0010]		[0.0013]
Cognitive*Social*Routine Task Intensity	-0.0014		-0.0013
	[0.0010]		[0.0012]
Social Skill Task Intensity		0.0047***	0.0140***
		[0.0011]	[0.0014]
Cognitive*Social Skill Task Intensity		0.0092***	0.0100***
		[0.0012]	[0.0015]
Social Skills* Social Skill Task Intensity		0.0033***	0.0027*
		[0.0012]	[0.0015]
Cognitive*Social*Social Skill Task Intensity		0.0027**	0.0017
		[0.0013]	[0.0015]
Worker FE	X	X	X
Observations	109,404	109,404	109,404
R-squared [10]	0.1745	0.1760	0.1801

[10]Refer to footnote 9

Table 12: Replication of Table 3 without Weights

	(1)	(2)	(3)
	ln_wage	ln_wage	ln_wage
Routine Task Intensity	0.0070***		0.0138***
	[0.0008]		[0.0009]
Cognitive*Routine Task Intensity	-0.0017**		0.0015
	[0.0008]		[0.0010]
Social Skills* Routine Task Intensity	-0.0016*		-0.0007
	[0.0008]		[0.0010]
Cognitive*Social*Routine Task Intensity	-0.0007		-0.0007
	[0.0008]		[0.0009]
Social Skill Task Intensity		0.0066***	0.0155***
		[0.0009]	[0.0011]
Cognitive*Social Skill Task Intensity		0.0079***	0.0086***
		[0.0010]	[0.0011]
Social Skills* Social Skill Task Intensity		0.0029***	0.0023**
		[0.0010]	[0.0011]
Cognitive*Social*Social Skill Task Intensity		0.0018*	0.0012
		[0.0010]	[0.0011]
Worker FE	X	X	X
Observations	109,404	109,404	109,404
R-squared [11]	0.1647	0.1659	0.1695

[11] Refer to footnote 9

Table 13: Replication of Table 3 for Prime Age Respondents

	(1)	(2)	(3)
	ln_wage	ln_wage	ln_wage
Routine Task Intensity	0.0079***		0.0140***
	[0.0011]		[0.0013]
Cognitive*Routine Task Intensity	-0.0015		0.0019
	[0.0011]		[0.0013]
Social Skills* Routine Task Intensity	-0.0009		-0.0002
	[0.0011]		[0.0014]
Cognitive*Social*Routine Task Intensity	-0.0013		-0.0013
	[0.0010]		[0.0012]
Social Skill Task Intensity		0.0050***	0.0139***
		[0.0012]	[0.0015]
Cognitive*Social Skill Task Intensity		0.0081***	0.0091***
		[0.0013]	[0.0016]
Social Skills* Social Skill Task Intensity		0.0024*	0.0020
		[0.0013]	[0.0016]
Cognitive*Social*Social Skill Task Intensity		0.0026**	0.0016
		[0.0013]	[0.0016]
Worker FE	X	X	X
Observations	94,867	94,867	94,867
R-squared [12]	0.1726	0.1738	0.1775

[12]Refer to footnote 9

Table 14: Wage Changes for Social and Routine Tasks

	(1)	(2)	(3)
	delta_wage	delta_wage	delta_wage
Social Tasks	7.4386	8.2630	
	[12.2067]	[12.0361]	
Routine Tasks	-1.0997	-0.4054	
	[6.2386]	[6.5581]	
Reasoning Tasks	4.3384	3.0557	5.5368
	[7.4276]	[7.7312]	[7.7085]
Maths Tasks	2.9190	-0.1077	0.1419
	[13.0159]	[13.7222]	[14.7922]
Coordination Tasks	-1.8611	-1.8985	3.4778
	[9.6717]	[9.7893]	[7.7314]
Number Facility	3.3351	4.7694	4.7733
	[11.0033]	[11.3615]	[12.9351]
Social Tasks X Routine Tasks			-0.4782
			[1.1823]
Controls		X	X
Observations	98,145	94,328	94,328
R-squared [13]	0.0001	0.0009	0.0009

[13]Robust standard errors in brackets, clustered at individual level. *** p $\leq$ 0.01, ** p$\leq$.05, * p$\leq$0.10. Data from ONET and NLSY79. Dependent variable is the the percentage change in wages year-on-year for individuals in the NLSY. The independent variables are the task contents of their jobs as obtained from the crosswalk with ONET data.