Why Choose Alternative Work Arrangements?: The Effect of Demand Shocks on AWAs in the U.S. Labor Market

WORKING PAPER

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Abstract

Alternative Work Arrangements (AWAs) are contract forms with lower wages, fewer benefits, and fewer legal protections. Firms using AWAs pay fewer fixed costs, but AWAs continue to account for only 10% of employment. I investigate whether AWAs respond to negative labor demand shocks, and could explain the lack of systematic increase. In a simple conceptual framework where firms can employ a worker in a short-term contract for a lower fixed cost, marginally profitable firms will use AWAs. Negative shocks push AWA-using firms out of business, reducing aggregate AWAs, conditional on employment. I test the effect of two negative labor demand shocks - exogenous decreases in housing wealth and increased competition from China - on workers' marginal probability of being in an AWA. I find that negative housing wealth shocks decreased workers' probability of being in an AWA by 0.25% for every 1% of housing price declines. Direct trade competition reduced workers probability of being in an AWA, however when examining the supply-chain effects of trade, 87% of workers saw a predicted increase. A simple counterfactual suggests that absent housing price declines from the Great Recession, AWAs would have increased by 1.5% since 2005.

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1 Introduction

Who are employees? For individual workers, the answer to this question is incredibly important. It determines who has access to health benefits, workers' compensation, and unemployment insurance. Researchers have an understanding that the full-time, 35+ hour a week employee is the standard form of work. However, some believe the "common" conception of employment is becoming rarer due to the rise of contracting out and independent contracting.[1] Legal definitions of "employment" are determined by firms' control over the work process and the degree to which the worker is reliant on their employer for wages (Muhl, 2002). Many workers[2] are in a nebulous legal status, commonly known as Alternative Work Arrangements (AWAs), which can greatly impact worker outcomes. AWAs encompass a variety of contract forms, and are better defined for what they aren't: the standard 40+ hours a week contract.

While some suggested AWA workers may be strictly cheaper for the firm (Muhl, 2002; Goldschmidt and Schmieder, 2017), if this were the case, we'd have expected an increase in AWA rates over time. However, AWAs have consistently hovered around 10% of employment.[3] Discussions on determinants of AWAs are wide-ranging (Dube and Kaplan, 2010; Goldschmidt and Schmieder, 2017; Katz and Krueger, 2016), but we still do not have an understanding of what causes firms to use AWAs.

In this paper, I identify that negative labor demand shocks disproprotionately affect workers in AWAs, reducing their overall rate in the workforce. I outline a conceptual framework where firms and workers agree to an AWA contract due to a combination of poor worker quality, poor firm quality, or high fixed costs. AWAs reduce fixed labor costs, but the contract is short-term; "standard" employment contracts allow both workers and firms to "lock in" a good match. Depending on the distributions of worker and firm productivity, negative shocks to firms or workers could reduce AWAs - the firms that use AWAs are marginal, and AWA-using firms are pushed out of the market by negative shocks.

I test these predictions using two negative labor demand shocks, exogenous increases in exposure to Chinese Trade (Autor et al., 2013; Wang et al., 2018), and the decline in housing wealth from the Great Recession (Mian and Sufi, 2014). In both instances, I find that negative labor demand shocks decrease the probability of workers being in AWAs, suggesting that more AWA jobs were lost to unemployment than were created by firms moving closer to unprofitability.

Research suggests that AWAs have long term wage penalties (Goldschmidt and Schmieder, 2017; Autor and Dorn, 2013). AWAs could be welfare enhancing if they are still beneficial relative to unemployment

[1] See Irwin (2017)

[2] Approximately 10% of employment - see the 2017 Contingent Worker Supplement.

[3] Increases in Independent Contracting in tax data appear to be driven by "gig" jobs such as Uber and Lyft. [Collins et al., forthcoming] Workers who use these services appear to be using them as consumption smoothing rather than as a primary source of income.(Koustas, 2018) When accounting for these companies, rates of Independent Contracting appear to be remarkably stable over time. [Collins et al., forthcoming]

(Schmieder et al., 2018), so understanding workers' counterfactual in understanding AWAs. My results provide evidence on this counterfactual - were it not for these contracts, these workers would otherwise be unemployed.

The paper is organized as follows. In Section 2 I discuss the relevant legatl rules that determine who is an employee and recent literature. In Section 3 I discuss to role of fixed costs in AWAs and outline my conceptual framework. Under this framework, negative shocks to either workers or firms could result in fewer AWAs, and will depend on the distribution of affected firms and their prior contracts.

Sections 5.1 and 5.2 provide reduced form evidence of economic outcomes of AWA workers. I show that when controlling for industry, occupation, and other covariates, *all* AWA rates have statistically the same or lower wage rates[4] and benefits.

Sections 4 and 6, outline my data and methodologies. Using a variation of the effect of the China Shock (Wang et al., 2018; Autor et al., 2013), I examine the role of expanded Chinese trade to specific sectors of the U.S. market, and provide causal estimates of those effects on workers' probability of being in an AWA. I also examine the effect of housing-wealth shocks (Mian and Sufi, 2014), interpreted as a shock to worker productivity(Bernstein et al., 2017), on AWA rates.

The results for the effect of the China Shock are described in Section 7. Section 8 contains my results for the effect of the housing wealth shock. I find that in both cases, these shocks causally reduced the likelihood of workers being in AWAs, suggesting that AWA workers are the first to be laid off, and the negative employment effects outweighed any shift of workers into AWAs.

However, there is some heterogeneity - because of the China Shock workers in less routine and less offshorable jobs (Autor and Dorn, 2013), saw a predicted increase in their likelihood of being in an AWA. For the Housing Wealth Shock, all workers saw a decrease in AWA likelihood, but the most routine workers were the least affected.

A simple counterfactual analysis of the housing wealth shock suggests that the Great Recession reduced AWAs, and that without the change in housing wealth AWAs would have increased by approximately 1.5% between 2005 and 2017. This suggests that researchers *should* potentially be concerned about increasing AWAs - were it not for the negative employment shocks they would have increased.

These findings show the importance of understanding workers' counterfactual when examining AWAs. While workers in AWAs face wage penalties (Dube and Kaplan, 2010; Goldschmidt and Schmieder, 2017; Dorn et al., 2018), my findings show that negative shocks decrease aggregate AWA rates - workers in AWA contracts are the first to be let go. Because unemployment can also be particularly damaging (Schmieder

[4]Many Independent Contractors may have high income but low wages if they are paid by 1099 forms. Using "total income" has similar results.

et al., 2018), AWAs may be welfare enhancing. If we seek to reduce AWAs because of the contracts' particular downsides (Mas and Pallais, 2016; Song et al., 2018; Muhl, 2002), it may instead be beneficial to consider reducing fixed costs of employment or allowing independent contractors to receive unemployment insurance, especially since AWA workers are more likely to be unemployed due to shocks

2 What are AWAs?

AWAs are better defined by what they are not - the "standard" 40-hour a week employment contract. The most common forms of AWAs are Independent Contracting, Temporary Help Services, Contracting Out, and On Call work. (Muhl, 2002; Katz and Krueger, 2016) AWAs are associated with lower pay (Muhl, 2002; Katz and Krueger, 2016; Goldschmidt and Schmieder, 2017; Dube and Kaplan, 2010), and may also have unobserved downsides such as higher variability in hours (Mas and Pallais, 2016), and low occupational mobility (Autor and Houseman, 2010; Irwin, 2017).[5] Using AWAs may also result in a more acrimonious relationship between workers and their employers (Pedulla, 2011).

Firms are not required to pay employment-based taxes for workers in AWAs, and are exempt from regulations about paying these workers the same benefits as other employees.[6] The lack of benefits may also explain the lower wage penalties for Contracted Out workers in the U.S. versus Germany.[7] Additionally workers in AWAs do not have collective bargaining rights.[8] Firms benefits for using AWAs suggest that absent legal limitations on their use, firms might prefer to use AWAs, especially if workers are less salient about their legal rights (Krueger and Posner, 2018).

Prior to 2017, no reliable information about AWAs was available. The Contingent Worker Supplement, the primary source of aggregate statistics on AWAs, had last been run in 2005.[9] Researchers feared that there had been an increase in AWAs (Katz and Krueger, 2016). However, the 2017 Contingent Worker Supplement found a slight decline in all forms of AWA rates, despite some evidence they were increasing in certain industries (Dey et al., 2012, 2017).[10]

The findings in the 2017 Contingent Worker Supplement suggest that AWAs are not necessarily preferred by firms: if they were strictly less costly, we would expect some increase, especially if we believe contracting

[5] One potential benefit is that workers in AWAs receive more generalized training. (Autor, 2001)

[6] See Appendix A.

[7] Goldschmidt and Schmieder (2017) found 15% wage penalties for contracted out German workers. Dorn et al. (2018) found 2-3% wage penalties for the same types of workers in the U.S.

[8] There have been some recent changes for Third-Party Contracting. For a discussion of recent changes see Appendix A.

[9] Administrative data on AWAs can be unreliable or misleading. See Section 4.6.

[10] As discussed by Dey et al. (2017), when compared to 2005, there appears to have been a 12% increase in the share of all temp agency workers in manufacturing. However, the number of interviewed workers is small.

costs have decreased.[11]Additionally, tax data suggests that usage of Independent Contractors, the largest types of AWAs, have not increased for primary employment.[12]

As I discuss in the next section, legal penalties and match productivity may explain the lack of shift towards AWAs. If firms who are more marginal use AWAs, a negative shock could reduce AWAs if more AWA workers become unemployed than "standard" employees become AWAs.

Therefore, negative labor demand shocks could result in either more or fewer AWAs, and the magnitude and direction of that effect is a lacking part of the literature. Autor et al. (2013) found that increased trade exposure to China in local markets caused a decrease in the percentage of the population employed in manufacturing.[13] Mian and Sufi (2014) found that the decline of household balance sheets during the great recession decreased employment - primarily among non-tradable industries. Both of these shocks provide useful avenues to examine whether AWAs increase or decrease in response to negative labor demand shocks.

Firms could also respond to these shocks with more innovation in automation (Acemoglu and Restrepo, 2017), causing a long-term increase in AWAs, especially because contract form is be driven by the type of labor performed. (Lemieux et al., 2009; MacLeod and Parent, 1999) A long-term increase in AWAs could also increase wage inequality. Song et al. (2018) find that within-firm inequality is decreasing, while inter-firm inequality is increasing, suggesting that firms may be becoming more specialized and using more contracting out.

In the next section, I will outline my Conceptual Framework, where I examine the role of fixed-costs and match productivity in determining whether a firms and workers might prefer an AWA.

3 Conceptual Framework

AWAs require lower fixed costs of employment - firms do not have to pay the same benefits or unemployment taxes (Muhl, 2002), and could potentially remove workers from their internal payscale (Goldschmidt and Schmieder, 2017).[14] Workers in AWAs are also much more likely to churn between jobs (Autor and Houseman, 2010), and the contracts tend to be shorter-term.[15] However, some workers end up in the same AWA for years. (Irwin, 2017)

[11]While the CWS would not necessarily pick up all forms of contracting out, the fact that it found no increase in any AWA is somewhat surprising, especially given recent trends in inter and intra-firm inequality Song et al. (2018).

[12]Collins et al., Forthcoming. Paper not yet available, based on results presented at the Boston Fed.

[13]The period of analysis deliberately related to China's admission to the WTO in 2001, and the associated expansion in trade. However, it is unclear that China's admission to the WTO substantially accelerated trade levels. See Figure **??**.

[14]There are some downsides - firms cannot legally direct workers in AWAs to the same degree as regular employees. Firms using a worker in an AWA as a regular employee is called misclassification. Appendix A contains a more in-depth discussion of the laws that regulate and determine firms' obligations to employees versus AWA workers.

[15]One of the forms of AWAs I don't investigate in this paper are fixed-length contracts.

Using these facts I outline a simple 2-period framework where workers and firms with variable productivity are randomly matched agree to either 2-period contract (regular employment) or a 1-period contract (an AWA). The firm has to pay a fixed-cost of employment each period, which can be interpreted as some combination of employer-based taxes and health benefits. The fixed cost for the 1-period contract is lower.

3.1 Setup

In a 2-period model, firms receive productivity draw $z_j \sim lognormal(\bar{z}, \sigma_z)$ with the CDF F_z. Firms draw a worker with productivity $\theta_i \sim lognormal(\bar{\theta}, \sigma_\theta)$, with the CDF F_θ.

After observing z_j and θ_i , firms can offer

- 1-period contract.
- 2-period contract.
- No contract.

The worker observes the firm's offer and can accept or reject. If the two parties agree on a 2-period contract the firm pays a per-period fixed cost of F_{2P} . If they agree on 1-period contract, the firm pays a fixed cost F_{1P}. The fixed costs are such that $F_{2P} > F_{1P}$.

Firm profit in each period is given by:

$$\beta p z_j \theta_i - F_{cP}$$

Where β is an exogenous measure of firm bargaining power, and p is the price of the output good. F_{cP} is the fixed cost of the agreed upon contract. If firms and workers do **not** match the firm receives 0. If a firm has a one-period contract or does not match, they draw a new worker in period 2.

The worker receives $(1-\beta)pz_j\theta_i$ in each period of match, if unmatched they receive θ_i. If the worker does not match in period 1, they are matched to a random firm in period 2 with type $z_{j,2} \sim lognormal(\bar{z}, \sigma_z)$. Firms in period 2 can only make a one-period contract offer. In the second period, matched workers and firms observe their outcomes, and unmatched workers and firms will decide whether to match for one period.

Using the knowledge of period 2 outcomes, the workers and firms in the first period agree on the form of contract or not to match. In Appendix B I solve the model using backwards induction and outline the conditions under which each contract will arise.

Both the firm and the worker will have threshold rules for when they prefer each contract as a function of their own productivity and the other party's productivity. High and low productivity matches will result

in either a 2-period contract or no-match, there is an "marginal band" of 1-period contracts where either the worker or firm are of too-low type to be worth a full-employment contract, but are better than not matching.

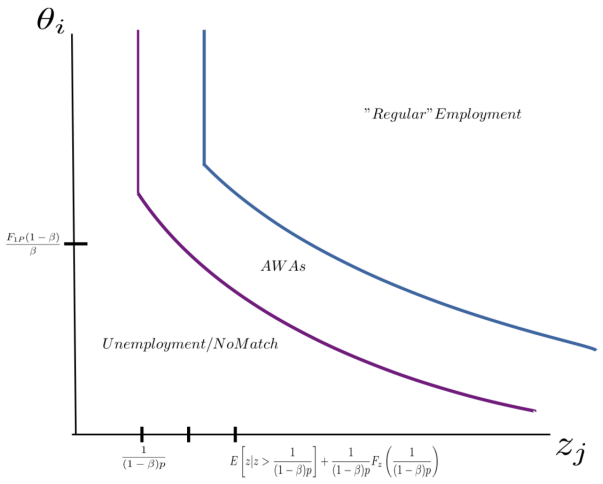
I also show that for a given pair with a poor match increasing p, θ_i or z_j while holding everything else fixed will unambiguously result in first a 1-period contract and then a 2-period contract.

3.2 Contract Space

The exact areas of contract agreement are discussed in Appendix B.

The predicted contract will be a function of exogenous parameters β, p, F_{1P}, F_{2P}, the distribution of z and θ, and the known values of θ_i and z_j . Figure 1, shows the contract space for z_j and θ_i, based on the threshold rules described in Appendix B.

Figure 1: Contract Space



When high-productivity workers and firms are matched, they agree to a two-period contract. If the productivity of a worker or firm is too low, there will be no match. Firms and workers agree to an AWA in the marginal band surrounding unemployment. Either a high-productivity worker is matched to a low-productivity firm, or vice-versa. In both instances, the 1-period match is beneficial to at least one party - it is better than not matching for one period, but the likelihood of them getting a better match in the next period is high enough to stop them from a two-period match.

Different types of AWAs could be thought of as different areas of this contract space. The AWA area with high-productivity workers and low-productivity firms could result in independent contractors. While the low-productivity workers with high-productivity firms are areas where the firm would contract out or

use a temporary help firm. This would suggest that the discussion around different legal forms within AWAs could be more related to productivity differences, or even traditional methods of using an AWA within certain occupations.(Goldschmidt and Schmieder, 2017; Dube and Kaplan, 2010).

3.3 Predictions - Lower Prices and Productivities

Using the framework described in the previous section, I use comparative statics to outline the effect that a given price shock to a specific firm (but not the market) or a given productivity θ_i or z_j . For simplicity, I assume that the shock occurs after matches in period 1, and carries with the firm or worker to period 2.

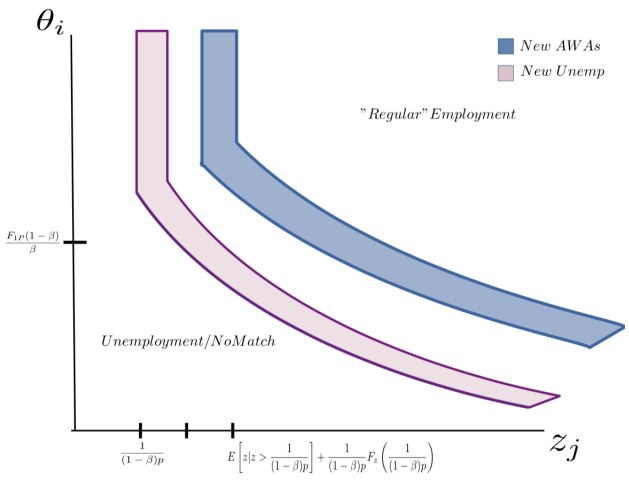
The comparative static results in AppendixB show clearly that decreases in price or productivity will have three effects.

1. Matches in AWAs shift to unemployment
2. Matches in 2-period contracts shift to AWAs.
3. Matches do not change contract type.

The exact mechanism will vary - for the productivity shifts, we can envision this as a change in θ_i or z_j, which will not change the thereshold rules but will correspond to a vertical or horizontal movement for a match.

Price shifts will "push out" the threshold rules for the workers and firms, but nevertheless result in the same outcomes - the worker and firm productivities have not changed, but matches in a specific range will now be in AWAs or unemployment depending on their value.2.

Figure 2: Change in p



These results mean that the predicted effect of any labor demand shock will be **ambiguous**, and depend on who is hit by the shock, and the pre-existing distribution of productivites. If the shock is small, we would see no change. If the shock is large but concentrated in less-productive firms or workers, we will see a decrease in AWAs, as the aggregate shift to unemployment will outweigh any increase in AWA rates. If the shock primarily affects more productive firms or workers, we could see an increase in the AWA rate.

This suggests that labor demand shocks will also have substantial heterogeneity. If I assume that each occupation is its own market - with its own associated prices, fixed costs, and distribution of productivities. Therefore large shock in high-productivity occupations could result in more AWAs, but the same shock could result in fewer AWAs for a low-productivity occupation.

I interpret the China Shock as an exogenous price decrease in affected firms. Because there is some evidence that less-productive firms were the most affected (Autor et al., 2013, 2014) I expect to see an aggregate decrease in AWAs, exactly the results I show in Section 7. I do also find evidence of heterogeneity. In Section 7.1 I show that workers in less-routine jobs are more likely to be in AWAs due to the China Shock, suggesting that for workers in higher-productivity occupations, the shift to AWAs has outweighed the shift to unemployment.

As in Bernstein et al. (2017), I interpret the change in housing wealth as a decline in worker productivity θ_i. Again, the predicted effect is ambiguous, but I again find that the housing wealth shock is associated with fewer AWAs, again suggesting that the within-occupation shift to unemployment outweighed the shift

to AWAs. Interestingly - the heterogeneity effect is different, more routine workers are *more* likely to be in AWAs - suggesting that the two shocks affected different segments of the workforce.

3.4 Discussion

This simple framework illustrates the role that fixed costs and match productivities can play in determining whether we observe more AWAs in response to negative labor shocks. After an exogenous change in price or productivity, we could see more or fewer AWAs depending on who was affected and the magnitude of the shock.

While I suggest firms are using AWAs to reduce fixed costs of employment when facing negative demand shocks, AWAs can also be used for flexibility reasons or for firms to discover the type of the employee before committing to hiring them. (Autor and Houseman, 2010) Firms may also prefer to use AWAs only for specific types of work that require little oversight, or are very technical.(MacLeod and Parent, 1999)

In my framework firms do still have an incentive to misclassify. If the firm is willing to face risk legal jeopardy, it could hire AWA workers into longer-term contracts and receive a better match, but simultaneously pay the lower fixed costs. This would be equivalent to the "perma-temp's" used by Microsoft in 1990's. [16] In this case, the firm would receive unambiguously higher profits.

One unrealistic assumption is that the firm and worker both accurately observe each-other's productivity. If the worker has an information disadvantage, the firm will be able to use that difference to collect rents, and potentially use more AWAs(MacLeod and Parent, 1999). On the other hand, if firms are wrong about their belief of a worker's type, AWAs may mean firms cannot update their beliefs on a specific workers, resulting in less occupational mobility and fewer promotions.[17] Firms may also be less likely to invest in worker safety if they are in an AWA, and workers in these contracts do not have collective bargaining rights.

Nevertheless, in this framework a large number of AWAs are efficient. Some set of workers who receive an AWA contract do so because the firm cannot afford the fixed-costs of full-time employment or their match quality is not as good. This suggests that simply outlawing AWAs may not be efficient - however reducing the fixed-cost differences could result in more two-period contracts.

4 Data

For my analysis, I only discuss workers in the following contract types, though there are other types of AWAs.

[16] See Vizcaino v. Microsoft - a class action brought by former "perma-temps" who were denied access to Microsofts Employee Stock Purchase Plan.

[17] Irwin (2017)is an example of anecdotal evidence that AWA usage, in this case contracting out, reduces within-firm upward mobility.

1. Independent Contractors (6.7% of sample, 65.9% of AWAs)
2. On-Call Workers (1.7% of sample, 16.7% of AWAs)
3. Contracted Out Workers (1.1% of sample, 10% of AWAs)[18]
4. Workers employed by Temporary-Help Agencies (0.8% of sample, 7.7% of AWAs)

These are the definitions used by the Contingent Worker Supplement (CWS), and make up the vast majority of AWAs observed.[19] This is not the universe of AWA contract forms, which can include day laborers, workers who are hired to be temporary replacements, Contract Company employees who work at multiple locations, and workers under fixed-length temporary contracts. Overall, AWAs account for approximately 10.21% of employment across all CWS samples, with the highest rate in 2005 at 10.7%.

Temporary-Help work and Contracting Out may also be under-reported in the CWS relative to other data sources (Dorn et al., 2018), due to mis-reporting of the client rather than the "employer" of the temporary help agency.[20] I do not anticipate that this would bias my results. A constant underreporting rate would still pick up the marginal effect of a shock or growth changes.[21] However, I do not assume that Temporary Help work and Contracting Out only combine for 1.9% of employment, and any interpretation of results should be with this underreporting in mind.

I choose these categories because they represent the four largest non-standard contract forms in my sample, and are the most commonly used in the literature.[22]

4.1 County Business Patterns

I use the County Business Patterns (CBP), a census survey of businesses that is performed in March of each year to determine the amount of employment at the county-industry level in the United States. County-level data going back to 1986 are available online, and provide the employment level in each industry and metro-area that is used in this analysis.

From 1986-1997, the CBP used a consistent scheme with the Standard Industry Classification (SIC) codes. From 1998 onwards, the CBP switched to the NAICS industry codes. In many cases, the employment levels

[18]Defined as workers who primarily work offsite for a single employer, which may underestimate contracted out employees. For example, many firms have outsourced security work to security "firms" (Dube and Kaplan, 2010), who may work at multiple sites.

[19]These categories are determined by the CWS recode variables "PRCNTRCT", "PRTMPAGC", "PRCALL" and "PRIC", which are equal to 1 if a worker is classified as one of these workers.

[20]The results of Song et al. (2018) combined with the lack of increase in Contracting out in the 2017 CWS suggest this is the case.

[21]I believe it is more likely that new AWAs in these contracts would be more likely to under-report, biasing my results towards zero.

[22]See Bernhardt (2014)and Katz and Krueger (2016).

in these data are given by ranges for privacy reasons. I therefore use the "imputed employment" measure from Autor et al. (2013). This methodology uses regression analysis to impute the employment rates in each industry-county combination based on these ranges. This methodology allows me to establish a measure of the total employment level for each industry-county combination, and aggregate to the metro-area level. Their methodology also creates a weighted crosswalk between SIC and NAICS codes. I adapt code used to create the imputed employment data from code made available by David Dorn on his website.[23] For this paper I use the years: 1990, 1991, 1992, 1995, 1996, 1997, and 2000.

I also create a crosswalk between SIC Codes and the 34 ISIC industries in the ICIO data (see next Section). This allows me to create estimates of local-area employment share in one of the 34 industries used in the ICIO tables. Because these industries are very broad, I also control for narrower industry fixed-effects in all regressions.[24]

4.2 ICIO Data

In order to get industry-level estimates of output, as well as link the data to supply chains, I use the Organization of Economic Co-Operation and Development (OECD) Inter-Country Input-Output (ICIO) Tables. These data represent the value of trade between and within countries for the purposes of direct exports in a given year, as well as goods used as intermediates for final goods produced within a given country. For each country, there are a total of 34 industries. These industries are notably broader than those generally used in the CPS. In order to link to a specific worker, I create a crosswalk to link workers 1990-basis Census industry codes to one of the 34 industries.

For a given country-industry we can observe how much that industry produced, the countries the final products went to, as well as the country-industries the value of goods were used as inputs in. By use of these tables, I can estimate the effects of upstream, downstream, and direct effects on *all* industries, not just those directly exposed to trade. In Sections 6 and 9 I outline the methodology by which I use these data.

4.3 Current Population Survey

I use the CPS' micro-data from February of 1995, 1997, 1999, 2001, 2005, and 2017. These were the years the CPS included the Contingent Worker Supplement, and includes the relevant questions from the CPS about contingent work status and contract type. Years 1995-2005 were downloaded from the National Bureau of Economic Research, and matched to the same dataset from IPUMS. I linked these datasets with both the

[23] http://www.ddorn.net/data.htm

[24] As noted in Section 4.6, CBP data would not include workers in AWAs. However, the CBP is only used to link local areas to national-level trade shocks. Consistent national under-reporting would not bias my results, and I control for local-area fixed effects should also control for any variation.

Annual Social and Economic Supplement (ASEC) and some outgoing rotation group information to collect data on income, hourly wages, and benefits information. I use these linkages to create the descriptive results in Section 5.1. The 2017 CWS was downloaded from DataFerrett.

I also use the IPUMS CPS to create the geography for my analysis outlined in Section 6. I follow the 1990 county-level construction listed on the IPUMS-USA website[25] and create a consistent geography to link workers to local metro-areas. Because I am relying on metro-area definitions, workers who live outside these areas will not be represented. If there is a systematic difference between rural and metropolitan areas I will only be able to observe the effects for metropolitan workers.

4.4 Measures of Housing Wealth Shock

I use the replication files from Mian and Sufi (2014), who estimated the cross-sectional county-level effects of the housing price changes during the great recession on employment. I link these data to the Contingent Worker Supplement from 2005 and 2017, and examine the effect of the change in housing wealth between 2006 and 2009 at the county-level on the probability of workers being in an AWA.

As in the previous Section, the county-level information from the CPS is only available for a smaller number of counties, so the effects of the housing wealth should only be interpreted as the effect on these counties.

4.5 Worker Investments, and Routine/Offshoring Data

I use the measure of firm-level required investments based on occupation, from MacLeod and Nakavachara (2006). I use these data to determine whether there is any heterogeneity in effect by level of required firm investment, which I interpret as one measure of differentiating occupational fixed costs of employment.

Finally, I also incorporate the occupation-based measures of job routineness and task-offshorability from Autor and Dorn (2013). These data use Census-based definitions of occupations and task requirements to create measures of how "routine" a job is. I use these definitions to create a "routine job index" (RTI) similar toAutor and Dorn (2013).[26] I will use these measures to investigate any variation within my estimates by task routineness and offshorability.

[25] Found at - https://usa.ipums.org/usa/volii/county_comp2b.shtml#balt

[26] RTI calculated as log(1+Routine Index)-log(1+Manual Index)-log(1+Abstract Index), where the indices are continuous measures of the occupation's characteristics based on the 1980 Dictionary of Occupational Titles.

4.6 AWAs in Administrative Data

Almost definitionally, it is extremely difficult to link AWA workers to their firms. For On Call, Temporary Help, and Contracted Out workers, administrative data from the IRS or state-unemployment agencies would contain information on the *legal* employer, which would not accurately represent the type of contract that a worker in a given occupation might have.

Administrative data from before the SUTA Dumping Prevention Act of 2004 may be particularly unreliable. Many third-party contracting firms (Temporary Help and Contracting Out) used their clients information when reporting to unemployment agencies to receive a lower unemployment tax rate, making data on employment counts in Temporary Help Services potentially unreliable (Kearns, 2006).[27]

Additionally, many Independent Contractors do not touch the UI system. While these workers would show up as being paid by a specific firm in tax data (from the form 1099-MISC), it is impossible to determine anything beyond the total amount paid. This means that common economic outcomes, such as hours and wages, are difficult to observe.

Therefore, the CPS' Contingent Worker Supplement is the best data source available for answering questions about AWAs, primarily because it is the only dataset that observes worker occupation. While the low number of individual occupations interviewed in a given survey means that it is not feasible to create reliable occupation-metro-area or occupation-state based AWA rates, I instead focus on using occupation fixed effects, which allows me to examine the change in probability of being in a certain contract given the job a given worker is actually performing.

5 Why do AWAs Matter?

In this section, I outline why a worker may be adversely impacted by being in an AWA, *solely* as a result of the form of the contract. In Section 1 I examine differences in mean characteristics by contract, while in Section 5.2 I show predicted effect of contract form on economic outcomes, after conditioning for occupation and other effects.

[27] Given that many commonly used data sources, including CBP and Quarterly Census of Employment and Wages (QCEW) ultimately rely on state-unemployment agencies, these data are somewhat unreliable as well.

5.1 Descriptive Statistics

Table 1: Descriptive Statistics by Contract Type

	Contract Type				
	Regular	Ind. Contractor	On Call	Contract Co.	Temp Agency
Age	39.946	46.261	39.991	38.261	37.042
	(13.275)	(12.945)	(15.283)	(12.277)	(13.384)
Female	0.487	0.351	0.495	0.315	0.552
	(0.5)	(0.477)	(0.5)	(0.465)	(0.497)
Black	0.092	0.046	0.084	0.088	0.192
	(0.288)	(0.209)	(0.277)	(0.283)	(0.394)
College Degree	0.377	0.437	0.342	0.440	0.299
	(0.485)	(0.496)	(0.474)	(0.497)	(0.458)
Has Multiple Jobs	0.065	0.092	0.090	0.080	0.068
	(0.246)	(0.29)	(0.287)	(0.271)	(0.251)
Usual Hrs Worked	39.021	39.729	30.931	40.479	36.878
	(11.244)	(16.723)	(15.695)	(11.48)	(9.741)
Full Time Employee	0.809	0.706	0.463	0.832	0.740
	(0.393)	(0.456)	(0.499)	(0.374)	(0.439)
Wage Income[1]	31,859.19	18,936.19	19,288.19	38,484.85	17,108.61
	(49916.69)	(44625.41)	(25620.68)	(39646.32)	(17843.82)
Employer Insurance[1]	0.58	0.37	0.44	0.57	0.33
	(0.49)	(0.48)	(0.50)	(0.50)	(0.47)
In Pension Plan[1]	0.37	0.08	0.18	0.33	0.09
	(0.48)	(0.27)	(0.39)	(0.47)	(0.28)
Job Switch[2]	0.04	0.06	0.074	0.08	0.14
	(0.21)	(0.23)	(0.26)	(0.27)	(0.34)

Standard Deviation in Parenthesis.
1: Insurance, Pension Plan, Wage Income Information are calculated using the March Supplement and only calculated for workers who reported working for the same employer in each interview after February, and were in their 5th month of interview or later. Only calculated from 1995-2005 data.
2: Job Switch is determined by whether a worker reported working for a different employer *after* their interview in February. Only calculated from 1995-2005 data.

Table 1 shows the descriptive statistics for a number of demographic and economic outcomes across contract types. Contract Workers have higher average wage income than all other employment types, including regular employees, and appear equally likely to receive employer-sponsored health insurance. This is not consistent with prior research that suggests contracted out workers face wage penalties (Dube and Kaplan, 2010; Goldschmidt and Schmieder, 2017). In the next section I will analyze the effect of the various AWAs on outcomes after conditioning on occupation and other potential explanatory variables, which may explain these differences. Additionally, if wage differences in Contracting Out are long-term effects I may not observe

differences.

It also appears that, aside from On Call Workers, all AWA types are likely to be considered Full Time employees and work, on average, more than 35 hours per week. This would suggest that AWAs are distinct from what we would consider "part time" work, but instead represent a different relationship to the firm.[28]

All AWAs types appear more likely to switch jobs, suggesting that there is likely more turnover between AWAs and other contracts. Consistent with the findings in the wider literature, Independent Contractors are older on average than regular employees.

5.2 Reduced Form Evidence

Alternative work and contract type can have substantial effects on welfare through reduction in wages (Dube and Kaplan, 2010) or higher variability in hours (Mas and Pallais, 2016).

However, this may not be true once we control for differences in industry, occupation, and other effects. I test the effect of contract form on a variety of economic outcomes by running the following regressions:

$$Outcome_i = \beta' ContractType + \beta_2' X_i$$

Where $Outcome_i$ is a dependent economic variable including workers usual number of hours, whether a worker's family makes $60,000 per year, whether a worker's hours vary, and whether a worker holds multiple jobs. $ContractType_i$ is a vector which equals 1 depending on the type of contract of the worker. X_i is a vector of worker characteristics, including occupation, industry, education fixed effects, gender, age, state, and year of intervierw. The results are shown in Table 2.

When controlling for occupation, industry, and other effects, I find that all AWA types appear to work similar hours. Independent Contractors and Temp Agency workers work about 1 hour less per week than "standard" employees, and Contracted Out workers work 1 hour more. While On-Call workers work about 6 hours less per week, that would put them at a predicted mean greater than 33 hours per week after conditioning on other factors.[29]

On Call Workers and Temp Agency workers are less likely to be in high-income brackets, and all AWA contracts are more likely to work multiple jobs and more likely to work variable hours.[30][31] While I did

[28] Controlling for covariates in Table **TO COME**, I find that all but On Call AWAs work <1 hour per week less than standard contracts, again suggesting they are working full-time. On-Call workers work 4.7 hours per week less than standard contracts.

[29] Running a similar regression using 1995-2005 data on employer provided healthcare, I find lower probability of employer-provided healthcare by 15% for Temp Agency and Independent Contractors, and 9% for On Call Workers. Contracted Out Workers see lower but insignificant point estimates.

[30] When using an ordinal designation of family income brackets that range from 1 (less than $5,000) to 13 ($60,000 or more), I find that all AWAs except Contracted Out workers receive lower income - Contracted Out workers receive the same.

[31] Adding a full contingent of state-occupation-industry-year FE did not noticably change my results.

Table 2: Reduced-Form Evidence - Effect of AWAs

	Dependent variable:			
	Hours	High Income	Variable Hours	Mult. Jobs
	(1)	(2)	(3)	(4)
Ind. Con.	-0.666^{***}	0.002	0.105^{***}	0.033^{***}
	(0.087)	(0.003)	(0.002)	(0.002)
On Call	-6.386^{***}	-0.026^{***}	0.206^{***}	0.023^{***}
	(0.163)	(0.006)	(0.003)	(0.004)
Contract Co	0.686^{***}	0.012	0.007^{*}	0.016^{***}
	(0.184)	(0.007)	(0.004)	(0.004)
Temp Agency	-1.068^{***}	-0.077^{***}	0.042^{***}	0.016^{***}
	(0.244)	(0.010)	(0.005)	(0.006)
Year FE	X	X	X	X
Occupation FE	X	X	X	X
Industry FE	X	X	X	X
State FE	X	X	X	X
Age FE	X	X	X	X
Education FE	X	X	X	X
Gender FE	X	X	X	X
Race FE	X	X	X	X
Observations	270,902	328,170	361,137	293,683
R^2	0.301	0.263	0.071	0.023
Adjusted R^2	0.299	0.261	0.069	0.020
Note:				*p<0.1; **p<0.05; ***p<0.01

not find that Contracted Out workers receive lower wages, that may be because the sample only includes contracted out workers who primarily work onsite at a single other firm. Table 2 suggests that AWAs are not necessarily that distinct from one-another, and that industry, occupation, and other effects make up the majority of their differences.

In this section I showed that when compared to "regular" contracts, AWAs are associated with lower income, more hours variability, and an equal number of hours. While my conceptual framework suggests that the differences in wages and multiple jobs may be due to type-matching effects, workers may not prefer to be in AWAs solely due to the lack of legal protections and increased hours variability. For this reason, it is important to better understand how negative labor demand shocks impact workers' likelihood of being in an AWA.

In the next section, I will outline my methodology for investigating whether labor demand shocks push more workers into AWAs.

6 Methodology and Identification Strategy

I causally estimate the effects of both the two labor demand shocks - the China Shock (Autor et al., 2013; Wang et al., 2018) and Housing Wealth (Mian and Sufi, 2014) - on the likelihood of workers being in AWAs.

6.1 Trade Shocks

The unit of analysis is a single individual worker $i$working in industry j and occupation o, living in metro area $k$in period t.[32]

Examining the role of exogenous trade shocks on employment is a large part of the labor literature. (Autor et al., 2013, 2014; Chetverkov et al., 2016; Acemoglu et al., 2016) Import penetration ratio of Chinese goods increased markedly over my analysis period, largely ascribed to China's admission to the WTO.[33] However, there has been no investigation into the role that the China Shock may have had on workers' probability of being in an AWA.

I use a variation on the Wang et al. (2018) analysis of supply-chain estimates in order to examine the role of these particular shocks on the probability of individual workers to be in an Alternative Work Arrangement.

My primary specification is:

[32]The periods in question are 1995-1997, 1996-1999, 1997-2001, and 2000-2005. I utilize the differential length of time period in order to avoid using the same starting labor share for each period. I do not use 1995 because the ICIO tables do not exist prior to 1995. I do not use 2017 because of changes to the Industry Classification between ISIC Rev. 3 and ISIC Rev. 4. make comparisons to earlier effects unreliable.

[33]See Figure 1 of Autor et al. (2013).

$$AWA_{ijkot} = \beta_0 + \beta_1 \Delta Direct_{jkt} + J_j + K_k + O_o + T_t + X_i'\beta$$

All my regressions are linear probability models. AWA_{ijkot} is a binary measure of whether worker i was in an AWA.[34] $\Delta Direct_{jkt}$ is the industry-metro-area specific direct change in the value of trade J_j K_k O_o and T_t are industry, area, occupation, and time fixed-effects. X_i is a matrix of individual-level controls, including age, gender, race, and education.

The construction of $\Delta Direct_{jkt}$ follows Wang et al. (2018), which allows me to incorporate the effect of increased trade for workers in *all* industries - not just manufacturing as in Autor et al. (2013).

$$\Delta Direct_{jkt} = \frac{L_{jkt-1}}{L_{kt-1}} \frac{M_{jt}^{CN,U} - M_{jt-1}^{CN,U}}{Y_{jt-1}^{U} + M_{jt-1}^{U} - E_{jt-1}^{U}} \tag{1}$$

Where $\frac{L_{jkt-1}}{L_{kt-1}}$ is labor share of industry j in area k, calculated from the CBP data, crosswalked to the 34 ICIO industries. $M_{jt}^{CN,U} - M_{jt-1}^{CN,U}$ is the change in value of imports from China to the US in industry j from the start of period to end of period t. Y_{jt-1} is the total U.S. industry output in industry j , M_{jt-1}^{U} is the total imports in industry j to the U.S. and E_{jt-1}^{U} is the total exports. The denominator $Y_{jt-1}^{U} + M_{jt-1}^{U} - E_{jt-1}^{U}$ is the "total absorption", or the total value of goods of the specific industry *within* the United States.

There are 34 aggregated industries in the ICIO data. For this reason, I use the more detailed 1990 basis census industry fixed effects in my regression, in order to accurately capture pre-existing means in industry-level AWA usage. I use beginning-of-period labor weights of the specific industry within a given metro area.[35] Notably, I am not relying on the "shift-share" design from Autor et al. (2013) and Wang et al. (2018). [36]

I examine the effect of demand shocks on contracting rates, *not* changes in overall employment share. All

[34] Because there may be variation by contract form, I also break the results out into the separate contracting outcomes - Independent Contractor, Temp-Agency, Contracted Out and On Call.

[35] Using labor-market share in this context is analogous to weighting by area-level output share. treating the industry-area specific effect of a national shock as a labor weight is also common in the literature. (Wang et al., 2018; Acemoglu et al., 2016; Autor et al., 2013)

[36] Recent work has suggested that using the shift-share design may be problematic and understate standard errors when constructing shocks as a weighted average of industry effects (Borusyak et al., 2018). Instead, the labor shares here only serve to link the effect of national trade changes at the firm level to metro areas. The assumption is that the effect of a demand shock in two areas with similar industry shares will be translated in the same way. For example, if the Cleveland metro-area has a 30% retail trade labor share, and the Seattle metro-area has a 60% retail trade labor share, the assumption is that the workers in the Seattle industry area will see twice the effect as those in Cleveland.

my results are conditioned on a worker being employed in a given occupation, therefore I am truly estimating the marginal effect on the probability of being in a specific contract. In order to make sure I am accounting for local-market effects, I cluster all regressions at the metro-area level.

6.1.1 Identification Strategy

$\Delta Direct_{jkt}$ may be correlated with unobserved U.S. demand shocks that are also correlated with contracting rates. Therefore, I construct an instrument using the change in trade from China to the "G5" of Japan, Germany, the United Kingdom, France, and Italy. The instruments are constructed as:

$$\Delta Direct^{IV}_{jkt} = \frac{L_{jkt_{lag}}}{L_{kt-1_{lag}}} \frac{M^{CN,G5}_{jt} - M^{CN,G5}_{jt-1}}{Y^{G5}_{jt-1} + M^{G5}_{jt-1} - E^{G5}_{jt-1}} \tag{2}$$

The objects are the same as described above, except instead of Chinese trade to the U.S., $\frac{M^{CN,G5}_{jt} - M^{CN,G5}_{jt-1}}{Y^{G5}_{jt-1} + M^{G5}_{jt-1} - E^{G5}_{jt-1}}$ uses Chinese exports to the G5. In order to avoid creating artificial correlations between instrument and endogenous variable, I use the 5-year lag of the start of period labor share $\frac{L_{jkt_{lag}}}{L_{kt-1_{lag}}}$. This methodology is also very similar to Autor et al. (2013), but has the advantage of using the ICIO tables which measure the change in China's direct competition with other countries. As noted by Wang et al. (2018), The industries which see large increases in competition from China may not be the same as those in the U.S. (Wang et al., 2018). Therefore it is a reasonable measure of higher comparative advantage in China, rather than changes in U.S. demand patterns Autor et al. (2013).

Negative direct competition effects may be outweighed by positive supply-chain effects; there are benefits of trade from decreased input costs (Wang et al., 2018). In Section 9 I outline my methodology for investigating the total trade effect including the supply-chain effects of increased trade from China. I will also investigate whether there are heterogeneous effects by firm investment requirements (MacLeod and Nakavachara, 2006) and occupational routineness or offshorability (Autor and Dorn, 2013).

6.2 Housing Wealth Shocks

I also investigate the role of reductions in the labor demand shock driven by a reduction housing wealth on contracting outcomes. I use the Mian and Sufi (2014) measure of change in housing wealth at the county-level between 2006 and 2009, and investigate the impact on AWA usage. My regression of interest is:

$$AWA_{ijkot} = \beta_0 + \beta_1 \Delta HNW_{kt} + J_j + K_k + O_o + T_t + X_i'\beta$$

Where ΔHNW_{kt} is the measure of county-level change in housing wealth between 2006 and 2009. The years I use in this sample are 2005 and 2017. In order to investigate the effect of the housing wealth shock, I treat $\Delta HNW_{kt} = 0$ if $t = 2005$. This allows me to incorporate county-level fixed effects, meaning I am examining the effect of the shock on contracting shifts, rather than a cross-sectional effect.

6.2.1 Identification Strategy

I believe it is reasonable to assume that the differential changes in housing wealth at the county level 8 years prior to the 2017 CWS are reasonably exogenous. However, declines in housing prices could decrease employment in construction, affecting the balance of contracts given the relatively high share of independent contractors.

Therefore, I also instrument for ΔHNW_{kt} with the county-level housing price elasticity based on Saiz (2010). Mian et al. (2013) show how local-level housing price elasticity is a good predictor of changes in housing wealth, which satisfies the relevance condition. It is also exogenous from changes in construction employment, meaning it will satisfy the exogeneity condition. This allows me to identify the causal effects of the housing net worth shock on contracting outcomes.

However, price elasticity is fixed over time, meaning I cannot instrument ΔHNW_{kt}. I do not believe this is a concern. Instrumenting only using 2017 data (a cross-sectional result), instrumenting setting price elasticity equal to 0 in $t = 2005$, and running the OLS regressions eliminating workers in construction industries all lead to the same outcomes in terms of sign, significance, and magnitude.[37]

Another method to gain true causal estimates is to use the change in predicted effect of county-level fixed effects. By running the following regression:

$$AWA_{ijkot} = \beta_0 + J_j + K_k + O_o + X_i'\beta$$

For $t = 2005$ and $t = 2017$ separately, I compare the change in effect of the location fixed-effects J_j, in separate time periods and do a simple IV on the relationship between the changin in county fixed-effects and ΔHNW_{kt}. Again, this does not change my primary results, declines in housing wealth decrease AWA probability.

However it is not immediately clear what the interpretive effect of the housing wealth shock is. Following Bernstein et al. (2017), I interpret a negative ΔHNW_{kt} as a reduction in worker productivity.

[37] These results are not reported for conciseness.

Another possible concern is net out-migration of AWA workers from counties with higher effects of the recession, especially given the longer time-frame. Mian and Sufi (2014) find no evidence for labor out-migration, suggesting that migration is an unlikely explainer of these outcomes.[38]

I also investigate whether there are heterogeneous effects by investment requirements, routineness, task offshorability, and the "tradability" of of the industry, which is taken from the Mian and Sufi (2014) measure of the county-industry Herfindahl index. It may be the case that there is an overall reduction in AWA rates for certain jobs, but a longer-term increase within more routine jobs or jobs which require more training.

6.3 Summary Statistics on $\Delta Direct_{jkt}$ and ΔHNW_{kt}

In Table 3 I show the average demographic characteristic, contract share, and job characteristics by quartile of $\Delta Direct_{jkt}$.

Table 3: Mean and Standard Deviation by Quartile of $\Delta Direct_{jkt}$

	$\Delta Direct_{jkt}$			
	<25%	25-50%	50-75%	>75%
Black	0.105	0.112	0.102	0.085
	(0.307)	(0.315)	(0.302)	(0.279)
Asian	0.038	0.048	0.049	0.059
	(0.191)	(0.214)	(0.215)	(0.235)
Female	0.523	0.466	0.468	0.447
	(0.499)	(0.499)	(0.499)	(0.497)
AWA	0.101	0.108	0.139	0.07
	(0.302)	(0.31)	(0.346)	(0.254)
RTI	-0.582	-0.439	-0.449	-0.31
	(0.883)	(0.814)	(0.799)	(0.867)
Offshorability	0.231	0.183	0.201	0.239
	(1.043)	(1.247)	(1.188)	(0.931)

Note: Standard errors in parenthesis. RTI and Offshorability measures taken from the Autor and Dorn (2013) indices. RTI calculated as log(1+Routine Index)-log(1+Manual Index) -log(1+Abstract Index).

There appears to be an increasing relationship between RTI and exposure to trade shocks, a finding similar to Autor and Dorn (2013) and Acemoglu et al. (2016). It also appears that the share of women is slightly

[38]The implementaton of the Affordable Care Act (ACA) in 2012 may also impact my outcomes. The ACA mandated that employers above a certain size provide health insurance to their employees. If counties with larger housing wealth changes had a higher differential between fixed costs of contract forms before the ACA, it might be the implemenation of these mandates that are causing the difference. For this reason I also use year fixed effects.

higher in low trade exposure, likely due to gender imbalances in manufacturing industries. Interestingly, the share of AWAs appears to be slightly higher among those in the 3rd quartile of trade shocks, and lower among those in the 4th quartile. This is consistent with my results in Section 7 that AWAs decrease in response to Trade Shocks.[39]

Table 4 shows the same statistics by quartile of of ΔHNW_{kt}. Here, the means are similar across quartiles, though again it does appear that top-quartile ΔHNW_{kt} is associated with lower AWA rates, consistent with my findings in Section 8.

Table 4: Mean and Standard Deviation by Quartile of ΔHNW_{kt}

	ΔHNW_{kt}			
	<25%	25-50%	50-75%	>75%
Black	0.1	0.12	0.106	0.143
	(0.3)	(0.324)	(0.308)	(0.35)
Asian	0.119	0.048	0.078	0.028
	(0.324)	(0.214)	(0.268)	(0.164)
Female	0.479	0.495	0.486	0.518
	(0.5)	(0.5)	(0.5)	(0.5)
AWA	0.104	0.108	0.118	0.087
	(0.305)	(0.311)	(0.323)	(0.283)
RTI	-0.485	-0.553	-0.458	-0.44
	(0.825)	(0.812)	(0.826)	(0.838)
Offshorability	0.03	0.015	0.011	-0.104
	(1.109)	(1.111)	(1.133)	(1.11)

Note: Standard errors in parenthesis. RTI and Offshorability measures taken from the Autor and Dorn (2013) indices. RTI calculated as log(1+Routine Index)-log(1+Manual Index) -log(1+Abstract Index).

7 Results - Trade Shock

In this section I outline my results showing the effect of trade shocks on workers' probability of being in an AWA. Table 5 shows that under a variety of different models, higher levels competition with China, causally reduced the probability of workers being in an AWA.

This suggests that the share of workers laid off were primarily AWA workers, and this outweighed any potential increase in AWA usage against firms who remained in business. Unfortunately, there is no easy

[39]Increasing AWAs in the 3rd quartile, but decreasing in the 4th suggest that smaller shocks might increase AWAs, but large employment shocks result in an employment effect large enough to outweigh any shift in AWAs.

Table 5: Effects of China Shock on AWA Probability

	Dependent variable:			
	AWA			
	(1)	(2)	(3)	(4)
$\Delta Direct_{jkt}$	-0.366^{***}	-0.454^{***}	-0.523^{***}	-0.809^{***}
	(0.104)	(0.142)	(0.143)	(0.305)
First Stage Coef.	1.113^{***}	1.120^{***}	1.121^{***}	1.335^{***}
	(0.015)	(0.019)	(0.018)	(0.037)
Controls	X	X	X	X
Year FE	X			
Occupation FE	X			
Industry FE	X	X	X	
Metarea FE	X	X		
Occupation-Year FE		X	X	X
Metarea-Year FE			X	X
Industry-Year FE				X
Observations	133,833	133,833	133,833	133,833

Note: *p<0.1; **p<0.05; ***p<0.01
All Regressions Clustered at Metro-area
Controls are for age, sex, race, education.
All regressions linear probability model.

economic interpretation of $\Delta Direct_{jkt}$. However, as in Wang et al. (2018) we can use the mean of the trade value to get a sense of the change in predicted level. Using the most conservative specification in Column (1), a worker exposed to the average level $\Delta Direct_{jkt}$, saw their probability of being in an AWA decrease by 0.346%.[40] If instead we were to examine distributional shifts, moving from the 10th percentile to the 90th percentile of $\Delta Direct_{jkt}$ would decrease the probability of a worker being in an AWA by approximately 1.1%, a plausible decrease.

There may be certain contracts that are responsible for the largest changes in AWA rates. In Table 6 I show the same specification as Column (1) of Table 5 broken out by contract form.

Table 6: Effects of China Shock on AWAs - By Contract

	Dependent variable:			
	Ind. Contractor	Temp Agency	Contract Co.	On Call
	(1)	(2)	(3)	(4)
$\Delta Direct_{jkt}$	-0.290^{***}	-0.019	-0.001	-0.054
	(0.083)	(0.035)	(0.046)	(0.049)
First Stage Coef.	1.113^{***}	1.113^{***}	1.113^{***}	1.113^{***}
	(0.015)	(0.015)	(0.015)	(0.015)
Controls	X	X	X	X
Year FE	X	X	X	X
Occupation FE	X	X	X	X
Industry FE	X	X	X	X
Metarea FE	X	X	X	X
Observations	133,833	133,833	133,833	133,833
Note:				*p<0.1; **p<0.05; ***p<0.01
				All regressions linear probability model.
				All Regressions Clustered at Metro-area. Controls are for
				age, sex, race, education.

Here, the point estimates are negative in all contract forms, but it appears that the effect is mostly concentrated among independent contractors. However, it is possible that there was heterogeneity by worker task and investment requirements, which I explore in the next section.

[40] For conciseness, I do not report the results from Table 5 using OLS or under different clustering specifications. The direction, magnitude and significance is very similar using OLS, and pairwise clustering by metro-area and aggregated industry has the same effect.

7.1 Effects by Firm Investment, Routineness, and Offshorability

In this section, I analyze the same results by various subgroups. Table 7 shows the effect of $\Delta Direct_{jkt}$ by Low, Medium, and High Firm investment, as defined by MacLeod and Nakavachara (2006). I interpret higher levels of firm investment as a sign of higher required fixed costs of employment.

Table 7: Effect China Shock - By Firm Investment

	Dependent variable:		
	AWA		
	(Low)	(Medium)	(High)
$\Delta Direct_{jkt}$	-0.268^{*}	-0.491^{***}	-0.218
	(0.139)	(0.173)	(0.487)
First-Stage	1.162^{***}	1.111^{***}	0.834^{***}
	(0.014)	(0.016)	(0.037)
Controls	X	X	X
Year FE	X	X	X
Occupation FE	X	X	X
Industry FE	X	X	X
Metarea FE	X	X	X
Observations	44,461	55,781	33,591
Note:			*p<0.1; **p<0.05; ***p<0.01
			All regressions linear probability model.
			All Regressions Clustered at Metro-area.
			Controls are for age, sex, race, education.

Table 7 shows that the largest effect of trade shocks on AWA rates came from medium-investment requirement occupations. Again, this suggests that more workers in high fixed cost occupations shifted to AWAs, exactly balancing out the change in probabilities.

Table 8 shows the same effect but broken out by whether a job is not routine (Column 1) - in the top 1/3rd of routine occupations (Column 2), and the interactive effect of the trade shock with both how routine the job is (Column 3) and how offshorable the job is (Column 4).[41] Column (2) suggests there was no change for workers in routine jobs in the effect of trade shocks on AWA rates. However, Column (3) suggests that routine jobs see a larger increase in the effect of direct trade shocks, and the least routine jobs were more likely to become AWAs. As RTI decreases, the effect of the trade shocks will flip to being positive.[42]

[41] Routineness of job and offshorability definitions from Autor and Dorn (2013).

[42] While Column 3 is not instrumented in order to properly analyze the interactive effect. Instrumenting for $\Delta Direct_{jkt}$ and $\Delta Direct_{jkt} * RTI$ with $\Delta Direct^{IV}_{jkt}$ and $\Delta Direct^{IV}_{jkt} * RTI$ leads to similar point estimates.

Column (4) also suggests workers in the least offshorable jobs saw a predicted increase in their probability of being in an AWA.

Table 8: Effects of China Shock - By RTI and Offshorability

	Dependent variable			
	AWA			
	Routine=0	Routine=1		
	(1 - IV)	(2 - IV)	(3 - OLS)	(4 - OLS)
$\Delta Direct_{jkt}$	-0.423^{***}	-0.159	-0.340^{***}	-0.263^{***}
	(0.142)	(0.154)	(0.082)	(0.082)
$\Delta Direct_{jkt}$*RTI			-0.196^{***}	
			(0.064)	
$\Delta Direct_{jkt}$*Offshorability				-0.122^{**}
				(0.056)
Controls	X	X	X	X
Year FE	X	X	X	X
Occupation FE	X	X	X	X
Industry FE	X	X	X	X
Metarea FE	X	X	X	X
Observations	102,115	31,706	133,821	133,821

Note: *p<0.1; **p<0.05; ***p<0.01
All regressions linear probability model.
All Regressions Clustered at Metro-area.
controls are for age, sex, race, education.
Routine means occupation in top 1/3rd of RTI.

Overall, these results suggest that trade shocks primarily reduced employment in affected industries AWA workforce, generally the workers most marginally attached to their workplace and the easiest to fire (Katz and Krueger, 2016). For workers in less routine occupations, trade shocks have increased their probability of being in an AWA.

For workers in the *least routine* occupations, moving from the 10th to the 90th percentile of the trade shocks increases their probability of being in an AWA by 0.3%. In contrast, workers in the *most* routine occupation saw a decrease in their probability of being in an AWA of approximately 2%. The least offshorable worker saw an increase in their probability of being in an AWA of approximately 0.3%, while the most offshorable worker saw a decrease of 2%.

This effect suggests that the workers who were the *least* affected by the China shocks(Chetverkov et al., 2016), workers in non-routine and non-offshorable occupations, are now more likely to be in AWAs, and may

pay higher taxes and have fewer collective bargaining rights as a result. (Muhl, 2002)

In this section, I have shown that one of my labor demand shocks, increased trade with China, has decreased overall AWA rates in the population. However, this effect is likely due to lower employment among the AWA population, suggesting that AWA workers are the first let go. There is heterogeneity among occupations, and workers who are in less routine and less offshorable occupations see predicted increases in their likelihood of being in an AWA.

As mentioned by Wang et al. (2018), increased competition from trade will also impact firms that are both upstream and downstream of those directly affected, and if we want to analyze the full impact of the China Shock we should consider these effects as well. I discuss results from this analysis in Section 9.2. Firstly, I discuss my findings on the effect of housing price reductions in the great recession on contracting outcomes.

8 Results - Housing Shock

As noted by Mian and Sufi (2014), there were substantial labor market effects of housing wealth declines, primarily among non-tradable employment. Bernstein et al. (2017) interprets the household wealth effect as a decline in worker productivity. By including 2 periods, I can control for county-level fixed effects, so the interpretation of these findings should be the long-run effects of the great recession on AWA rates.[43]

Table 9 shows the effect of changing housing prices at the county level from 2006 - 2009 on the likelihood of workers being in an AWA. There is a positive association between housing wealth changes and probability of workers being in AWAs. Given the vast majority of the housing value changes during the recession were negative, this shows that the Great Recession reduced AWA rates while also reducing employment.

Table 10 shows the same regression as Column (1), broken out by contract form. The effects appear to be driven primarily by workers in temporary help agencies, rather than independent contracting as in the previous section. However, the point estimates are not different from one another.

As discussed in Section 6, I use a variety of methods to instrument for ΔHNW_{kt}, finding similar results. Figure 3 shows the effect of ΔHNW_{kt}, on changes in county-fixed effects.

I run the same specification in Column (1) of Table 9 for 2005 and 2017 separately. I then plot ΔHNW_{kt} on the change in the county-fixed effects on AWA probability from 2005 to 2017, and regress that change on ΔHNW_{kt}, instrumenting by the county-level price elasticity. This analysis measures the causal effect of ΔHNW_{kt} on the change in county k's specific contracting effect from 2005 to 2017 on workers probability of being in an AWA.[44]

[43] As discussed in Section 6, a variety of methods of instrumenting for ΔNHW_{kt} resulted in substantially similar outcomes.

[44] Doing the same analysis without instrumenting leads to a similarly positive relationship between ΔHNW_{kt} and the change

Table 9: Effects of Housing Shock on AWAs

	Dependent variable:			
	AWA			
	(1)	(2)	(3)	(4)
ΔHNW_{kt}	0.122^{***}	0.163^{***}	0.150^{***}	0.258^{***}
	(0.042)	(0.063)	(0.042)	(0.086)
Controls	X	X	X	X
Year FE	X			
Occupation FE	X			
Industry FE	X	X	X	X
County FE	X		X	
Occupation-County FE		X		X
Occupation-Year FE			X	X
Observations	31,495	31,495	31,495	31,495

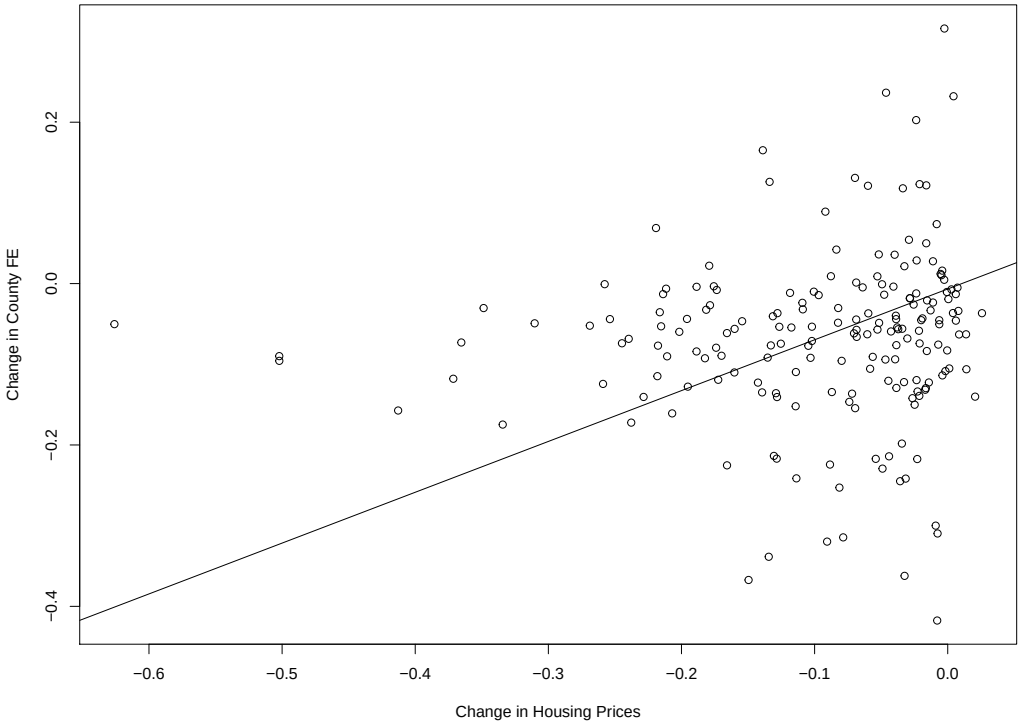
Note: *p<0.1; **p<0.05; ***p<0.01
All Regressions in linear probability model.
All Regressions Clustered at State-Level.
Controls for sex, race, and education.
Weight by total number of houses in 2006.

Table 10: Effects of Housing Shock on AWAs - By Contract

	Dependent variable:			
	Ind Con	Contract Co	Temp Agency	On Call
	(1)	(2)	(3)	(4)
ΔHNW_{kt}	0.014	0.017	0.022^{**}	0.055
	(0.038)	(0.029)	(0.009)	(0.069)
Controls	X	X	X	X
Year FE	X	X	X	X
Occupation FE	X	X	X	X
Industry FE	X	X	X	X
County FE	X	X	X	X
Observations	31,495	31,495	31,495	31,495

Note: *p<0.1; **p<0.05; ***p<0.01
All Regressions in linear probability model.
All Regressions Clustered at State-Level.
Controls for sex, race, and education.
Weight by total number of houses in 2006.

Figure 3: Change in County FE effect on AWA by ΔHNW_{kt}



Note: Only includes counties for which elasticity, ΔHNW_{kt}, and observations were available. Line of fit regresses ΔHNW_{kt} (instrumenting with county-level price elasticity) on the county-level change in county FE prediction on linear probability model of worker being in an AWA, conditional on industry, occupation, education, and other individual controls. Regression clustered at the state level. Line of fit is approximately $\Delta CountyFE$=0.62988*ΔHNW_{kt} -0.0667

The effects in Figure 3 are substantially similar to Table 9. Negative changes in housing prices in the recession causally *decreased* the likelihood of workers being in AWAs. These results are substantially similar to the effects of the China Shock and again suggest that negative labor demand shocks result in more AWA workers entering unemployment than "regular" workers becoming AWAs.

If we assume the interpretation of Bernstein et al. (2017) and treat the negative housing wealth shock as a decrease in worker productivity, this is in line with the predicted effects of my conceptual framework - if

in county fixed effects, though the effects are smaller in magnitude.

workers have random productivity shocks, some will become AWAs and some will become unemployed - the overall effect will depend on the balance of previous contracts and who is most affected.

The most conservative estimates of my results suggest that moving from the the 10th to the 90th percentile of housing price declines in the county-level cross section would decrease AWA rates by approximately approximately 2.1%.[45] This number is large, but again plausible, and would represent a change in relative probability of being in an AWA of about 20%, assuming the overall rate of AWA employment of 10%.[46]

8.1 Effects by Firm Investment, Routineness, Offshorability, and Tradability

As with the previous section, I use the estimates of occupation-level firm investment, routineness, and offshorability in order to see if there is any heterogeneity in the effect of the housing wealth shock. Table 11 shows the effects by firm investment and Table 12 shows the the same effects interacted with measures of routineness, offshorability, and the county-industry Herfindahl measure of industry tradability from Mian and Sufi (2014). The goal of the Herfindahl index is to measure is to determine whether industries that are "non-tradable", i.e. that rely on local market labor, are more affected by housing wealth shock, since they are less substitutable.

Table 11: Effects of Housing Shock - By Firm Investment

	Dependent variable:		
	AWA		
	(Low)	(Med)	(High)
ΔHNW_{kt}	0.081	0.089	0.246***
	(0.066)	(0.064)	(0.090)
Controls	X	X	X
Year FE	X	X	X
Occupation FE	X	X	X
Industry FE	X	X	X
County FE	X	X	X
Observations	9,888	11,782	9,825
Note:			*p<0.1; **p<0.05; ***p<0.01
			All Regressions in linear probability model.
			All Regressions Clustered at State-Level.
			Controls for sex, race, and education.
			Weight by total number of houses in 2006.

[45] 90th percentile is a decline of 17.2%, 10th percentile is an increase of 0.3%

[46] (10%-2.1%)/10%

Table 11 shows the change appears to have come largely from workers who require the *most* investment, consistent with the idea that fixed costs may be a driving factor in firms' hiring and contracting decisions.

Table 12: Effects of Housing Shock - Routine,Offshorability,Tradability

	Dependent variable:		
	AWA		
	(1)	(2)	(3)
ΔHNW_{kt}	0.111**	0.162***	0.151***
	(0.046)	(0.063)	(0.041)
ΔHNW_{kt}*RTI	−0.023*		
	(0.013)		
ΔHNW_{kt}*Offshore		0.014	
		(0.020)	
ΔHNW_{kt}*$Herf_{kj}$			−0.144
			(0.603)
Controls	X	X	X
Year FE	X	X	X
Occupation FE	X	X	X
Industry FE	X	X	X
County FE	X	X	X
Observations	31,495	31,495	31,495
Note:			*p<0.1; **p<0.05; ***p<0.01
			All Regressions in linear probability model.
			All Regressions Clustered at State-Level.
			Controls for sex, race, and education.
			Weight by total number of houses in 2006.

The results in Table 12 are somewhat different from Section 7.1. While there is no heterogeneity by tradability or offshorability, it does appear that workers with more routine jobs see *less* of an effect from the housing price declines. Here, all workers saw a predicted decrease in their probability of being in an AWA, the relative decrease was smaller for workers who were the most routine.[47]

When performing the same analysis as Table 12 broken out by contract,[48] the results are substantially similar, and the interactive effect is stronger for the likelihood of workers becoming independent contractors. Similar to the previous section, we can compare the effect of the housing price declines for the most and least routine workers in the dataset.[49] The least routine worker sees their probability of being in an AWA

[47]No worker saw a predicted increase in the probability of being in an AWA for any level of RTI. This result is larger and significant at the 5% level when controlling for occupation-county fixed-effects.

[48]Results not reported for conciseness.

[49]The highest value of the RTI is 1.59, the lowest value is -2.38. The change from the 10th to 90th percentile of housing price

decrease by 2.8%, while the most routine worker saw sees their probability of being in an AWA decrease by only 1.2%.

9 Supply-Chain Effects

While there are negative direct employment effects of trade shocks (Autor et al., 2013), the gains from decreased input costs to firms downstream of the competition, might actually outweigh the direct employment effects. (Wang et al., 2018) Similarly, the findings in Section 7 only account for the negative labor demand shock on affected firms. Given the total effect of the China shock will be the sum of these effects it is also worthwhile to investigate the upstream and downstream.

Because of lower prices of manufacturing goods, firms in sectors that use those goods as inputs benefit (Acemoglu et al., 2016; Wang et al., 2018). Firms who do not face competition directly but whose U.S. customers face additional competition are made worse off, since they have seen similar decreases in demand.

I construct similar measures of the downstream and upstream effect, and run the following regression:

$$\begin{aligned} AWA_{ijkot} = \beta_0 + \beta_1 \Delta Direct_{jkt} + \beta_2 \Delta Up_{jkt} + \beta_3 \Delta Down_{jkt} \\ + J_j + K_k + O_o + T_t + X_i'\beta \end{aligned}$$

Where the new objects ΔUp_{jkt} and $\Delta Down_{jkt}$ are constructed as:

$$\Delta Down_{jkt} = \frac{L_{jkt-1}}{L_{kt-1}} \sum_{g=1}^{J} w_{gjt}^{down} \frac{Mint_{gt}^{CN,U} - Mint_{gt-1}^{CN,U}}{Yint_{gt-1}^{U} + Mint_{gt-1}^{U} - Eint_{gt-1}^{U}}$$

So for industry g in China , $\frac{Mint_{gt}^{CN,U} - Mint_{gt-1}^{CN,U}}{Yint_{gt-1}^{U} + Mint_{gt-1}^{U} - Eint_{gt-1}^{U}}$ is the change in Chinese trade of *intermediate goods* of industry g. The downstream weights are defined as

$$w_{gjt}^{down} = \frac{Z_{g,j,t-1}^{CN,U}}{\sum_i Z_{ij,t-1}^{CN,U}}$$

Where $Z_{g,j,t-1}^{CN,U}$ is the value of intermediate inputs from China industry g to U.S. industry j . So each weight represents the share of intermediate goods from China's industry g that go specifically to U.S. industry j to be used as intermediate inputs to final production. The upstream effect is defined as:

declines of 17.56%.

$$\Delta Up_{jkt} = \frac{L_{jkt-1}}{L_{kt-1}} \sum_{g=1}^{J} w_{jgt}^{up} \Delta Direct_{gkt}$$

Where:

$$w_{jgt}^{up} = \frac{Z_{j,g,t-1}^{U,U}}{\sum_i Z_{j,i,t-1}^{U,U}}$$

and $Z_{j,g,t-1}^{U,U}$ is the total value of the goods produced by U.S. industry j that are used by U.S. industry g as intermediate inputs. This represents the fact that, because Chinese firms are now competing with specific U.S. industries, the U.S. firms whose products are used as intermediate inputs are also differentially impacted.

9.1 Supply-Chain Instruments

The instruments for $\Delta Down_{jkt}$ and ΔUp_{jkt} are constructed as:

$$\Delta Down_{jkt}^{IV} = \frac{L_{jkt_{lag}}}{L_{kt_{lag}}} \sum_{g=1}^{J} w_{gjt}^{down-IV} \frac{Mint_{gt}^{CN,G5} - Mint_{gt-1}^{CN,G5}}{Yint_{gt-1}^{G5} + Mint_{gt-1}^{G5} - Eint_{gt-1}^{G5}}$$

$$\Delta Up^{IV}{}_{jkt} = \frac{L_{jkt_{lag}}}{L_{kt_{lag}}} \sum_{g=1}^{J} w_{jgt}^{up-IV} \Delta Direct_{gkt}^{IV}$$

Where the objects are the same as described above.

The biggest difference in using the intermediate goods is that the weights $w_{gjt}^{down-IV}$ and w_{jgt}^{up-IV} are constructed using the specific country information from ICIO tables. As described by Wang et al. (2018), previous literature has relied on the assumption that goods imported as intermediates are used the same way in the U.S. and other high income countries. This methodology allows for the possibility that intermediates may be used differently across countries.[50]

In this analysis I have three variables of interest and three instruments. The relevance condition will be satisfied depending on the first stage of these estimates, and I include the minimum F-statistic for each regression. The exogeneity condition requires that increases in trade from China to the other G5 countries are not correlated with wider U.S. demand. While it is theoretically possible that there is some reverse causality, with G5 countries exporting to the US using Chinese imports, the removal of exports mitigates this risk.

[50] Wang et al. (2018) test this assumption and find evidence that the U.S. and the G5 do not use Chinese imports in the same ways.

9.2 Results - Supply Chain

In this section, I perform the same analyses as Section 7, but using the three endogenous variables and their instruments as described above. The goal of this section is to understand the total effect of the China Shock on workers' contracts, not just the direct competition effects.

The main results are shown in Table 13, and show that when taking into account the full supply chain effects of trade with China, direct competition decreases AWA rates (as shown in Section 7), but lower input costs (higher $\Delta Down_{kjt}$) also reduce AWA rates, and higher upstream costs increase AWA rates.

Table 13: Effects of Direct, Downstream, and Upstream Demand Shocks

	Dependent variable:				
	AWA	Ind. Contractor	Temp Agency	Contract Co.	On Call
	(1)	(2)	(3)	(4)	(5)
$\Delta Direct_{jkt}$	-1.186^{*}	-0.726	0.210	-0.892^{***}	0.122
	(0.674)	(0.491)	(0.247)	(0.334)	(0.261)
$\Delta Down_{jkt}$	-0.259^{***}	-0.199^{**}	-0.084^{***}	0.006	-0.002
	(0.097)	(0.087)	(0.031)	(0.059)	(0.044)
ΔUp_{jkt}	1.151^{*}	0.698	-0.100	0.844^{***}	-0.164
	(0.655)	(0.475)	(0.224)	(0.291)	(0.246)
Minimum First Stage F-stat	353.48	353.48	353.48	353.48	353.48
Controls	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Occupation FE	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y
Metro-Area FE	Y	Y	Y	Y	Y
Observations	133,833	133,833	133,833	133,833	133,833

Note: *p<0.1; **p<0.05; ***p<0.01
All Regressions in linear probability model.
All Regressions clustered at Metro-area level.
Controls for age, sex, race, and education.

The downstream effect, interpreted as an increase in firm productivity, is directly in line with my model. The sign on the upstream effect is surprising, since firms whose customers face competition also had a negative employment effect (Wang et al., 2018). Additionally, the result appears to be focused on workers being contracted out.

This difference may be due to the degree of the shock. The results in Section 7 were direct effects of competition with China, which was concentrated in a relatively small number of industries (Autor et al., 2013; Wang et al., 2018). The upstream effect on the other hand, is more diffuse (Wang et al., 2018). In the

context of my conceptual framework, the upstream shock pushes more firms to the red "1-period" region than it pushes firms out of business, resulting in a positive causal relationship between ΔUp_{jkt} and contracting out.[51] A worker exposed to the mean level of each shock saw an extremely small decrease in their predicted probability of being in an AWA.

However, as above there is heterogeneity - workers with particularly high upstream shocks (approximately 1/4th of the smaple) saw a slight increase in their AWA probability, with the largest increase being 0.1%.

Table 14 shows the effect of the direct, upstream and downstream competition interacted with the measure of routine-ness and task-offshorability from Autor and Dorn (2013) on the probability of workers being contracted out.[52] I use the three trade shock instruments interacted with the routine and offshorability indices to create 6 instruments for the 6 unknowns.

The direct effect was insignificant in Table 13, but here I find that direct competition decreases AWA rates, consistent with my results in the previous sections. As in Section 8.1, more routine jobs see less of an effect of the direct trade shocks.

Because it is difficult to parse the combination of effects in this instance, I calculate the predicted change in contracting out probability of the combination of trade shocks in Column (1) of Table 13, and find that 87% of my sample saw an increase in their probability of being in an AWA when incorporating the non-linearities of routine jobs.

Perhaps most interestingly, when accounting for differing level of effects for offshorability, there are almost no differences, however it appears that downstream competition increases AWA rates, an effect that increases for more offshorable jobs. This could be explained by firms using the decreased input costs to invest in automation, while workers in less offshorable tasks see a predicted decrease in AWAs.(Acemoglu and Restrepo, 2017; Lemieux et al., 2009; MacLeod and Parent, 1999). This could increase inequality for remaining workers, resulting in offshorable jobs in AWAs, with less offshorable jobs remaining in full-time employment, consistent with the results of Song et al. (2018).

Overall, these findings bolster the evidence from my results in Sections 7 and 8 - Direct Trade shocks appear to decrease the likelihood of workers being in AWAs, likely through the negative employment effect. Most importantly, the direct effect of the China shock reduced AWA rates (as shown in Section 7), the *total* effect of the China shock *increased* those rates for more than 87% of my sample, strong evidence that the China shock not only changed employment patterns, but also reduced the relative share of the workforce in standard contracts in aggregate.

[51] This is similar to the potential non-linearity shown in Table 4, where 3rd quantile levels of trade shocks see higher AWAs, before declines at the 4th quantile.

[52] I focus on contracting out because of the finding in Table 13 that tbe difference in upstream and direct effects were primarily through contracting out.

Table 14: Effects of Supply Chain - Heterogeneous Effects

	Dependent variable: Contract Company	
	(IV)	(IV)
$\Delta Direct_{jkt}$	-0.804^{**}	-0.877^{***}
	(0.321)	(0.302)
$\Delta Down_{jkt}$	0.793^{***}	0.824^{***}
	(0.287)	(0.266)
ΔUp_{jkt}	-0.0001	0.014
	(0.056)	(0.060)
$\Delta Direct_{jkt}$*RTI	0.625^{***}	
	(0.218)	
ΔUp_{jkt}*RTI	-0.460^{***}	
	(0.161)	
$\Delta Down_{jkt}$*RTI	-0.025	
	(0.033)	
$\Delta Direct_{jkt}$*Offshore		-0.092
		(0.215)
ΔUp_{jkt}*Offshore		-0.053
		(0.156)
$\Delta Down_{jkt}$*Offshore		0.099^{**}
		(0.048)
Minimum First Stage F-stat	506.82	560.40
Controls	Y	Y
Year FE	Y	Y
Occupation FE	Y	Y
Industry FE	Y	Y
Metro-Area FE	Y	Y
Observations	133,821	133,821

Note: *p<0.1; **p<0.05; ***p<0.01
Controls for age, sex, race, education.
Linear Probability Model
Clustered at Metro-area

10 Discussion

The results in Sections 7 and 8 show that negative labor demand shocks reduced the probability of workers being in AWAs. This is the first finding that provides causal evidence of a link between the wider labor market and AWAs. When negative labor demand shocks hit, the AWA workers were the first to go, and the decline in AWA employment outweighed any structural increases in AWAs that may also occur.

Notably, in the case of the effects of the Great Recession, these effects have remained in place even 8 years later - the housing wealth shock in 2017 appeared to have decreased employment in AWAs, but resulted in less routine workers becoming more likely to enter AWAs. This long-term effect is consistent with a slow recovery.

While the 2017 Contingent Worker Supplement alleviated some fears among researchers that AWAs were structurally increasing (Gibbons and Katz, 1991), my results do suggest that the lack of increase was due to negative employment effects from the recession. A simple counterfactual suggests that 11.91% of workers would be in an AWA were it not for the great recession[53] - an increase of 1.5% since the previous Contingent Worker Supplement in 2005. This may explain why perceptions of higher rates of AWAs have increased, even though they have remained stable. (Katz and Krueger, 2016) Additionally, there is also substantial heterogeneity among workers - the China Shock caused more AWAs for workers in less routine jobs.

These findings also suggest that AWAs are not all bad - while these contracts are associated with long-term wage declines (Dube and Kaplan, 2010; Goldschmidt and Schmieder, 2017; Dorn et al., 2018) and have fewer legal protections, (Muhl, 2002) the fact that these workers appear to be the "first to go" when a negative shock hits suggest the counterfactual of an AWA for many of these workers would be unemployment, not necessarily a full-time contract.

This has important policy implications. Simply outlawing AWAs, or even stepping up more robust enforcement of misclassification, might just result in AWA workers being unemployed, an outcome which is also particularly bad and leads to lower wages (Schmieder et al., 2018). Instead, it may be more beneficial to focus on what makes AWAs relatively beneficial - the low firing costs and low costs of benefits they have to pay. (Muhl, 2002) The difference in legal rules between the U.S. and Germany may also explain the difference in relative wage penalities when comparing across countries (Goldschmidt and Schmieder, 2017; Dorn et al., 2018).[54]

However, misclassification, especially if workers are less aware of the legal implications of being in an

[53] If I take the most conservative estimate from Table 9, and find the predicted probability of each worker in 2017 being in an AWA conditional on $\Delta HNW_{kj} = 0$, 11.91% of workers are in an AWA. If you replace the workers with predicted probability outside [0,1] with zero or one, 12.55% of workers are in an AWA.

[54] For a discussion of the legal rules and precedence surrounding AWAs see Appendix A. For the text of selected legislation and regulation see the Legal Appendix.

AWA is still problematic, as firms could extract rents from workers' lack of knowledge.(Krueger and Posner, 2018)

11 Conclusion

Who is an employee can be of enormous consequence to workers, and determine whether they have access to employee healthcare or pensions, or can access firm-specific rents (Dube and Kaplan, 2010). AWAs are forms of labor contracts in which a worker is not *legally* an employee of the firm that they provide labor for. Instead, they operate independently, or are legally employed by a separate company. These types of arrangements can have severe consequences, including determining who has access to collective bargaining rights. (Muhl, 2002)

While there was a fear that these types of contracts were becoming more common (Katz and Krueger, 2016), recent data suggests that the use of these contracts has been stable since 2005 (Contingent Worker Supplement, 2017). Additionally, while there has been substantial research on the economic costs of being contracted out or being an independent contractor (Dube and Kaplan, 2010; Dorn et al., 2018; Goldschmidt and Schmieder, 2017), there is comparatively little research on what may cause firms to use these types of contracts in the first place.

Part of this is due to data-quality issues: it is almost impossible to properly link workers in these contracts to specific firms (Bernhardt, 2014). Even in administrative datasets, temporary help and staffing firms may use their clients information to reduce their unemployment tax burden (Kearns, 2006), or tax data may not be clear on what is considered primary employment[55]. While there is a belief that these types of contracts are cheaper for employers, the fact that there has been no unambiguous increase in their use is surprising, and suggests that there may be understudied downsides of AWAs.

In this paper, I outline a simple conceptual framework where firms and workers agree on AWAs, depending on their productivities and firm-specific fixed costs. While AWAs allow firms to shift fixed employment costs to workers (Independent Contractors) or other firms (Temporary Help Agencies, Contracting Out), legal rules and precedence requires that firms not observe or "direct" these workers as they can with normal employees.[56]

I test the causal effects of two well-known labor demand shocks, the "China Shock" (Autor et al., 2013) and the housing wealth shock from the Great Recession (Mian and Sufi, 2014; Bernstein et al., 2017) on AWAs. In both cases, negative labor demand shocks decreased the probability of workers being in an AWA.

[55] Collins et al., forthcoming, based on results presented at the Boston Fed.

[56] For a discussion of the legal rules and precedence surrounding AWAs see Appendix A. For the text of selected legislation and regulation see the Legal Appendix.

This is the first causal link between labor demand shocks and AWAs, and also provides evidence that AWA workers are the first to go during downturns.

However, there is substantial heterogeneity, workers in less routine jobs, who are likely at the higher-end of the payscale (Autor and Dorn, 2013), while less likely to be laid off due to the China Shock (Chetverkov et al., 2016), saw an increase in their likelihood of being in an AWA. Additionally I find that absent the housing price declines from the great recession, AWAs would have amounted to approximately 1.5% higher share of employment, a finding that suggests that there has been a structural increase in AWAs in some sectors and occupations. These findings also demonstrate the importance of understanding when firms are misclassifying their workers, and whether legal rules surrounding who is considered an employee are potentially impacting these effects. This may help explain the perception that AWAs have increased despite no evidence that they have in aggregate. (Irwin, 2017)

In both of these analyses I only focused on workers from urban areas or larger counties that are represented in the Contingent Worker Supplement. Recent research on firm monopsony power has shown that firms have substantial effects on the level of pay workers receive (Krueger and Posner, 2018) While to some degree contract form will be contingent on the type of work performed (MacLeod and Parent, 1999; Lemieux et al., 2009), if firms in rural areas have stronger labor market power, they may be able to shift their workers to contracts they prefer less (Mas and Pallais, 2016; Krueger and Posner, 2018).

Further investigations of AWAs should look beyond wages and hours, and consider the role of employee benefits, unionization, and other less-studied factors. Adiditionally, we should consider the importance of the counterfactual in understanding AWAs - would these workers be otherwise unemployed? While AWAs are bad for workers, (Irwin, 2017; Mas and Pallais, 2016), unemployment might still be worse (Schmieder et al., 2018). Finally, if we seek to eliminate the particular harms of AWAs, it may be more important to reduce the differences in fixed-employment costs or reducing those costs alltogether.

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A Legal Regulations and Misclassification

While researchers may refer to AWAs as a monolithic group, the contract forms are very distinct. There is no specific hours rule that determines whether a worker is an employee versus an AWA worker.[57] Instead, a myriad of regulations, laws, and precedence govern whether a worker is in an AWA, and if they are correctly classified. In the Legal Appendix, I also provide a selection of relevant quotations from laws, NLRB decisions, and IRS fact sheets and rules on 3rd party employers and independent contractors. Data also suggests that firms are not using AWAs as a form of part-time work: the average hours worked across most AWA types remains above 35 hours per week,[58] meaning that AWA workers are largely full-time employees.

Regulators have focused the bulk of their attention on independent contractors, because they constitute the largest group of AWAs. The Department of Labor, for example, is greatly worried firms "misclassify" workers: claiming a worker is an independent contractor when they are in reality an employee.[59] Firms have a number of incentives to misclassify workers as independent contractors in order to not provide benefits, overtime pay, workers compensation, and bargaining rights. Independent Contractors also pay all employer-based taxes such as Medicare and Social Security. (Muhl, 2002)

A number of different laws determine the benefits employees receive. At the Federal level, the National Labor Relations Act (NLRA) regulates rights to join a union and protected action, the Fair Labor and Standards Act (FLSA), regulates pay and overtime rules, the Employee Retirement Income Security Act (ERISA)

[57] The IRS charges employment taxes for all workers, with some exceptions for low-wage household workers and foreign students. In 2018, the threshold for household workers was $2,100, which is below the income of more than 95% of all contract types, so this restriction does not bind. See IRS Publication 926 - https://www.irs.gov/pub/irs-pdf/p926.pdf

[58] Shown in Table 1 and footnote 28.

[59] See https://www.dol.gov/whd/workers/misclassification/

regulates retirement benefits and health benefits. The Health Insurance Portability and Accountability Act (HIPAA) also provides some regulations on health insurance provision for private employers.

Generally, as discussed in Muhl (2002), courts will use the "Right to Control": the "*ability* of the employer to take control [of the work process] is sufficient to create an employer-employee relationship." There are several tests to determine whether a worker has been misclassified, and different regulatory agencies will use different tests depending on the statute in question. The "Common Law Test", used by the IRS, determines employee status based on the employer's ability to control the work product, while the "Economic Realities Test" examines whether a person is dependent on the firm for continued employment. (Muhl, 2002) These distinctions generally come into play during legal disputes, when a worker claims they have been "misclassified" as a contractor when they are an employee.

The National Labor Relations Board has recently suggested that misclassification as independent contractors may be a violation of the NLRA. Because "the law does *not* cover...independent contractors,"[60] misclassification could result in workers losing their collective bargaining protections. In a recent case, the NLRB used a variety of tests to consider whether FedEx drivers were employees or contractors, including the Right to Control, but also whether employees were required to wear uniforms and had control over their work processes.[61]

While the discussion thus far has focused on Independent Contractors, the other forms of AWAs are subject to similar legal and regulatory restrictions. Temp Agency workers and Contract Company employees are different in that, while they are considered employees, they are not employees of the firm they primarily provide labor for, but instead their services are "contracted out." The staffing agency or contract company is considered the primary employer in many cases. The primary reason to use such a system would be less necessary oversight and lower employment taxes (Muhl, 2002). In instances of underpayment (or non-payment) of employment taxes, "the liability of the employer for employment taxes may shift depending on the type of third-party arrangement."[62] However, the IRS does commonly use the "Common Law" rule discussed in Muhl (2002), meaning that if a third-party does not pay the appropriate employment taxes, the original employer would still be liable.[63]

The NLRB has also vacillated about so-called "joint employer" regulation. In 2015, the "Browning-Ferris" decision established a new standard that "joint employment" should be considered "even when two entities have never exercised joint control over essential terms and conditions of employment".[64] However, in 2017 the

[60] https://www.nlrb.gov/resources/faq/nlrb#t38n3182

[61] FedEx Home Delivery v. NLRB 849 F. 3d 1123 - Court of Appeals, Dist. of Columbia Circuit 2017

[62] IRS Internal Revenue Manual, Part 5, Chapter 1, Section 24. - https://www.irs.gov/irm/part5/irm_05-001-024r

[63] "The existence of an employer-employee relationship generally is determined using the common law control test and is based on the facts and circumstances of each case." IRS Internal Revenue Manual, Part 5, Chapter 1, Section 24. - https://www.irs.gov/irm/part5/irm_05-001-024r

[64] 365 NLRB No. 156 Hy-Brand Industrial Contractors, Ltd. and Brandt Construction Co.,

NLRB overruled that decision, returning to the previous standard where the firms would be considered "joint employers" only instances where the firm had exercised "direct and immediate" control over the supplying firm.[65]

The pre-Browning-Ferris standard does allow for the firm to exercise routine authority to oversee these types of employees and ensure that the contracted labor is being adequately provided. However, the hiring firm is not allowed to provide day-to-day instruction, discipline, or termination of workers. The change to the Browning-Ferris standard and back again may have changed AWA usage between 2015 and 2017, explaining some of the difference between Katz and Krueger (2016) and the 2017 CWS. However, it is unlikely that firms shifted AWA usage to the extent of 5% of the labor force in response.

Legal rules can also determine the benefits workers receive. Under the original HIPAA/ERISA rules, firms that offer health and retirement benefits must provide the *same benefits* to "similarly situated individuals."[66] This means that firms who offer benefits to a given class of worker (by occupation, tenure, job title, etc.) must offer the same benefits to all workers in the same class. Therefore, a firm with two classes of employee, say laborers and managers, can offer two separate benefits programs to each type, but must offer the same benefits within them. While this regulation was primarily created to prevent firms form discriminating on the basis of pre-existing conditions, it also restricts firms' ability to cut benefits for a single employee. In practice, if the cost of creating a benefits plan is high, firms may prefer to offer a single plan to all employees.

There are a number of costs associated with hiring employees, from employment taxes to restrictions on benefits. By using an AWA, a firm can effectively shift these costs to the worker (Independent Contractors) or a different firm (Temporary Help Agencies and Contract Companies). Additionally, they would be able to avoid cutting benefits for the remaining employees. While the firm may need to pay a wage premium, they can more flexibly respond to a higher wage by contracting for fewer hours. If firms "cheat" and misclassify workers they can pay severe penalties.(Muhl, 2002)

B Solution of Model

B.0.1 Backwards Induction

I solve the model starting in the second period. All firms and workers with 2-period contracts are previously matched. If a worker or firm received a one-period contract or did not match, they will receive the one-period contract offer.

[65] "[t]he essential element in [the joint-employer] analysis is whether a putative joint employer's control over employment matters is direct and immediate" - 365 NLRB No. 156 Hy-Brand Industrial Contractors, Ltd. and Brandt Construction Co.,

[66] Health Insurance Portability and Accountability Act of 1996 - https://www.gpo.gov/fdsys/pkg/PLAW-104publ191/html/PLAW-104publ191.htm

Unmatched workers θ_i matched with firm $z_{j,2}$ will accept any one-period contract offer with:

$$(1-\beta)pz_{j,2}\theta_i > \theta_i$$

or

$$z_{j,2} > \frac{1}{(1-\beta)p}$$

Unmatched firms, z_j matched with worker $\theta_{i,2}$ will only offer a one-period contract if:

$$\beta p z_j \theta_{i,2} > F_{1P}$$

or:

$$\theta_{i,2} > \frac{F_{1P}}{\beta p z_j} \tag{3}$$

Period 1 - Firm Profit In the first period, firms will be forward looking.

2-period contract - Firm J

$$\pi_{2p,j} = 2\left[\beta p z_j \theta_i - F_{2P}\right]$$

1-Period contract - Firm J

$$\pi_{1p,j} = \beta p z_j \theta_i - F_{1P} + \int_{\frac{F_{1P}}{\beta p z_j}}^{\infty} \left[\beta p z_j \theta - F_{1P}\right] f_\theta(\theta) d\theta$$

if $z_j > \frac{1}{(1-\beta)p}$. If $z_j \leq \frac{1}{(1-\beta)p}$, they receive:

$$\beta p z_j \theta_i - F_{1P}$$

No Match - Firm J If the firm does not match, they receive

$$\pi_{nm,j} = \int_{\frac{F_{1P}}{\beta p z_j}}^{\infty} \left[\beta p z_j \theta - F_{1P}\right] f_\theta(\theta) d\theta$$

if $z_j > \frac{1}{(1-\beta)p}$, and zero otherwise.

B.1 Period 1 - Worker Profit

B.1.1 2-period contract - Worker i

If the worker is offered and accepts a 2-period contract, they receive:

$$\pi_{2p,i} = 2(1-\beta)pz_j\theta_i$$

B.1.2 1-period contract - Worker i

If the worker is offered and accepts a 1-period contract, in period 2, they will both receive and accept an offer if 2 conditions are true.

$$z_{2,j} > \frac{1}{(1-\beta)p}$$

and

$$z_{2,j} > \frac{F_{1P}}{\beta p\theta_i} \tag{4}$$

Where Eq. 4 is a reordering if Eq. 3. Since the worker observes his own type, letting:

$$\begin{cases} k = \frac{1}{(1-\beta)p} & if \frac{1}{(1-\beta)p} > \frac{F_{1P}}{\beta p\theta_i} \\ k = \frac{F_{1P}}{\beta p\theta_i} & otherwise \end{cases}$$

$$\begin{aligned} \pi_{1p,i} = (1-\beta)pz_j\theta_i \\ + \int_k^\infty (1-\beta)\theta_i pzf_z dz \\ + \int_0^k \theta_i f_z dz \end{aligned}$$

B.1.3 No-Match contract - Worker i

If a worker does not match, they receive:

$$\pi_{nm,i} = \theta_i + \int_k^\infty (1-\beta)\theta_i pzf_z dz + \int_0^k \theta_i f_z dz$$

B.2 Equilibrium - For a given Worker i, firm j

No match will occur if $z_j < \frac{1}{(1-\beta)p}$, since the firm would not be accepted in periods 1 or 2.

B.2.1 No match Areas

Firm not good enough

$$z_j < \frac{1}{(1-\beta)p}$$

Worker not good enough

$$\theta_i < \frac{F_{1P}}{\beta p z_j} \quad and \quad z_j \geq \frac{1}{(1-\beta)p}$$

and if $\theta_i < \frac{F_{1P}}{\beta p z_j} < \frac{F_{2P}}{\beta p z_j}$, the firm would never profit from a 2-period contract in this situation.

B.2.2 2-period

First Choice - Both prefer 2-period

$$\theta_i > \frac{2F_{2P} - F_{1P}}{\beta p z_j} + \int_{\frac{F_{1P}}{\beta p z_j}}^{\infty} \left[\theta - \frac{F_{1P}}{\beta p z_j}\right] f_\theta(\theta) d\theta$$

and

$$z_j > \int_k^{\infty} z f_z dz + \int_0^k \frac{1}{(1-\beta)p} f_z dz$$

Worker Second Choice - Worker prefers 1-period but will accept 2-period.

$$\frac{1}{2}\left[\frac{1}{(1-\beta)p\theta_i} + \int_k^{\infty} z f_z dz + \int_0^k \frac{1}{(1-\beta)p} f_z dz\right] < z_j < \int_k^{\infty} z f_z dz + \int_0^k \frac{1}{(1-\beta)p} f_z dz$$

$$\theta_i > \frac{2F_{2P} - F_{1P}}{\beta p z_j} + \int_{\frac{F_{1P}}{\beta p z_j}}^{\infty} \left[\theta - \frac{F_{1P}}{\beta p z_j}\right] f_\theta(\theta) d\theta$$

Firm Second Choice - Firm prefers 1-period but worker can credibly threaten This is not possible. If the worker prefers no match to one-period, then:

$$z_j < \frac{1}{(1-\beta)p}$$

However, if this is the case the firm would not be able to afford a one-period contract.

B.2.3 1-Period

First Choice

$$\frac{1}{(1-\beta)} < z_j < \int_k^{\infty} z f_z dz + \int_0^k \frac{1}{(1-\beta)p} f_z dz$$

and

$$\frac{F_{1P}}{\beta p z_j} < \theta_i < \frac{2F_{2P} - F_{1P}}{\beta p z_j} + \int_{\frac{F_{1P}}{\beta p z_j}}^{\infty} \left[\theta - \frac{F_{1P}}{\beta p z_j}\right] f_\theta(\theta) d\theta$$

Worker Second Choice - Worker prefers 2 period but will accept 1-period.

$$z_j > \int_k^{\infty} z f_z dz + \int_0^k \frac{1}{(1-\beta)p} f_z dz$$

and

$$\frac{F_{1P}}{\beta p z_j} < \theta_i < \frac{2F_{2P} - F_{1P}}{\beta p z_j} + \int_{\frac{F_{1P}}{\beta p z_j}}^{\infty} \left[\theta - \frac{F_{1P}}{\beta p z_j}\right] f_\theta(\theta) d\theta$$

Firm Second Choice - Firm prefers 2-period but worker can credibly threaten no match

$$\theta_i > \frac{2F_{2P} - F_{1P}}{\beta p z_j} + \int_{\frac{F_{1P}}{\beta p z_j}}^{\infty} \left[\theta - \frac{F_{1P}}{\beta p z_j}\right] f_\theta(\theta) d\theta$$

and

$$z_j < \int_k^{\infty} z f_z dz + \int_0^k \frac{1}{(1-\beta)p} f_z dz$$

and

$$z_j < \frac{1}{2}\left[\frac{1}{(1-\beta)p} + \int_k^{\infty} z f_z dz + \int_0^k \frac{1}{(1-\beta)p} f_z dz\right]$$

B.3 Comparative Statics

I assume that price shocks p_j hit an individual firm but not the whole market, which reduces the price of firm j's output to $p_j < p$. The profit for worker i, firm j under each contract is:

$$
\begin{aligned}
\pi_{nm,i} &= \theta_i + \int_k^{\infty} (1-\beta)\theta_i p z f_z dz + \int_0^k \theta_i f_z dz \\
\pi_{1p,i} &= (1-\beta)p_j z_j \theta_i + \int_k^{\infty} (1-\beta)\theta_i p z f_z dz + \int_0^k \theta_i f_z dz \\
\pi_{2p,i} &= 2(1-\beta)p_j z_j \theta_i \\
\pi_{nm,j} &= \int_{\frac{F_{1P}}{\beta p z_j}}^{\infty} \left[\beta p z_j \theta - F_{1P}\right] f_\theta(\theta) d\theta \\
\pi_{1p,j} &= \beta p_j z_j \theta_i - F_{1P} + \int_{\frac{F_{1P}}{\beta p_j z_j}}^{\infty} \left[\beta p_j z_j \theta - F_{1P}\right] f_\theta(\theta) d\theta \\
\pi_{2p,j} &= 2\left[\beta p_j z_j \theta_i - F_{2P}\right]
\end{aligned}
$$

B.4 Delta-p

$$
\begin{aligned}
\frac{\partial \pi_{i,nm}}{\partial p_j} &= 0 \\
\frac{\partial \pi_{i,1}}{\partial p_j} &= (1-\beta) z_j \theta_i > 0 \\
\frac{\partial \pi_{2,1}}{\partial p_j} &= 2(1-\beta) z_j \theta_i > 0
\end{aligned}
$$

Additionally, we will have that:

$$
\frac{\partial \left(\pi_{i,2} - \pi_{i,1}\right)}{\partial p_j} = \frac{\partial \pi_{2,1}}{\partial p_j} - \frac{\partial \pi_{i,1}}{\partial p_j} = (1-\beta) z_j \theta_i > 0 \implies \frac{\partial \pi_{2,1}}{\partial p_j} > \frac{\partial \pi_{i,1}}{\partial p_j}
$$

So as p_j increases, 2 period contract profit will increase faster than it does for 1-period contracts. This implies a standard relationship in worker preferences. As p_j increases the worker will always eventually prefer a 2-period contract. Similarly, as p_j decreases, the worker will eventually start to prefer a 1-period contract and then a no-match contract (whose value does not change with p_j)

$$\begin{aligned}\frac{\partial \pi_{j,nm}}{\partial p_j} &= \frac{\partial \int_{\frac{F_{1P}}{\beta p_j z_j}}^{\infty} \left[\beta p_j z_j \theta - F_{1P}\right] f_\theta(\theta) d\theta}{\partial p_j} \\ &= \beta z_j \frac{\partial p_j \int_{\frac{F_{1P}}{\beta p_j z_j}}^{\infty} \theta f_\theta(\theta) d\theta}{\partial p_j} + F_{1P}\left(\frac{\partial F_\theta\left(\frac{F_{1P}}{\beta p_j z_j}\right)}{\partial p_j}\right) \\ &= \beta z_j \frac{\partial p_j E\left[\theta | \theta > \frac{F_{1P}}{\beta p_j z_j}\right]}{\partial p_j} + F_{1P}\left(\frac{\partial F_\theta\left(\frac{F_{1P}}{\beta p_j z_j}\right)}{\partial p_j}\right)\end{aligned}$$

Using the chain rule:

$$\frac{\partial \pi_{j,nm}}{\partial p_j} = \beta z_j E\left[\theta | \theta > \frac{F_{1P}}{\beta p_j z_j}\right] + \beta z_j p_j \frac{\partial E\left[\theta | \theta > \frac{F_{1P}}{\beta p_j z_j}\right]}{\partial p_j} - F_{1P}\left(f_\theta\left(\frac{F_{1P}}{\beta p_j z_j}\right)\frac{F_{1P}}{\beta z_j p_j^2}\right)$$

Where the first term is positive by definition, the second term is negative, and the third term is negative. This means that it is theoretically possible that for some values of parameters, an increase in p_j could lead to a *decrease* in no-match profit - this would happen because in period 2, the firm would have a 1-period match if:

$$z_j > \frac{1}{(1-\beta)p}$$

and

$$\theta_i > \frac{F_{1P}}{\beta p_j z_j}$$

If p_j increases, the firm would be willing to offer a contract to a lower-type worker, and that decline in profit could outweigh the benefits of the higher price. I assume that price declines will strictly push firms out of the market, therefore, the set of parameters $(\beta, F_{1P}, \mu_\theta, \sigma_\theta, p)$ must be such that:

$$\beta z_j E\left[\theta | \theta > \frac{F_{1P}}{\beta p z_j}\right] > F_{1P}\left(f_\theta\left(\frac{F_{1P}}{\beta p z_j}\right)\frac{F_{1P}}{\beta z_j p^2}\right) - \beta z_j p \frac{\partial E\left[\theta | \theta > \frac{F_{1P}}{\beta p z_j}\right]}{\partial p_j} \quad \forall z_j \tag{5}$$

With that assumption, we have:

$$\frac{\partial \pi_{j,1}}{\partial p_j} = \beta z_j \theta_i + \frac{\partial \pi_{j,nm}}{\partial p_j} > 0$$

$$\frac{\partial \pi_{j,2}}{\partial p_j} = 2\beta z_j \theta_i > 0$$

$$\frac{\partial \left(\pi_{j,1} - \pi_{j,nm}\right)}{\partial p_j} = \beta z_j \theta_i > 0 \implies \frac{\partial \pi_{j,1}}{\partial p_j} - \frac{\partial \pi_{j,nm}}{\partial p_j} > 0 \implies \frac{\partial \pi_{j,1}}{\partial p_j} > \frac{\partial \pi_{j,nm}}{\partial p_j}$$

$$\frac{\partial \left(\pi_{j,2} - \pi_{j,1}\right)}{\partial p_j} = \frac{\partial \pi_{j,2}}{\partial p_j} - \frac{\partial \pi_{j,1}}{\partial p_j} = \beta z_j \theta_i - \frac{\partial \pi_{j,nm}}{\partial p_j} > 0$$

It is therefore possible that as p_j increases, the firm might prefer more 2-period contracts or more 1-period contracts, depending on the existing match type θ_i.

B.5 Delta-z_j

$$\begin{aligned}
\frac{\partial \pi_{i,nm}}{\partial z_j} &= 0 \\
\frac{\partial \pi_{i,1}}{\partial z_j} &= (1-\beta) p \theta_i > 0 \\
\frac{\partial \pi_{2,1}}{\partial z_j} &= 2(1-\beta) p \theta_i > 0
\end{aligned}$$

$$\frac{\partial \left(\pi_{i,2} - \pi_{i,1}\right)}{\partial z_j} = \frac{\partial \pi_{2,1}}{\partial z_j} - \frac{\partial \pi_{i,1}}{\partial z_j} = (1-\beta) p \theta_i > 0 \implies \frac{\partial \pi_{2,1}}{\partial p_j} > \frac{\partial \pi_{i,1}}{\partial p_j}$$

So again, as the firm's productivity increases, workers will start to prefer more 2-period contracts. For the firm, the results are largely similar to the results from the previous section:

$$\begin{aligned}
\frac{\partial \pi_{j,nm}}{\partial z_j} &= \frac{\partial \int_{\frac{F_{1P}}{\beta p z_j}}^{\infty} \left[\beta p z_j \theta - F_{1P}\right] f_\theta(\theta) d\theta}{\partial z_j} \\
&= \beta p \frac{\partial z_j \int_{\frac{F_{1P}}{\beta p z_j}}^{\infty} \theta f_\theta(\theta) d\theta}{\partial z_j} + F_{1P} \left(\frac{\partial F_\theta \left(\frac{F_{1P}}{\beta p z_j} \right)}{\partial z_j} \right) \\
&= \beta p \frac{\partial z E \left[\theta | \theta > \frac{F_{1P}}{\beta p z_j}\right]}{\partial z_j} + F_{1P} \left(\frac{\partial F_\theta \left(\frac{F_{1P}}{\beta p z_j} \right)}{\partial z_j} \right)
\end{aligned}$$

So again: I assume that for the parameters $(\beta, F_{1P}, \mu_\theta, \sigma_\theta, p)$

$$\beta pE\left[\theta|\theta > \frac{F_{1P}}{\beta p z_j}\right] > F_{1P}\left(f_\theta\left(\frac{F_{1P}}{\beta p z_j}\right)\frac{F_{1P}}{\beta z_j^2 p}\right) - \beta p z_j \frac{\partial E\left[\theta|\theta > \frac{F_{1P}}{\beta p z_j}\right]}{\partial z_j} \quad \forall z_j \tag{6}$$

B.6 Delta θ_i

Taking the no-match profit:

$$\begin{aligned}\frac{\partial \pi_{i,nm}}{\partial \theta_i} &= 1 + (1-\beta)pE\left[z|z \geq k\right] + \theta_i \frac{\partial E\left[z|z \geq k\right]}{\partial \theta_i} \\ &+ F_z(k) + \theta_i \frac{\partial F_z(k)}{\partial \theta_i}\end{aligned}$$

Where:

$$k = \begin{cases} \frac{1}{(1-\beta)p} & if\ \theta_i > \frac{F_{1P}(1-\beta)}{\beta} \\ \frac{F_{1P}}{\beta p \theta_i} & otherwise \end{cases}$$

So if $\theta_i > \frac{F_{1P}(1-\beta)}{\beta}$ then

$$\frac{\partial \pi_{i,nm}}{\partial \theta_i} = 1 + (1-\beta)pE\left[z|z \geq k\right] + F_z(k) > 0$$

However, for lower θ_i, we have $k = \frac{F_{1P}}{\beta p \theta_i}$, which means that $\frac{\partial E[z|z \geq k]}{\partial \theta_i} < 0$ and $\frac{\partial F_z(k)}{\partial \theta_i} < 0$. Similarly to the previous sections, I assume that the parameters must be chosen such that:

$$(1-\beta)pE\left[z|z \geq \frac{F_{1P}}{\beta p \theta_i}\right] + F_z\left(\frac{F_{1P}}{\beta p \theta_i}\right) > \frac{F_{1P}}{\beta p \theta_i} f_z\left(\frac{F_{1P}}{\beta p \theta_i}\right) - \frac{\partial E\left[z|z \geq k\right]}{\partial \theta_i} \quad \forall \theta_i \leq \frac{F_{1P}(1-\beta)}{\beta} \tag{7}$$

Thus, we have that:

$$\frac{\partial \pi_{i,1}}{\partial \theta_i} > 0$$

Under the assumption from 7

$$\frac{\partial \pi_{i,2}}{\partial \theta_i} = 2(1-\beta)p_j z_j$$

This means that as θ_i increases, workers' profit will decrease. Additionally:

$$\begin{aligned}\frac{\partial \pi_{j,nm}}{\partial \theta_i} &= 0 \\ \frac{\partial \pi_{j,1}}{\partial \theta_i} &= \beta z_j p > 0 \\ \frac{\partial \pi_{j,2}}{\partial \theta_i} &= 2\beta z_j p > 0\end{aligned}$$

and

$$\frac{\partial \pi_{j,1}}{\partial \theta_i} > \frac{\partial \pi_{j,1}}{\partial \theta_i}$$

So for sufficiently large θ_i increases, the firm will start to prefer a 2-period to a 1-period contract

B.7 Discussion:

One important thing to note about the assumptions is that they will not change any equilibrium outcomes even if they do not hold. Because in the case of each of the shifts, either the workers or firms are affected in strictly one direction - increases in p_j or z_j will **unambiguously** result in workers' starting to prefer 2-period contracts. Similarly, increases in θ_i will result in firms unambiguously beginning to prefer 2-period contracts.

Therefore, the assumptions are only necessary for the predicted direction in worker and firm profits to be reasonable. Nevertheless, these comparative statics show that there is a clear ordering to outcomes. Low p_j will result in no match, but as p_j increases workers will prefer 1-period contracts and then 2-period contracts once p_j is high enough. The results are similar for z_j.

Low θ_i will result in no-match, but as θ_i increases, firms will prefer 1-period and then 2-period contracts in that order. This supports the notion of a "narrow band" for AWAs where the match quality relatively low.

B.8 Preferences Graphs

Based on the above results, the graph of worker preferences are shown in Figure 4 and the graph of firm preferences are shown in Figure 5. Firm preferences are shown where for z_j below the first line, the worker

will never prefer to match. For z_j above that they will prefer a 1-period contract. For z_j below the second line the worker can credibly threaten not to match if the firm offers a 2-period contract, and for z_j above the third line, the worker will prefer a two-period contract.

Firm preferences are such that for θ_i below the first line, the firm will not wish to match - as they cannot afford the fixed costs. For θ_i between the two lines, the firm will prefer a 1-period contract, and for θ_i above the second line the firm will prefer a 2-period contract.

Figure 4: Worker Preferences

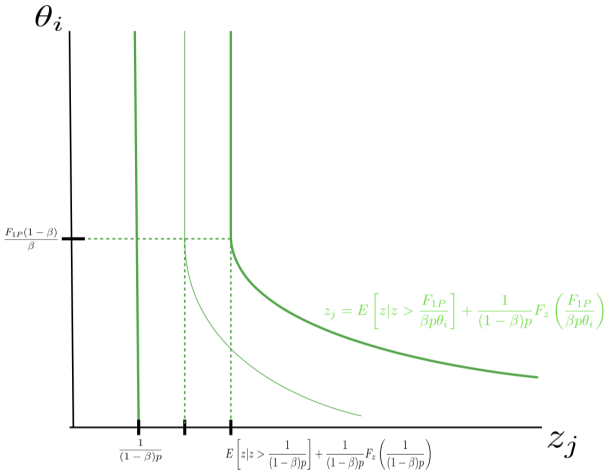
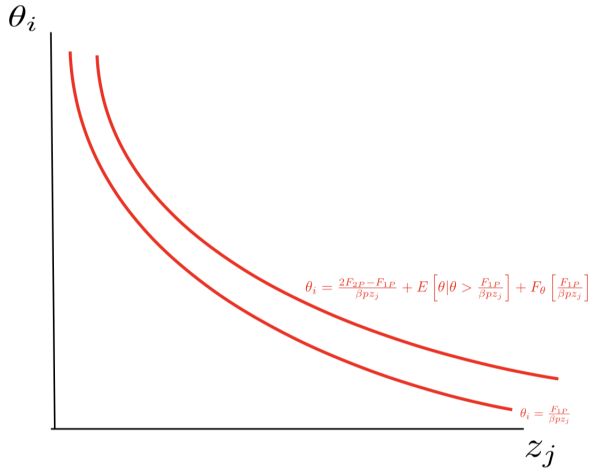


Figure 5: Firm Preferences



C Legal Appendix

In this section, I provide text of some of the relevant regulations and legal decisions discussed in Section 3.

C.1 HIPAA

"SEC. 702. PROHIBITING DISCRIMINATION AGAINST INDIVIDUAL PARTICIPANTS AND BENEFICIARIES BASED ON HEALTH STATUS.

"(a) IN ELIGIBILITY TO ENROLL.—

"(1) IN GENERAL.—Subject to paragraph (2), a group health plan, and a health insurance issuer offering group health insurance coverage in connection with a group health plan, may not establish rules for eligibility (including continued eligibility) of any individual to enroll under the terms of the plan based on any of the following health status-related factors in relation to the individual or a dependent of the individual:

"(A) Health status.

"(B) Medical condition (including both physical and mental illnesses).

"(C) Claims experience.

"(D) Receipt of health care.

"(E) Medical history.

"(F) Genetic information.

"(G) Evidence of insurability (including conditions arising out of acts of domestic violence).

"(H) Disability.

"(2) NO APPLICATION TO BENEFITS OR EXCLUSIONS.—To the extent consistent with section 701, paragraph (1) shall not be construed—

"(A) to require a group health plan, or group health insurance coverage, to provide particular benefits other than those provided under the terms of such plan or coverage, or

"(B) to prevent such a plan or coverage from establishing limitations or restrictions on the amount, level, extent, or nature of the benefits or coverage for similarly situated individuals enrolled in the plan or coverage.

"(3) CONSTRUCTION.—For purposes of paragraph (1), rules for eligibility to enroll under a plan include rules defining any applicable waiting periods for such enrollment.

"(b) IN PREMIUM CONTRIBUTIONS.— "(1) IN GENERAL.—A group health plan, and a health insurance issuer offering health insurance coverage in connection with a group health plan, may not require any individual

(as a condition of enrollment or continued enrollment under the plan) to pay a premium or contribution which is greater than such premium or contribution for a similarly situated individual enrolled in the plan on the basis of any health status-related factor in relation to the individual or to an individual enrolled under the plan as a dependent of the individual.
"(2) CONSTRUCTION.—Nothing in paragraph (1) shall be construed—
"(A) to restrict the amount that an employer may be charged for coverage under a group health plan; or
"(B) to prevent a group health plan, and a health insurance issuer offering group health insurance coverage, from establishing premium discounts or rebates or modifying otherwise applicable copayments or deductibles in return for adherence to programs of health promotion and disease prevention.

C.2 ERISA

SEC. 702. [1182] PROHIBITING DISCRIMINATION AGAINST INDIVIDUAL PARTICIPANTS AND BENEFICIARIES BASED ON HEALTH STATUS.
(a) IN ELIGIBILITY TO ENROLL.— (1) IN GENERAL.—Subject to paragraph (2), a group health plan, and a health insurance issuer offering group health insurance coverage in connection with a group health plan, may not establish rules for eligibility (including continued eligibility) of any individual to enroll under the terms of the plan based on any of the following health status-related factors in relation to the individual or a dependent of the individual:
(A) Health status.
(B) Medical condition (including both physical and mental illnesses).
(C) Claims experience.
(D) Receipt of health care.
(E) Medical history.
(F) Genetic information.
(G) Evidence of insurability (including conditions arising out of acts of domestic violence).
(H) Disability.
(2) NO APPLICATION TO BENEFITS OR EXCLUSIONS.—To the extent consistent with section 701, paragraph (1) shall not be construed—
(A) to require a group health plan, or group health insurance coverage, to provide particular benefits other than

those provided under the terms of such plan or coverage, or
(B) to prevent such a plan or coverage from establishing limitations or restrictions on the amount, level, extent, or nature of the benefits or coverage for similarly situated individuals enrolled in the plan or coverage.
(3) CONSTRUCTION.—For purposes of paragraph (1), rules for eligibility to enroll under a plan include rules defining any applicable waiting periods for such enrollment.
(b) IN PREMIUM CONTRIBUTIONS.—
(1) IN GENERAL.—A group health plan, and a health insurance issuer offering health insurance coverage in connection with a group health plan, may not require any individual (as a condition of enrollment or continued enrollment under the plan) to pay a premium or contribution which is greater than such premium or contribution for a similarly situated individual enrolled in the plan on the basis of any health status related factor in relation to the individual or to an individual enrolled under the plan as a dependent of the individual.

C.3 IRS Control Rules

5.1.24.1.1 (03-02-2018)

Background

This IRM section provides a summary of the different types of third-party payer arrangements and procedural guidance for Collection employees investigating employment tax delinquencies involving employers and third-party payers.

An employer may choose to enter into an agreement with a third party in which the third party performs some or all of the employer's federal employment tax withholding, reporting and payment obligations. Collection issues arise when the third party fails to file returns, make deposits, or pay on behalf of the employer.

The liability of the employer for employment taxes may shift depending on the type of third-party arrangement.

Liability is always determined by the provisions of the Internal Revenue Code (IRC or Code) and cannot be altered by a private agreement or contract between an employer (see IRM 5.1.24.3) and a third party.

5.1.24.3.2.1 (08-15-2012)

Control of the Payment of Wages

A third party is the section 3401(d)(1) employer only if it has exclusive control over the payment of wages. Treasury Regulation 31.3401(d)-1(f) provides that the term "employer" means the person having

legal control of the payment of the wages. If it shares control with the common law employer, then the third party is not a section 3401(d)(1) employer.

Whether or not a third party is in control of the payment of wages depends upon the facts and circumstances. Generally, the IRS considers a third party to be in control of the payment of wages if the payment is not contingent upon, or proximately related to, the third party having first received funds from the employer. Conversely, if the payment of wages is contingent on, or proximately related to, the common law employer's transfer of funds to the third party, the Service considers the common law employer to be in control of the payment of wages. Thus, the common law employer remains obligated to withhold, report, and pay employment taxes.

The determination of whether a third party is a section 3401(d)(1) employer is based on the facts and circumstances. The third-party payer could be a section 3401(d)(1) employer for some payments and not for others.

C.4 IRS Fact Sheet on Misclassification

FS-2017-09, July 20, 2017

The Internal Revenue Service reminds small businesses of the importance of understanding and correctly applying the rules for classifying a worker as an employee or an independent contractor. For federal employment tax purposes, a business must examine the relationship between it and the worker. The IRS Small Business and Self-Employed Tax Center on the IRS website offers helpful resources.

Worker classification is important because it determines if an employer must withhold income taxes and pay Social Security, Medicare taxes and unemployment tax on wages paid to an employee. Businesses normally do not have to withhold or pay any taxes on payments to independent contractors. The earnings of a person working as an independent contractor are subject to self-employment tax.

The general rule is that an individual is an independent contractor if the payer has the right to control or direct only the result of the work, not what will be done and how it will be done. Small businesses should consider all evidence of the degree of control and independence in the employer/worker relationship. Whether a worker is an independent contractor or employee depends on the facts in each situation.

Help with Deciding

To better determine how to properly classify a worker, consider these three categories – Behavioral Control, Financial Control and Relationship of the Parties.

Behavioral Control: A worker is an employee when the business has the right to direct and control the work performed by the worker, even if that right is not exercised. Behavioral control categories are:

- Type of instructions given, such as when and where to work, what tools to use or where to purchase supplies and services. Receiving the types of instructions in these examples may indicate a worker is an employee.
- Degree of instruction, more detailed instructions may indicate that the worker is an employee. Less detailed instructions reflects less control, indicating that the worker is more likely an independent contractor.
- Evaluation systems to measure the details of how the work is done points to an employee. Evaluation systems measuring just the end result point to either an independent contractor or an employee.
- Training a worker on how to do the job -- or periodic or on-going training about procedures and methods -- is strong evidence that the worker is an employee. Independent contractors ordinarily use their own methods.

Financial Control: Does the business have a right to direct or control the financial and business aspects of the worker's job? Consider:

- Significant investment in the equipment the worker uses in working for someone else.
- Unreimbursed expenses, independent contractors are more likely to incur unreimbursed expenses than employees.
- Opportunity for profit or loss is often an indicator of an independent contractor.
- Services available to the market. Independent contractors are generally free to seek out business opportunities.
- Method of payment. An employee is generally guaranteed a regular wage amount for an hourly, weekly, or other period of time even when supplemented by a commission. However, independent contractors are most often paid for the job by a flat fee.

Relationship: The type of relationship depends upon how the worker and business perceive their interaction with one another. This includes:

- Written contracts which describe the relationship the parties intend to create. Although a contract stating the worker is an employee or an independent contractor is not sufficient to determine the worker's status.

- Benefits. Businesses providing employee-type benefits, such as insurance, a pension plan, vacation pay or sick pay have employees. Businesses generally do not grant these benefits to independent contractors.
- The permanency of the relationship is important. An expectation that the relationship will continue indefinitely, rather than for a specific project or period, is generally seen as evidence that the intent was to create an employer-employee relationship.
- Services provided which are a key activity of the business. The extent to which services performed by the worker are seen as a key aspect of the regular business of the company.

C.5 NLRB Decision - Laerco Transportation (1984)

"The joint employer concept recognizes that two
or more business entities are in fact separate but
that they share or codetermine those matters governing
the essential terms and conditions of employment.
l ° Whether an employer possesses sufficient
indicia of control over petitioned-for employees
employed by another employer is essentially a
factual issue. To establish joint employer status
there must be a showing that the employer meaningfully
affects matters relating to the employment
relationship such as hiring, firing, discipline, supervision,
and direction. In examining the relationship
between Laerco and CTL, we find that Laerco
does not possess sufficient indicia of control over
CTL employees to support a joint employer finding.
It is undisputed that the major elements of the
petitioned-for employees' terms and conditions of
employment are determined by CTL in context of
its collective-bargaining relationship with the Intervenor.
In fact, the very acquisition and retention of
their employment is controlled by CTL. CTL provides
these employees to Laerco who, for the most
part, supplies them to its clients. Thus, in the instant

situation Laerco, itself, is removed from some
of the daily worksites of the employees."

C.6 NLRB Decision - Browning-Ferris (2015)

"Today, we restate the Board's joint-employer standard
to reaffirm the standard articulated by the Third Circuit
in Browning-Ferris decision. Under this standard, the
Board may find that two or more statutory employers are
joint employers of the same statutory employees if they
"share or codetermine those matters governing the essential
terms and conditions of employment."
In determining
whether a putative joint employer meets this standard,
the initial inquiry is whether there is a common-law
employment relationship with the employees in question.
If this common-law employment relationship exists, the
inquiry then turns to whether the putative joint employer
possesses sufficient control over employees' essential
terms and conditions of employment to permit meaningful
collective bargaining."