Teaching and Learning Centre

The following paper was written during LSE GROUPS 2019.

LSE GROUPS takes place during the final fortnight of the summer term. Undergraduate students are placed in small groups; these are cross-year, interdisciplinary, and group members do not know one another in advance. Each group must then devise its own research question, and carry out all stages of a small-scale research project in less than two weeks.

The overall theme of LSE GROUPS 2019 was *The Future of Work.*

This paper was submitted on the final Thursday afternoon of the project. (Students then presented their work at a conference, on the closing Friday.)

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Gig it yourself: The impact of gig work on incidence of training cost in Australia, 2001-2017

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LSE GROUPS 2019: *The Future of Work*
The London School of Economics and Political Science

Abstract:

This paper investigates the question of how the shift to gig work affects human capital investment. While existing empirical research, based on Becker's human capital theory and Soskice and Hall's *Varieties of Capitalism*, supports a shift from corporate to personal investment in human capital due to growing flexibility in the labour market, the specific impact of gig working on the patterns human capital investment has been neglected by existing research.

We compiled a new dataset at a 4-year interval between 2001-2017 across 18 industries and statistics on the labour market based on findings of the Australian Bureau of Statistics.
We proxy gig work as 'independent contractor' and operationalise human capital investment as 'work-related training' to analyse the labour market. The case of Australia is selected due to the economy's relative maturity in the development of flexible workforce.

The main findings support existing theories that, as the percentage of independent contractors in employment increases, the percentage of the labour force which bears the cost of work-related trainings also tends to increase. This research, therefore, expands existing knowledge on the impact of changing forms of employment on patterns of human capital investment.

Key words: Gig economy, independent contractor, human capital investment, work-related training, labour market, Australia.

I. Introduction

This research paper explores the phenomenon of gig work and its impact on human capital investment. The emergence of gig work initially offers multiple benefits. While, from the perspective of an employee, greater autonomy over the work is becoming increasingly desirable, employers gain access to a bolstered pool of talents. It is intuitively a win-win situation for both, so it appears "to be here to stay" (Wallenstein, de Chalendar, Reeves, & Bailey, 2019, p. 10). However, with evolving new forms of employee classification, a question arises on who will bear the costs of employee training. We investigate how this recent change of working patterns influences human capital accumulation.

Using a case study of the Australian economy, we aim at answering the following research question: **how does gig working affect human capital investment?**

The analysis focuses on an important academic area because as growth theories dating from 1980s suggest, human capital is significant for macroeconomic growth (Lucas, 1988). Simultaneously, we note wage growth is ultimately driven by worker productivity growth, and therefore human capital investment has likewise meaningful microeconomic implication. The potential change in the incidence of cost of investment may have inequality implications both in terms of income distribution across workers and the firm, and among workers themselves, as the more financially endowed workers can afford to invest more in their own human capital.

The paper uses a case study of the Commonwealth of Australia which has a well-performing and stable economy that allows us to control the effect of economic cycles on investment in the economy. In fact, it has experienced the longest period of undisrupted economic growth among OECD countries (Australian Trade and Investment Commission, 2018). Hence, with well-rounded understanding, findings can be transferred to investigate labour markets following the same trend of increased flexibility.

The first part of the paper outlines the theoretical framework under Becker's human capital theory and varieties of capitalism by Soskice and Hall and analyses relevant empirical studies

on patterns of human capital investment. The second part describes our methodology, analyses employment statistics collected from the Australian Bureau of Statistics during 2001-2017 and discusses our findings from regression. We conclude the paper by explaining the observed relationship between gig work and human capital investment made by companies and by individuals, implications and inspirations for further research.

II. Literature Review

The following literature review outlines the theories on human capital investment and labour market flexibility that the paper adopts, followed by existing research on corporate investment in training, the mediation of such through flexibility and competition within labour markets and the impact of fluid labour markets on incentives for self-investment in specialised training. Eventually, this section shows the gap of existing research on the specific relationship between gig work, in the form of independent contractors, and human capital investment and outlines two hypotheses. We define gig work as task-based on-demand work (Prassl, 2018, p. 13) and independent contractors as "persons who operate their own business and who are contracted to perform services for others without having the legal status of an employee" (Pink, 2010, p. 59). Human capital investment is defined as the "activities that influence future real income through the imbedding of resources in people", such as education and training (Becker, 1962, p. 9).

a. Human Capital Theory and Varieties of Capitalism

In order to examine corporate incentives for investment in human capital, we adopt Becker's (1962) theory of human capital. Becker's seminal study shows that, in general, employers will lack incentive to invest in its workforce in the existence of a perfectly competitive labour market. The value of the trainee's marginal output must compensate for the total cost incurred on the firm but given the market determination of wage rate the firm must make negative profit due to training and opportunity costs. The traditional forms of employment, however, introduce frictions to the labour market, due to employment regulations and the long maturity of contracts, which mediate the effect that Becker describes. Gig working introduces The fluidity in the labour market with potential implications to approximate the labour market assumed in Becker's model. We therefore expect a shift of the costs of investment in human capital from

the firm to the individual (Becker, 1962).Furthermore, Soskice and Hall's (2001) theory on the varieties of capitalism adds validity to the implications derived from Becker's human capital theory. The study looks more generally at differences between labour markets, drawing a distinction between liberal and coordinated market economies with varying institutional comparative advantages. The relevant part of the theory claims that in liberal market economies, characterised by fluid labour markets, firms hire employees on the basis of general skills education and do not invest in the development of specialised knowledge of their workforce (Soskice & Hall, 2001).

Deriving insights from both theories, this paper assumes that the shift to gig working serves as a flexibility-enhancing tool within the labour market (Prassl, 2018; Degryse, 2016) which disincentivises firm investment in human capital, shifting the costs onto the individual. This study therefore theorises the potential aggregate effect of the trend towards labour market flexibility on the accumulation of human capital.

b. Corporate Human Capital Investment

A large body of literature researches corporate investment in employee training of which central findings are summarised below. Looking at adults' participation in training, O'Connell (1999) finds in the analysis of 11 OECD countries that, at the time of the study, job-related training was mostly accounted for by firms, while the previous possession of higher education, the age of the trainee and the size of the firm had a reinforcing effect on the participation in training (O'Connell, 1999).

Further literature examines the relationship in the focus of this paper, i.e. between labour market flexibility and corporate investment in training. Examining the rise in flexible forms of employment, Arumlampalam and Booth (1998) and Draca and Green (2004) suggest that there is a "trade-off between flexible employment and the expanding proportion of workforce getting into work-related training" (Arulampalam & Booth, 1998, p. 532), while David (2010) adds that specifically the rise of specialised independent contractors within the workforce disincentivises firms to train their "own employees with up-to-date skills" (David , 2010, p. 65).

c. Flexible Labour Markets and Self-Investment in Human Capital

Lastly, this paper looks at the shift to self-investment on human capital as a consequence of the rise of flexible employment through gig working. Previous studies outline how the shift from life-time employment towards less permanent roles creates conflict on who provides employees' training. Since individual workers are increasingly dependent on the need of maintaining 'employability', self-investment in specialised skills becomes more relevant (Forrier & Sels, 2003). This is supported by research on the experience of individuals in the gig economy, who are found to mostly self-fund training and education to specialise for "what work was on offer, what skills they needed for their work and what would give them and 'edge' over the people using the same platforms." (Broughton, et al., 2018, p. 79).

d. Hypotheses:

The current literature outlines the relevance of the impact of increased labour market flexibility on the shift of incentives for firms and individuals in human capital. While each study implicitly addresses the purpose of this paper, no studies have been conducted on the specific outcomes of rising gig work on the patterns of investment in human capital on behalf of firms and of individuals. Therefore, we propose the following hypotheses:

H1: The increase of independent contracting decreases not individually-funded work-related training.

H2: The increase of independent contracting increases individually-funded work-related training.

II. Methodology

To test our hypotheses, Australia is chosen for our study, for two reasons: the size of its flexible workforce and the relative stability of its economy.

First, Australia has a large flexible workforce, with over one million independent contractors, accounting for 8% of total employment (Gilfillan, 2018). Further, the establishment of the association Independent Contractors Australia (ICA) in 1999 institutionalised gig workers in the Australian labour market (Self-Employed Australia, n.d.).

Second, the stability of the Australian economy avoids cyclical shocks to gig-working, providing time-consistency for the independent contractor population. Katz and Krueger (2018) noted that the number of workers employed in alternative work arrangements tend to fluctuate in accordance to business cycles, as the labour market becomes tighter. The stability of Australian growth provides a stable labour market, mitigating the macroeconomic effects on employment patterns.

We operationalise gig workers as independent contractors, an employment category compiled by the ABS; and human capital investment as work-related training (WRT). We then measure the incidence of the cost of human capital investment by the percentage of trainees whose costs are borne by themselves.

Independent contractors as a category were only compiled by the ABS since 2009, corresponding to their growing importance. Previously, independent contractors are classified into other categories. We approximate them by the closest categories available, ‘self-identified casuals’ and ‘owner managers’, used in 2001 and 2005 respectively (Trewin, 2002; 2005).

In order to study changing employment patterns over time, we used data points collected at a regular 4-year interval from 2001-2017 and merged them from two data sets: *Forms of Employmen*t (6359.0) and *Characteristics of Employment* (6333.0). The former is a survey throughout Australia in November as a supplement to the ABS monthly Labour Force Survey (LSF) 1998-2013 (Australian Bureau of Statistics, 2002). The latter is a similar survey conducted each August between 2014 and 2018 (Australian Bureau of Statistics, 2018). These surveys contain sector-level observations on employment characteristics in Australia, including gender, forms of employment, among others.

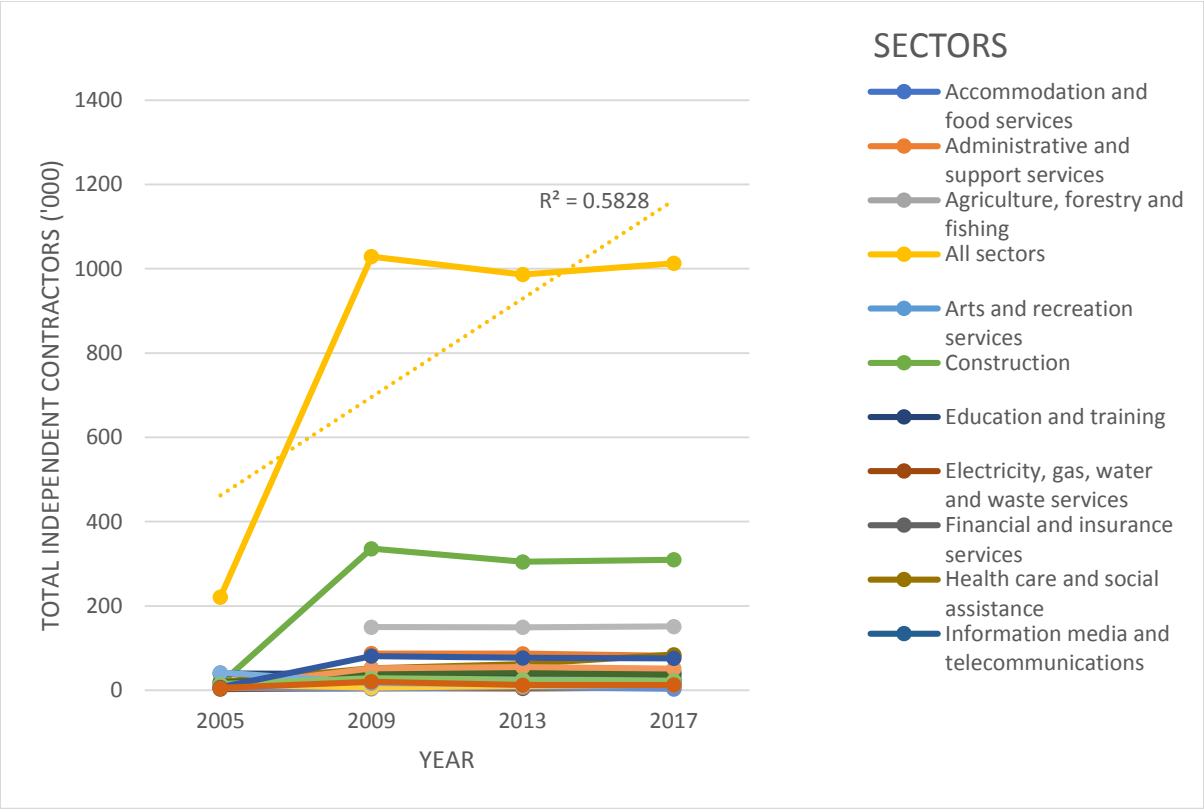
For WRT, we merged data from two groups of ABS statistics: Education and Training Experience (6278.0) and Work-Related Training and Adult Learning (4234.0), also in the same years as above. The former is a questionnaire conducted throughout Australia from March to June between 1993 and 2009. Information was collected, by personal interview, from individuals on their participation in education and training and on their educational attainment (Australian Bureau of Statistics, 2010). The latter is a similar survey conducted throughout Australia as a supplement of LFS in 2013 and 2017.

Moreover, we included several control variables to account for other factors which may cause variations in the outcome variable. We account for the prior level of education of the workforce, as previous studies find that more educated employees are more likely to be in WRT (O'Connell, 1999). We control this variable by separating workers into those with and without non-school education, an ABS classification meaning university- or certificate-level education. Other control variables include respective percentages of gender and part-time workers in a sector. This is because, as predicted by Becker's theory, firms lack incentive to invest in individuals who will generate lower future returns than the cost of training (Becker, 1962). This suggests less corporate investment in training for female workers, who are more likely to take on maternity leaves, and part-time workers (Draca & Green , 2004).

Though detailed, there are several limitations in this data set. Firstly, the ABS revised its methodology to reflect changes in the Australian economy over time. E.g. in 2006 the ABS expanded its original classification of industries from 16 to 18 sectors (Australian Bureau of Statistics, 2008). Furthermore, the ABS did not always collect information on the same characteristics of training participants over time. E.g. the ABS did not record gender of WRT participants in 2009. Therefore, we estimated gender of WRT participants in 2009 by assuming the cross-industry gender ratio of training participants remains constant between 2004 and 2009. Implications of this issue in methodology will be discussed further.

III. Analysis

Using the available data, we have observations on 18 sectors spanning over 16 years at a 4-year interval. This forms a natural set of panel data. We first note the overall trend of independent contractors in Australia in each sector.



Graph 1. Total independent contractors over time, '000

We note an overall level increase across every industry. However, we note a slight decline from 2013 to 2017. This is confirmed by an Australian parliamentary inquiry which reports that the share of independent contractors in total employment has fallen from 9% to 8%, which may be due to stronger growth in the number of permanent employees than growth in casual employees (Gilfillan, 2018).

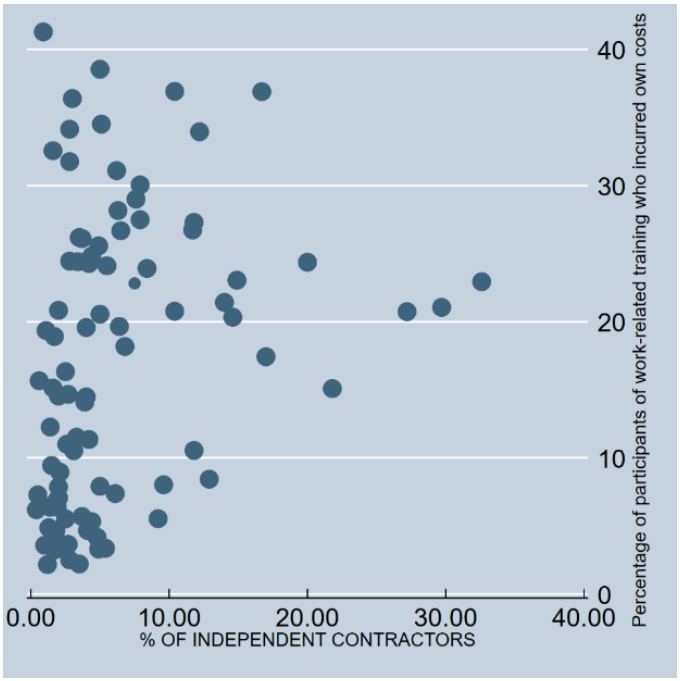
We summarise the interested variables below.

Variable	Obs	Mean	Std. Dev.	Min	Max
Percentage of workforce employed as independent contractors, %	91	6.141758	6.332931	0.4	32.6
Number of males in work-related training, '000	91	63.00769	58.39901	10.8	221.8
Number of females in work-related training, '000	91	57.76264	95.644	4.4	576.1
Total number of individuals in work-related training, '000	91	120.6604	137.2922	21.1	704.2
Percentage of females in work-related training, %	91	42.42795	13.96562	7.236842	81.80914
Number of participants in work-related training with training costs incurred personally,'000	90	29.93333	32.8774	0.7	174.8
Number of participants in work-related training without training costs incurred personally,'000	90	201.7689	250.3799	18.6	1336.1
Percentage of participants in work-related training with training costs incurred personally, %	90	16.89716	10.65805	2.160381	41.29181
Number of full-time workers, '000	91	345.0714	247.3359	48	971.6
Number of part-time workers, '000	91	131.6945	175.6479	1.9	782.7
Percentage of full-time workers, %	91	77.57101	15.56239	36.65199	98.65724
Number of workers who have non-school education, '000	91	333.2121	256.9078	37.9	1288.4
Number of workers without non-school education, '000	91	218.0264	168.7536	16.7	841.6
Percentage of workers who have non-school education, %	91	59.02488	14.56227	24.78327	88.28203
Average wages and salaries, $	68	78093.45	181696	10149.84	1345442

Table 1. Summary Statistics of Variables

We note that, first, Australia has a substantial percentage of independent contractors constituting its workforce. Second, there is substantial cross-sector variations in all variables. This suggests the use of fixed effects in panel data regressions.

Next, we plot a scatter plot of the two variables of interest (**Graph 2),** observing a weak positive correlation. This conforms to our hypotheses that, as the percentage of independent contractors increases, the percentage of WRT participants who incurred personal costs increases. This also suggests that a linear regression analysis would be useful in interpreting the relationship.



Graph 2. Scatter Plot of the Causal and Outcome Variables

We note the distribution of the outcome variable, rightly skewed with mean larger than median, exhibiting positive kurtosis (see **Graph 2**). Since this deviates from the normal distribution, this suggests a GLS/FGLS model should be used for regression analysis instead of OLS.

Graph 3. Histogram of the Outcome Variable

Regression analysis

Given the panel data and the cross-sector differences, we use fixed-effect panel data FGLS regression on the outcome variable. We do not observe any non-linear relationship between the outcome variable and the independent variables. Therefore, no transformation is made. We report the regression output below.

Percentage of participants in work-related training who incurred training costs personally				
	(1)	(2)	(3)	(4)
Percentage of workforce employed as independent contractors	0.460109* (.1787216)	0.494923*** (.1774897)	0.604415*** (.1704679)	0.538066*** (0.1712376)
Percentage of the workforce which has non-school education		-0.1947** (.0841381)	-0.16941** (.0730734)	-0.01523112** (0.0706862)
Percentage of women in work-related training			0.190415** (.0770394)	0.1226667 (0.0870801)
Percentage of the workforce employed on a full-time basis				-0.1342966* (0.0767399)
Constant	14.00995*** (1.709378)	25.29135*** (5.166697)	15.07256*** (5.529541)	27.74349*** (9.288786)
R-sq	8.13%	12.16%	18.86%	21.69%

***Significant at 1% level

**Significant at 5% level

*Significant at 10% level

Table 2. Regression Results

Table 2 summarizes regression results. Firstly, as the coefficient of the main independent variable, percentage of workforce employed as independent contractors, remains positive and statistically significant throughout all 4 models. Therefore, we have empirical support of our second hypothesis that *the increase of independent contracting increases personal human capital investment* since as the percentage of independent contractors increases, the percentage of participants who personally bear training costs increases. Meanwhile, the fact that more participants bear costs of training suggests that firms are spending less on investment of human capital. Therefore, we also confirm our first hypothesis that the *increase of independent contracting decreases corporate human capital investment.*

We can expect a 0.54% increase in workers bearing WRT costs as the share of independent contractor in one sector increase by 1%. The magnitude of the coefficient is significant. Moreover, the magnitude of the coefficient increases from 0.46 to 0.54 and its statistical significance increases as more control variables are added to the model. Therefore, there is tentative reason to believe that this positive relationship is not coincidental.
This is consistent with Becker's human capital theory and Soskice and Hall's theory of *Varieties of Capitalism* because we observe a shift from corporate investment to personal investment on human capital as the labour market become increasingly flexible.

Furthermore, we observe statistically significant relations between most control variables and the outcome variable, with signs of coefficients consistent with the coefficients of control variables are mostly statistically significant and are in the same direction as our theoretical predictions. The negative coefficient in education confirms O'Connell's study in 1999 that, when WRT participants have non-school education, firms invest more in human capital, which results in decrease in percentage of WRT participants who personally bear the cost of training. Meanwhile, the positive coefficient in gender and the negative coefficient in full-time employment confirms our predictions derived from Becker's theory, that firms tend to invest less in employees who are expected to generate low returns to firms in the future.

In addition, it is interesting to note that when comparing model 2, 3 and 4, the addition of full-time employment as a confounding variable decreases the magnitude of the coefficient for education, suggesting a positive relation between the two variables, as to be expected.

Moreover, it increases the standard error and decreases the statistical significance of gender from model 3 to 4. This indicates potential multicollinearity between the gender variable and full-time employment variable.

Our final model (model 4) can explain around 22% of the variations in the dependent variable, which, while not substantial, does provide a decent fit for our data. Hence, overall our empirical evidence is in line with theoretical predictions.

We note, however, the regression used is without entity fixed effects. This is due to a severe lack of data for each sector. A panel data regression with fixed effects, however, is noted in the appendix. We note that the primary coefficient of interest, that on the percentage of independent contractors, remains positive and statistically significant.

IV. Conclusions

To conclude, our paper suggests that, by increasing flexibility of the existing labour market, gig working leads to a transition from corporate investment to self-investment in human capital. Empirical analysis of ABS data over the past two decades suggests a positive relation between the percentage of workforce employed as independent contractors and that of WRT participants who bear the cost of training. This confirms our initial hypotheses and supports our theoretical predictions which we have developed based on existing literature.

We derive several implications from our results. Firstly, while our case study focuses on Australia, the findings may be applicable to other countries in a similar stage of economic development. Despite the recent slight decline in independent contracting in Australia locally, we note the opposite trend in other countries, such as the US (Gilfillan, 2018; Katz & Krueger, 2019). Secondly, our findings imply an increase in variation in the level of training every individual receives. Since higher levels of training tend to be correlated with higher levels of wages, changes in independent contracting may increase social inequality because more financially endowed workers can afford to invest more in their own human capital.

In addition, our paper opens many promising areas for further research. Firstly, we assumed that the effect of independent contractor on human capital investment is sector-homogeneous. If company-level observations are available, future researchers can potentially investigate variations in the impact of gig working on human capital investment in different sectors. Secondly, our research focuses on corporate and personal investment in human capital. However, another actor in the economy interested in human capital investment is the government. Hence, further research on public investment should be conducted. Thirdly, we also note that workers can behave strategically in response to change in corporate training opportunities and choose to join the full-time employment accordingly, which can potentially lead to reverse causality. Therefore, researchers can also investigate this further. Finally, gig working is only one of the many possibilities of the future of work. Further research can also examine the impact of other non-standard forms of employment on human capital investment and looking at implications for how individuals could adapt and thrive in a more flexible labour market in the future.

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8. Appendices

	Coef.	Std. Err.	t	P>t
Sector				
Administrative and support services	-5.00017	5.670213	-0.88	0.381
Agriculture, forestry and fishing	-5.05657	7.065396	-0.72	0.477
Arts and recreation services	1.558206	5.085877	0.31	0.76
Construction	-4.99442	9.214381	-0.54	0.59
Education and training	1.027941	9.923643	0.1	0.918
Electricity, gas, water and waste services	-17.0397	9.950755	-1.71	0.092
Financial and insurance services	-9.11007	8.333692	-1.09	0.278
Health care and social assistance	6.891725	8.144664	0.85	0.401
Information media and telecommunications	-5.9646	8.109717	-0.74	0.465
Manufacturing	-12.4239	8.252964	-1.51	0.137
Mining	-8.5825	9.772232	-0.88	0.383
Other services	3.088507	7.557997	0.41	0.684
Professional, scientific and technical services	-0.54766	10.0714	-0.05	0.957
Public administration and safety	-9.64666	8.96023	-1.08	0.286
Rental, hiring and real estate services	2.074231	7.845108	0.26	0.792
Retail trade	-7.65699	3.705379	-2.07	0.043
Transport, postal and warehousing	-8.55693	7.29757	-1.17	0.245
Wholesale trade	-9.68083	8.219546	-1.18	0.243
Constant	41.63271	12.41726	3.35	0.001

Table 3. Sector-specific fixed effect

```
Random-effects GLS regression                   Number of obs      =        91
Group variable: groupSector                     Number of groups   =        19

R-sq:                                           Obs per group:
     within  = 0.0053                                         min =         3
     between = 0.5658                                         avg =       4.8
     overall = 0.2060                                         max =         5

                                                Wald chi2(1)       =     16.25
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0001
```

femmepercent	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Xfullpercent	-.3798968	.0942433	-4.03	0.000	-.5646102	-.1951833
_cons	71.86841	7.456494	9.64	0.000	57.25395	86.48287
sigma_u	3.3272833					
sigma_e	11.667958					
rho	.07520318	(fraction of variance due to u_i)				

Table 4. Auxiliary regression between percentage of women in WRT and of full-time employment

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. reg incurpercent OFINDEPENDENTCONTRACTORS unipercent femmepercent Xfullpercent i.group
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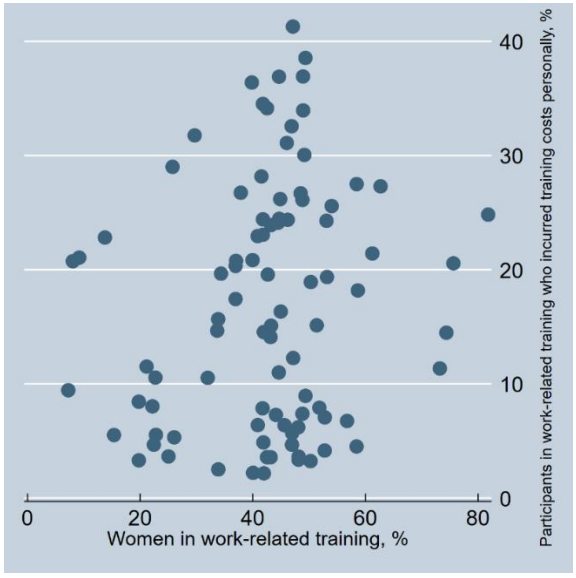
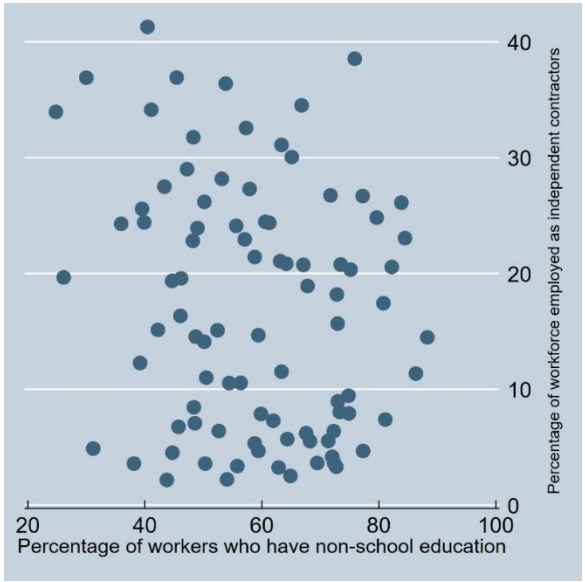
Source	SS	df	MS		
Model	4262.85704	22	193.766229	Number of obs	= 90
Residual	5847.01815	67	87.2689276	F(22, 67)	= 2.22
				Prob > F	= 0.0067
				R-squared	= 0.4217
				Adj R-squared	= 0.2317
Total	10109.8752	89	113.594103	Root MSE	= 9.3418

incurpercent	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
OFINDEPENDENTCONTRACTORS	.5474219	.2466445	2.22	0.030	.0551173	1.039726
unipercent	-.3588971	.1728107	-2.08	0.042	-.7038287	-.0139655
femmepercent	.0019519	.1030376	0.02	0.985	-.2037121	.2076159
Xfullpercent	.1525122	.2225627	0.69	0.496	-.2917247	.5967491
groupSector						
2	-7.118517	9.014176	-0.79	0.432	-25.11089	10.87385
3	-10.59643	9.355749	-1.13	0.261	-29.27059	8.077722
4	1.099041	7.492441	0.15	0.884	-13.85593	16.05401
5	-13.19371	13.7712	-0.96	0.341	-40.68113	14.29372
6	4.909025	12.24585	0.40	0.690	-19.5338	29.35185
7	-15.50231	14.35358	-1.08	0.284	-44.15219	13.14756
8	-10.24976	12.07572	-0.85	0.399	-34.353	13.85347
9	11.57263	9.386478	1.23	0.222	-7.16286	30.30812
10	-7.573674	11.88957	-0.64	0.526	-31.30536	16.15801
11	-16.33397	11.79486	-1.38	0.171	-39.87662	7.208678
12	-11.38671	14.10131	-0.81	0.422	-39.53304	16.75962
13	2.220613	10.95353	0.20	0.840	-19.64272	24.08395
14	-.9537294	14.61134	-0.07	0.948	-30.11809	28.21063
15	-9.561354	12.86141	-0.74	0.460	-35.23283	16.11013
16	.5132246	11.44423	0.04	0.964	-22.32955	23.356
17	-8.141981	5.972489	-1.36	0.177	-20.06312	3.779157
18	-14.22964	10.37993	-1.37	0.175	-34.94806	6.488784
19	-14.11883	11.47943	-1.23	0.223	-37.03186	8.794208
_cons	29.03951	18.39941	1.58	0.119	-7.685853	65.76488

Table 5. OLS regression with fixed effects



Graph 4.



Graph 5.