The Effect of Healthcare Costs on Low-Skill Domestic Outsourcing

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Abstract

Between 1975 and 2012, the share of low-skill workers in the US that are domestically outsourced increased by approximately 10 percentage points to 14 percent. This development coincided with three trends: rising medical care prices, rising income, and shifting labor demand towards high-skill workers. Using a general equilibrium model, I explore the relationship between these trends. As firms increased the generosity of their employer-provided health plans for high-skill employees, anti-discrimination statutes from the US tax code required that they offer the same health plans to all their employees. This fact raised the relative cost of low-skill employees, increasing low-skill domestic outsourcing. With the calibrated model, I find that the rising price of medical care interacting with the anti-discrimination statutes accounted for 9 to 19 percent of the rise in low-skill domestic outsourcing between 1975 and 2012, while rising income and the shift towards high-skill workers had minimal effects. These results suggest that the rising price of medical care is an economically meaningful driver of the increase in low-skill domestic outsourcing in the US.

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1 Introduction

In the US, many low-skill workers supply labor to US-based firms while not being directly employed by them, a practice known as domestic outsourcing. For instance, many janitors and security guards are employed by business service firms, which sell their labor to other companies (Dube and Kaplan, 2010). Additionally, firms commonly hire manual laborers and office assistants through temporary help agencies (Segal and Sullivan, 1997), and technology companies like Uber use independent contractors for tasks like food delivery and transportation services.

Domestic outsourcing of low-skill workers has increased dramatically in the US in recent decades. Using data detailed in Section 2.2, I find that the share of privately employed low-skill workers that are domestically outsourced more than tripled between 1975 and 2012, growing from 4 to 14 percent. While several explanations for this growth have been tested (Autor, 2003; Bostanci, 2021; Bergeaud et al., 2021), the reason for this growth is yet to be determined.

In 1978, near the start of this growth, the US introduced anti-discrimination statutes to its tax code. These statutes force firms to offer all their employees the same menu of health plans. As high-skill workers prefer generous health plans, these statutes increase the cost of janitors, security guards, and other low-skill employees.

In theory, firms could outsource their low-skill workers to circumvent these laws. Over time, the price of medical care, income, and the share of compensation paid to high-skill workers increased. These trends could have increased the cost of the health plans high-skill workers want and, in turn, caused firms to increase the generosity of their health plans. Then, the anti-discrimination laws could have increased the compensation costs of low-skill employees, increasing low-skill domestic outsourcing. Hence, employer health plan costs could drive the increase in low-skill domestic outsourcing.

I explore this theory using a structural model. The model has three types of agents. First are workers. Workers are endowed with labor of varying skill levels: there are low-, medium-, and high-skill workers. They supply labor to firms, and their preferences turn goods and medical care into utility. The second agent is the traditional firm. Its production technology uses the labor of all skill levels from both workers and the outsourcing firms. The last type of agent is the outsourcing firms. There is a single representative outsourcing firm for each skill level. Each turns labor from workers of their respective skill levels into outsourced labor of the same skill level. Then, they supply the outsourced labor to the traditional firm. The key difference between traditional and outsourcing firms lies in their production technologies. The traditional firm uses labor from workers of all skill levels. In contrast, each outsourcing firm uses only one type of labor.

The model features two facets of the US tax code that affect the health plan market. First is the tax advantage of employer health plans. Employer health plans are a form of untaxed compensation that can only be used to purchase medical care. Wages, the only other form of compensation, can be used to purchase both goods and medical care but are taxed. The second facet of the US tax code is the anti-discrimination statutes. These constraints force firms to offer all their employees the same health plans, preventing them from offering high-skill employees more expensive plans than low-skill employees.

In equilibrium, firms offer health plans because of the tax advantage. As workers are free to move across firms, they supply labor to whichever firm offers a compensation package that yields the highest level of utility. So, in order to attract employees, firms must offer a compensation package that matches each worker's best outside option — which is measured in utils. Because of the tax advantage, the cheapest way to do this is to offer an employer health plan. I call the health plan in the cheapest compensation package that matches a worker's best outside option the cost-minimizing health plan.

I find that enforcing the anti-discrimination regulation increases domestic outsourcing. Because the traditional firm uses workers of all skill levels, the law prevents it from offering each skill level its cost-minimizing health plan. However, these laws do not affect outsourcing firms because they each demand only one skill level of labor. So, outsourcing firms offer the cost-minimizing plans. Hence, the law increases the price of employees above that of outsourced workers. Firms hire an inefficiently low amount of employees, and outsourcing increases.

Following the previous result, outsourcing firms have lower labor costs than traditional firms. For low-skill workers, the traditional firm offers a higher health plan than the outsourcing firm, which allows it to offer a lower wage. However, the traditional firm's overall compensation costs remain higher than the outsourcing firm's. This result gives intuition to how outsourcing firms can exist in a competitive equilibrium: They purchase labor at a lower price than the traditional firms and then sell that labor to the traditional firms.

The change in the low-skill outsourcing rate between 1975 and 2012 due to employer health plan costs is a function of only three variables. First is the elasticity of substitution between low-skill employees and low-skill outsourced workers. I estimate this parameter using across-industry variation in low-skill outsourcing expenditures and the compensation costs of employees. The former is taken from Input-Output tables, and the latter draws on health plan expenditures and wage data from the Annual Survey of Manufacturers (ASM), the Services Annual Survey (SAS), and the Occupational Employment and Wage Statistics (OEWS). The second variable is the price of low-skill employees relative to that of low-skill outsourced workers in 2012. This moment measures the extra cost of employees due to employer health plans. I estimate this moment using worker-level micro data from the Current Population Survey Annual Social and Economic Supplement. Third is the outsourcing weight in 1975, which is an efficiency parameter that determines how productive outsourced workers are. Optimality conditions imply this parameter is pinned by the low-skill outsourcing rate, which I estimate using OEWS and County Business Patterns data.

Using these three variables and the model structure, I find that the extra cost of employees due to employer health plans can explain between 9 to 19 percent of the increase in low-skill domestic outsourcing. However, the extra cost of employees is endogenous and depends on several underlying factors. First is the presence of the anti-discrimination statutes — without these, employees and outsourced workers cost the same. With anti-discrimination statutes, three trends can potentially increase the relative price of low-skill employees: rising medical care prices, rising income, and shifting labor demand toward high-skill workers. Each of these trends could increase the cost of the health plan preferred by high-skill workers, causing the traditional firm to increase its health plan, increasing the relative price of low-skill employees. By turning these trends on one by one, the model can isolate the effect of each trend on the relative price of employees in 2012 and thus attribute the rise in low-skill domestic outsourcing to each trend. Whichever trend is impactful depends mainly on the utility function, specifically whether price or income effects caused medical care expenditures to increase over the past four decades.

I calibrate the entire model to attribute the rise in low-skill domestic outsourcing to trends in the price of medical care, income, and high-skill labor demand. Specifically, I internally calibrate the utility function's parameters by matching two key moments. First is the change in employer health plan expenditures across industries. This moment is measured using ASM, SAS, and OEWS data and speaks to income effects. Second is the change in employer health plan expenditures across time, taken directly from the National Income and Product Accounts. This moment speaks to income and price effects. The model is validated by matching several untargeted moments, including the change in the medical care expenditure share over time, calculated from the Federal Reserve Economic Data, and the income elasticity of medical care as estimated by Acemoglu et al. (2013).

With the calibrated model, I find that the extra cost of employees due to health plans was entirely due to the rising price of medical care. Hence, the rising price of medical care accounts for 9 to 19 percent of the rise in low-skill domestic outsourcing. This result hinges on the estimation of the utility function, in which goods and medical care are strong complements. I conclude that the rising price of medical care is an economically meaningful driver of the increase in low-skill domestic outsourcing.

I also use the calibrated model to perform three policy counterfactuals. The first is removing the anti-discrimination laws. This increases the utility of both low- and high-skill workers by shifting the mix of wages and health plans in their compensation packages while keeping their overall costs the same. The health plan paid to low-skill workers decreases, but their wages increase, allowing them to consume more (non-medical care) goods. This increases their overall utility. Conversely, the health plan paid to high-skill workers increases, allowing them to purchase more medical care with non-taxed health plans instead of taxed wages, increasing their utility. The second policy counterfactual is removing the tax advantage of employer health plans. Similar to the previous policy counterfactual, this increases the utility of low- and high-skill workers. The last counterfactual is a policy that forces the traditional firm to offer outsourced workers the same health plan as employees. This causes firms to offer outsourced workers lower wages, decreasing their overall utility. I conclude that legislation that causes firms to increase employer health plans should be approached with caution because firms respond by decreasing wages.

I make three contributions to the literature on domestic outsourcing. First is a new theoretical explanation for why firms outsource. That is, compared to traditional firms, outsourcing firms are less affected by anti-discrimination health plan regulations because their workforces are more homogeneous. This makes workers housed in outsourcing firms cheaper than employees. While a common explanation for domestic outsourcing is that outsourced labor is cheaper than in-house labor, this is a new theory explaining why outsourced labor is cheaper. Other explanations are centered on unions or worker power (Holmes and Snider, 2011), upward slopping labor supply curves (Bilal and Lhuillier, 2021; Bergeaud et al., 2021; Chan and Xu, 2017), or within-firm wage compression (Weil, 2019). More broadly, this is a new theoretical explanation for why firms outsource. Other explanations center on firing costs (Bostanci, 2021; Autor, 2003; Houseman et al., 2003) or specialization by the outsourcing firms (Abraham and Taylor, 1996).

Second, I explore three new theoretical explanations for the growth of low-skill domestic outsourcing: rising medical care prices, rising income, and rising demand for high-skill labor. The theory also clarifies what features are necessary for these trends to affect domestic outsourcing: the anti-discrimination constraints are crucial. Further, I quantitatively assess all these explanations with my calibrated model. Alternative explanations for the increase in low-skill domestic outsourcing include rising firing costs (Autor, 2003), increased protection of trade secrets (Bostanci, 2021), and decreasing communication costs between firms (Bergeaud et al., 2021).

Third, with the calibrated model, I perform several policy counterfactuals, assessing changes in welfare and inequality from policies that affect domestic outsourcing. This contributes to the literature discussing how domestic outsourcing affects welfare. An extensive empirical literature explores its effect on wages (Goldschmidt and Schmieder, 2017; Dube and Kaplan, 2010; Drenik et al., 2023; Dorn et al., 2018; Felix and Wong, 2021; Daruich et al., 2023), while a smaller structural literature explores its effect on welfare and efficiency (Bostanci, 2021; Chan and Xu, 2017; Bilal and Lhuillier, 2021).

This paper is organized as follows. Section 2 discusses background information on laws around employer health plans in the US and trends in domestic outsourcing and employer health plans. Sections 3 and 4 present the theoretical model and characterize equilibrium results. Sections 5 and 6 calibrate the model and estimate the percent of the rise in low-skill domestic outsourcing attributable to trends in the price of medical care, income, and high-skill demand. Section 7 discusses the policy counterfactual exercises. Section 8 concludes.

2 Background

2.1 US Laws Around Employer-Provided Health Plans

In the US, employer-provided health plans are widespread. In 2015, of all people covered by private plans, almost 90 percent were covered by employer-provided plans (Kaiser Family Foundation, 2021b). In this same year, employer contributions to health plans accounted for seven percent of total employee compensation, according to NIPA data.[1]

Employers commonly provide health plans for two reasons. First is that firms face lower prices for health insurance than individuals do. One reason for this is adverse selection (Currie and Madrian, 1999). People who tend to be unable to work and thus do not have access to health plans through their employers also tend to have high medical care expenditures, like old and sick people. So, the price of health insurance on the private market reflects this selection. The second reason is the favorable tax treatment. Compensation in the form of health plans is generally not taxed, while conversely, wages are. The tax rate on wages is high; Heathcote et al. (2017) estimates that the average marginal tax rate on wages was 34 percent in the early 2000s.

While employer health plans are generally not taxed, they are taxed if they violate anti-discrimination statutes from the US tax code. These laws force firms to offer all their employees the same menu of health plans. If firms violate these laws, then compensation in the form of health plans is taxed just like wages. The anti-discrimination laws apply to two of the most common types of health insurance plans: self-funded plans and cafeteria plans. A health plan is self-funded if the employer assumes direct financial responsibility

[1] Specifically, NIPA Section 6 Tables 6.2 and 6.11.

for the costs of enrollees' medical claims (Kaiser Family Foundation, 2020). In 2021, 64 percent of employees with employer-provided health plans were covered by self-funded plans (Kaiser Family Foundation, 2021a). Under IRS Code section 105(h), self-funded benefit plans cannot discriminate in favor of the highest-paid 25 percent of all employees (Legal Information Institution, n.d.a). Cafeteria plans allow employees to choose between receiving their compensation as cash or a benefit; if taken as a benefit, the compensation is not taxed (Society of HR Management, 2023). In 2006, 49 percent of all workers had access to a cafeteria health plan (Stolzfus, 2007). Under IRS Code section 125(c), cafeteria plans cannot discriminate in favor of highly compensated participants, which includes employees making over \$80,000 a year (Legal Information Institution, n.d.b). Sections 105(h) and 125(c) were both enacted in 1978 (Jensen et al., 1998; Government Publishing Office, n.d.).

The anti-discrimination laws force firms to offer all employees the same menu of health plans, but firms could offer multiple plans in an attempt to circumvent these laws. A firm could offer a generous health plan with high employer premiums to satisfy its high-wage employees but make the employee premiums prohibitively expensive for the low-wage workers. Hence, the firm could attempt to induce low-wage workers into choosing cheap health plans. If this were the case, many employers would offer multiple plans and a significant amount of the variance of employer health plan costs would be within firms, not between.

I find suggestive evidence that this is not the case using data on employer health plans. The 1993 Robert Wood Johnson Foundation Employer Health Insurance Survey has data on all the health plans offered by 15,000 employers (Long and Marquis, 2006). For each plan, the data set has the employer that offers the plan, the number of employees enrolled, and employer premiums. Only 25% of firms in the dataset offer more than one health plan. Further, I use a simple variance decomposition to understand how much of the total dispersion of employer premiums is between firms. The decomposition is

$$\underbrace{Var(x_{ij} - \bar{x})}_{\text{Total dispersion}} = \underbrace{Var(x_{ij} - \bar{x}_j)}_{\text{Within firm}} + \underbrace{Var(\bar{x}_j - \bar{x})}_{\text{Between firm}}$$

where i denotes a health plan, j is employer, x is employer premium, and the overbar denotes mean.[2] I run the above decomposition separately for single and family coverage, assuming singles and people with families operate in separate markets. I find that 83% of the total dispersion of single plan employer premiums is between firms. For family plans, 86% is between firms. The results are not sensitive to weighting by employees. A caveat of this exercise is that it uses data from the 90s, the middle of our period of interest. Nevertheless, it is likely also representative of the 70s and 80s. I conclude that firms were not circumventing

[2]For a similar decomposition, see Haltiwanger et al. (2022).

the anti-discrimination laws by offering multiple health plans, at least up until the 1990s.

2.2 Trends in Domestic Outsourcing And Health Plans, 1975-2015

I estimate the share of low-skill workers domestically outsourced each year since 1975. To do this, I must define skill levels and identify whether a worker is outsourced. To define skill levels, I use data from the OEWS to rank all occupations by mean income level and group them into terciles. I define all occupations in the bottom tercile to be low-skill. To determine whether a worker is domestically outsourced, following the literature I use industry classification.[3] Low-skill workers are domestically outsourced if they are employed in the Administration and Support Services Industry (NAICS 561). This industry is composed of low-skill labor services commonly discussed in the literature, such as janitorial, security guard, and temporary help services (e.g., Goldschmidt and Schmieder (2017), Dube and Kaplan (2010), or Drenik et al. (2023)). Further, a large majority of its output — over 90 percent according to Input-Output data from the Bureau of Economic Analysis (BEA) — is used as intermediate inputs instead of final consumption.

I estimate the quantity of low-skill domestically outsourced workers in year t, O_{lt}, as the number of low-skill workers in Administration and Support Services (NAICS 561), adjusting by the share of the industry's output that is used as intermediate inputs:

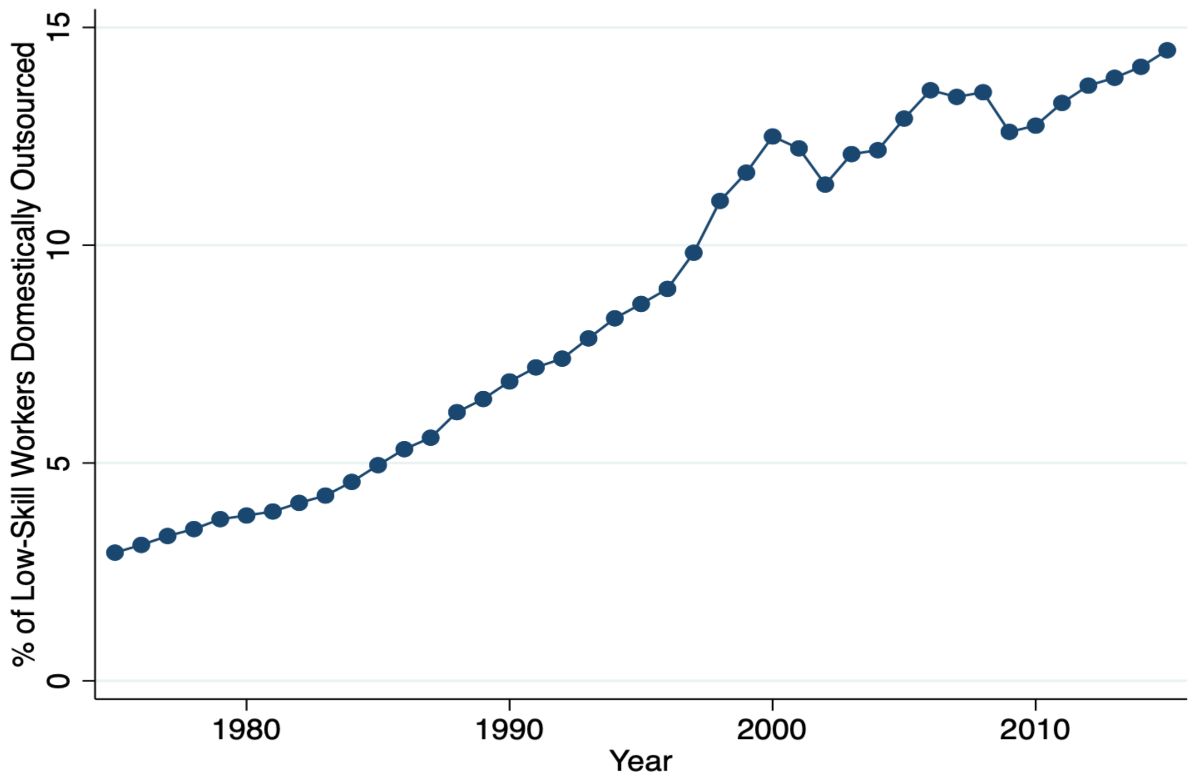
$$O_{lt} = n_{561,t} \times n^{l}_{561,2012} \times m_{561,t}$$

where $n_{561,t}$ is employment in administrative services in year t, taken from CBP data with harmonized industry classification from Eckert et al. (2021); $m_{561,t}$ is the share of administrative services' output that is used as intermediate inputs, taken from the BEA Input-Output tables; and $n^{l}_{561,2012}$ is the share of administrative services' employment that is low-skill in the year 2012, taken from the OEWS. I use the 2012 share across all years because the underlying OEWS data is inconsistently offered before 1997.

Figure 1 plots the share of privately employed low-skill workers that are domestically outsourced. The share of low-skill workers in this industry more than tripled between 1975

[3] Using industry classification to identify domestic outsourcing is standard in the literature. Using administrative data, Goldschmidt and Schmieder (2017) measures the rise in domestic outsourcing in Germany by estimating the percent of workers employed in the temporary help, janitorial, security, or logistic services industries. Using the Consumer Population Survey, Dube and Kaplan (2010) measure the percent of janitors and security guards that are outsourced by calculating the share of them that are employed in the "business services" industry. Dorn et al. (2018) and Bostanci (2021) perform similar exercises with the American Community Survey and the Annual Social and Economic Supplement. Similar to this paper, Bostanci (2021) measures expenditure on domestic outsourcing using expenditures on multiple business services, drawing on data from the Census of Manufacturing.

Figure 1: The Rise in Low-Skill Domestic Outsourcing



Notes: The figure shows the share of privately employed low-skill workers that are domestically outsourced. Workers are considered low-skill if they are in an occupation that ranks in the bottom tercile when occupations are ranked by average income, and workers are considered domestically outsourced if they are employed in the Administrative and Support Services industry (NAICS 561). Underlying data is County Business Patterns data with harmonized industry classification from Eckert et al. (2021), the Occupational Employment and Wage Statistics data, and Input-Output data from the Bureau of Economic Analysis.

and 2015. Over this same period, employer health plan expenditure also grew dramatically. Using data from NIPA, I find that employer contributions to health plans as a share of total employee compensation more than doubled over this period, from roughly three percent to over six percent.

One potential explanation for the increase in low-skill domestic outsourcing is centered on employer health plans. Because of the preferential tax treatment, the cheapest way to purchase a high-skill employee is a compensation package with a generous health plan, so firms offer generous health plans. Consequently, firms must offer these same health plans to low-skill employees because of the anti-discrimination statutes from the US tax code, as discussed in Section 2.1. This increases the relative price of low-skill employees relative to outsourced workers, increasing domestic outsourcing. As employer health plan costs have grown over time, so has low-skill domestic outsourcing.

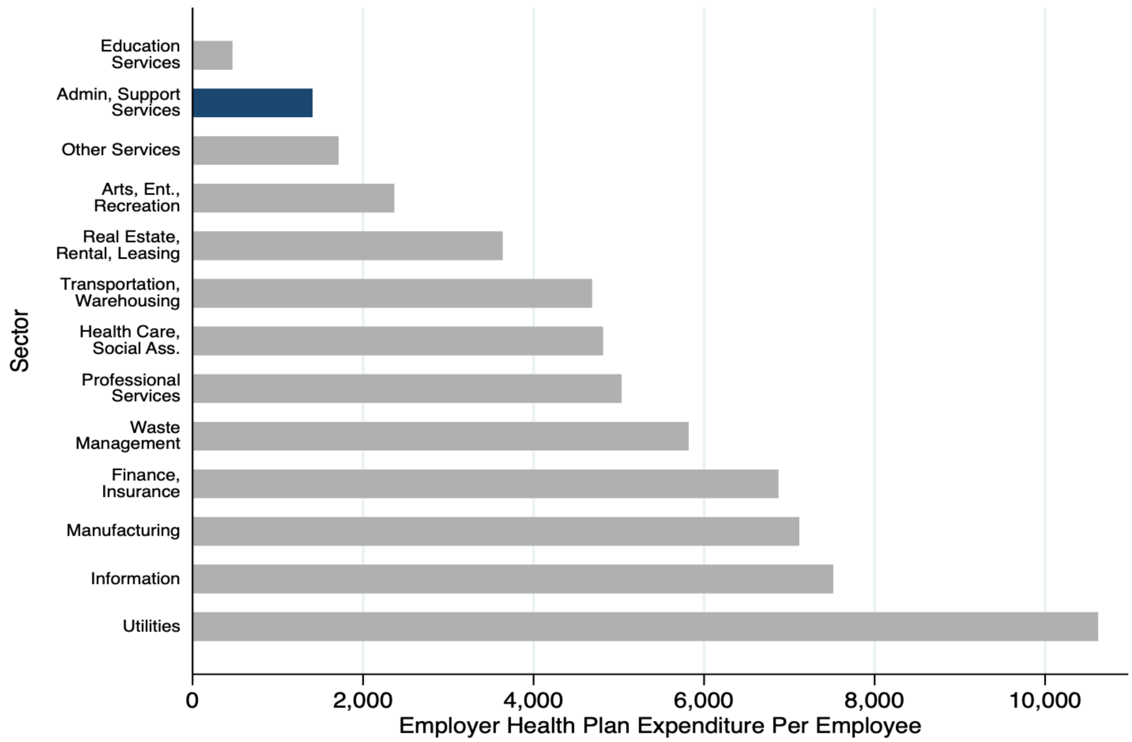
Two facts from the data support this theory. First, the Administrative and Support Services industry, which supplies firms with outsourced low-skill labor, spends a low amount on employer health plans. Using cross-sectional industry data from 2012 described in Section 5.1, Figure 2 shows employer health plan expenditures per employee by sector; Administrative and Support Services ranks second from the bottom. Second, skill-intensive industries offer expensive health plans and outsource more low-skill workers. Using the same data from Section 5.1, Figure 3 panel (a) plots the relationship between skill intensity and health plan generosity: The share of labor expenditure on low-skill occupations (in-house and outsourced) and health plan expenditures per employee have a negative relationship. Panel (b) plots the relationship between skill intensity and low-skill outsourcing: The share of labor expenditure on low-skill occupations (in-house and outsourced) and the share of low-skill labor expenditure on outsourced labor have a negative relationship. Thus, as industries use more high- and medium-skill labor, they also spend more on employer health plans and low-skill outsourced labor.

By this theory, the rise in low-skill domestic outsourcing could be attributed to the rise in employer health plan contributions. More specifically, this rise can be attributed to whatever underlying trend increased the cost of the health plans high-skill workers want, relative to that preferred by low-skill workers. Three trends over the past four decades are possible candidates, all shown in Figure 4. The first trend is the increase in the price of medical care. Using CPIs from FRED, I find that the price of medical care (relative to the price of all items less medical care) doubled between 1980 and 2010. If goods and medical care are complements, an increase in the price of medical care could increase the relative cost of the health plan preferred by high-skill workers. Intuitively, if both high- and low-skill workers want to spend a small fraction of their incomes on medical care, the amount they spend on medical care would be close in absolute terms, even if their incomes are far apart. If goods and medical care are complements and the price of medical care increases, then the share of income they want to spend on medical care increases. This causes the level difference between their desired expenditures — and thus their desired health plans —- to spread out.

The second trend is the increase in income. Using data from FRED, average (deflated) employee compensation increased by almost 40 percent between 1980 and 2010. Further, the increase in income occurred at almost all percentiles of the income distribution, except for roughly the bottom 20 percent of earners (Song et al., 2019). If the share of income workers want to spend on medical care increases with income, then this trend could also increase the relative cost of the health plan high-skill workers want.

The third trend is the shift in labor demand towards high-skill workers. Using supplementary data from Song et al. (2019), I calculate the total wages paid to the top tercile

Figure 2: Admin and Support Services has Low Health Plan Costs



Notes: Data is drawn from the Annual Survey of Manufacturers, the Services Annual Survey, and County Business Patterns, as discussed in Section 5.1. Sectors are 2-digit NAICS codes, with the exceptions of Manufacturing (31-33), Retail Trade (44-45), and Transportation and Warehousing (48-49). Several sectors are missing because they are missing from the Services Annual Survey. Sector 56 is split into two subsectors: Administrative and Support Services (NAICS 561) and Waste Management (NAICS 562). The sector "Other Services" is the 2-digit NAICS code 81, not a grouping of all other services.

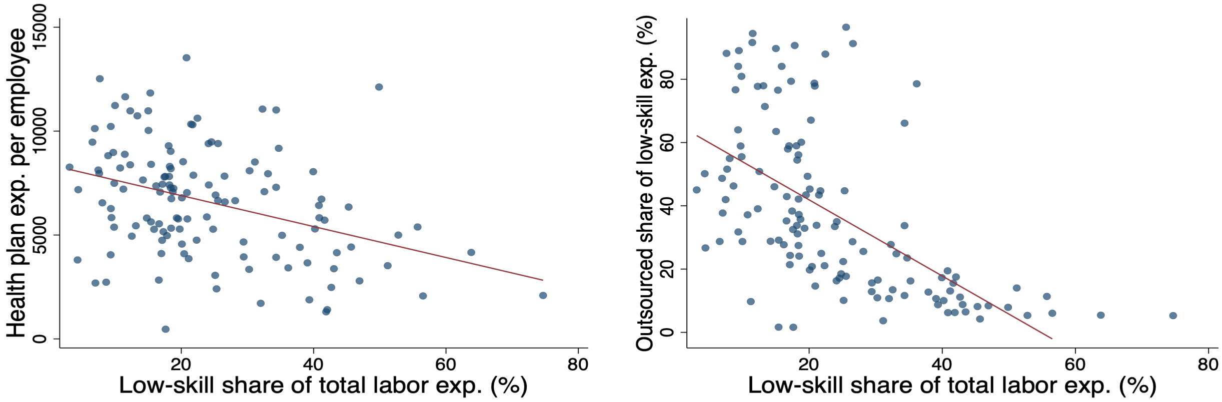
of earners divided by that paid to the bottom tercile. This ratio increased by 30 percent between 1980 and 2010. Broadly speaking, as the supply of high-skill workers increased over this period, as measured by college completion rates, this increase is due to increased demand for high-skill workers.[4] This trend increased the utility level of high-skill workers. If medical care expenditures increase with utility, this could also increase the relative cost of the health plan high-skill workers want.

Looking ahead, Sections 3 and 4 explore the relationships between employer health plans and domestic outsourcing using a general equilibrium model. Section 5 uses the model structure to attribute a share of the rise in low-skill domestic outsourcing to employer health plan costs. This accounting exercise only requires the model structure, two parameters, and

[4]For more information on the increase in income inequality or the increase in compensation paid to high-wage workers, see Krusell et al. (2000), Card and DiNardo (2002), Song et al. (2019), or Braxton et al. (2021).

Figure 3: Skill-Intensity, Health Plan Costs, and Low-Skill Outsourcing

(a) Health Plans (b) Low-Skill Outsourcing



Notes: Each dot is an industry. The red lines are linear best-fit lines. An occupation is low-skill if it is in the bottom tercile when occupations are ranked by mean income. "Low-skill share of total labor expenditure" is low-skill labor expenditure on both employees and outsourcing divided by total labor expenditure on employees and outsourced labor. "Outsourced share of low-skill expenditure" is expenditure on low-skill outsourced labor divided by expenditure on low-skill employees and low-skill outsourced labor. Underlying data is described in Section 5.1.

one moment. Notably, it does not require the specification of the worker's preferences. In turn, Section 6 calibrates the worker's preferences and further attributes the rise in domestic outsourcing to the rising price of medical care, rising income, and the shift in labor demand toward high-skill workers.

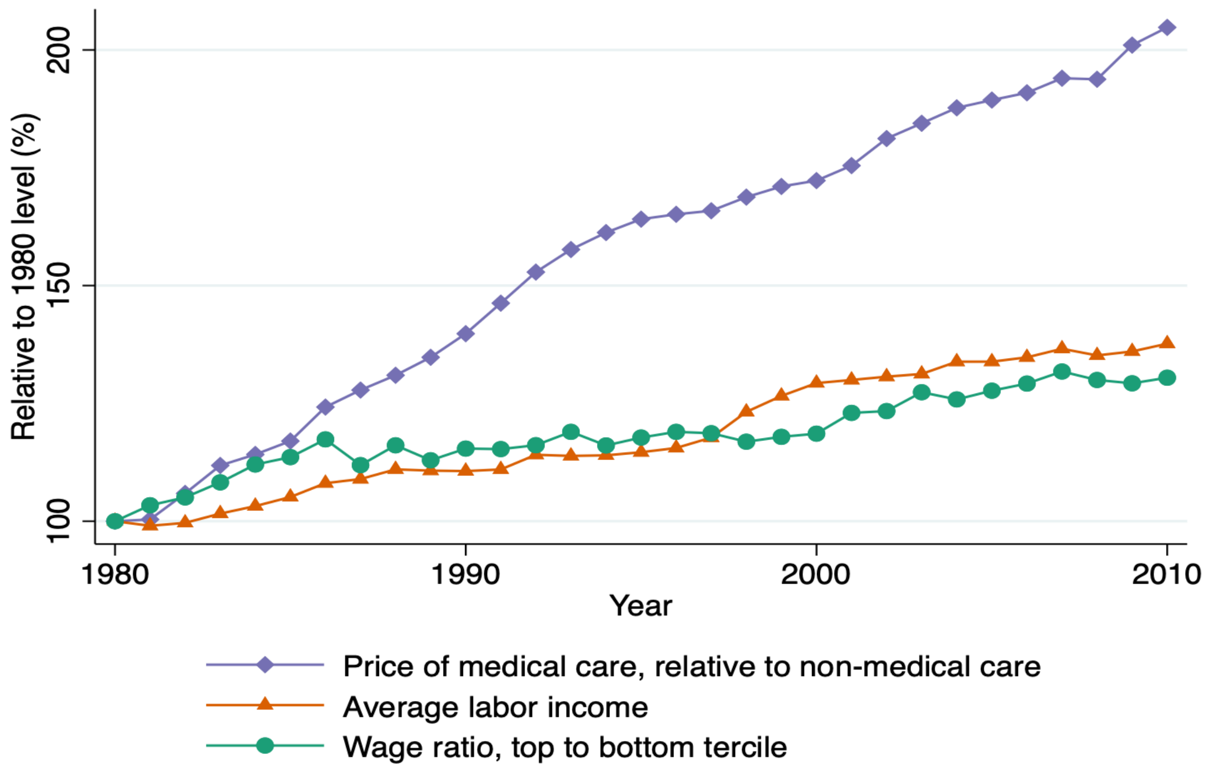
3 A Theory of Outsourcing and Health Plans

3.1 Environment

Time is discrete. Each agent solves a static problem, so I drop time subscripts everywhere for convenience. The economy has three types of agents: workers, traditional firms, and outsourcing firms. Throughout, variables use superscripts to denote firm and subscripts to denote skill levels.

Workers. Each worker is endowed with one unit of labor. Workers are exogenously heterogeneous in the skill level of their labor endowment. The discrete set of skills is $\mathcal{S}$, and the mass of workers of skill $s \in \mathcal{S}$ is N_s. A worker's preferences turn (non-medical care) goods c and medical care m into utility u, while potentially being non-homothetic. The functional form of the utility function is Comin CES preferences (Comin et al., 2021), in which utility u is implicitly defined by

Figure 4: Three Rising Trends: Medical Care Prices, Income, and the Skill Premium



Notes: The relative price of medical care series draws from CPI data from the Federal Reserve Bank Economic Data (FRED). Specifically, the series is the CPI for medical care divided by the CPI for all items less medical care. (These CPIs are annual, seasonally adjusted, and for all urban consumers.) The average labor income series, also drawn from FRED, is total compensation to employees divided by total employees. Like the Medical Care CPI, it is also adjusted for inflation using the CPI for all items less medical care. The wage ratio draws on supplementary data from Song et al. (2019). This data summarizes administrative tax data and provides mean incomes by income percentiles for the entire income distribution.

$$\psi \left(\frac{c}{u}\right)^{1-1/\eta} + (1-\psi) \left(\frac{m}{u^{\epsilon}}\right)^{1-1/\eta} = 1. \tag{1}$$

The parameter η is the elasticity of substitution between goods and medical care. I assume $\eta < 1$ so goods and medical care are complements — an increase in the relative price of medical care increases the relative expenditure on medical care. The parameter $\epsilon > 0$ controls the non-homotheticity of medical care. If $\epsilon < 1$, then relative expenditure on medical care decreases with utility. If $\epsilon > 1$, then it increases with utility.[5] If $\epsilon = 1$, then the preferences are equivalent to the standard CES preferences, and the share of expenditure on medical care does not change as utility increases. The parameter $\psi \in (0, 1)$ is a weight. As it increases, workers want to consume more goods and less medical care.

[5]See Equation (5) of Comin et al. (2021).

Traditional Firm. The traditional firm is denoted with f. The traditional firm's production technology inputs employees n_s^f and outsourced labor o_s^f of each skill. Across skill levels, the technology is Cobb-Douglas. Within each skill level, the technology is CES between employees n_s^f and outsourced labor o_s^f. The firm's production technology is

$$y = z \left(\prod_{s \in \mathcal{S}} \left(\left(n_s^f\right)^{1-1/\theta_s} + \alpha_s^{1/\theta_s} \left(o_s^f\right)^{1-1/\theta_s} \right)^{\frac{\varphi_s \theta_s}{\theta_s - 1}} \right), \tag{2}$$

where $z > 0$ is efficiency, $\alpha_s > 0$ is a weight on outsourced labor, and $\varphi_s > 0$ is a skill weight. The skill weights sum to one, $\sum_{s \in \mathcal{S}} \varphi_s = 1$. The parameter θ_s is the elasticity of substitution between employees and outsourced labor of skill s, which I dub the *outsourcing elasticity*. For now, I assume that $\theta_s > 1 \ \forall s \in \mathcal{S}$, implying that employees and outsourced workers are gross substitutes — as the relative price of employees increases, relative expenditure on outsourced labor increases. I also assume that $\theta_s < \infty$, ruling out perfect substitutes, simplifying the discussion of the equilibrium results. Later, I estimate this elasticity from the data.

Explicit Microfoundation. In the traditional firm's production technology employees and outsourced workers are aggregated together by a CES technology. The microfoundation for the CES technology is a discrete choice model. The traditional firm must complete a continuum of tasks and decide to hire either employees or outsourced labor for each task. For example, tasks could include cleaning, administrative work, and manual labor, and the firm decides to hire either an employee or a business service firm to complete each task. If the productivities of employees and outsourced workers for each task are drawn from the appropriate extreme value distribution, the resulting problem is equivalent to the CES aggregator. The microfoundation is detailed in Appendix A.2.

Outsourcing Firms. There is a single outsourcing firm for each skill $s \in \mathcal{S}$. The s-skill outsourcing firm's technology inputs s-skilled labor from workers, n_s^o, and outputs outsourced labor of the same skill, O_s, which it supplies to the traditional firm. The technology is constant returns to scale, $O_s = n_s^o$. (Note: I could have an efficiency parameter in the outsourcing firm's technology, but this parameter is isomorphic and not separately identifiable from the outsourcing weight α_s.)

3.2 Timing and Choices

The timing of each period follows. First, each firm j offers compensation packages composed of wages w_s^j and health plans a_s^j to attract employees. Second, each worker chooses which firm to work for based on the distribution of compensation packages. Third, workers spend their compensation packages on goods and medical care. I describe compensation packages and then each step in reverse chronological order.

Compensation Packages. Each firm j can compensate workers with wages w_s^j and health plans a_s^j. Wages and health plans are different in two ways. First, wages can be spent on goods or medical care, while health plans can only be spent on medical care. Second, per the US tax code, wages are taxed at a rate of T, while employer health plans are not. Medical care bought with wages and health plans are perfect substitutes. Health plans are simply an un-taxed form of compensation that can only be spent on medical care, similar to how cafeteria plans work in the US.

Worker Expenditure Choice. Given a compensation package $\{w_s^j, a_s^j\}$, a worker chooses consumption c, and medical care purchased with after-tax wages m_w and that purchased with the health plan m_a to maximize utility u. Both forms of medical care are perfect substitutes. Utility u is implicitly defined by Equation (1). The worker's expenditure choice is:

$$
\begin{aligned}
v(a_s^j, w_s^j) = \max_{c, m_a, m_w} & \; u\left(c, m_a + m_w\right) \\
s.t. \quad & c + p_m m_w \leq w_s^j (1 - T) \\
& p_m m_a \leq a_s^j
\end{aligned}
$$

where p_m is the price of medical care, T is a tax on wages, and $v(a_s^j, w_s^j)$ denotes the worker's indirect utility function.

Worker Firm Choice. Workers have perfect information and are free to move across firms. Hence, given the compensation packages offered by each firm, the worker chooses which firm to work at to maximize utility,

$$
\max_{j \in \mathcal{J}} v(a_s^j, w_s^j)
$$

where $\mathcal{J}$ is the set of all firms (traditional and outsourcing).

Traditional Firm Profit Maximization. The traditional firm f chooses employees n_s^f, outsourced labor o_s^f, wages w_s^f, and health plans a_s^f for each skill level. Its objective is to maximize profits, which is revenue minus labor costs,

$$y - \sum_{s \in \mathcal{S}} \left((w_s^f + a_s^f) n_s^f + p_s o_s^f \right) \tag{3}$$

where y is its output as defined by Equation (2) and p_s is the price of outsourced labor of skill s.

The firm's choices are subject to two constraints. First is the anti-discrimination constraint: the firm must offer all employees the same health plan.

$$a_s^f = a_{s'}^f \quad \forall s, s' \in \mathcal{S}. \tag{4}$$

Second, because workers move to whichever firm offers the highest utility, firms must offer each skill level a compensation package that yields at least as much utility as each skill's best-outside option, denoted $\tilde{v}_s$,

$$v(a_s^f, w_s^f) \geq \tilde{v}_s \quad \forall s \in \mathcal{S}. \tag{5}$$

The best outside option $\tilde{v}_s$ acts as reservation utility level; firms must offer a compensation package that yields at least $\tilde{v}_s$ utility if they want to attract employees. Note that the price of medical care p_m and the tax on wages T enter into the firm's problem through these constraints.

The traditional firm's problem follows. Given reservation utility levels $\{\tilde{v}_s\}_{s \in \mathcal{S}}$ and the prices for outsourced labor $\{p_s\}_{s \in \mathcal{S}}$, the traditional firm chooses employees n_s^f, outsourced labor o_s^f, wages w_s^f, and health plans a_s^f to maximize profits (3) subject to offering all employees the same health plan (4) and offering compensation packages that at least yield the reservation utility levels (5).

Outsourcing Firms Profit Maximization. Recall the s-skill outsourcing firm only uses s-skill labor. Given the price of outsourced labor p_s and reservation utility level $\tilde{v}_s$, the s-skill outsourcing firm picks labor n_s^o, wage w_s^o and a health plan a_s^o to maximize profits

$$p_s n_s^o - (w_s^o + a_s^o) n_s^o.$$

subject to offering all of its employees the same health plan (4) and offering a compensation package that matches their reservation utility level (5).

3.3 Equilibrium Definition

Given the price of medical care p_m and other exogenous parameters, an equilibrium is reservation utility levels $\{\tilde{v}_s\}_{s\in\mathcal{S}}$, prices for outsourced labor $\{p_s\}_{s\in\mathcal{S}}$, choices for the traditional firm $\{n_s^f, o_s^f, a_s^f, w_s^f\}_{s\in\mathcal{S}}$, and outputs and choices for each outsourcing firm $\{O_s, n_s^o, a_s^o, w_s^o\}_{s\in\mathcal{S}}$ that satisfy the following: given a compensation package workers maximize their utility; the compensation packages for each skill level yield their respective reservation utility levels so workers are indifferent to where they supply their labor; given prices for outsourced labor and the reservation utility levels each firm solves their profit maximization problem; labor markets for employees and outsourced labor clear,

$$n_s^o + n_s^f = N_s \quad \forall s \in \mathcal{S},$$
$$o_s^f = O_s \quad \forall s \in \mathcal{S}.$$

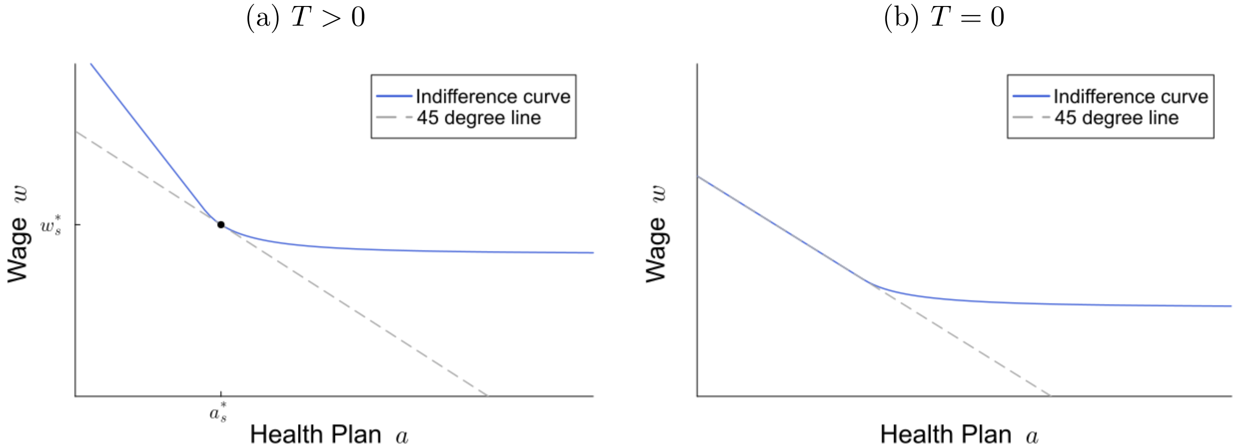
In the background, the traditional firm produces the good c that workers consume. A medical care firm purchases this good and uses a constant returns to scale technology to transform c_m units of goods into $z_m c_m$ units of medical care. Following from the medical care firm's optimality conditions, the price of medical care is pinned by an exogenous parameter, $p_m = \frac{1}{z_m}$. Hence, I treat the price of medical care as exogenous. The resource constraint for this good is cleared by Walras's Law and thus is unnecessary to include in the equilibrium definition. Lastly, tax revenue entirely finances wasteful government spending — the reason I include a tax on wages is to give the firm a reason to offer health plans, as discussed in the next section.

4 Equilibrium Results

This section characterizes efficiency results and how health plan costs affect domestic outsourcing. It begins with explaining why a tax on wages is necessary; it ensures the equilibrium is unique and that firms offer health plans. Next, it discusses an economy without the anti-discrimination laws. In this economy, the competitive equilibrium is Pareto Efficient, and trends in the price of medical care and other aggregate variables do not affect the domestic outsourcing rate. Then, I turn to an economy with anti-discrimination laws. The anti-discrimination laws increase the relative price of low-skill employees, increasing low-skill outsourcing above its efficient level.

Without loss of generality, assume there are two skill levels with different utility levels in equilibrium. Denote the skill level that has higher utility with an h for "high-skill", and denote the one with lower utility with an l for "low-skill".

Figure 5: Indifference Curves between Wages and Health Plans



Notes: The blue lines are indifference curves between wages and health plans; all compensation packages on an indifference curve yield the same utility level. The dashed grey line is a 45-degree line that passes through the cheapest compensation package that is on the indifference curve. In the graph on the left, the black dot marks the cheapest compensation package that lies on or above the indifference curve. On the graph on the right, there is not a unique cheapest compensation package.

4.1 A Tax on Wages Ensures that Firms Offer Health Plans

Proposition 1. *If the tax on wages is strictly greater than zero, $T > 0$, then all firms offer health plans, $a^j > 0\ \forall j \in \mathcal{J}$.*

Proof. See Appendix A.4. □

The intuition for this proposition is shown in Figure 5. In both graphs, the y-axis is wage w, and the x-axis is health plan a. The blue line is an indifference curve for a worker of an arbitrary skill level. To attract employees of this skill level, a firm must offer a compensation package on or above the indifference curve. The graph on the left shows an economy with a tax on wages $T > 0$. The cheapest compensation package on or above the indifference curve $\{a_s^*, w_s^*\}$ has a positive health plan, $a_s^* > 0$. Intuitively, \$X of wages can purchase $\frac{X(1-T)}{p_m}$ units of medical care, while \$X of employer health plan can purchase $\frac{X}{p_m}$ units of medical care, which is a $\frac{T}{1-T}$% increase. As all workers want to consume a positive level of medical care, firms find it optimal to offer a positive amount of health plans.

A positive tax on wages also ensures that the equilibrium is unique. The intuition is shown in panel b of Figure 5. The graph shows the economy without a tax on wages. There are multiple compensation packages that minimize costs, including one composed of only wages. Workers are indifferent between receiving one dollar of wage and one dollar of health plan up until their marginal utility of medical care is strictly greater than that of goods.

Firms are indifferent between offering multiple compensation packages, creating multiple equilibriums. Note that a positive tax on wages is sufficient for a unique equilibrium to exist, but it is not necessary. Alternatively, the worker could face a higher price for out-of-pocket medical care than for medical care purchased with the health plan, and that would cause employer health plans to be positive.

Throughout I assume that the tax on wages T is strictly greater than 0. This is solely to ensure that firms offer health plans and the equilibrium is unique, so I assume that tax revenue is spent entirely on wasteful government spending. Later I discuss efficiency, and the benchmark efficient economy is a social planner problem with a friction that represents the tax on wages — it destroys a percent of the output that is consumed as the non-medical care good.

4.2 Efficiency Without the Anti-Discrimination Laws

Consider the baseline economy without the anti-discrimination laws. The equilibrium for this economy is Pareto Efficient — no worker can be made strictly better off without making some worker strictly worse off.

Proposition 2. *Consider the baseline economy without the anti-discrimination constraints. The resulting equilibrium is Pareto Efficient.*

Proof. See Appendix A.3. □

The intuition for this result follows from a condition from the social planner's problem that (in part) characterizes efficient allocations: the marginal product of s-skill employees is equal to that of s-skill outsourced labor.

$$\frac{\partial y}{\partial n_s^f} = \frac{\partial y}{\partial o_s^f} \qquad \forall s. \tag{6}$$

Logically, if the marginal product of employees is greater than that of outsourced workers, the traditional firm should use more employees and fewer outsourced workers. If the marginal products are equal, the firm allocates workers efficiently and maximizes output.

A competitive equilibrium without anti-discrimination laws satisfies the efficiency Equation (6). To see this, first note that optimality conditions imply that marginal products equal marginal costs, so i) the marginal products of workers at the traditional firm equal their costs, and ii) the price of outsourced labor equals the cost of the outsourcing firm's compensation package:

$$\frac{\partial y}{\partial n_s^f} = w_s^f + a^f, \qquad \frac{\partial y}{\partial o_s^f} = p_s, \qquad p_s = w_s^o + a_s^o. \tag{7}$$

In a competitive equilibrium without the anti-discrimination laws, the only constraint facing both traditional and outsourcing firms when setting their compensation package is the best outside option constraint (5). Hence, the traditional firm and the outsourcing firms offer *the cheapest compensation package* that satisfies this constraint, denoted by $\{a_s^*, w_s^*\}$.

$$\{a_s^*, w_s^*\} = \underset{\{a,w\}\in R_+^2}{\operatorname{argmin}} \left\{a + w \mid v(a,w) \geq \tilde{v}_s\right\}. \tag{8}$$

Thus, employees and outsourced workers of the same skill level have the same marginal cost. By Equations (7), the marginal products of employees and outsourced labor of the same skill level are equal. Labor is allocated in a way that maximizes output.

$$\frac{\partial y}{\partial n_s} = w_s^f + a^f = w_s^* + a_s^* = p_s = \frac{\partial y}{\partial l_s}.$$

Further, simplifying Equation (6) with the market clearing conditions and the outsourcing firm's technology shows that an exogenous parameter — the outsourcing weight α_s — pins the outsourcing rate $\frac{O_s}{N_s}$,

$$\frac{O_s}{N_s} = \frac{\alpha_s}{1+\alpha_s}. \tag{9}$$

Equation (9) is a necessary condition for a efficiency. Further, it directly implies that changes in the price of medical care p_m or the reservation utility levels $\tilde{v}_s$ do not affect the outsourcing rate in an economy without the anti-discrimination laws, leading to the next proposition.

Proposition 3. *Consider the baseline economy without the anti-discrimination constraints. A change in the price of medical care or other aggregates does not change the domestic outsourcing rate.*

Proof. Follows from Equation (9). □

4.3 Anti-Discrimination Laws Increase Outsourcing

When choosing a compensation package, the traditional firm chooses from the set of compensation packages that satisfy the reservation utility constraints (5). However, the anti-discrimination constraint (4) and the fact they demand multiple skill levels of labor prevents it from offering each skill their cheapest compensation package $\{a_s^*, w_s^*\}$. Following optimality conditions and a Taylor approximation, traditional firms intuitively choose a health plan that is a weighted average of each skill level's cost-minimizing health plan a_s^*.

Proposition 4. *The optimal health plan of the traditional firm, a^f, is approximately equal to a weighted average of each skill's cost-minimizing health plan a_s^*:*

$$a^f \approx \sum_s \frac{\omega_s}{\sum_{s'} \omega_{s'}} a_s^*, \tag{10}$$

$$\omega_s = \underbrace{\varphi_s}_{\substack{\text{skill} \\ \text{weight}}} \times \underbrace{\frac{(w_s^f + a^f)n_s^f}{(w_s^f + a^f)n_s^f + p_s o_s^f}}_{\substack{\text{share of } s\text{-expenditure} \\ \text{on employees}}} \times \underbrace{\frac{\partial^2}{\partial a^2}\Big(\log\big(a + w(a, \tilde{v}_s)\big)\Big)\Big|_{a=a_s^*}}_{\substack{\text{compensation package} \\ \text{cost curvature}}},$$

where $w(a, \tilde{v}_s) = min_{w \in R_+}\big(w \mid v(a, w) \geq \tilde{v}_s\big)$.

Proof. See Appendix A.5. □

The weight on the cost-minimizing health plan for s-skill employees, a_s^*, is increasing with (a) the s-skill weight, φ_s, (b) the share of s-skill labor expenditure that is on employees, and (c) the curvature of the price of s-skill employees at a_s^*. The intuition for (a) and (b) is that as the quantity of s-skill employees increases, the firm moves its health plan towards the health plan that minimizes the cost of s-skill employees. The intuition for (c) is that as the cost of deviating from a_s^* increases, the firm moves its health plan closer to a_s^*.

Unlike the traditional firm, each outsourcing firm offers the cost-minimizing compensation package $\{a_s^*, w_s^*\}$. As they each input only one skill level of labor, they are unaffected by the anti-discrimination constraint. Thus, the outsourcing firms have the lowest labor costs in the economy. This provides intuition for how outsourcing firms can exist in a competitive equilibrium; they purchase labor at a lower cost than the traditional firm and then sell that labor to the traditional firm.

Proposition 5. *Outsourcing firms offer the cheapest compensation packages possible that satisfy the best outside option constraint, $\{a_s^*, w_s^*\}$. The price of outsourced labor equals the cost of $\{a_s^*, w_s^*\}$,*

$$p_s = w_s^* + a_s^*.$$

Proof. Each outsourcing firm uses only one skill level of labor and is thus unaffected by the anti-discrimination constraint, so they offer $\{a_s^*, w_s^*\}$. The price p_s follows from optimality conditions. □

For low-skill workers, the traditional firm offers a higher health plan and lower wages than the low-skill outsourcing firm. The overall cost of low-skill employees at the traditional firm is higher, but the utility levels of low-skill workers at both firms are equal because workers are free to move across firms. Similarly, for high-skill workers, the traditional firm offers a lower health plan and higher wages than the high-skill outsourcing firm. The overall cost of high-skill employees at the traditional firm is higher, but the utility levels of high-skill workers at both firms are equal.

Propositions 4 and 5 also lead to the following result: the anti-discrimination constraint increases domestic outsourcing

Proposition 6. *Applying the anti-discrimination constraints increases domestic outsourcing for each skill level above its efficient level as defined by Equation* (9)*.*

Proof. See Appendix A.6. □

The intuition for this result follows. Optimality conditions imply that the outsourcing rate $\frac{O_s}{N_s}$ is equal to

$$\frac{O_s}{N_s} = \frac{\alpha_s \left(\frac{w_s^f + a_s^f}{w_s^* + a_s^*}\right)^{\theta_s}}{1 + \alpha_s \left(\frac{w_s^f + a_s^f}{w_s^* + a_s^*}\right)^{\theta_s}}. \tag{11}$$

The key object is the endogenous *cost ratio* $\frac{w_s^f + a_s^f}{w_s^* + a_s^*}$, which is the compensation costs of employees relative to that of outsourced workers. This measures the extra cost of employees due to health plans. The cost ratio is bounded below by one because employee compensation costs are weakly greater than those of outsourced workers. As the traditional firm's health plan approaches a_l^*, the cost ratio approaches one and the outsourcing rate approaches its efficient level $\frac{\alpha_s}{1+\alpha_s}$, as shown in Equation (9). As the traditional firm's health plan approaches infinity the outsourcing rate approaches one.

Without the anti-discrimination laws, both firms offer the cheapest compensation package $\{a_s^*, w_s^*\}$, the cost ratio equals one, and the outsourcing rate is at its efficient level $\frac{\alpha_s}{1+\alpha_s}$. With the anti-discrimination laws, the outsourcing firm still offers the cheapest package, but the traditional firm's packages become more expensive. This increases both the cost ratio and thus domestic outsourcing. Intuitively, the anti-discrimination constraint causes the traditional firm to hire an inefficiently low amount of employees, so outsourcing increases.

To sum up, applying the anti-discrimination constraints increases domestic outsourcing. Equation (11) characterizes how health plan costs affect domestic outsourcing. The elasticity of substitution between low-skill outsourced labor and employees θ_l is key as it enters exponentially into Equation (11). This equation also shows how a change in the price of medical care or other aggregates affects domestic outsourcing — they do so by changing the compensation cost ratio.

5 Accounting Exercise: Measuring the Effect of Health Plan Costs on Low-Skill Domestic Outsourcing

The main accounting exercise is to estimate the share of the rise in low-skill domestic outsourcing due to employer health plan costs. By Equation (11), the increase in the outsourcing rate over time is due to only two factors: an increase in the compensation cost ratio $\frac{w_l^f + a_l^f}{w_l^* + a_l^*}$ and an increase in the outsourcing weight α_{lt}. An increase in the outsourcing weight accounts for all other reasons besides health plan costs that caused the outsourcing rate to increase. The main accounting exercise is to estimate a counterfactual change in the outsourcing rate over time by holding the outsourcing weight at its 1975 value and only allowing the cost ratio to vary. I attribute the counterfactual change entirely to the extra cost of employees due to health plans. By comparing it to the real change in the data, I get the share of the rise in low-skill domestic outsourcing due to employer health plan costs.

The main accounting exercise requires estimating only two parameters and one moment. Dropping low-skill subscripts for convenience, by Equation (11) the counterfactual change in the outsourcing rate due to only health plan costs is

$$\Delta \mathcal{O}_t^{cf} = \frac{\alpha_{1975} \left(\frac{w_{2012}^f + a_{2012}^f}{w_{2012}^o + a_{2012}^o} \right)^{\theta_l}}{1 + \alpha_{1975} \left(\frac{w_{2012}^f + a_{2012}^f}{w_{2012}^o + a_{2012}^o} \right)^{\theta_l}} - \frac{\alpha_{1975}}{1 + \alpha_{1975}}. \tag{12}$$

The outsourcing weight is held at its 1975 value, so the only factor that can increase outsourcing is health plan costs. I also simplified the expression by setting the cost ratio equal to one in 1975 because the anti-discrimination laws had yet to be passed. This section estimates the three parameters or moments in Equation (12) — the outsourcing weight in 1975, the outsourcing elasticity θ_l, and the compensation cost ratio $\frac{w_l^f + a_l^f}{w_l^* + a_l^*}$ in 2012 — and performs the main accounting exercise.

The 1975 outsourcing weight follows immediately from Equation (9). Because the anti-discrimination laws had not been enacted yet, the outsourcing weight in 1975 α_{1975} is pinned by the low-skill outsourcing rate. Using the data described in Section 2.2, I find that the outsourcing weight in 1975 was equal to 0.03.

5.1 Estimating the Outsourcing Elasticity

Manipulating Equation (11) yields

$$\underbrace{\log \frac{p_l o_l^f}{n_{fl}}}_{\substack{\text{outsourcing expenditure} \\ \div \text{ in-house employees}}} = \theta_l \log(\underbrace{w_l^f + a^f}_{\substack{\text{compensation} \\ \text{costs}}}) + \underbrace{(1-\theta_l)\log p_l}_{\text{constant}} + \underbrace{\log \alpha_l^f}_{\substack{\text{weight} \\ \text{parameter}}} + \underbrace{\epsilon^f}_{\substack{\text{error} \\ \text{term}}} \tag{13}$$

Hence, the parameter θ_l can be estimated using variation in low-skill outsourcing expenditure per low-skill employee and low-skill compensation costs. While firm-level data with these measures is not publicly available, data with these measures are publicly available at the industry level. Hence, I use variation in these measures across industries to estimate θ_l. To map the model to the data, I assume there are many traditional firms, each indexed by j, and these firms are grouped into industries where every firm within an industry has identical skill weights, φ_s^j. Then, every industry can be represented by a single firm. I focus on the year 2012 due to constraints in the underlying data.[6]

Data on employment and wages is drawn from the 2012 Occupation and Employment Wage Statistics (OEWS) data. This data includes employment and wages by NAICS industry and the granular 5-digit SOC occupation code.[7] I map occupation codes into three skill groups (low, medium, and high) equally sized in employment based on their average economy-wide earnings. For each industry, s-skill employment n_s^j is the sum of employment in occupations of skill level s, and wages w_s^j is the employee-weighted average wage for occupations of skill level s.

Data on health plan costs is drawn from the Annual Survey of Manufacturers (ASM) and the Services Annual Survey (SAS), which have health plan expenditures by industry. Because of the anti-discrimination laws and the majority of employer premium variance is between firms, as discussed in Section 2, I assume that all employees within an industry receive the same health plan. For each industry, health plan expenditure per employee a^j is total health plan expenditure divided by employees. Employee counts are taken from County Business Patterns for the service industries because the SAS data does not have employee counts.

Measures of outsourced labor expenditure are drawn from the BEA's 2012 Input-Output (IO) data.[8][9] The IO data has each industry's expenditure on outputs from all other in-

[6]Health plan expenditure from the Services Annual Survey and the Annual Survey of Manufacturers is only available for a wide range of industries between 2012-2017, while detailed measures of outsourcing expenditure from the Input-Output tables are most detailed in 2012.

[7]Some examples of 5-digit level occupation codes are "Podiatrists," "Traffic Technicians," and "Line Installers and Repairers."

[8]The BEA has several different Input-Output tables, varying by expenditure definition; I use the "Use Tables/Before Redefinitions/Producer Value." I use Before Redefinitions for consistent classification with the BEA's historical tables.

[9]The data for 2012, at its most disaggregate level, has 405 industries, as opposed to 71 in most other years.

dustries. I assume that expenditures on the 4-digit sub-industries of "Administrative and Support Services" (NAICS 561) and "Professional, Scientific, and Technical Services" (NAICS 541) are expenditures on outsourced labor. Sub-industries of NAICS 561 include Temporary Help Services, Janitorial Services, Security Guards Services, and other service firms that supply establishments with low-skill outsourced labor. Sub-industries of NAICS 541 include legal services and other high-skill business services. To calculate outsourcing expenditure by skill by industry, $p_s o_s^j$, I map expenditure on each 4-digit sub-industry of NAICS 541 and 561 to the single skill level that has the highest employment share in that sub-industry, where the employment shares by skill-level are from the OEWS. For example, the most employed skill level in the janitorial service industry is low-skill, so I consider all expenditures on janitorial services to be expenditures on low-skill outsourced labor. (For robustness, I also map each 4-digit sub-industry to multiple skill levels by multiplying expenditure by employment skill shares, and the results are similar.)

Altogether, the data has in-house employment n_s^j, wages w_s^j, and outsourcing expenditure $p_s o_s^j$ by skill by industry, and health plan a^j by industry for 128 industries for the year 2012. Industries are defined at the most detailed level possible, given the availability in the underlying survey data. Every manufacturing industry is defined at the 4-digit level. Service industries are defined at the 2-, 3-, or 4-digit level.

There are two main issues when confronting Equation (13) with the data. The first is the presence of the weight parameter α_l^j. This parameter acts as an exogenous shifter; in other words, some industries are inherently better at outsourcing low-skill workers. Omitting this parameter biases my estimate of θ_l upwards. If an industry has a high α_l^j, holding all else equal, it outsources a relatively high share of low-skill labor, which increases the dependent variable. This also allows them to increase their health plan a^j to decrease their cost of in-house high-skill labor, which increases the cost of low-skill labor, $w_l^j + a^j$. Hence, the shifter α_l^j is positively correlated with both the dependent and key independent variables, so omitting it will bias my estimate of θ_l upwards. To control for the shifter α_l^j, I include controls for communication services expenditure per employee, taken from the ASM and SAS. These expenditures include internet, telephone, cellular, fax, and other wired and wireless communication services. These technologies improve a firm's ability to communicate and coordinate with outsourced workers (Bergeaud et al., 2021).

The second issue with this estimation is that within each skill level, wage and health plan are positively correlated across industries. In the model, these variables are negatively correlated, so workers within the same skill level are all on the same indifference curves. In the data, this is not the case for two reasons. The first are forces that cause workers with labor endowments of the same skill level to be on different indifference curves — search frictions, monopsony power, inter-firm wage compression, unions, etc. The second reason is an inherent imperfection of mapping occupations to skill levels; workers within the "low-skill" occupations have different occupations, education levels, and job experience and thus have labor endowments of varying skill levels, thus commanding varying compensation packages in the labor market. The first reason is not an issue in estimation; the estimation strategy relies on variation in employee costs, but as long as the employees are actually of the same skill level, the source of this variation does not matter. However, the second source biases the outsourcing elasticity downward. If an industry's low-skill workers are of relatively high ability, then the firm offers higher wages for low-skill workers and relatively high health plans. The positive correlation between health plans and wages biases the compensation costs $w_l^f + a^f$ upwards, biasing its coefficient downward.

Differentiating from these two sources is difficult, so I estimate two elasticities that I use as a lower and upper bound. First, I assume all low-skill workers across industries have the same labor endowment, so the correlation between wages and employer health plan contributions does not bias the outsourcing elasticity estimate. Second, I assume that all the difference in wage is due to imperfections in mapping occupation data to skill levels, so low-skill workers across industries actually have different labor endowments. I adjust for this bias by holding wages constant across industries at the low-skill outsourced worker's wage level in the regression Equation (14), thus only allowing the health plan to vary across industries. This specification assumes that a firm cannot decrease a low-skill worker's wages upon increasing their health plan contributions. Looking ahead to Section 6, I find this when I calibrate the utility function.

Using the cross-sectional industry data, I run the regression:

$$\log \frac{p_l o_l^j}{n_l^j} = \theta_l \log(w_l^j + a^j) + \beta_0 + \beta_1 X^j + \epsilon_j. \tag{14}$$

where X^j is logged per-employee expenditures for communication services. The variable of interest, θ_l, measures how much variation in outsourced labor expenditure relative to the number of employees can be explained by variation in low-skill compensation costs.

The results of this regression are in Table 1. I find that the elasticity of substitution θ_l is large, positive, and statistically significant. The first two columns of Table 1 correspond to the regressions where I take the compensation costs straight from the data, without adjusting wages. I find that a 1 percent increase in the price of in-house low-skill labor increases the low-skill outsourcing expenditure per low-skill employee by 6.3 percent. While controlling for communication services expenditure in the second column, this estimate decreases to 4.308. In the last two columns, I hold wages constant across industries at their level in

Table 1: Elasticity of Substitution, Employees vs Outsourced Low-Skill Labor

	Low-skill out expnd per low-skill employee			
	(1)	(2)	(3)	(4)
Low-skill compensation	6.331***	4.308***	12.35***	8.119***
	(0.820)	(0.846)	(2.141)	(1.547)
Communication services		1.192***		1.146***
		(0.287)		(0.214)
Adjust wages?	×	×	✓	✓
Observations	128	126	128	126
R^2	0.485	0.727	0.503	0.717

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The table shows the results from regressing low-skill outsourcing expenditure per low-skill employee on low-skill compensation and covariates. All variables are in logs. The coefficient in the first row is the elasticity of substitution between low-skill employees and outsourced labor. The first two columns correspond to specifications where I take the compensation costs straight from the data. The last two columns correspond to where I adjust wages to be constant across all industries, only allowing the health plan costs to vary and affect low-skill compensation costs across industries. I use robust standard errors and weight industries by total employment. The regression is run on cross-industry data from 2012, described in Section 5.1.

the outsourcing industry, so only variation in employer health plans factor into the low-skill compensation costs. With controls and this wage adjustment, I find an elasticity of substitution of 8.119. I use 4.308 and 8.119 as lower and upper bounds on this elasticity in my main analysis.

5.2 Estimating the Compensation Cost Ratio

The cost ratio measures the difference in the cost of employees compared to outsourced workers due to differences in their health plans. I estimate this ratio using the Current Population Survey Annual Social and Economic Supplement (ASEC) data. This data set is advantageous because it provides employer health plan contributions, which most other surveys do not, along with the typical industry, occupation, demographic, and income variables.

I create a sample of low-skill workers for which outsourcing status can be identified. To restrict to low-skill workers, I filter to workers with less than a college education. I further restrict to occupations for which outsourcing can be identified using industry codes: janitors, security, guards, and laborers.[10] A janitor, guard, or laborer is considered outsourced if they

[10] To identify occupations I use the occupation code variable `occ1990`. Janitors are code 493, security guards are code 426, and laborers (or more specifically "Operators, fabricators, and laborers") are codes 703-890.

work in "Personnel Services," which includes temporary help services. Additionally, a janitor or guard is considered outsourced if they work in "Services to Buildings and Dwellings", and a guard is also considered outsourced if they work for "Detective and Protective Services". This classification is similar to that performed in Dube and Kaplan (2010). Lastly, I restrict to people not living in group quarters (like prisons), to people between the ages of 26 and 55, and the years 2010 to 2015.

Taking the mean wage and employer contribution for outsourced and in-house workers directly from the sample yields a compensation cost ratio of over 1.5. That is, workers in the traditional firm cost over 50 percent more than outsourced workers. However, a majority of this difference stems from differences in mean wages. I want to isolate the difference in cost driven by only the difference in health plans, not wages. Using an incite from the calibrated model in Section 6, I find that when a firm increases the health plan of a low-skill worker, it allows them to decrease their wages only slightly. So, I set the employee's wage equal to that of the outsourced worker and only let the employer health plan contributions vary. I estimate that the cost ratio equals 1.080.

An issue with the above exercise is selection. The workers in the traditional firm could have higher employer health plans due to workers with higher experience, human capital, or ability selecting into the traditional firm. To control for selection bias, I estimate the effect of outsourcing on the employer contribution, while controlling for age and demographics. Then, I use this coefficient to calculate the cost ratio. The regression is

$$EMPCONTRB_{it} = \xi out_{it} + \beta_0 + \beta X_{it} + \Theta_t + \epsilon_{it}$$

where $EMPCONTRB_{it}$ is the employer health plan contribution, out_{it} is a dummy that equals 1 if person i is outsourced at time t, β_0 is a constant, X_{it} contains demographic information, and Θ_t is a year fixed effect. The key coefficient is ξ, which measures the correlation between outsourcing status and employer contribution. I find that $\xi = -1820$, meaning that outsourcing is associated with a \$1820 decrease in employer health plans. To calculate the cost ratio, I estimate the mean wage and employer health plan of the outsourced worker, then assume the employee has the same wage and employer contributions that are \$1820 higher than the outsourced worker. With a mean wage of \$24,300 and employer contribution of \$1300 for the outsourced worker, I get a cost ratio of 1.071.

The difference in health plans between outsourced and traditionally employed workers is partly driven by the fact that more outsourced workers more often report employer contributions equal to zero. Of workers in the sample, 60% of not-outsourced workers had positive employer health plan contributions, while only 32% of outsourced workers did. Repeating the above exercise but restricting to workers with strictly positive health plans decreases the

Table 2: Accounting Exercise: The Effect of Health Plan Costs on Low-skill Domestic Outsourcing

Low-skill domestic outsourcing rate	
Data: Increase between 1975 and 2012	10.72pp
Model: % explained by healthcare costs	9.1 to 19.4%
Parameters/moments	
Outsourcing weight in 1975 α_l	0.03
Cost ratio in 2012 $\frac{w_l^f+a_l^f}{w_l^o+a_l^o}$	1.071
Outsourcing elasticity θ_l	4.31 to 8.12

Notes: The table shows the percent of the increase in the low-skill outsourcing rate explained by healthcare costs. Following from Equation (12), I hold the low-skill outsourcing weight at its 1975 and only allow changes in health plan costs to affect the outsourcing rate. The only variables needed for this accounting exercise are the three parameters/moments in the bottom panel which are detailed in Section 5.

effect of outsourcing on employer contributions to -\$1427 and yields a cost ratio of 1.039.

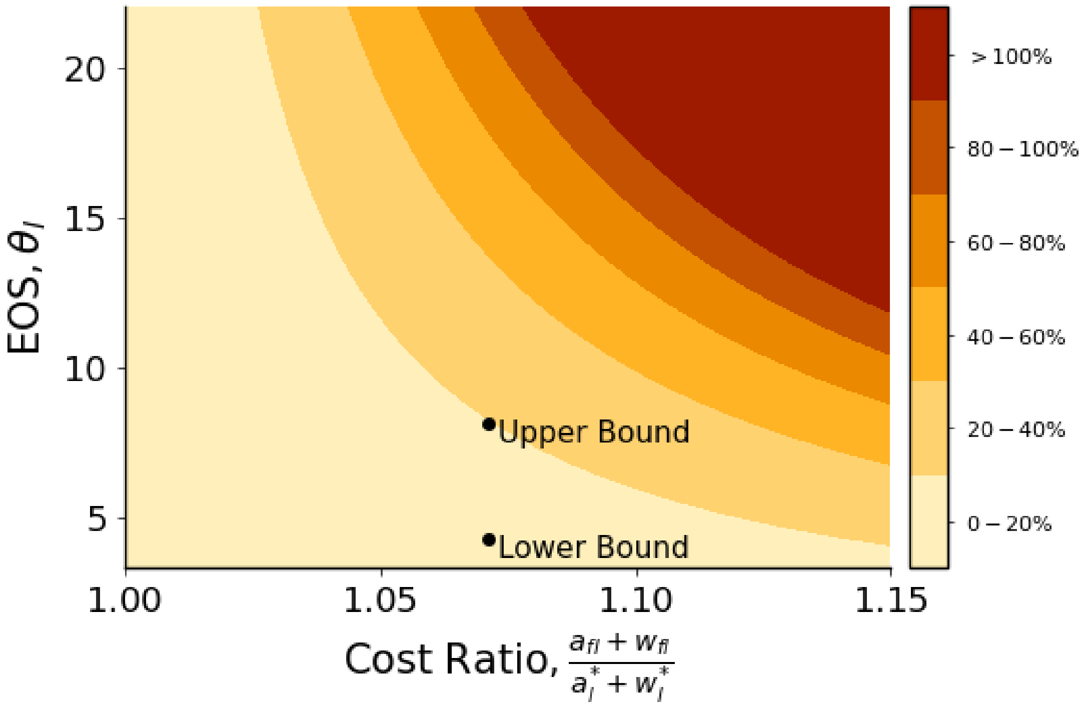
I conclude that the cost ratio is roughly equal to 1.071. I verify that this estimate is similar to that using the industry data described in Section 5.1. The employer health plan of the outsourced low-skill worker is the mean employer contribution in the Administration and Support Industry. That for the low-skill employee is taken as the mean employer contribution over all other industries. As with the ASEC data, wages and employer contributions are positively correlated, so when calculating the cost ratio I only allow the employer contributions to vary between the outsourced worker and the employee, holding the wages fixed at its value for the outsourced worker. I find a cost ratio of 1.08, reassuringly similar to that estimated with the worker-level microdata.

5.3 Results and Discussion

The results of the accounting exercise are in Table 2. I find that the difference in health plan costs at the traditional and outsourcing firms explains between 9 and 19 percent of the increase in low-skill outsourcing over time.

How sensitive are the results to the outsourcing elasticity and the compensation cost ratio? Figure 6 shows a heat map of the overall effect with respect to the cost ratio on the x-axis and the elasticity of substitution on the y-axis. Using Equation (12), the outsourcing weight α_{lt} is held at its 1975 value, and counterfactual outsourcing rates for 2012 are computed using different values for the elasticity θ_l and the cost ratio. These counterfactual outsourcing rates are then compared to the actual low-skill outsourcing rate in 2012 to see how much of the rise in the data could be explained by health plan costs. The figure shows

Figure 6: Sensitivity Analysis: The Percent of the Rise in Low-Skill Domestic Outsourcing Explained by Health Plan Costs



Notes: The heat map shows the percent of the rise in low-skill domestic outsourcing in the data explained by the difference in compensation costs between employees and outsourced workers. A counterfactual change in outsourcing rate over time is calculated using Equation (12) along with a value for the outsourcing elasticity θ_l (from the y-axis) and a value for the cost ratio (from the x-axis). Then, the counterfactual change is compared to the actual change seen in the data to get the percent of the increase due to only employer health plans, which is what the shading of the heat map shows. The dots correspond to the cost ratio estimated from the Consumer Population Survey Annual Social and Economic Supplement, 1.07, and the lower and upper bound for the elasticity of substitution θ_l estimated from the cross-industry data detailed in Section 5.1.

that a cost ratio around 1.07 and an elasticity of around 8.1 — the upper bound for this elasticity — explains almost 20% of the increase in low-skill outsourcing over time. If the cost ratio — which I measured with both worker-level microdata and industry-level aggregate data — is accurate, then the only way health plan costs can explain a majority of the increase in low-skill outsourcing is if the outsourcing elasticity is significantly mismeasured. An outsourcing elasticity of roughly 15 is necessary so that healthcare costs can explain half of the increase in low-skill domestic outsourcing.

In theory, labor supplied by employees and outsourced workers could be perfect or close to perfect substitutes. However, with an elasticity of substitution of less than ten, I find that, while they are strong substitutes, they are far from perfect substitutes. This is the first paper to estimate the elasticity of substitution between outsourced labor and employees, which makes comparing my estimate to the literature impossible. However, the outsourcing elasticity is similar to the Armington elasticity. Also known as the Trade elasticity, this is the elasticity of substitution between a good produced domestically and the same good produced abroad. This elasticity is similar to the outsourcing elasticity because goods produced domestically and abroad in theory could also be close to perfect substitutes, but the data rejects this. Due to its importance in the International or Trade Economics literature, this elasticity has been estimated thousands of times. Bajzik et al. (2020) perform a meta-analysis of the papers that estimate this parameter, compiling over 3,500 reported estimates of this elasticity. After accounting for publication bias and study quality, Bajzik et al. (2020) estimates that the Armington elasticity is between 2.5 and 5.1, with a median of 3.8. Hence, my estimate for the elasticity of substitution between employees and outsourced low-skill workers is similar to that between domestic and foreign goods. I conclude that my estimated elasticity is reasonable.

Another explanation for why employees and outsourced workers are not perfect substitutes is variation by occupation. Some low-skill occupations — like janitors and security guards — could have high elasticities of substitutions, while other low-skill occupations, like baristas, do not. Then, when all low-skill workers are aggregated together, the result is a high elasticity of substitution around four to eight.

To sum up, I estimate the percentage of the rise in low-skill domestic outsourcing due to only health plan costs. I find that between one-tenth and one-fifth of the increase is due to health plan costs alone. This estimation hinged mainly on the outsourcing elasticity θ_l and the compensation cost ratio — the cost of employees relative to outsourced workers. The next section attributes the level of the compensation cost ratio in 2012, and thus the increase in low-skill domestic outsourcing due to health plans, to various underlying trends.

6 Attributing the Rise of Low-Skill Domestic Outsourcing to Three Trends

The previous section found that the difference in employer health plan costs between the traditional and outsourcing firms can explain 9 to 19 percent of the rise in low-skill domestic outsourcing. However, the underlying reason why the health plan costs at the traditional firm are higher than those at the outsourcing firm is yet to be determined. This section attributes this difference in costs — and thus the rise in low-skill domestic outsourcing — to three trends: rising medical care prices, rising income, and shifting labor demand towards high-skill workers. The main accounting exercise is to calibrate the model to 1975, change a single facet to its 2012 value (e.g. double the price of medical care), and calculate the change in the outsourcing rate. The change is entirely attributed to the single facet.

For intuition to how these trends can affect the outsourcing rate, I use a Taylor approximation and Equation (10) to decompose the cost ratio into several components,

$$\frac{a_l^f + w_l^f}{a_l^* + w_l^*} \approx 1 + \underbrace{(a_h^* - a_l^*)^2}_{\substack{\text{Distance between cost-}\\\text{minimizing plans}}} \times \underbrace{\left(\frac{\partial^2 w(a, \tilde{v}_l)}{\partial a^2} \bigg|_{a=a_l^*} \right)}_{\substack{\text{Sensitivity of } w_l^f \text{ to}\\\text{change in health plan}}} \times \underbrace{\left(\frac{\omega_h}{\omega_l + \omega_h} \right)^2}_{\substack{\text{Weight on}\\ a_h^* \text{ in } a^f}} \times \underbrace{\frac{1}{w_l^* + a_l^*}}_{\substack{\text{Cheapest low-skill}\\\text{compensation cost}}} \tag{15}$$

where $w(a, \tilde{v}_s) = \min_{w \in R_+} \left(w \mid v(a, w) \geq \tilde{v}_s \right)$. An increase in the price of medical care can increase the cost ratio, and thus low-skill domestic outsourcing, by increasing the distance between cost-minimizing plans. This is the case if goods and medical care are complements $\eta < 1$, as an increase in the price of medical care then increases the share of income workers want to spend on medical care. An increase in efficiency (or overall income level) can also increase the distance between cost-minimizing plans. This is the case if relative expenditure on medical care increases with utility, largely determined by the non-homotheticity parameter ϵ. A shift towards high-skill labor can increase the cost ratio by increasing the weight on a_h^* in a^f. As seen in Equation (10), this weight increases with the high-skill weight φ_h. Intuitively, if demand for high-skill employees increases, the firm chooses a health plan close to that which minimizes their price. This moves the health plan further away from that which minimizes the cost of the low-skill worker, increasing the cost ratio. Whichever of these three trends is the most impactful depends chiefly on the utility function parameters. So, I calibrate these parameters internally, matching moments that characterize price and income effects.

6.1 Calibration

Calibration has three steps. First, I externally calibrate several parameters. Second, I calibrate the time-varying parameters to simulate the trends in the price of medical care, income, and high-skill labor demand. Third, I internally calibrate the utility function parameters, successfully matching moments that characterize price and income effects for medical care expenditure. Finally, I discuss the model's fit of several untargeted moments.

Before detailing the calibration strategy, I make several modifications to the model. I assume that there are three skill levels: low, medium, and high. I make the traditional firm's technology decreasing returns to scale, simplifying computation. (This creates profits, which are paid to an entrepreneur who uses them to purchase goods and medical care.) As this paper focuses on low-skill domestic outsourcing, I shut off high- and medium-skill outsourcing by simplifying the traditional firm's production technology:

$$y = z\left(\left(\left(n_l^f\right)^{1-1/\theta_l} + \alpha_l^{1/\theta_l}\left(o_l^f\right)^{1-1/\theta_l}\right)^{\frac{\varphi_l\theta_l}{\theta_l-1}}\left(n_m^f\right)^{\varphi_m}\left(n_h^f\right)^{\varphi_h}\right)^{\nu},$$

where $\nu < 1$ is the decreasing returns to scale parameter. The l subscript denotes low skill, m medium skill, and h high skill. I also add a price wedge parameter $\gamma > 0$ to the worker's budget constraint, which exogenously increases the cost workers pay for medical care out of pocket. The budget constraint becomes:

$$c + (1+\gamma)p_m m \leq (1-T)w$$

Adding this parameter ensures that the policy counterfactual economies have unique equilibriums.

I externally calibrate every parameter except those that govern the utility function and the low-skill outsourcing weight in 2012 $\alpha_{l,2012}$. I begin by taking the estimate for the outsourcing weight in 1975 α_{1975} from Section 5. I also take the estimate for the outsourcing elasticity θ_l from this section, choosing an estimate in the middle between the lower and upper bound, $\theta_l = 6.21$. I set the share of each type of worker to be equal, $N_s = 1\ \forall s \in \{l, m, h\}$, because I assumed each skill level had the same share of employment when mapping the data on occupations to skills. I set the tax on wages $T = 0.34$ to match the average marginal tax rate from Heathcote et al. (2017). I set the price wedge parameter γ so that workers pay 4.77 percent more for medical care out-of-pocket, which matches the difference between average annual premiums for family plans between large and small firms in 2012 (Kaiser Family Foundation, 2021a). I use the difference between large and small firms because an estimate of the difference between firms and individuals is difficult to find. I set the returns to scale of the traditional firm, ν, to 0.95.

6.1.1 Calibrating the Time-Varying Parameters

While a majority of parameters are time-invariant, four vary across time, allowing me to match the increases in the price of medical care, income, the share of income paid to the top tercile, and the low-skill domestic outsourcing rate over time. The time-varying parameters are the price of medical care p_{mt}, efficiency z_t, skill weights φ_{st}, and the outsourcing weight α_t. Note that the only time periods I model are 1975 and 2012, and I detail how I calibrate each parameter's 1975 and 2012 values.

I normalize the price of medical care to one in 1975. I then set the price of medical care in 2012 to match the increase in this price between 1975 and 2012, calculated using CPIs from the Federal Reserve Economic Data (FRED). As the price of medical care is relative to that of non-medical care in the model I adjust the price of medical care using the CPI for all items less medical care.[11] The

[11]Specifically, the price of medical care is the "Consumer Price Index for All Urban Consumers: Medical Care in US City Average, Index 1980=100, Annual, Seasonally Adjusted", divided by "Consumer Price Index for All Urban Consumers: All Items Less Medical Care in US City Average, Index 1980=100, Annual, Seasonally Adjusted".

price of medical care equals 2.15 in 2012, as shown in Figure 4.

I normalize efficiency z in 1975 to 1. Using optimality conditions and the fact that the relative supplies of each skill level are constant in the model, I find that the relative efficiency in 2012 is approximately equal to the relative overall employee compensation:

$$\frac{z_{2012}}{z_{1975}} \approx \frac{\text{total employee compensation}_{2012}}{\text{total employee compensation}_{1975}} = 1.34.$$

Hence, I set $z_{2012} = 1.34$. Total employee compensation is taken from FRED, and is pictured in Figure 4. As with the price of medical care, in the model compensation is relative to the price of all items less medical care. To adjust for inflation, I divide employee compensation by the CPI for all items less medical care.[12]

I set the skill weights in 2012 using the optimality condition and the data from Section 5.1:

$$\varphi_s = \frac{\text{Expenditure on } s\text{-skill labor}}{\text{Total expenditure on labor}}. \tag{16}$$

The resulting skill weights are $\varphi_{l,2012} = 0.19$, $\varphi_{m,2012} = 0.27$, and $\varphi_{h,2012} = 0.54$. To calculate this parameter in 1975, I would ideally use similar data to that which I used to calibrate the parameter in 2012. However, data of this kind is not publicly available. So, my strategy is to match the change in these parameters over time using data only on wages. I match the change in wage shares for the three quintiles between 1978 and 2012, as calculated using supplementary data from Song et al. (2019). This data summarizes mean wages for every percentile of the income distribution, calculated using private administrative tax data. This data is advantageous because it is not top-coded, and its coverage is large. The disadvantage is that it only covers wages, not employer health plans or outsourcing expenditures. This disadvantage is small as employer health plans and outsourcing expenditures were small in the 1970s.

The calibration of the outsourcing weight in 1975 follows from Section 5. I calibrate the outsourcing weight in 2012 α_{2012} internally to match the outsourcing rate in 2012. Logically, following from Equation (11), the cost ratio accounts for a share of the outsourcing rate, while α_{2012} accounts for the rest.

6.1.2 Internal Calibration

I internally calibrate the three utility function parameters and the 2012 outsourcing weight using a minimum distance estimator. I simulate and match four moments from the data. I describe how I construct each moment from the data and which parameter each moment (roughly) pins. The first moment — the ratio of employer health plan expenditures to wage expenditures in 2012 — is taken

[12]Specifically, the series is "National income: Compensation of employees, Billions of Dollars, Annual, Not Seasonally Adjusted" divided by "Employment Level, Thousands of Persons, Annual, Seasonally Adjusted", then adjusted by "Consumer Price Index for All Urban Consumers: All Items Less Medical Care in US City Average, Index 1980=100, Annual, Seasonally Adjusted".

Table 3: Summary of Parameters and Targeted Moments

Parameter		Value	Moment	Model	Data
External, time-invariant					
N_s	Mass of workers of skill s	1			
T	Average tax on wages	0.34			
γ	Medical care price wedge	0.05			
ν	Returns to scale, traditional firms	0.95			
θ_l	EOS, low-skill employees vs outsourced	6.21			
External, time-varying					
$p_{m,1975}$	Price of medical care, 1975	1	Normalized		
$p_{m,2012}$	Price of medical care, 2012	2.15	Δprice of medical care, 1975-2012		
z_{1975}	Efficiency, 1975	1	Normalized		
z_{2012}	Efficiency, 2012	1.34	Δemployee compensation, 1975-2012		
$\varphi_{s,1975}$	Skill weights, 1975	[0.2,0.29,0.5]	Δskill-level wage shares, 1975-2012		
$\varphi_{s,2012}$	Skill weight, 2012	[0.19,0.27,0.54]	Skill-level expenditure shares, 2012		
α_{1975}	Weight on low-skill outsourcing, 1975	0.03	Low-skill outsourcing rate, 1975	0.03	0.03
Internal					
α_{2012}	Weight on low-skill outsourcing, 2012	0.11	Low-skill outsourcing rate, 2012	0.14	0.14
ψ	Weight on goods in utility	0.999...	$\frac{\text{health plan}}{\text{wage}}$, 2012	0.14	0.09
η	EOS, goods vs medical care	0.06	$\Delta\frac{\text{health plan}}{\text{wage}}$, 1975 to 2012	0.05	0.05
ϵ	Non-homotheticity	0.81	$\Delta\frac{\text{health plan}}{\text{wage}}$ across industries, 2012	0.1	0.1

Notes: The table shows the parameter values and the targeted moments from the main model specification. EOS stands for "elasticity of substitution."

directly from NIPA data. Loosely, this moment pins the weight on goods in the utility function ψ.

The second moment is the change in the employer health plan to wage ratio across industries. I measure this moment using the industry data described in Section 5.1. I group industries in the cross-sectional data into quantiles using their high-skill weights. I calculate the health plan to wage ratio and average skill weights for each quantile. Then, using only the top and bottom quantiles, I measure the change in employer health plans with respect to wages. I find that across industries a \$10 increase in wage bill per employee is associated with a \$1 increase in employer health plan expenditures per employee. Using more disaggregated data does not significantly affect this slope. This moment captures income effects. Employer health plan contributions vary with labor composition across industries. This variation speaks to how income affects the demand for medical care. Loosely, this moment pins the non-homotheticity parameter ϵ.

The third moment is the change in the employer health plan to wage ratio over time. It is taken directly from NIPA data. I find that total expenditures on employer health plans divided by total expenditure on wages increased by 0.05 between 1975 and 2012. Intuitively, the previous moment determines how much income effects can drive the increase in medical care expenditure over time. Whatever is left over is considered due to price effects and thus pins the elasticity of substitution between goods and medical care η.

The last moment is the outsourcing rate in 2012. Intuitively, this moment pins the outsourcing rate in 2012. Some share of the outsourcing rate in 2012 is due to the cost ratio, and whatever is not due to the cost ratio is attributed to the outsourcing weight.

Table 4: Untargeted Moments

Moment	Model	Data	Source
Income elasticity of medical care	0.86	0.72	Acemoglu et al. (2013)
$\frac{\text{cost of low-skill at traditional firm}}{\text{cost of low-skill at outsourcing firm}}$, 2012	1.06	1.07	CPS ASEC
Δ Medical Care Expenditure Share, 1975-2012	0.15	0.14	FRED
Medical Care Expenditure Share, 2012	0.29	0.25	FRED

Notes: The table shows untargeted moments from the data and the model. FRED stands for Federal Reserve Economic Data. CPS ASEC stands for the Current Population Survey Annual Social and Economic Supplement.

I describe the steps to simulate the four moments for a set of parameters. First, I calibrate the model to 1975. I set the four time-varying parameters $\{p_m, z, \varphi_s, \alpha\}$ to their 1975 values and remove the anti-discrimination constraint. From this equilibrium, I get the ratio of employer health plans to wages for 1975. Next, I calibrate the model to 2012. I set the price of medical care p_m, efficiency z, the skill weight φ_s, and outsourcing weight α to their 2012 values and implement the anti-discrimination constraints. From this equilibrium, I get the outsourcing rate in 2012 and the employer health plan to wage ratio for 2012. Together with the health plan to wage ratio for 1975, I get the change in this ratio over time. Next, while keeping prices and aggregates the same, I calculate the employer health plans to wage ratio for two traditional firms: one with a high demand for high-skill labor, and one with a low demand for high-skill labor. These two traditional firms' skill weights are taken directly from the data: I group industries into quantiles by their high-skill weights. The mean skill weights from the bottom quantile are used to calibrate the traditional firm with low demand for high-skill labor. The mean skill weights from the top quantile are used for the firm with high demand for high-skill labor. I use these two traditional firms to calculate the change in employer health plans with respect to wages across industries.

Table 3 displays the parameter's calibrated values and the matched moments. The model matches the change in the employer health plan to wage ratio both over time and across industries. I estimate that goods and medical care are strong complements — with a low elasticity of substitution of 0.06. This estimate implies that a 1 percent increase in the relative price of medical care p_m increases the relative expenditure on medical care $\frac{p_m m}{c}$ by 0.94 percent. It also implies that increasing the health plan offered to low-skill employees allows their wage rate to be decreased by a minuscule amount. Turning to the non-homotheticity parameter, I estimate this parameter ϵ is less than one. Hence, I find that medical care is a necessity: an increase in utility decreases the share of expenditure on medical care. Hence, the increase in the medical care expenditure share over time is entirely due to price effects, not income effects.

The model matches several untargeted moments, as shown in Table 4. While the model overshoots the medical care expenditure share in 2012 by four percentage points, it matches the change in this ratio over time. Hence, despite the model's simple relationship between employer health

Table 5: Attributing the Increase in Low-Skill Domestic Outsourcing to the Three Trends

	Δ p.p.	% explained
Data:	10.72	
Model:		
High-skill demand $\varphi_h \uparrow$ alone	0	0
Efficiency $z \uparrow$ alone	0	0
Price of medical care $p_m \uparrow$ alone	0	0
Anti-discrimination laws alone	0.53	4.9
Laws + $\varphi_h \uparrow$	0.53	4.9
Laws + $z \uparrow$	0.5	4.6
Laws + $p_m \uparrow$	1.26	11.8
Laws + $\varphi_h \uparrow + z \uparrow + p_m \uparrow$	1.18	11.1

Notes: The table shows the percentage point change in low-skill domestic outsourcing between 1975-2012 and the amount of this change explained by each model counterfactual.

plans and medical care expenditure, the model matches untargeted moments characterizing medical care expenditure. The model also matches the compensation cost ratio in 2012. The last moment in the table is the income elasticity of medical care. I find that the income elasticity of medical care — the percent increase in medical care expenditure given a one percent increase in income — is 0.82 percent. This estimate reasonably fits into the literature, where Acemoglu et al. (2013) estimates an income elasticity of 0.72, with an upper bound of 1.1. I conclude that the calibration strategy is valid because it matches several important untargeted moments.

6.2 Results

With the calibrated model in hand, I attribute the difference in compensation costs between employees and outsourced workers — and thus the growth in domestic outsourcing — to the increase in the price of medical care, the increase in income, the shift in labor demand towards high-skill labor, the passage of anti-discrimination laws, and interactions between these factors. I solve for the equilibrium of the 1975 baseline model, change a facet of the model to match a moment from 2012, and then solve for the new equilibrium. I attribute the change in outsourcing between the two equilibriums to the facet I changed.

Table 5 shows the results. As expected from the discussion in Section 4, each trend does not affect outsourcing without the anti-discrimination laws. Adding the laws alone explains 4.9 percent of the increase in low-skill domestic outsourcing seen in the data.

The interaction between the shift in demand towards high-skill labor φ_h and the laws had close to zero effect on the outsourcing rate. This result follows from the fact that the traditional firm finds it optimal to offer a health plan close to that which minimizes the cost of the medium skill worker a_m^*. Hence, the distance between a_m^* and a_l^* largely determines how much more expensive low-skill employees are than low-skill outsourced workers, thus determining the low-skill outsourcing rate. The increase in the high-skill weight in φ_h shifts up the utility of high-skill workers but shifts down that of medium and low-skill. The traditional firm still finds choosing a health plan close to a_m^* optimal. The distance between a_m^* and a_l^* only changes slightly, barely affecting outsourcing. To meet the high-skill worker's new utility level, the firm finds it optimal to increase their wages instead of increasing the health plans of all their workers.

The interaction between the efficiency z increase and the laws had a small, negative effect on the outsourcing rate. This follows from the fact that medical care is a necessity; as utility increases, workers want to decrease their relative expenditure on medical care. Hence, an increase in efficiency, and thus utility for all workers, does not significantly increase the distance between cost-minimizing health plans.

The interaction between the price of medical care and the laws did contribute to the rise in low-skill domestic outsourcing, explaining 11.8 percent of its increase. This follows from the fact that goods and medical care are strong complements. An increase in the price of medical care increases the share of income all workers want to spend on medical care, increasing the level difference between cost-minimizing plans and, thus, low-skill domestic outsourcing.

I conclude that the difference in employer health plan costs between employees and outsourced workers — and the share of the increase in domestic outsourcing due to health plan costs — is entirely due to the interaction between the rising price of medical care and the anti-discrimination laws. In contrast, the increase in income and high-skill demand had negligible effects. This result hinges on the estimation of the utility function parameters. Note that the explanatory power of healthcare costs — the 9 to 19 percent in the second row of Table 2 — is unaffected by the utility function parameterization. For instance, if medical care was a luxury instead of a necessity, then the percent of domestic outsourcing explained by the model would shift from the rising price of medical care to the rising income, but the total amount explained by health plans would remain the same.

7 Policy Counterfactuals

I perform three policy counterfactuals and measure their welfare and inequality implications. First, I remove the anti-discrimination constraint. Second, I remove the tax advantage of employer health plans. Third, I force the traditional firm to offer outsourced workers the same health plans as employees. This section has two parts. I first describe the goals of each counterfactual along with the expected effect through the lens of the model. Then, I explain the resulting welfare and distributional effects of each policy.

7.1 Discussion of Each Policy Counterfactual

The first policy counterfactual is removing the anti-discrimination laws. The anti-discrimination laws themselves aim to improve the quality of health plans that low-skill workers receive. Through the lens of the model, the anti-discrimination laws are inherently inefficient through two channels. First, it increases the price of employees above outsourced labor, causing the traditional firm to hire an inefficiently low amount of employees. This decreases overall output. Second, it forces the traditional firm to offer all workers the same health plan. This causes low-skill workers to consume an inefficiently high amount of medical care — they could achieve the same level of utility using fewer resources if they consumed less medical care and more non-medical care goods. Similarly, high-skill workers waste some of their compensation because they purchase medical care with both after-tax wages and non-taxed health plans, as opposed to only non-taxed health plans. Hence, I expect that removing this policy will increase welfare.

The second policy counterfactual is removing the tax exemption of employer health plans. The tax exemption on employer-provided health plans is costly; according to Congressional Budget Office (2019), the tax exclusion of employer health plans cost the government \$300 billion dollars in 2020. This exemption acts as a substantial subsidy on employer health plans Finkelstein et al. (2023), and a large literature documents the distortionary effects of this subsidy on health insurance coverage, wages, and labor supply decisions (e.g. Gruber and Madrian (2002)). For example, Finkelstein et al. (2023) finds that removing this tax subsidy would decrease the college wage premium by 11 percent and increase non-college employment by half a million.

In the model, I remove the tax exemption by setting a tax on employer health plans equal to that on wages, then adjusting the rate of these taxes to keep tax revenue neutral. Removing the tax advantage should decrease medical care consumption and increase goods consumption. Firms will still offer positive employer health plans because medical care is exogenously cheaper when purchased through the employer due to the exogenous price wedge γ.

The third policy counterfactual forces traditional firms to offer outsourced workers the same health plans as employees. This policy is similar to Assembly Bill 5 in California (California Legislative Information, 2019) and that suggested by the Labor Secretary in 2021 (Bose, Nandita, 2021). The idea behind these policies is to give outsourced workers access to employee benefits and increase their overall compensation.

In the model, this policy affects efficiency through two channels, pulling in opposite directions. First, it increases the marginal cost of low-skill outsourced workers to that of low-skill employees. This causes the traditional firm to purchase fewer outsourced workers and makes the marginal products of both types of workers equal, satisfying efficiency condition (6) and increasing output:

$$\frac{\partial y}{\partial n_s} = w_s^f + a_s^f = \frac{\partial y}{\partial l_s}.$$

However, this policy also moves outsourced workers away from their cost-minimizing compensa-

Table 6: Policy Counterfactuals: Changes in Welfare Relative to Baseline Economy

	Skill		
	Low	Medium	High
a. Remove Anti-Discrimination Laws			
%Δ Utility v_s	5.2	0.0	3.7
%Δ Consumption (Non-Medical) $E[c]$	6.2	-0.2	3.2
%Δ Medical Care $E[m]$	-22.5	1.2	5.3
b. Remove Tax Advantage of Employer Health Plan			
%Δ Utility v_s	3.1	-1.8	2.3
%Δ Consumption (Non-Medical) $E[c]$	4.4	-1.5	2.3
%Δ Medical Care $E[m]$	-24.9	-2.5	1.9
c. Outsourced and Employees get Same Health Plan			
%Δ Utility v_s	-0.8	-0.0	-0.0
%Δ Consumption (Non-Medical) $E[c]$	-0.9	0.1	-0.0
%Δ Medical Care $E[m]$	3.6	-0.5	-0.0

Notes: The table shows the change in metrics for the policy counterfactual economies relative to the baseline economy.

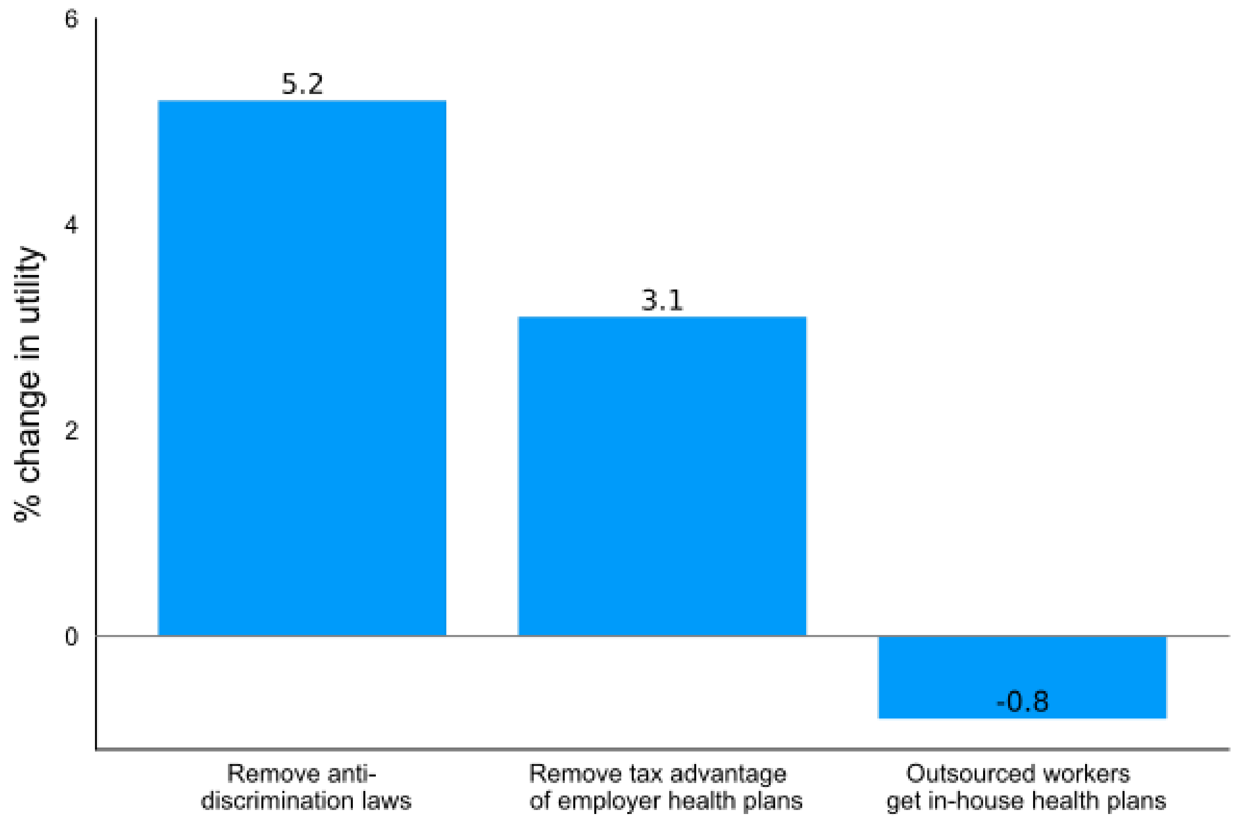
tion package. Outsourced workers' health plans increase while their wages decrease. The level of resources they consume to stay on the same indifference curve increases, creating inefficiency.

7.2 Results

Figure 7 displays the welfare effects for each policy counterfactual for the low-skill workers. The y-axis is the percent change in utility of the low-skill worker compared to the baseline economy. Each bar corresponds to a policy counterfactual. As pictured, removing the anti-discrimination laws has a large effect on the low-skill worker's welfare, increasing their utility by 5.2 percent. Removing the tax advantage of employer health plans also has a large welfare effect, increasing their utility by 3.1 percent. Conversely, forcing firms to offer outsourced workers the same health plans as their employees has a small, negative effect on low-skill workers — decreasing their utility by 0.8 percent.

Table 7 shows the changes in utility, consumption, and medical care between the counterfactual and baseline economies, for each skill level of worker. As seen in the first column, the low-skill worker's utility increases in the first two policy counterfactuals by increasing their non-medical care consumption. In these counterfactuals, their medical care consumption decreases by a large amount. This is due to the anti-discrimination laws forcing firms to offer low-skill workers inefficiently large health insurance plans. When these constraints are removed or weakened due to removing the tax advantage on employer health plans, the low-skill workers consume more goods and less medical care. In the third counterfactual, where outsourced workers and employees get the same health

Figure 7: Policy Counterfactuals: Welfare Effects for Low-Skill Workers



Notes: The figure shows the percent change in the low-skill worker's utility for each policy counterfactual, compared to the benchmark 2012 economy.

plan, medical care consumption of low-skill workers increases as expected, but general consumption decreases, causing overall utility to decrease.

What about medium-skill workers? Column 2 in Table 7 shows their welfare metrics. Removing the anti-discrimination constraints only slightly affects their utility level. In the baseline economy with these constraints, the traditional firm found it optimal to offer a health plan close to that which minimized the cost of the medium-skill worker, a_m^*. When the anti-discrimination constraints are removed, the firm does not change the medium-skill worker's compensation package very much. As a result, their utility does not change in the first counterfactual. In the second counterfactual, their utility actually decreases. The reason is that when the tax advantage is removed, the firm finds it optimal to decrease their health plan close to the level that minimizes the low-skill worker's cost, a_l^*. This increases the cost of the medium-skill worker and decreases their demand and, thus, utility. The third counterfactual does not affect the welfare of the medium-skill worker.

The welfare effects of each counterfactual on the high-skill workers are in column 3 of Table 7. When the anti-discrimination laws are removed, the high-skill worker's utility increases by 3.7 percent. This stems from their cost decreasing, increasing their demand and utility. Similarly,

Table 7: Inequality in the Baseline and Counterfactual Economies

	Ratio, high- to low-skill	
Economy	Wage $E[\frac{w_{jh}}{w_{jl}}]$	Utility $\frac{v_h}{v_l}$
Baseline	3.39	3.02
Remove Anti-Discrimination Laws	2.97	2.97
Remove Tax Advantage of Employer Health Plan	3.44	2.99
Outsourced and Employees get Same Health Plan	3.42	3.04

Notes: The table shows the change in the wages and utility of the high-skill workers relative to that of the low-skill, for the baseline and policy counterfactual economies.

removing the tax advantage increases their utility by 2.3 percent, as they benefit from the lower tax on wages. Lastly, forcing outsourced workers to get the same health plans as employees has a minimal effect on the high-skill workers.

The welfare improvements of the first two policy counterfactuals follow from a more efficient allocation of resources. That is, the marginal utility of goods moves closer to the marginal utility of medical care. Hence, workers yield their utility levels using overall less resources. The first two policy counterfactuals could have potentially increased overall output by decreasing workers' marginal costs, but this channel is insignificant. Under the first two policy counterfactuals total output increases by less than 0.1 percent.

Next, I explore the effect of the policy counterfactuals on inequality. Table 7 displays the utility and wages of high-skill workers relative to low-skill for the baseline and counterfactual economies. In the baseline economy, the high-skill worker's wage is 3.39 times that of the low-skill worker. Removing the anti-discrimination laws decreases this ratio to 2.97. Hence, removing the anti-discrimination decreases wage inequality by a large amount. However, the utility ratio barely changes between these two economies. Hence, while wages move closer together, employer health plans spread out. This means that looking only at wages to measure inequality is somewhat misleading. The other two policy counterfactuals have minuscule effects on either measure of inequality.

8 Conclusion

I construct a new theory to explore the relationship between employer health plans and domestic outsourcing. Quantitatively, I find that the rising price of medical care interacting with the anti-discrimination tax statutes was responsible for 9 to 19 percent of the increase in low-skill outsourcing seen in the data between 1975 and 2012. I conclude that the rising price of medical care is an economically meaningful driver of the increase in low-skill domestic outsourcing in the US.

The employer health plan explanation for the rise in domestic outsourcing is unique to the US. Other countries, like Germany (Goldschmidt and Schmieder, 2017) and France (Bilal and Lhuillier, 2021), have also seen an increase in low-skill domestic outsourcing but offer universal, publicly funded health care. Economists may argue that the driver of low-skill domestic outsourcing must be universal across countries, thus discounting the health plan explanation. However, the health plan explanation can explain at most one-fifth of the rise in the US, leaving the possibility for a universal driver across all countries to play a role.

I also use the calibrated model to perform several policy counterfactuals. I find that removing the tax advantage and employer health plans or removing the anti-discrimination laws increases the welfare of both low- and high-skill workers. I also find that forcing firms to offer outsourced workers in-house health plans decreases the welfare of low-skill workers. I conclude that policy that forces firms to offer low-skill workers generous health plans should be considered with caution, as firms may respond by decreasing wages, lowering the overall welfare of low-skill workers.

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Table 8: Employment Growth by Low-Skill Outsourcing Industry, 1980-2015

	Employment Share, %		
Admin Services 5-digit Sub-Industry	1980	2015	Change, pp
Temporary Help Services	0.4	2.7	2.2
Professional Employer Organizations	0.1	2	1.8
Janitorial Services	0.3	0.8	0.5
Security Services	0.2	0.6	0.4
Office Administrative Services	0.1	0.4	0.3
Telephone Call Centers	0.1	0.4	0.2
Facilities Support Services	0	0.2	0.2
Other	1.4	1.6	0.2

Notes: The table displays employment shares for the 5-digit sub-industries of Administrative and Support Services (NAICS 561). An industry's employment share is its share of total private employment. Data is from Eckert et al. (2021).

A Appendix

A.1 The Rise of Low-Skill Domestic Outsourcing

As is common in the literature, I use industry classification to identify outsourced labor.[13] I define employment in "Administrative and Support Services" (NAICS 561) as low-skill domestically outsourced labor and measure this using County Business Patterns data from Eckert et al. (2021), who use crosswalks to harmonize industry classification across time. I classify expenditure on output from this industry as expenditure on low-skill domestically outsourced labor, and I measure this expenditure using input-output tables from the BEA.

Since 1980 firms increased their usage of low-skill domestically outsourced labor of many occupations. This can be seen in Table 8, which documents the growth of 5-digit sub-industries of "Administrative and Support Services." The table shows the growth of the industry is due to the growth of multiple sub-industries. As sub-industries specialize in different occupations, this implies that the overall growth of the industry is due to growth across multiple occupations. "Temporary Help Services" by nature employs many different occupations. "Janitorial Services" mainly employs janitors, while "Security Services" mainly employs security guards. "Professional Employer Organizations" supply firms with Human Resources services. (Arguably, this industry fits better in medium- or high-skill domestic outsourcing. This is the only major sub-industry of Administrative Services that qualitatively does not fit under the low-skill outsourcing label.)

If service industries, on average, use more outsourced labor than manufacturing, then the shift of economic activity towards services would mechanically increase domestic outsourcing. I find

[13]See Dube and Kaplan (2010), Dorn et al. (2018), or Bostanci (2021).

Table 9: Change in Economy-Wide Intermediate Input Intensity, 1980-2015

	Share of Economy's Output, %		
Intermediates Supplied by Sector	1980	2015	Change, pp
Finance, Insurance, and Real Estate	4.7	9.4	4.6
Professional, Scientific, and Technical Services	2.9	5.5	2.6
Administrative and Support Services	0.9	2.5	1.7
All Other Service Industries	10.6	12.2	1.5
Goods-Producing Industries	31.4	17.1	−14.2

Notes: The table shows the share of economy-wide output spent on intermediate inputs from each sector. Data is from Input-Output tables from the BEA.

that this is not the case using a variance decomposition. Let s denote expenditure on low-skill domestically outsourced labor divided by value added. The change in this ratio over a period is

$$\Delta s = \sum_{j \in J} \underbrace{\bar{\omega}_j \Delta s_j}_{\text{within-industry}} + \underbrace{\Delta \omega_j \bar{s}_j}_{\text{between-industry}}$$

where J is the set of all industries and ω_j is industry j's share of total economy-wide output. The over bar denotes the mean of the variable over the period, and Δ denotes the percentage point change over the period. The within-industry component measures how much of the overall change was due to changes that occured within each industry. Between 1970 and 2021, the within component was responsible for 86% of the total increase, while the between component was responsible for only 14%. Hence, the increase in expenditure on low-skill domestic outsourcing is due to many industries increasing their use of outsourced labor, not the shift from manufacturing to services.

How does the growth of low-skill domestic outsourcing compare to that of other intermediate inputs? Table 9 shows the share of the economy's total output paid to intermediate inputs from every sector. The share of the economy's output paid to intermediates from the low-skill outsourcing industry increased by 1.7 percentage points between 1980 and 2015. Over this same period, only two sectors experienced higher growth: Finance, Insurance, and Real Estate (NAICS 53 and 55); and Professional, Scientific, and Technical Services (NAICS 541). The latter is associated with high-skill outsourcing, comprising accounting, legal, managerial consulting, and other high-skill services. All other service industries combined had less growth along this dimension, while goods-producing industries saw a significant decline.

A.2 Microfoundation for the CES Aggregator

This section follows Eaton and Kortum (2002). For each skill level $s \in \mathcal{S}$ there is a unit measure of tasks $j \in [0, 1]$. These unit measures do not overlap; each task can be completed by only one skill level. I drop firm and skill subscripts from here on out for convenience.

Workers are either in-house or outsourced. I call a worker's employment status its type. The efficiency of type i workers in producing a unit of task j is $z_i(j)$. Hence $Q_i(j) = n_i(j)z_i(j)$.

With CRS, the price of a unit of task j from workers of type i is $p_i(j) = \left(\frac{c_i}{z_i(j)}\right)$, where c_i is the input cost for workers of type i. For in-house workers, $c_{in} = (w + a)$, and for outsourced workers $c_{out} = p_o$. Firm chooses to outsource task j if the price is lower.

Assume that task-level labor $Q(j)$ is aggregated in a CES fashion to yield total labor,

$$\mathbf{n} = \left(\int_0^1 Q(j)^{\frac{\sigma-1}{\sigma}} dj\right)^{\frac{\sigma}{\sigma-1}}.$$

where $Q(j) = \sum_i n_i(j) * z_i(j)$.

Assume efficiency of type i workers for task j $z_i(j)$ is the realization of a random variable z_i drawn independently for each j from a type specific discribution $F_i(z)$. Assume that this distribution is a Frechet distribution,

$$F_i(z) = e^{-T_i z^{-\psi}}$$

where $T_i > 0$ and $\psi > 1$. Following Eaton and Kortum (2002), assuming that the efficiencies are pulled from a Frechet distribution yields that the price index for labor $\mathbf{n}$ is

$$q_n = \gamma[\sum_i T_i c_i^{-\psi}]^{-1/\psi},$$

where $\gamma = \left[\Gamma\left(\frac{\psi+1-\sigma}{\psi}\right)\right]^{1/(1-\sigma)}$ is a constant (Γ is the Gamma function). The share of expenditure on type i workers is

$$\frac{X_i}{X} = \frac{T_i c_i^{-\psi}}{\sum_{i'} T_{i'} c_{i'}^{-\psi}}.$$

Thus, the expenditure shares and price index from the task-based set up match the model's main CES specification. To clearly see this, set parameters $\psi = \theta - 1$, $T_{in} = \gamma^{\psi}$, and $T_{out} = \alpha\gamma^{\psi}$.

A.3 Proof of Proposition 2

Assume one traditional firm. The overview of this proof follows. First, I characterize the Pareto Efficient equilibrium of the social planner's problem. Then, I characterize the competitive equilibrium of the baseline economy without the anti-discrimination constraint. The equations that characterize these two equilibrium are identical, thus proving the competitive equilibrium is Pareto Efficient.

The social planner's problem is:

$$\max_{c_s,m_s,n_s,l_s} \sum_s \omega_s u(c_s, m_s) \tag{17}$$

$$s.t. \sum_s \tau c_s + X \leq y(\{n_s, l_s) \tag{18}$$

$$M \leq z_m X \tag{19}$$

$$\sum_s m_s \leq M \tag{20}$$

$$o_s \leq O_s \quad \forall s \tag{21}$$

$$O_s + n_s \leq N_s \quad \forall s \tag{22}$$

where ω_i is the weight on person i, X is the amount of output used to produce medical care, z_m is the efficiency of the medical care technology, M is the total quantity of medical care produced, and $\tau = \frac{1}{1-T}$ is a friction that destroys output when it is consumed as the non-medical care good. The solution is characterized by the following equations:

$$u_c(c_s, m_s) = \frac{\lambda\tau}{\omega_s} \quad \forall s \tag{23}$$

$$u_m(c_s, m_s) = \frac{\lambda}{z_m\omega_s} \quad \forall s \tag{24}$$

$$\frac{\partial y}{\partial n_s} = \frac{\partial y}{\partial l_s} \quad \forall s \tag{25}$$

$$o_s + n_s = N_s \quad \forall s \tag{26}$$

$$\sum_s \tau c_s + \frac{1}{z_m} m_s = y \tag{27}$$

where λ is the lagrangian multiplier on the reseource constraint.

Now I turn to the competitive equilibrium. Firms are unconstrained by the anti-discrimination constraints, so their choices for compensation packages is only constrained by the market prices $\tilde{v}_s$. Given market prices firms solve for and offer the cost-minimizing compensation packages defined by Equation (8).

Claim 1. *Claim: An s-skill worker given $\{a_s^*, w_s^*\}$ sets out-of-pocket medical care $m = 0$. Hence, all their medical care is purchased with the health plan.*

Proof. Proof: Assume by way of contradiction that $m > 0$. Let ϵ denote the share of after tax wages spent on out-of-pocket medical care, so $\epsilon > 0$. Goods consumed is $(1 - T)w(1 - \epsilon)$, and medical care is $\frac{a+(1-T)w\epsilon}{p_m}$. Consider the compensation package $\{a_s^* + \delta, w_s^* - \delta\}$, where δ satisfied $(1 - T)w\epsilon < \delta < w\epsilon$. This compensation package is the same cost as $\{a_s^*, w_s^*\}$, and it yields strictly more utility than $\{a_s^*, w_s^*\}$. Thus, $v(a_s^* + \delta, w_s^* - \delta) > v(a_s^*, w_s^*) = \tilde{v}_s$. Hence, from here consider the package $\{a_s^* + \delta - \omega, w_s^* - \delta - \omega\}$, for sufficiently small ω. This package is cheaper than $\{a_s^*, w_s^*\}$ while yielding more utility than $\tilde{v}_s$. So, we have constructed a compensation package that is cheaper than $\{a_s^*, w_s^*\}$ while satisfying $v(a, w) \geq \tilde{v}_s$. Thus, $\{a_s^*, w_s^*\}$ is not the argmin of (8). We have reached a contradiction. Thus, at the cost-minimizing compensation package, out-of-pocket medical care is 0, $m = 0$. $\square$

Hence, firms offer the cost minimizing compensation packages where $m = 0$. Hence, Equation (8) simplifies to

$$\{a_s^*, w_s^*\} = \underset{\{a,w\} \in R_+^2}{\operatorname{argmin}} \left\{ a + w \mid u\left((1-T)w, \frac{a}{p_m}\right) \geq \tilde{v}_s \right\}. \tag{28}$$

Thus consumption of the s-skill worker is $c_s = (1-T)w_s^*$, and medical care is $m_s = \frac{a_s^*}{p_m}$. The optimality conditions of (28) yield the following two equations, which in part characterize the equilibrium allocation.

$$u_c = \lambda_s^{-1} \frac{1}{(1-T)} \ \forall s, \tag{29}$$

$$u_m = \lambda_s^{-1} \frac{1}{z_m} \ \forall s. \tag{30}$$

where we use the fact that $p_m = \frac{1}{z_m}$ following from the medical care firm's profit maximization problem. The outsourcing firm profit maximization problem implies $p_s = (w_s^* + a_s^*)$. Now consider the firm profit maximization problem. Optimality implies

$$\frac{\partial y}{\partial n_s} = w_s^* + a_s^* \quad \forall s \in \mathcal{S}$$
$$\frac{\partial y}{\partial o_s} = w_s^* + a_s^* \quad \forall s \in \mathcal{S}$$

which simplifies to

$$\frac{\partial y}{\partial n_s} = \frac{\partial y}{\partial o_s} \tag{31}$$

The equilibrium allocation is characterized by equations (29), (30), (31) and the labor market clearing condition and the resource constraint. Hence, the competitive allocation is identical to the social planner problem if the social planner uses the following weights:

$$\omega_s = \lambda \lambda_s \tag{32}$$

Hence, social planner weights exist such that the social planners allocation is identical to the competitive equilibrium allocation. Because the social planners allocation is Pareto Efficient, so is the competitive equilibrium allocation without the anti-discrimination laws.

A.4 Proof of Proposition 1

(Note that I write this proof for a traditional firm with anti-discrimination constraints, but the proof for outsourcing firms or a traditional firm without anti-discrimination constraints is identical, with the exception of some notation.)

Assume by way of contradiction that the profit maximizing choice for a firm has $a^j = 0$ for some firm j. Denote the compensation packages and resulting allocations with hats, so wages are $\hat{w}_s$. By the fact the utility function satisfies INADA conditions, all workers at firm j expend a positive amount of after-tax wages on medical care, $\hat{m}_s > 0 \; \forall s$. WLOG, label the smallest medical care $\hat{m}_l$. Let $\hat{\iota}_s$ denote the share of wages spent on medical care by skill s.

Consider compensation packages $\{\bar{w}_s, \bar{a}\}_s = \{\hat{w}_s - p_m \hat{m}_l, p_m \hat{m}_l\}_s$. By construction, under this scheme each worker costs the same as that under the profit maximizing scheme. Consider $io\bar{t}a_s = io\hat{t}a_s \frac{\hat{w}_s}{\hat{w}_s - p_m \hat{m}_l} - \frac{p_m \hat{m}_l}{\hat{w}_s - p_m \hat{m}_l}$. With packages $\{\bar{w}_s, \bar{a}\}_s$ and $\hat{\iota}_s$, consumption $\hat{c}_s = \bar{c}_s$ and $\hat{m}_s < \bar{a}_s$. Hence, $\{\bar{w}_s, \bar{a}\}_s$ yields at least strictly more utility than the profit maximizing scheme, so

$$v(\bar{a}, \bar{w}_s) > v(0, \hat{w}_s) \geq \tilde{v}_s.$$

Consider a compensation package $\{\bar{w}_s, \bar{a} - \delta\}_s$, where δ is sufficiently small so that $v(\bar{a} - \delta, \bar{w}_s) > \tilde{v}_s$. This compensation package satisfies both constraints facing the traditional firm, and decreases the cost of all workers. Hence, the resulting profits from this package are at least strictly greater than that of the profit maximizing package. This is a contradiction.

$\square$

A.5 Proof of Proposition 4

The traditional firm first order conditions (dropping the firm superscript for convenience) are

$$\nu \varphi_s y = q_s \mathbf{n}_s \quad \forall s \tag{33}$$

$$\tilde{v}_s = u(w_s, a) \quad \forall s \tag{34}$$

$$\frac{\partial q_s}{\partial w_s} \mathbf{n}_s = \lambda_s \frac{\partial u_s}{\partial w_s} \quad \forall s \tag{35}$$

$$\sum_s \frac{\partial q_s}{\partial a} \mathbf{n}_s = \sum_s \lambda_s \frac{\partial u_s}{\partial a} \tag{36}$$

where $q_s = [(w_s + a)^{1-\theta_s} + \alpha p_s^{1-\theta_s}]^{\frac{1}{1-\theta_s}}$ is the price index of $\mathbf{n}_s$, and $u_s \equiv u(w_s, a)$. Combine (36) and (35) to get

$$\sum_s \left(\frac{\partial q_s}{\partial a} - \frac{\partial u_s}{\partial a} \frac{\partial w_s}{\partial u_s} \frac{\partial q_s}{\partial w_s}\right) \mathbf{n}_s = 0$$

$$\sum_s \left(\frac{\partial q_s}{\partial a}\frac{\partial w_s}{\partial q_s} - \frac{\partial u_s}{\partial a}\frac{\partial w_s}{\partial u_s}\right)\mathbf{n}_s \frac{\partial q_s}{\partial w_s} = 0$$

$$\sum_s \left(\frac{\partial q_s}{\partial a}\frac{\partial w_s}{\partial q_s} - \frac{\partial u_s}{\partial a}\frac{\partial w_s}{\partial u_s}\right)\mathbf{n}_s \frac{\partial q_s}{\partial w_s} = 0$$

$$\sum_s \left(1 - \frac{\partial u_s}{\partial a}\frac{\partial w_s}{\partial u_s}\right)\mathbf{n}_s \frac{\partial q_s}{\partial w_s} = 0$$

By the chain rule

$$\frac{du_s}{da} = \frac{\partial u_s}{\partial a} + \frac{\partial u_s}{\partial w}\frac{\partial w}{\partial a} \tag{37}$$

By (34), $\frac{du_s}{da} = \frac{d\tilde{v}_s}{da} = 0$ since $\tilde{v}_s$ is a constant (a change in a causes w to change so that the utility level remains the same. Similarly, a change in w causes a to change so that the utility level remains the same). Use this fact and (37) to get

$$-\frac{\partial w_s}{\partial a} = \frac{\partial w}{\partial u_s}\frac{\partial u_s}{\partial a} \tag{38}$$

Now continue with the algebra

$$\sum_s \left(1 + \frac{\partial w_s}{\partial a}\right)\mathbf{n}_s \frac{\partial q_s}{\partial w_s} = 0$$

$$\sum_s \frac{\partial a + w_s}{\partial a}\mathbf{n}_s \frac{\partial q_s}{\partial w_s} = 0$$

Use (33) to get

$$\sum_s \frac{\partial a + w_s}{\partial a}\varphi_s q_s^{-1} \frac{\partial q_s}{\partial w_s} = 0$$

$$\sum_s \frac{\partial a + w_s}{\partial a}\varphi_s \frac{(w_s + a)^{-\theta}}{(w_s + a)^{1-\theta} + \alpha p_s^{1-\theta}} = 0$$

$$\sum_s \frac{\partial \log(a + w_s)}{\partial a}\varphi_s \frac{(w_s + a)^{1-\theta}}{(w_s + a)^{1-\theta} + \alpha p_s^{1-\theta}} = 0$$

Following from (11), I get

$$\sum_s \frac{\partial \log(a + w_s)}{\partial a}\varphi_s \frac{(w_s + a)n_s}{(w_s + a)n_s + p_s l_s} = 0$$

Take a second order Taylor approximation of $\frac{\partial \log(a+w_s)}{\partial a}$ around a_s^* to get

$$\frac{\partial \log(a + w_s)}{\partial a} \approx \frac{\partial \log(a + w_s)}{\partial a}|_{a=a_s^*} + \frac{\partial^2 \log(a + w_s^*)}{\partial a^2}\Big|_{a=a_s^*}(a - a_s^*).$$

(I take the second order approximation as opposed to the first because $\frac{\partial \log(a+w_s)}{\partial a}|_{a=a_s^*} = 0$ by the fact a_s^* minimizes labor costs)

Plug in the taylor approximations and rearrange to get

$$a \approx \sum_{s} \frac{\varphi_s \times \frac{\partial^2 \log(a+w(a,\tilde{v}_s))}{\partial a^2}\big|_{a=a_s^*} \times \frac{(w_s+a)n_s}{(w_s+a)n_s+p_s l_s}}{\sum_{s'} \varphi_{s'} \times \frac{\partial^2 \log(a+w(a,\tilde{v}_{s'}))}{\partial a^2}\big|_{a=a_{s'}^*} \times \frac{(w_{s'}+a)n_{s'}}{(w_{s'}+a)n_{s'}+p_{l_{s'}} l_{s'}}} a_s^*. \tag{39}$$

□

A.6 Proof of Proposition 6

The traditional firm's optimality conditions imply that the marginal product of either source of labor equals their per unit cost,

$$\frac{\partial y}{\partial n_s} = w_s^f + a^f, \qquad \frac{\partial y}{\partial l_s} = p_s.$$

Proposition 5 states that the price of outsourced labor equals the cost-minimizing package, $p_s = w_s^* + a_s^*$, while Proposition 4 states that the traditional firm's compensation costs are greater than the cost-minimizing package, and so the efficiency condition (6) does not hold:

$$\frac{\partial y}{\partial n_s} = w_s^f + a^f > w_s^* + a_s^* = p_s = \frac{\partial y}{\partial l_s}.$$

Thus, because one of the necessary conditions for efficiency does not hold, the resulting allocation is not efficient.

□