The Effect of Healthcare Costs on Low-Skill Domestic Outsourcing

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January 28, 2024

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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 accounts for 10 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.

*Preliminary, do not cite without permission. Email address: bassl009@umn.edu. Special thanks to Diego Ascarza Mendoza, Fil Babalievsky, Anmol Bhandari, V.V. Chari, Thomas Hasenzagl, Larry Jones, Patrick Kiernan, Hannes Malmberg, Joseph Pedtke, Chris Phelan, Todd Schoellman, Kjetil Storesletten, and Abigail Wozniak. I also thank all participants at the 2023 SED conference, the Spring 2023 Midwestern Macro Conference, and workshops at the University of Minnesota.

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 example, over a quarter of janitors are employed in Administrative & Support Service firms, which sell janitorial services to other companies (Dorn et al., 2018). Additionally, hospitals and universities commonly outsource the day-to-day operations of their cafeterias to companies like Aramark. Using data discussed in Section 2.1, Figure 1a plots the share of low-skill workers that are domestically outsourced; over the past four decades, it grew by 13 percentage points to 16 percent in 2018. Many economists are concerned with this trend, believing it is a major driver of inequality and limits workers' access to benefits (e.g. Weil, 2014; Dube and Kaplan, 2010; Song et al., 2019). However, while several explanations for this growth have been tested (Autor, 2003; Bostanci, 2021; Bergeaud et al., 2021), the driving force is yet to be determined.

I theorize that rising health insurance costs caused the rise in low-skill domestic outsourcing. Administrative & Support Service firms — which supply low-skill labor services to other firms — are almost entirely composed of low-skill employees, so they offer cheap health plans. Conversely, a traditional firm has a mix of high- and low-skill employees, so they offer more expensive health plans. This makes low-skill workers cheaper when employed through an Administrative & Support Service firm. Or, from the traditional firm's point of view, this makes outsourced low-skill workers cheaper than low-skill employees. Over time, the rise in health insurance costs further increased the price of employees relative to that of outsourced workers, increasing domestic outsourcing.

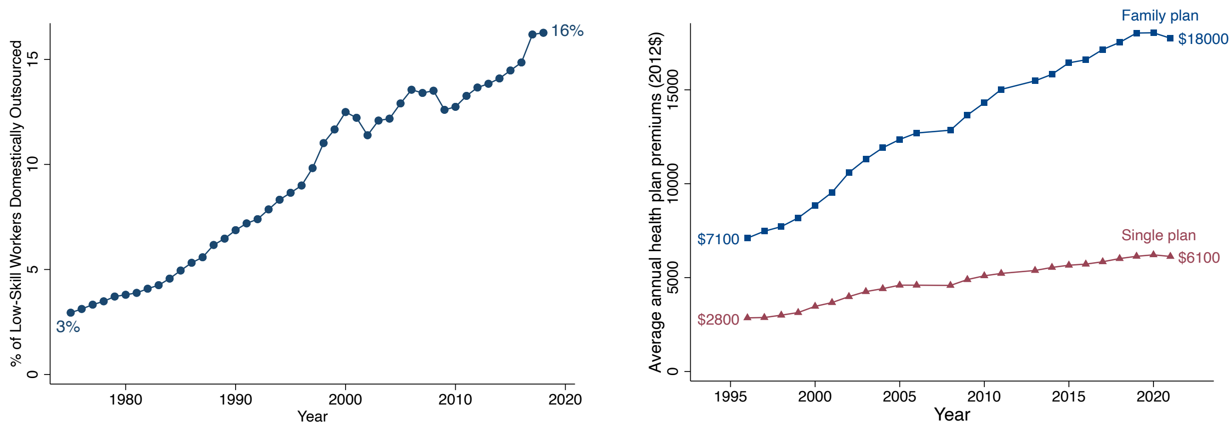
I explore this theory using a structural model. The model has three types of agents. First are workers. Low- and high-skill workers supply labor to firms, and their preferences turn goods and medical care into utility. The second agent is the traditional firm. Its production technology uses the labor of all skill levels. I assume a constant elasticity of substitution between labor from in-house employees and outsourced workers of the same skill level. Last are the outsourcing firms. There is a single representative outsourcing firm for each skill level. Each turns labor from workers into outsourced labor of the same skill level. Then, they supply the outsourced labor to the traditional firm. The key difference between the two types of firms lies in their production technologies. The traditional firm uses labor from workers of all skill levels, while each outsourcing firm uses only one skill level.

Firms compensate workers with wages and health plans. Wages can purchase both goods and medical care, while health plans can only purchase medical care. The advantage of health plans lies in their difference in tax treatment. The model features two frictions from

Figure 1: Two Increasing Trends

(a) Low-Skill Domestic Outsourcing

(b) Health Insurance Premiums



Notes: Subfigure (a) shows the percent of privately-employed low-skill workers that are domestically outsourced, following from Equation (1). Workers are low-skill if they are in the bottom tercile of occupations when ranked by mean income. Workers are domestically outsourced if they are employed in Administrative & Support Services (NAICS 561). I adjust by the share of Administrative & Support Services's output that is used as intermediates in production. Data is drawn from harmonized County Business Patterns from Eckert et al. (2021), Occupational Employment and Wage Statistics, and Input-Output tables. Subfigure (b) shows average annual premiums for employer-provided health insurance plans, using data from the Insurance Component of the Medical Expenditure Panel Survey. Premiums are normalized to 2012 dollars using the "Consumer Price Index for All Urban Consumers: All Items in U.S. City Average, Annual, Seasonally Adjusted," downloaded from Federal Reserve Economic Data.

the IRS tax code. First is the tax advantage of employer health plans — wages are taxed while health plans are not. Second are anti-discrimination constraints. These 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.

The model predicts how changes in three key parameters interacting with the IRS frictions impact the low-skill outsourcing rate. The three key parameters are the price of medical care, the traditional firm's TFP (which translates to the average income level), and the weight on high-skill workers (which translates to the demand for high-skill workers). I describe the logic in three steps. (These steps all occur simultaneously in general equilibrium, but thinking of them step by step helps with intuition.) First, the three key parameters and the tax advantage of health plans determine the cheapest compensation package that yields a worker's reservation utility level. I call the health plan in this package the *cost-minimizing health plan*.

Second, the level difference between the cost-minimizing health plans for low- and high-skill workers determines the price of employees relative to outsourced workers. Outsourcing firms use labor of only one skill level, so they choose the cheapest compensation packages for their employees. Conversely, the traditional firm uses the labor of all skill levels, so the anti-discrimination constraint forces it to choose a health plan between those that minimize the price of low- and high-skill workers. This raises the price of employees above that of outsourced workers. Suppose the cost-minimizing plans for low- and high-skill workers are close together in levels. In that case, the traditional firm offers a compensation package close to the outsourcing firm's. As the cost-minimizing plans spread out, the traditional firm increasingly offers higher health plans to low-skill workers. This increases the price of employees relative to that of outsourced workers.

Third, the relative price of employees determines the outsourcing rate. The outsourcing rate is a function of i) this relative price, ii) the elasticity of substitution between outsourced workers and employees, and iii) a weight parameter. Hence, the only way the three key parameters affect the outsourcing rate is through their effect on this relative price in general equilibrium. Further, the only way changes in these three parameters affect the low-skill outsourcing rate is in the presence of the IRS frictions. Without the tax advantage, firms do not offer health plans. Without the anti-discrimination constraint, both firms offer the same compensation packages. In either case, the relative price of employees is pinned at one.

I use the model to perform an accounting exercise and measure the effect of rising health insurance costs on low-skill domestic outsourcing. The accounting exercise has two steps. The first step requires little of the model structure. Using worker-level microdata, I estimate the difference in employer contributions to health plans for low-skill outsourced workers and employees. I use this to estimate the increase in the relative price of employees due to health insurance over time. I plug this into a closed-form equation for the increase in the low-skill outsourcing rate, and I find that this rising relative price explains 10 percent of the increase in low-skill domestic outsourcing. Importantly, this estimate relies on only a single parameter: the elasticity of substitution between outsourced workers and employees. However, the question remains: What caused the relative price of employees to increase? That is, why has the difference in employer health plan costs for low-skill employees and outsourced workers increased over time?

In the second step of the accounting exercise, I use the entire model to determine why employees have received increasingly higher employer health plan contributions than outsourced workers over time. This step requires a fully calibrated model. I simulate 1975, change one factor to its 2012 value, and attribute the change in the relative price of employees and, thus, the outsourcing rate to that factor. I test changes in three key variables: the price of medical care, TFP, and the high-skill weight. Each of these trends can potentially spread out the distance between the cost-minimizing plans for the high- and low-skill workers, depending mostly on the shape of the worker's utility function. I find that the rising price of employees due to health plans is entirely explained by rising medical care prices interacting with the IRS frictions. This follows from the fact that I find goods and medical care are strong complements when I calibrate the model. I conclude that rising medical care prices are a modest, economically meaningful driver of the increase in low-skill domestic outsourcing.

I perform three policy counterfactuals with the calibrated model. 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. 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 plan contributions should be approached cautiously because firms respond by decreasing wages.

The way I model outsourcing frictions is simple. To ensure that the traditional firm uses both outsourced workers and in-house employees, I assume these two types of labor are imperfect substitutes.[1] The advantage of my approach is twofold. First is its simplicity. One of the contributions of this paper is to understand the mechanism by which health plan expenditures impact low-skill domestic outsourcing. As shown in this paper, explicitly modeling an outsourcing friction is not necessary to understand this mechanism, and adding such frictions could actually obfuscate the mechanism. Second, the main accounting exercise only requires one parameter: the elasticity of substitution between outsourced workers and employees. This makes the accounting exercise very transparent.

My model is also stylized in its depiction of medical care and health insurance. Medical care is simply a good that enters into the utility function. Health plans are simply an

[1] I assume the labor from employees and outsourced workers enter into the traditional firm's technology in CES fashion, with an elasticity $\theta_l < \infty$. If the outsourcing elasticity $\theta_l \to \infty$, then in the baseline economy with both IRS frictions all workers are outsourced. The assumption that $\theta_l < \infty$ is sufficient to create an interior solution, where the traditional firm uses both employees and outsourced workers. Hence, I am taking a reduced form approach to modeling the frictions that create an interior solution. Some other papers take a different approach. They assume employees and outsourced workers enter additively in the firm's production technology, and add other frictions to the model to ensure interior solutions. For example, one sufficient friction is upward slopping labor supply curves (e.g. Chan and Xu, 2017; Bilal and Lhuillier, 2021). Firms face upward sloping supply curves for labor, or they can outsource at a fixed price. In equilibrium, large firms outsource while small firms do not, creating an interior solution.

untaxed form of compensation. I do not explicitly model health capital, shocks, insurance, or risk. The advantage of this simplicity is in its tractability — it allows me to formally prove propositions, discuss efficiency, and cleanly discuss a mechanism that is new to the literature. Further, despite the simplicity, the calibrated model matches several important untargeted moments, like the change in medical care expenditures over time, the income elasticity of medical care as measured by Acemoglu et al. (2013), and the difference in the price of low-skill employees and outsourced workers due to employer health plans.

My hypothesis for the rise in low-skill domestic outsourcing centers on employer health plans, but domestic outsourcing has been documented in countries with Universal health insurance, like Germany (Goldschmidt and Schmieder, 2017) and France (Bilal and Lhuillier, 2021). A reader may argue that because domestic outsourcing occurs in these other countries, the explanation for this phenomenon must not center on health insurance. I present three points against this argument. First, I find that rising health plan costs can explain 10 percent of the rise in low-skill domestic outsourcing, which leaves plenty of room for a universal driver working across many countries. Second, my theory is more general than just health plans. My theory is about forms of compensation that must be given equally to all employees — this could be other monetary benefits or amenities like subsidized cafeterias. Third, while domestic outsourcing is documented in multiple countries, its growth differs. I compare the US to Canada because they use the same industry classification schemes. In 2018, the share of total private employment in NAICS 56 — the industry that predominantly supplies low-skill labor services to firms — was 10 percent in the US but only 5 percent in Canada. This is shown in Appendix Figure 7, which uses data from County Business Patterns and Statistics Canada.

I make three contributions to the literature on domestic outsourcing. First is a novel theory with both domestic outsourcing and employer health plans. This is the first theory to feature both aspects of the labor market. The theory clarifies the mechanism by which these two forces interact. Further, the model offers a new theoretical explanation for why firms outsource. That is, compared to traditional firms, outsourcing firms are less affected by anti-discrimination 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 sloping 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 measure the effect of rising health insurance costs on low-skill domestic outsourcing. While the link between these two elements is often discussed, I am the first to quantify this relationship. Further, I explore three potential explanations for the growth of health insurance costs and, thus, 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 IRS tax frictions are crucial. 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 the rise in domestic outsourcing, employer health insurance premiums, and laws around employer health plans in the US. Sections 3 and 4 present the theoretical model and characterize the low-skill outsourcing rate. Section 5 estimates the elasticity of substitution between employees and outsourced workers, and Section 6 uses the elasticity to measure the effect of rising health insurance costs on low-skill domestic outsourcing. Section 7 calibrates the model, which the following Section 8 uses to measure the effects of the three underlying trends on low-skill domestic outsourcing. Section 9 discusses the policy counterfactual exercises. Section 10 concludes.

2 Background Information

2.1 The Rise In Low-Skill Domestic Outsourcing

Following the literature, I measure low-skill domestic outsourcing using the Administrative & Support Services (NAICS 561) industry.[2] This industry predominantly supplies low-

[2]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) measures the domestic out-

Table 1: The Most Domestically Outsourced Occupations, 2019

		Domestically Outsourced	
SOC Code	Occupation	Rate (%)	Total
37-3000	Grounds Maintenance Workers	64	637000
37-1000	Supervisors of Building, Grounds Cleaning, Maintenance	49	128000
33-9000	Other Protective Service Workers	48	771000
37-2000	Building Cleaning and Pest Control Workers	38	1189000
43-2000	Communications Equipment Operators	26	19000
39-7000	Tour and Travel Guides	19	9000
41-9000	Other Sales and Related Workers	17	105000
53-7000	Material Moving Workers	14	1000000
51-2000	Assemblers and Fabricators	14	259000
51-9000	Other Production Occupations	12	323000
43-4000	Information and Record Clerks	12	672000
49-2000	Electronic Equipment Mechanics, Installers, Repairers	11	60000
41-3000	Sales Representatives, Services	10	216000
43-9000	Other Office and Administrative Support Workers	10	362000
43-3000	Financial Clerks	8	238000

Notes: The table shows the 15 occupations with the highest outsourcing rates. Workers are considered outsourced if they are employed in the Administrative & Support Services industry (NAICS 561). Occupations are taken at the 4-digit SOC-code level. The Rate column is the percent of workers that are domestically outsourced. The Total column is the total domestically outsourced employment by occupation. Data is drawn from the 2019 Occupational Employment and Wage Statistics.

skill labor services to the economy; its sub-industries include janitorial services, security guard services, temporary help services, and office administrative services. These are the sub-industries commonly discussed in the domestic outsourcing literature. Further, over 90 percent of its output is used as intermediates in production, according to BEA Input-Output (IO) tables. Table 1 shows the occupations with the highest share of their employment in Administrative & Support Services in 2019, using Occupational Employment and Wage Statistics data (OEWS). These occupations include security guards, janitors, office assistants, call center representatives, and various manual laborers.

I estimate the share of low-skill workers domestically outsourced each year since 1975. 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-

sourcing rate for janitors and security guards by calculating the share 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.

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

$$O_{lt} = n_{561,t} \times n^{l}_{561,2012} \times m_{561,t} \tag{1}$$

where $n_{561,t}$ is employment in administrative services in year t, taken from County Business Patterns (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 IO 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 1a shows the percent of all privately employed low-skill workers that are domestically outsourced. This share increased by 13 percentage points to 16 percent between 1975 and 2018.

Is this growth part of a larger trend of increased use of intermediates in production? If the economy has increasingly used intermediates, then an increase in employment in Administration & Support Services is expected because a large share of its output is used as intermediates. Using IO data, I find that this is not the case. Appendix Table 7 shows the share of economy-wide output on intermediate inputs from each sector. The share of the economy's total output spent on Administrative & Support Services increased by a large 1.7 pp between 1980 and 2015. For comparison, only two sectors saw higher increases in this share: Finance, Insurance, and Real Estate (4.6pp) and Professional, Scientific, and Technical Services (2.6pp).[3] All other service industries combined saw less growth in this share (1.5pp), and the Goods-Producing Industry saw a large decrease (-14.2pp). Thus, the increase in low-skill domestic outsourcing is not due to a larger trend of increased intermediates.

A common hypothesis for the rise in low-skill domestic outsourcing centers on manufacturing. The idea is that the manufacturing sector increasingly used domestic outsourcing to circumvent unions. I find evidence against this hypothesis using IO tables. I measure each sector's expenditure on outputs from Administrative & Support Services (NAICS 561) as a percent of value added. Appendix Table 8 displays this percentage for 1980 and 2015. All sectors of the economy have increased their spending on low-skill domestically outsourced labor, but manufacturing's increase is relatively small (1pp). This increase is less than six

[3]The latter is associated with high-skill outsourcing, comprising accounting, legal, managerial consulting, and other high-skill services.

sectors and more than only three. For comparison, this share grew by 5.7pp in the Information sector.

If service industries use more outsourced labor than manufacturing, then the shift of economic activity towards services would mechanically increase domestic outsourcing. In this case, the simple reason low-skill domestic outsourcing increased over time is that manufacturing shrunk. I find that this is not the case using a variance decomposition. Let s denote expenditure on Administrative & Support Services divided by value added. The change in this ratio over a period is

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

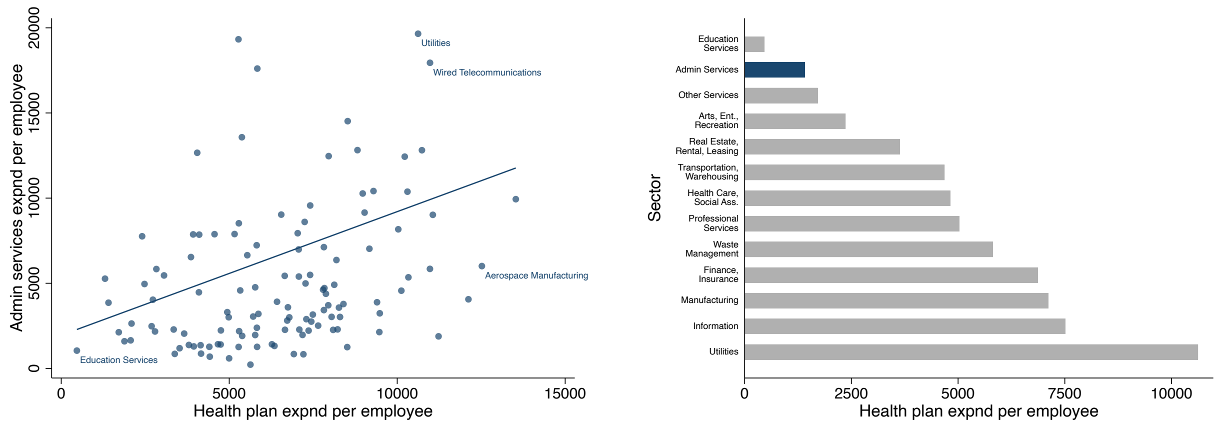
where J is the set of all industries and ω_j is industry j's share of total economy-wide output. The over bar denotes the variable's mean over the period, and Δ denotes the percentage point change over the period. The within-industry component measures how much of the overall change was due to changes that occurred 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, increased expenditure on low-skill domestic outsourcing was due to many industries increasing their use of outsourced labor, not the shift from manufacturing to services.

While the growth in low-skill domestic outsourcing occurs over many sectors, I find that industries that spend more on health insurance also spend more on low-skill domestically outsourced labor. Figure 2a shows this relationship using data from the Annual Survey of Manufacturers (ASM), Services Annual Survey (SAS), CBP, OEWS, and IO Tables. A ten percent increase in health insurance expenditure is associated with a six percent increase in Administrative & Support Services expenditure. This correlation is not sensitive to weighting by employment. Hence, as health plan costs increase across industries, so does low-skill domestic outsourcing.

This finding motivates my theory that health plan costs increasing over time has driven the increase in low-skill domestic outsourcing. Administrative & Support Service firms are almost entirely composed of low-skill employees, so they offer cheap health plans. Conversely, a traditional firm has a mix of high- and low-skill employees, so they offer more expensive health plans. This makes low-skill workers cheaper when employed through an Administrative & Support Service firms. Or, from the traditional firm's point of view, this makes outsourced low-skill workers cheaper than employees. Over time, the rise in health insurance costs has further increased the price of employees relative to that of outsourced workers, increasing domestic outsourcing.

Figure 2: Motivating Facts, 2012

(a) Positive Correlation (b) Admin Services: Low Health Plan Expnds



Notes: Subfigure (a) shows the positive correlation between health plan expenditure per employee and Administrative & Support Services expenditure per employee. Each point is an industry. Subfigure (b) displays total employer contributions to health plans per employee by sector. Administrative & Support Services is highlighted in blue. Health plan expenditure per employee draws from the Annual Survey of Manufacturers, Services Annual Survey, and County Business Patterns. Administrative & Support Services Expenditure draws on BEA Input-Output tables.

Another finding that supports this theory is that Administrative & Support Services have low health plan expenditures. Using ASM, SAS, and CBP data, Figure 2b plots total employer health plan contributions divided by total employees by sector. Administrative & Support Services has one of the lowest health plan costs in the economy, ranking second to last.

2.2 IRS Frictions and Employer-Provided Health Plans

Having discussed how the rise in low-skill domestic outsourcing could be driven by employer health plans, this section discusses the key IRS tax code frictions in the US health plan market. These frictions cause firms to offer all their workers similar health insurance benefits. These IRS frictions are key in my theoretical model.

Since 1954, employer contributions to health plans have been excluded from worker's taxable income (Thomasson, 2003). Section 106 of the IRS tax code states that "... gross income of an employee does not include employer-provided coverage under an accident or health plan" (Legal Information Institution, n.d.b). Because of this favorable tax treatment, 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.[4]

In 1978, the US Senate was concerned that firms were designing discriminatory health plans. The 1978 Committee on Finance's Senate report states, "In some cases uninsured medical reimbursement plans have been established by businesses under which the principal beneficiaries are the offices of the company, its major shareholders, and its highest paid workers. These plans can tailor their benefits to fit the particular needs of these employees. Under present law, such a plan can exclude all rank-and-file workers" (Committee on Finance, 1978).

The Committee on Finance added an anti-discrimination statute to Section 105 of the IRS tax code to address their concern. The statute states that *self-insured plans* cannot discriminate in favor of *highly compensated individuals*; if a plan violates this statute, then the benefits paid to highly compensated individuals are included in taxable income (Legal Information Institution, n.d.a). To clarify, health plans are either self-insured or fully-insured.[5] A plan is *self-insured* (also known as self-funded) if the employer assumes direct financial responsibility for the costs of enrollees' medical claims. In contrast, a plan is fully-insured (also known as fully-funded) if the insurance company assumes this responsibility (Kaiser Family Foundation, 2020). A *highly compensated individual* is any employee that is in the highest paid 25 percent of all employees.[6]

As the anti-discrimination statutes only apply to self-funded plans, firms could attempt to circumvent them by offering fully-funded plans. However, underwriting considerations generally prevent or limit how discriminatory a fully-funded plan can be (Committee on Finance, 1978). (Additionally, this was the Senate's stated reason for not extending the anti-discrimination statute to fully-funded plans.) Further, fully-funded plans have additional costs relative to self-funded plans. For instance, state insurance laws constrain and raise the cost of fully-funded plans, while federal legislation exempts self-funded plans from these laws. The state insurance laws include reserve requirements, premium taxes, consumer protection regulations, and mandated benefits (Kaiser Family Foundation, 2021a). In practice, a majority of employees, especially those in large firms, have self-funded plans. In 2010, of all employees covered by employer-provided health plans, 59 percent were covered by self-funded plans. Of those in firms with 5,000 or more employees, 93 percent were covered by self-funded plans (Kaiser Family Foundation, 2010).

To determine whether a self-funded plan is discriminatory, the IRS has two testing crite-

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

[5]The reader may see various sources mention level-funded plans. These are a type of self-insured plan.

[6]Highly compensated individuals also include 1) the five highest-paid officers, and 2) shareholder who owns (with the application of section 318) more than 10 percent in value of the stock of the employer (Legal Information Institution, n.d.a).

ria: generosity and eligibility. The generosity criterion is that firms must provide all covered employees the same benefits. Any benefit that is provided to only highly compensated individuals is included in gross taxable income.

The eligibility criterion is that a plan must benefit a majority of employees. Specifically, the plan must 1) benefit 70 percent or more of all employees or 2) benefit 80 percent or more of all the employees who are eligible to benefit under the plan, if 70 percent or more of all employees are eligible to benefit under the plan (Legal Information Institution, n.d.a). (If both of these conditions fail, the IRS can let a plan pass the eligibility test on an ad hoc basis if it finds the plan covers a representative cross-section of employees. This option is risky as it acquires IRS approval through an audit process or an advance ruling (Wolfe, 1981)). If a plan fails this criterion, a percent of the benefits paid to highly compensated individuals is taxed like income. The percent is the share of all benefits that are paid to highly compensated individuals. This criterion encourages firms to offer health plans to all or most of their employees and structure the plans so that a majority participates.

What if a firm offers multiple health plans? A firm could seemingly fail the eligibility test if employees are split up among multiple plans, so no plan benefits a majority of employees. However, as long as high-wage and rank-and-file employees receive similar benefits, the firm will not violate the anti-discrimination regulation (Wolfe, 1981). Hence, firms do not fail the eligibility test simply by offering multiple plans. However, they do fail the eligibility test if they structure their compensation packages to pay high-wage and low-wage workers wildly different health benefits.

The anti-discrimination statute suggests that most of the variance in employer health insurance premiums is between firms, not within. I find that this is 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. To understand how much of the total dispersion of employer premiums is between firms, I use a simple variance decomposition:

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

where i denotes a health plan, j is employer, x is employer premium, and the overbar denotes mean.[7] 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 percent of the

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

total dispersion of single plan employer premiums is between firms. For family plans, 86 percent is between firms. The results are not sensitive to weighting by employees.

To sum up, the anti-discrimination law and the data on employer health plans suggest that firms must offer all their in-house employees similar health insurance benefits. However, firms could circumvent the anti-discrimination law by domestically outsourcing all their low-skill workers from a separate legal entity. Section 3 explores this idea with a general equilibrium model that features domestic outsourcing, employer health plans, and anti-discrimination legislation.

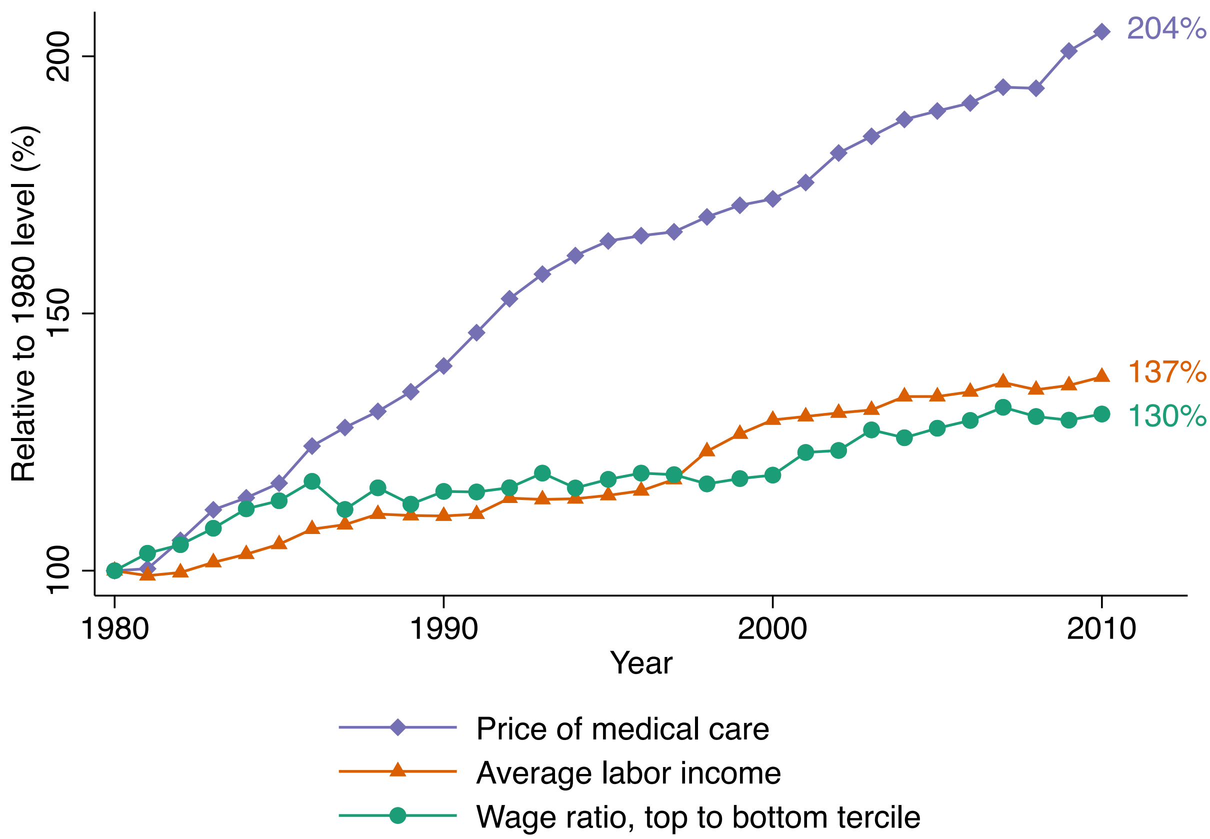
2.3 Rising Employer Health Plan Costs

Using data from the Insurance Component of the Medical Expenditure Panel Survey, Figure 1b shows that premiums for employer-sponsored health insurance plans have more than doubled over the last 20 years. I theorize that this increase drove the increase in low-skill domestic outsourcing. More specifically, I theorize that the increase in the difference in health plans high- and low-skill workers want has caused the rise in low-skill domestic outsourcing. If high- and low-skill workers want the same health plans, then all firms offer the same health plans. As the difference in health plans these workers desire increases, this puts pressure on traditional firms to offer generous health plans to low-skill workers due to the anti-discrimination laws. Meanwhile, Administrative & Support Service firms simply offer the health plans that low-skill workers want, as they are almost entirely composed of low-skill workers. Hence, trends that increase the difference in health plans desired by low- and high-skill workers could drive the increase in low-skill domestic outsourcing.

Three trends over the past four decades could potentially increase the difference in health plans that high- and low-skill workers want, all shown in Figure 3. 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. Intuitively, if high- and low-skill workers want 1 percent of their compensation in the form of employer contributions to health plans, then the difference between their desired health plans is small. If rising medical care prices increases this share from 1 percent to 10 percent, then the level difference grows as well. This could occur if goods and medical care are complements, which means that a relative increase in the price of medical care would also increase relative expenditure on medical care.

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

Figure 3: Three Rising Trends: Medical Care Prices, Income, and the Skill Premium



Notes: The 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.

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 spread out the difference in the desired health plans of low- and high-skill workers.

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 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.[8] This trend increased the utility level of high-skill workers.

[8]For more information on the increase in income inequality or the increase in compensation paid to high-

If medical care expenditures increase with utility, this could also increase the relative cost of the health plan high-skill workers want.

In the next section, I build a theory with domestic outsourcing, health plans, and all three of these potential drivers. Later, in Section 8, I use the calibrated model to measure the effect of each of these trends.

3 A Theory of Outsourcing and Health Plans

Having discussed three potential drivers for the increase in employer health plans and low-skill domestic outsourcing, I develop a novel theory featuring all these forces. The model features a traditional firm that chooses i) the mix of wages and health plans it uses to compensate its employees and ii) the share of its labor that is domestically outsourced. Ultimately, the model predicts how the three trends and IRS frictions affect the low-skill outsourcing rate.

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, the traditional firm, and outsourcing firms. Throughout, variables use superscripts to denote firm and subscripts to denote skill levels.

Worker Preferences. 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. To allow for changes in prices and income to affect medical care expenditure shares, I use a non-homothetic CES function for the utility function. Specifically I use Comin CES preferences (Comin et al., 2021), in which utility u is implicitly defined by

$$\psi \left(\frac{c}{u}\right)^{1-1/\eta} + (1-\psi)\left(\frac{m}{u^{\epsilon}}\right)^{1-1/\eta} = 1. \tag{2}$$

The parameter η is the elasticity of substitution between goods and medical care. If $\eta < 1$, then goods and medical care are complements — an increase in the relative price of medical care increases the relative expenditure on medical care. If $\eta > 1$, then goods and medical care are substitutes — an increase in the relative price of medical care decreases 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 $\epsilon > 1$,

wage workers, see Krusell et al. (2000), Card and DiNardo (2002), Song et al. (2019), or Braxton et al. (2021).

then it increases with utility.[9] 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. For now, I do not make assumptions on η or ϵ. Later, I calibrate these parameters to match patterns of health plan expenditures across industries and time.

Traditional Firm Technology. 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

$$y = z\left(\prod_{s\in\mathcal{S}}\left(\left(n_s^f\right)^{1-1/\theta_s} + \alpha_s^{1/\theta_s}\left(o_s^f\right)^{1-1/\theta_s}\right)^{\frac{\varphi_s\theta_s}{\theta_s-1}}\right), \tag{3}$$

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. A CES technology aggregates employees and outsourced workers in the traditional firm's production 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 Firm Technology. 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

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

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.)

Timing. 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. As firms compete for workers, this is a dynamic game that I solve in reverse chronological order. But first, I describe compensation packages.

Compensation Packages and IRS Frictions. Each firm j can compensate workers with wages w_s^j and health plans a_s^j. Wages can purchase goods or medical care, while health plans can only purchase medical care. Health plans are simply a form of compensation that can purchase only one type of good. The model features two frictions from the IRS tax code. First is the tax advantage: wages are taxed at T, while health plans are not taxed. Second, firms face an *anti-discrimination constraint* which forces them to offer all employees the same health plans, as discussed in Section 2.2.

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 (2). 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,

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

where $\mathcal{J}$ is the set of all firms (traditional and outsourcing), and v_s is the highest utility level a worker of skill s can get. If a firm wants to hire employees, it must offer a package that yields at least v_s. Hence, v_s acts as the *reservation utility level*, and firms will internalize this constraint in their profit maximization problem.

Traditional Firm Profit Maximization. I use bold to denote a vector with an entry for each skill level. Given reservation utility levels $\boldsymbol{v_s}$ and the prices for outsourced labor $\boldsymbol{p_s}$, the traditional firm chooses employees $\boldsymbol{n_s^f}$, outsourced labor $\boldsymbol{o_s^f}$, wages $\boldsymbol{w_s^f}$, and health plans $\boldsymbol{a_s^f}$ to maximize profits (revenue minus labor expenditures), subject to i) matching each worker's reservation utility level and ii) offering all employees the same health plan.

$$\begin{aligned}
V^f(\boldsymbol{v_s}, \boldsymbol{p_s}) = & \max_{\boldsymbol{n_s^f}, \boldsymbol{o_s^f}, \boldsymbol{w_s^f}, \boldsymbol{a_s^f}} y\big(\boldsymbol{n_s^f}, \boldsymbol{o_s^f}\big) - \sum_{s \in \mathcal{S}} \big((w_s^f + a_s^f) n_s^f + p_s o_s^f\big) \\
s.t. \quad & v(a_s^f, w_s^f) \geq v_s \quad \forall s \in \mathcal{S} \\
& a_s^f = a_{s'}^f \quad \forall s, s' \in \mathcal{S},
\end{aligned}$$

where revenue is defined by Equation (3). Note that the price of medical care p_m and the tax on wages T enter into the firm's problem through the reservation utility level constraint.

Outsourcing Firms Profit Maximization. Recall the s-skill outsourcing firm only uses s-skill labor. Given the reservation utility level v_s and the price of outsourced labor p_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, subject to matching each worker's reservation utility level.

$$\begin{aligned}
V_s^o\big(v_s, p_s\big) = & \max_{n_s^o, a_s^o, w_s^o} p_s n_s^o - (w_s^o + a_s^o)\, n_s^o \\
s.t. \quad & v(a_s^o, w_s^o) \geq v_s
\end{aligned}$$

Because they each use only one type of labor, by construction the anti-discrimination law does not affect the outsourcing firms.

Equilibrium Definition. Given the price of medical care p_m and other exogenous parameters, an equilibrium is reservation utility levels $\boldsymbol{v}_s$, prices for outsourced labor $\boldsymbol{p}_s$, choices for the traditional firm $\{\boldsymbol{n_s^f}, \boldsymbol{o_s^f}, \boldsymbol{a_s^f}, \boldsymbol{w_s^f}\}$, and outputs and choices for each outsourcing firm $\{\boldsymbol{O_s}, \boldsymbol{n_s^o}, \boldsymbol{a_s^o}, \boldsymbol{w_s^o}\}$ 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,

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

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 clears 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.

I finish this section with a technical note on the boundary of the firm. The model can be generalized to give the traditional firm access to the outsourcing firm's technology. That is, I can allow the traditional firm to turn workers into both n_s^f and o_s^f. Looking ahead, in the baseline economy with both IRS tax friction, the traditional firm finds it optimal to *not* use the outsourcing firm's technology, as the outsourcing firm can provide the same type of labor at a lower price.

4 Characterizing the Outsourcing Rate

With the model's equilibrium defined, I explain what determines the low-skill outsourcing rate. The model delivers a closed form solution for the low-skill outsourcing rate; as expected, it is increasing in the relative price of employees. Health insurance costs affect the outsourcing rate by affecting this relative price in general equilibrium. I discuss how the firm technologies, IRS frictions, and aggregate variables determine the relative price of employees, which in turn determines the low-skill outsourcing rate.

Cheapest Compensation Packages. In the textbook general equilibrium model, workers and firms take the wage as given, and the wage is set so that labor demand equals labor supply. In this model, the reservation utility levels v_s serve this purpose; agents take v_s as given, and it is set to clear the labor market. While firms take v_s as given, they choose the combination of wages w_s^j and health plan a_s^j to yield v_s. As an illustrative example, Figure 4a displays the possible compensation packages that yield v_s; reservation utility v_s acts as an indifferent curve. A firm must choose a compensation on or above this curve to attract employees. Let $\{a_s^*, w_s^*\}$ denote the cheapest compensation package on the indifference curve v_s.

$$\{a_s^*, w_s^*\} \equiv \underset{\{a,w\}\in R_+^2}{\operatorname{argmin}} \{a + w \mid v(a, w) \geq \tilde{v}_s\}. \tag{4}$$

A tax on wages is sufficient to cause the cheapest compensation package to be unique and have a strictly positive health plan, $a_s^* > 0$. Intuitively, suppose a worker spends $\$X$ of after-tax wages on medical care, purchasing $\frac{X(1-T)}{p_m}$ units of medical care. If the firm increases its health plan by $\$X(1-T)$ and decreases its wages by $\$X$, then the worker can purchase the same amount of goods and medical care. Hence, the firm can decrease its labor costs while the worker stays on it's indifference curve. To clearly show $\{a_s^*, w_s^*\}$, Figure 4b plots an indifference curve, but with the price of the compensation package on the y-axis. With the tax on wages, the indifference curve has a saddle point, which is $\{a_s^*, w_s^*\}$.

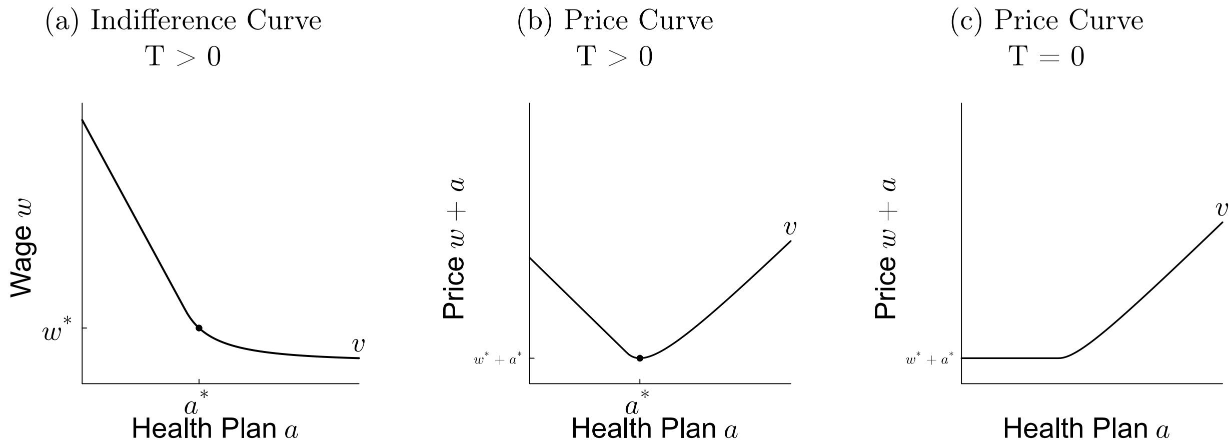
Without a tax on wages, $\{a_s^*, w_s^*\}$ is not unique, and includes the compensation package with no health plan expenditures, $a_s^* = 0$. Workers are indifferent between receiving one dollar of wage and one dollar of health plan up until their marginal utility of medical care is strictly greater than that of goods. An indifference curve in an economy without a tax on wage is shown in Figure 4c; it does not have a saddle point. Firms are indifferent between offering multiple compensation packages, creating multiple equilibriums. Hence, a tax on wages is sufficient to create interesting equilibirums where 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.3. □

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.

Figure 4: Examples of Indifference and Price Curves



Notes: Subfigure (a) shows an example of an indifference curve the firms face. To attract employees, the firm must offer a compensation package on or above the indifference curve v. The dot denotes the cheapest compensation package $\{w^*, a^*\}$. Subfigure (b) also shows the indifference curve, but with the price of the compensation package on the y-axis, to clearly show the saddle point $\{w^*, a^*\}$. Subfigure (c) is the indifference curve but for an economy with no tax on wages. With no tax on wage, there is no unique cheapest compensation package. Multiple compensation packages minimize costs, including the one with the health plan set to 0.

The Relative Price of Employees. Let $\rho_s \equiv \frac{w_s^f + a_s^f}{p_s}$ denote the price of employees relative to the price of outsourced workers. Optimality conditions for the outsourcing firm imply that the price of outsourced labor equals its costs, $p_s = w_s^o + a_s^o$. So, the relative price of employees is equal to the ratio of employee's and outsourced worker's compensation costs:

$$\rho_s = \frac{w_s^f + a_s^f}{w_s^o + a_s^o}.$$

I discuss how the IRS frictions and underlying trends in aggregate variables determine the relative price of employees ρ_s.

Without both IRS frictions, all firms offer the cheapest compensation packages $\{a_s^*, w_s^*\}$. Without the anti-discrimination constraint, the only constraint firms face is that they must meet the reservation utility levels. Thus, both firms offer the cheapest compensation package, and the relative price of employees is 1. Without the tax advantage of employer health plans, firms can minimize the price of employees by not offering health plans. Both firms offer a package in the set $\{a_s^*, w_s^*\}$, and the relative price of employees is pinned at 1.

Proposition 2. *Consider the baseline economy without both IRS tax friction. Both firms offer the cheapest compensation packages $\{a_s^*, w_s^*\}$, the relative price of employees equals 1*

Proof. Follows from Equation (4). □

With both IRS tax frictions, the key determinant of the relative price of employees ρ_l is the difference in technology between the two types of firms. The tax advantage causes the cost-minimizing health plans to be positive, $a_s^* > 0$. Each outsourcing firm uses only one skill level, so they are unaffected by the anti-discrimination constraint and offer $\{a_s^*, w_s^*\}$. On the other hand, the traditional firm uses every type of labor, so the anti-discrimination laws constrain it. It is unable to offer each skill level their cheapest compensation package. Intuitively, optimality implies that the traditional firm's health plan is a weighted average of those in the cheapest compensation packages. Hence, the outsourcing firms have lower labor costs than the traditional firm, and $\rho_l > 1$.

Proposition 3. *Consider the baseline economy with both IRS tax frictions and two skill levels. WLOG, label the skill level with lower utility "low-skill" and the one with higher utility "high-skill".*

1. *Each outsourcing firm offers the cheapest compensation packages that yield their skill level's reservation utility level,* $\{a_s^*, w_s^*\}$.

2. *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^*, *with the weights defined in Appendix A.4.*
$$a^f \approx \sum_s \widetilde{\omega}_s a_s^*. \tag{5}$$

3. *Outsourcing firms have lower labor costs than the traditional firm,* $w_s^o + a_s^o < w_s^f + a^f$ *and the relative price of employees* ρ_s *is greater than 1.*

4. *Holding all else equal, an increase in the traditional firm's health plan* a^f *increases the relative price of low-skill employees* ρ_l.

Proof. Result 1 follows from the fact that each outsourcing firm uses only one skill level of labor and is thus unaffected by the anti-discrimination constraint. For a proof of Result 2 see Appendix A.4. Result 3 follows from Results 1 and 2. Result 4 follows from the fact that a_l^* is the unique solution to Equation (4). □

Further, with both IRS tax frictions and holding all else equal, an increase in the distance between the cost-minimizing plans increases the relative price of employees ρ_l. For intuition, suppose WLOG there are only two skill levels, low and high. The traditional firm chooses a health plan between their their cost-minimizing plans. If their cost-minimizing plans are close together in level, then the traditional firm chooses a health plan (and wage) that is close in levels to that chosen by the low-skill outsourcing firm. So, the relative price of employees is close to one. As the cost-minimizing plans spread out, the traditional firm's compensation package moves further away from the outsourcing firm's, increasing the relative price of employees. The following equation shows this mechanism. It follows from a Taylor Approximation and Equation (5), and I leave the derivation to the Appendix A.5.

$$\rho_l \approx \quad 1 + \underbrace{(a_h^* - a_l^*)^2}_{\text{Distance between cost-minimizing plans}} \times \underbrace{\left(\frac{\partial^2 w\,(a, v_l)}{\partial a^2}\bigg|_{a=a_l^*} \right)}_{\text{Sensitivity of } w_l^* \text{ to change in health plan}} \times \underbrace{\widetilde{\omega}_h^2}_{\text{Weight on } a_h^* \text{ in } a^f} \times \underbrace{\frac{1}{w_l^* + a_l^*}}_{\text{Cheapest low-skill compensation cost}} \tag{6}$$

With the IRS frictions, three trends can potentially increase the distance between cost-minimizing health plans, thus increasing the relative price of employees ρ_l. Whichever trend is the most impactful depends on the parameterization of the utility function. First is an increase in the price of medical care p_m, if goods and medical care are complements $\eta < 1$. Second is an increase in efficiency z, which simulates an increase in average income. An increase in efficiency increases utility for all workers. If relative expenditure on medical care increases with utility $\epsilon > 1$, then this trend can spread out the cost-minimizing health plans. Third is an increase in the high-skill weight φ_h. This simulates an increase in demand for high-skill workers, and increases their utility. Again, if relative expenditure on medical care increases with utility $\epsilon > 1$, then this trend can spread out the cost-minimizing health plans.

Low-Skill Outsourcing Rate. The low-skill outsourcing rate, $\mathcal{O}_l = \frac{n_l^o}{N_l}$ has a closed form solution. It depends on only the relative price of employees, the outsourcing elasticity θ_l, and the outsourcing weight α_l.

$$\mathcal{O}_l = \frac{\alpha_l \rho_l^{\theta_l}}{1 + \alpha_l \rho_l^{\theta_l}}. \tag{7}$$

As expected, the percent of low-skill workers that are outsourced increases with the relative price of employees ρ_l. Further, the only way changes in aggregate variables, like the price of medical care p_m, can effect the low-skill outsourcing rate is by effecting the relative price of employees ρ_l in general equilibrium. The following proposition summarizes my main theoretical results:

Proposition 4. *Main result: Characterizing Outsourcing*

1. *The only way changes in parameters $\{p_m, z, \varphi_h\}$ and IRS frictions can effect the low-skill outsourcing rate is through general equilibrium effects on the relative price of employees ρ_l.*

2. *Without both IRS frictions, the relative price of employees equals 1, and the outsourcing rate is pinned by an exogenous variable α_l, $\mathcal{O}_l = \frac{\alpha_l}{1+\alpha_l}$. Hence, aggregate trends do not affect the low-skill outsourcing rate.*

3. *With both IRS frictions and holding all else equal, a trend that causes the cost-minimizing health plans to spread out increases the relative price of employees and thus the low-skill outsourcing rate.*

Proof. Follows from Proposition 3 and Equations (6) and (7). □

Changes in any of the key parameters $\{p_m, z, \varphi_h\}$ could potentially drive the increase in low-skill domestic outsourcing by increasing the health plan that the traditional firm's offer workers. Disentangling the effect of each trend requires the fully calibrated model, specifically the parameterization of the utility function. However, measuring the net cumulative effect of these forces together only requires the outsourcing elasticity. The rise in low-skill domestic outsourcing can be decomposed into two components: i) part due to the rising relative price of employees due to health insurance, and ii) everything else:

$$\underbrace{\Delta \log \left(\frac{n_{lt}^{o}}{n_{lt}^{f}} \right)}_{\substack{\text{Increase in} \\ \text{low-skill D.O.}}} = \underbrace{\theta_l \Delta \log \rho_{lt}}_{\substack{\text{Increase in relative} \\ \text{price of employees}}} + \underbrace{\Delta \log \alpha_{lt}}_{\substack{\text{Everything else} \\ \text{(residual)}}} \tag{8}$$

Looking ahead, I measure the difference in employer health plan premiums for outsourced workers and employees from worker level micro data. I use this difference to estimate how much health insurance costs have caused the relative price of employees to increase over time ρ_{lt}. Then, I can perform the accounting exercise with just the outsourcing elasticity. Section 5 estimates the outsourcing elasticity, and Section 6 performs this simple accounting exercise. Section 8 takes the accounting exercise one step further by using the fully calibrated model to determine which key parameters $\{p_m, z, \varphi_h\}$ are responsible for the growth of ρ_{lt} and thus $\mathcal{O}_l$.

Inefficiencies of the IRS frictions. This section ends with a short note on efficiency. The baseline model with neither IRS tax friction is Pareto Efficient — no worker can be made strictly better off without making some worker strictly worse off. I show this in Appendix A.6. The tax on wages, by construction, is inefficient, as it decreases worker's compensation and tax revenue is wasted. The anti-discrimination constraint is inefficient in two ways. First, it decreases overall output in the economy. In the efficient economy, the marginal revenue of an employee is equal to that of an outsourced worker. However, with the IRS frictions, outsourced workers are cheaper than employees. This causes the traditional firm to hire an inefficiently low amount of employees. Second, it moves employees at the traditional firm away from their cheapest compensation packages $\{a_s^*, w_s^*\}$. This means that a worker's utility can be increased while keeping the total amount of output allotted to them the same.

5 Estimating the Outsourcing Elasticity

Having shown that the accounting exercise hinges on the outsourcing elasticity, I turn to estimating it. Following from the CES assumption in the traditional firm's technology, the optimality conditions of the traditional firm implies

$$\underbrace{\log \frac{p_l o_l^f}{n_l^f}}_{\substack{\text{outsourcing expenditure} \\ \div \text{ in-house employees}}} = \theta_l \log(\underbrace{w_l^f + a^f}_{\substack{\text{compensation} \\ \text{costs}}}) + \underbrace{(1-\theta_l)\log p_l + \log \alpha_l^f}_{\text{constant}} + \underbrace{\epsilon^f}_{\substack{\text{error} \\ \text{term}}} \tag{9}$$

Hence, variation in compensation costs and outsourcing expenditures can be used the estimate the outsourcing elasticity.

While firm-level data with measures of outsourcing expenditures and employee compensation costs 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.[10]

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 code by occupation code.[11] 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 expenditures is drawn from the Annual Survey of Manufacturers (ASM) and the Services Annual Survey (SAS), which have health plan expenditures by NAICS code. I assume that all employees within an industry receive the same health plan. Health plans a^j are total health plan expenditures divided by employees. (The SAS data does not have employee counts, so I take employee counts from County Business Patterns for service industries.)

Measures of low-skill outsourced labor expenditure are drawn from the BEA's 2012 Input-Output (IO) data.[12] The IO data has each industry's expenditure on outputs from all other industries. I

[10]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. The Input-Output data for 2012 has 405 industries, as opposed to 71 in most other years.

[11]The occupation codes are granular 5-digit SOC codes. Some examples are "Podiatrists," "Traffic Technicians," and "Line Installers and Repairers."

[12]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.

map each 4-digit sub-industry of Administrative & Support Services (NAICS 561) to the single skill level with the highest employment share in that sub-industry, where the employment shares by skill level are from the OEWS. Expenditures on the following industries are considered expenditures on low-skill domestic outsourcing $p_l o_l^j$: Employment Services (5613), Investigation and Security Services (5616), Services To Buildings and Dwellings (5617), and Other Support Services (5619).[13]

Altogether, the data has in-house low-skill employment n_l^j, wages w_l^j, outsourcing expenditure $p_s o_l^j$, and health plans 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. Variables are scaled appropriately across the underlying datasets to minimize mismeasurement.

I run the regression specified in Equation (9) on the cross-sectional industry data set. The key assumption is that the outsourcing weight α_l is constant across industries. I weight industries by their total employment size and use robust standard errors. As I use a Univariate regression, I display the results graphically with a scatter plot in Figure 5. The x-axis is the independent variable, the y-axis is the dependent variable, each dot is an industry, and the straight line is the linear best-fit line. I find that the outsourcing elasticity $\theta_l = 6.3$. In words, a one percent increase in the relative price of low-skill employees is associated with a 6.3 percent increase in relative expenditure on low-skill outsourced labor. This estimate is statistically significant at the one percent level, and the regression yields a high $R^2 = 0.485$. Appendix A.7 discusses alternative specifications of this regression, with my preferred elasticity remaining close to 6.3.

6 Accounting Exercise

With the outsourcing elasticity in hand, I turn to the main accounting exercise. I estimate the percentage of the rise in low-skill domestic outsourcing due to rising health insurance costs between 1975 and 2012. As shown in Equation (8), to perform this exercise I only need to estimate (a) the outsourcing elasticity, (b) the outsourcing rate across time, and (c) the effect of rising health insurance premiums on the relative price of employees across time.[14] As I estimated (a) and (b) in

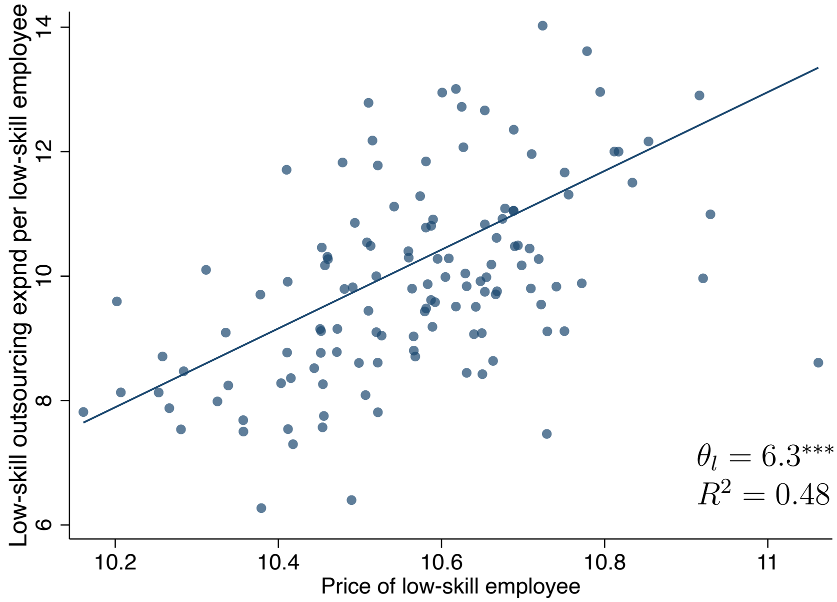
[13]To better understand these 4-digit codes, Temporary Help Services is included in Employment Services. Janitorial and Landscaping Services are included in Services to Buildings and Dwellings. Packaging and Labeling Services are included in Other Support Services.

[14]I express the accounting exercise using the ratio of outsourced workers to employees instead of the outsourcing rate because it simplifies the algebra. This footnote clarifies the algebra using rates. The counterfactual change in the outsourcing rate due to only health plan costs is

$$\Delta\mathcal{O}_t^{cf} = \frac{\alpha_{1975}\rho_{2012}^{\theta_l}}{1+\alpha_{1975}\rho_{2012}^{\theta_l}} - \frac{\alpha_{1975}\rho_{1975}^{\theta_l}}{1+\alpha_{1975}\rho_{1975}^{\theta_l}}. \tag{10}$$

where I hold α at its 1975 value, only allowing changes in the relative price to affect the outsourcing rate. I assume $\rho_{1975} = 1$ because the anti-discrimination laws are yet to be enacted. This assumption also makes

Figure 5: Outsourcing Elasticity θ_l is large, positive, statistically significant



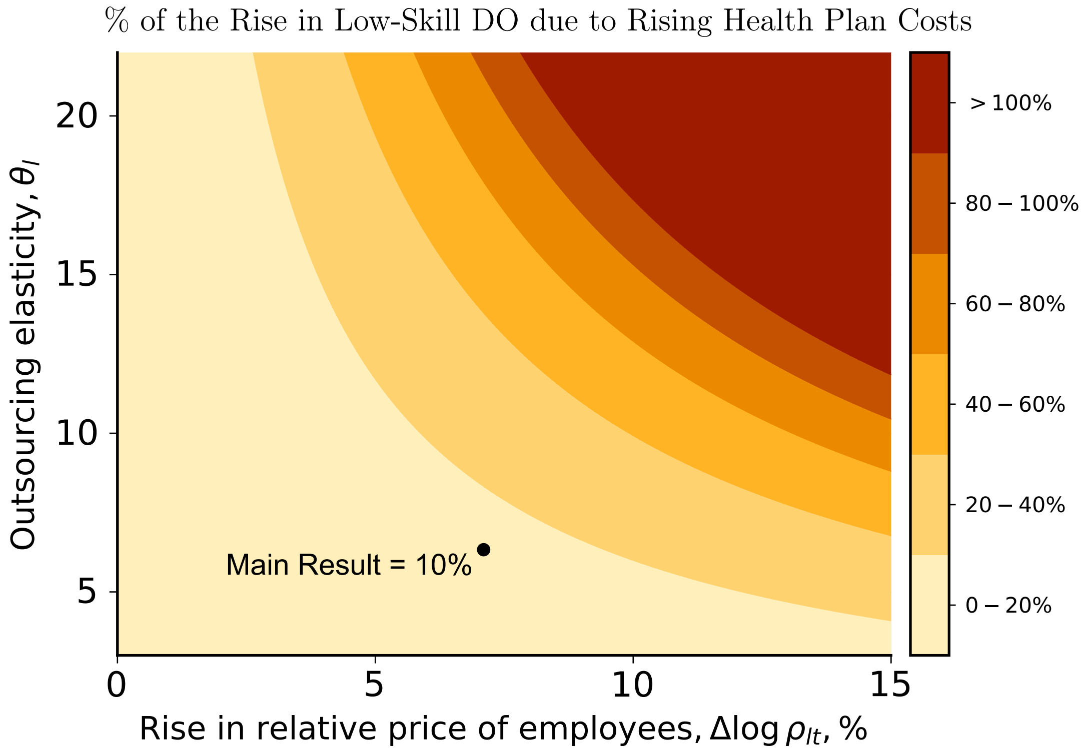
Notes: The figure displays the results from the univariate regression (9). Across industries, I regress low-skill outsourcing expenditure per low-skill employee on the price of low-skill employees and a constant. Industries are weighted by employment, and I use robust standard errors. In the figure, each dot is an industry, and the straight line is the linear best-fit line.

Sections A.7 and 2.1, I discuss how I estimate (c) and the accounting exercise results.

I lean further on the model structure to simplify my estimation of the relative price of employees. I assume it equals one in 1975 because the anti-discrimination laws had yet to be passed. I ultimately make this assumption due to a lack of data, but it is a safe assumption as health insurance premiums were a small expenditure in 1975. To estimate this relative price in 2012, I use the Consumer Population Survey Annual Social And Economic Supplement (ASEC). The advantage of this data is that it is the only publicly available worker-level microdata with i) employer health plan premiums and ii) sufficient variables to determine whether a worker is outsourced (occupation and industry). To create the relative price, I filter to low-wage occupations for which I can use industry codes to determine whether a worker is outsourced. For example, I assume a janitor in the janitorial services industry is outsourced. Then, I compare employer contributions to health plans for outsourced and traditionally employed workers. I find that this difference in employer contributions raises the price of employees relative to outsourced workers by 7 percent. I find a similar estimate when using the industry-level data to estimate the outsourcing elasticity in Section 5. I leave details to the Appendix A.8.

outsourcing weight in 1975 a function of only the outsourcing rate in 1975: $\mathcal{O}_{1975} = \frac{\alpha_{1975}}{1+\alpha_{1975}}$. Hence, for this counterfactual, I only need to estimate the outsourcing rate in 1975 and 2012, the relative price in 2012, and the outsourcing elasticity.

Figure 6: Sensitivity Analysis



Notes: The x-axis is the percent increase in the relative price of employees due to health insurance costs over time. The y-axis is the outsourcing elasticity θ_l. The heat shows the corresponding percent of the rise in low-skill domestic outsourcing explained by the model, as shown in Equation (8). The dot corresponds to my main result. With a 7 percent increase in the relative price of employees and an outsourcing elasticity of 6.3, I find that rising health insurance costs can explain around 10 percent of the rise in low-skill domestic outsourcing.

I plug my estimates into Equation (8) and perform the accounting exercise. I find that roughly 10 percent of the rise in low-skill domestic outsourcing between 1975 and 2012 can be explained by the rising relative price of employees due to health insurance. As this result hinges on the outsourcing elasticity and the change in the relative price of employees, Figure 6 shows the sensitivity of the main results to changes in these two estimates. The figure is a heat map where the x-axis is the change in the relative price of employees due to health insurance, the y-axis is the outsourcing elasticity, and the shading indicates the resulting percent of the rise in outsourcing explained by health insurance costs. If my estimate for the relative price 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. For instance, an outsourcing elasticity of roughly 15 is necessary so that healthcare costs can explain half of the increase in low-skill domestic outsourcing.

7 Calibration

The previous section found that rising health plan costs explains 10 percent of the rise in low-skill domestic outsourcing. The only parameter required for this estimate is the outsourcing elasticity. However, the underlying reason why the health plan costs rose over time is yet to be determined. Three possible driving forces are rising medical care prices, rising income, and shifting labor demand towards high-skill workers. Disentangling the effect of each of these trends requires a fully calibrated model. Additionally, a fully calibrated model is required for policy counterfactuals.

This section calibrates the entire model in 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.

7.1 Externally Calibrated Parameters

I externally calibrate every parameter except those that govern the utility function and the low-skill outsourcing weight in 2012 $\alpha_{l,2012}$. The outsourcing weight in 1975 α_{1975} is determined be the outsourcing rate, $\mathcal{O}_{1975} = \frac{\alpha_{1975}}{1+\alpha_{1975}}$. This follows from Equation (7), as I assume the relative price of employees equals one in 1975 because the anti-discrimination laws had yet to be passed. I take the outsourcing elasticity θ_l from Appendix Section A.7, $\theta_l = 6.2$. 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.

7.2 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.[15] The price of medical care equals 2.15 in 2012, as shown in Figure 3.

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 3. 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.[16]

I set the skill weights in 2012 using the data from Section A.7 the following optimality condition and :

[15] 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".

[16] 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".

$$\varphi_s = \frac{\text{Expenditure on } s\text{-skill labor}}{\text{Total expenditure on labor}}. \tag{11}$$

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.

While calibration of the outsourcing weight in 1975 is exogenous, I calibrate the outsourcing weight in 2012 α_{2012} internally to match the outsourcing rate in 2012. Following from Equation (8), the change in the outsourcing rate is a targeted moment, which I match using the αs. This leaves the change in the relative price of employees as an untargeted moment, which, as discussed, later the model matches.

7.3 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 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 A.7. 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 a slope of 0.1 — 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. With the entire cross-section of industries, this slope is close to 0.08.) 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

Table 2: 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."

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.

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

Table 3: Untargeted Moments

Moment	Model	Data	Source
Income elasticity of medical care	0.86	0.72	Acemoglu et al. (2013)
Relative price of low-skill employees, ρ_l, 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. The relative price of employees is the labor costs of employees divided by the labor costs outsourced workers, where labor costs are wages plus employer contributions to health plans. I set wages for both workers equal, so that the difference in price only reflects the difference in employer contributions.

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 2 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.

7.4 Validation: Untargeted Moments

The model matches several untargeted moments, as shown in Table 3. 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 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.

Table 4: Attributing the Rise in Low-Skill D.O. to the Three Trends, 1975-2012

	Δ p.p.	% explained
Data:	10.72	
Model: Price of employees $\rho_{lt} \uparrow$	1.18	11.1
Passage of IRS Frictions alone	0.53	4.9
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
IRS Frictions + $\varphi_h \uparrow$	0.53	4.9
IRS Frictions + $z \uparrow$	0.5	4.6
IRS Frictions + $p_m \uparrow$	1.26	11.8

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. I model 1975, change a factor(s) to its 2012 value, then attribute the increase in low-skill domestic outsourcing to that factor(s). The first model row corresponds to the decomposition in Equation (8), and is equivalent to *IRS Frictions* $+ \varphi_h \uparrow + z \uparrow + p_m \uparrow$. The following rows decompose this rise to the underlying three trends, the passage of the IRS frictions, and their interactions. The fact the three trends alone without the IRS frictions explain 0 percent of the rise in low-skill domestic outsourcing follows from Proposition 2.

8 Attributing the Rise in Outsourcing To Three Trends

With the calibrated model in hand, I attribute the rise in domestic outsourcing to the following: rising medical care prices p_m, the increase in income z, the shift in labor demand towards high-skill labor φ_h, the passage of the IRS frictions, and the 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 4 shows the results. As expected from the discussion in Section 4, each trend does not affect outsourcing without the IRS frictions. Adding the frictions 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 IRS frictions. 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 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.

9 Policy Counterfactuals

With the calibrated model 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.

9.1 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, increasing output:

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

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

9.2 Results

Column 1 of Table 5 displays the welfare effects for each policy counterfactual for the low-skill workers. I measure welfare effects using a wage subsidy; I calculate the percent increase/decrease in wage for low-skill workers in the baseline economy that equates their utility level with that in the counterfactual economy, CF,

Table 5: Welfare effects in terms of wage subsidy to employees

	Skill		
Policy Counterfactual	Low	Medium	High
Remove anti-discrimination laws	4.4	0.0	3.5
Remove tax advantage of employer health plans	2.3	-2.0	2.4
Outsourced get same health plans as employees	-0.6	-0.0	-0.0

Notes: The table shows the wage subsidy that makes employees of the traditional firm indifferent between i) the baseline economy with the subsidy and ii) the counterfactual economy. The wage subsidy is defined in Equation (12).

$$v\left(a_l^j, (1 + x^{j,CF})w_l^j\right) = v_l^{CF} \tag{12}$$

where the left-hand side is the outsourced or in-house low-skill worker's utility with the wage subsidy $x^{j,CF}$ in the baseline 2012 economy, and the right-hand side v_l^{CF} is the low-skill worker's utility in the counterfactual economy CF. As shown in the table, removing the anti-discrimination laws has a large, positive effect on the low-skill worker's welfare; a wage subsidy of 4.4% is necessary to make low-skill traditional employees indifferent between the baseline and counterfactual economy. Removing the tax advantage of employer health plans also has a large, positive welfare effect, with wage subsidies of 2.3%. Conversely, forcing firms to offer outsourced workers the same health plans as their employees has a small, negative effect on low-skill workers, equivalent to a wage subsidy of -0.6%.

Column 2 in Table 5 shows the wage subsidy for medium-skill workers. 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 5. When the anti-discrimination laws are removed, the high-skill worker's utility increases by 3.5 percent. This stems from their cost decreasing, increasing their demand and utility. Similarly, removing the tax advantage increases their utility by 2.4 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.

Table 6: Inequality in the Baseline and Counterfactual Economies

Economy	Ratio, high- to low-skill: Wage $\mathbb{E}[\frac{w_{jh}}{w_{jl}}]$	Utility $\frac{v_h}{v_l}$
Baseline	3.36	3.03
Remove Anti-Discrimination Laws	2.99	3.0
Remove Tax Advantage of Employer Health Plan	3.42	3.03
Outsourced and Employees get Same Health Plan	3.39	3.05

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.

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 6 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 3.36 times that of the low-skill worker. Removing the anti-discrimination laws decreases this ratio to 2.99. 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.

10 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 10 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.

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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A Appendix

A.1 Tables and Graphs

Table 7: 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

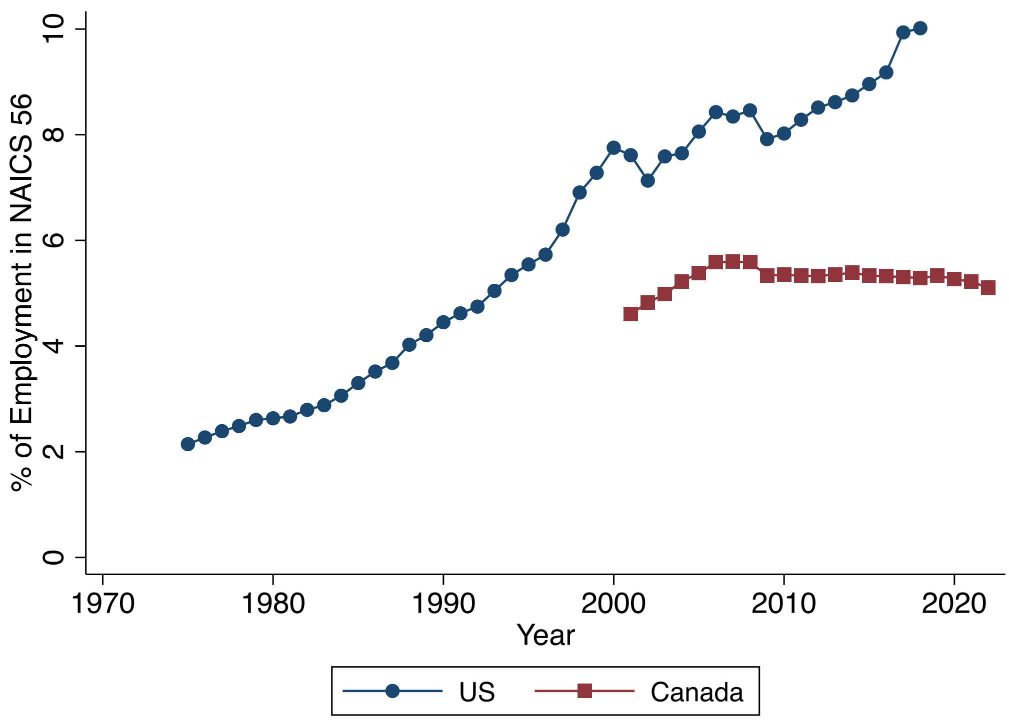
Notes: The table shows the share of economy-wide output spent on intermediate inputs from each sector. Data is from Input-Output tables from the BEA.

Table 8: Low-Skill Outsourcing Expenditure to Value Added Ratio

	Ratio		
Sector	1980	2015	Change, pp
Information	0.8	6.4	5.7
Professional and Business Services	3.3	7.5	4.1
Trade, Transportation, and Utilities	1.7	5.5	3.8
Financial Activities	1.2	4.9	3.7
Education and Health Services	3	5.6	2.6
Construction	0.2	1.5	1.3
Manufacturing	0.9	1.9	1
Other Services	3	3.8	0.8
Natural Resources and Mining	0.2	1	0.8
Leisure and Hospitality	2.4	2.9	0.6

Notes: The table displays each sector's expenditure on output Administrative & Support services (NAICS 561) divided by its value added. Data is from the Input-Output tables from the BEA.

Figure 7: Growth of Low-Skill Domestic Outsourcing is Larger in the US than Canada



Notes: Figure shows the share of total private employment in Administrative, Support, and Waste Managements Services (NAICS 56). Data is drawn from County Business Patterns for the US and Statistics Canada for Canada. Due to limitations with the Statistics Canada series, I measure low-skill domestic outsourcing using NAICS 56 instead of NAICS 561 — this should be a small issue as a large majority of NAICS 56 employment is in NAICS 561. For example, in the US in 2018, 97 percent of employment in NAICS 56 is in NAICS 561.

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 scripts 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 $z_i(j)$. I assume task-level production is CRS, hence task level labor from type i workers $Q_i(j)$ is simple the amount of labor from type i workers, $n_i(j)$, times their productivity, $z_i(j)$,

$$Q_i(j) = n_i(j)z_i(j).$$

Likewise, total labor for a task is the sum of task level labor from each type of worker:

$$Q(j) = \sum_i Q_i(j)$$

.

With CRS, the price of a unit of task j from workers of type i is $p_i(j) = \frac{c_i}{z_i(j)}$, where c_i is the input cost for workers of type i. For in-house workers, $c_{in} = (w + a)$, and for outsourced workers $c_{out} = p$. Hence, a firm outsourced a task j if the price is lower: $p_{out}(j) \leq p_{in}(j)$. So, the firm makes a discrete choice of whether to outsource each task.

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

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

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 n is

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

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, X_i is

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

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 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 $\bar{iota}_s = \hat{iota}_s \frac{\hat{w}_s}{\hat{w}_s - p_m\hat{m}_l} - \frac{p_m\hat{m}_l}{\hat{w}_s - p_m\hat{m}_l}$. 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

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

Consider a compensation package $\{\bar{w}_s, \bar{a} - \delta\}_s$, where δ is sufficiently small so that $v(\bar{a} - \delta, \bar{w}_s) > v_s$. 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.

□

A.4 Proof of Proposition 3 part 2

For convenience, I drop the traditional firm superscript, and I define the labor composite $\mathsf{n}_s = (n_s^{1-1/\theta_s} + \alpha_s o_s^{1-1/\theta_s})^{\frac{\theta_s}{\theta_s - 1}}$. Denote the price index of n_s as $q_s = [(w_s + a)^{1-\theta_s} + \alpha p_s^{1-\theta_s}]^{\frac{1}{1-\theta_s}}$. I also introduce the notation $V_s \equiv v(w_s, a)$

Following from optimality conditions, we get

$$\frac{o_s}{n_s} = \left(\frac{w_s^f + a_s^f}{p_s}\right)^{\theta_s} \tag{13}$$

Using n_s and q_s, the traditional firm's first order conditions are

$$\varphi_s y = q_s \mathsf{n}_s \quad \forall s \tag{14}$$

$$v_s = V_s \quad \forall s \tag{15}$$

$$\frac{\partial q_s}{\partial w_s}\mathsf{n}_s = \lambda_s \frac{\partial V_s}{\partial w_s} \quad \forall s \tag{16}$$

$$\sum_s \frac{\partial q_s}{\partial a}\mathsf{n}_s = \sum_s \lambda_s \frac{\partial V_s}{\partial a} \tag{17}$$

Combine (16) and (17) to get

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

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

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

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

By the chain rule

$$\frac{dV_s}{da} = \frac{\partial V_s}{\partial a} + \frac{\partial V_s}{\partial w}\frac{\partial w}{\partial a} \tag{18}$$

By (15), $\frac{dV_s}{da} = \frac{dv_s}{da} = 0$ since 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 (18) to get

$$-\frac{\partial w_s}{\partial a} = \frac{\partial w}{\partial V_s}\frac{\partial V_s}{\partial a} \tag{19}$$

Now continue with the algebra

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

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

Use (14) 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 (13), I get

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

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

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

(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

$$a \approx \sum_s \frac{\varphi_s \times \frac{\partial^2 \log(a+w(a,v_s))}{\partial a^2}\big|_{a=a_s^*} \times \frac{(w_s+a)n_s}{(w_s+a)n_s+p_s o_s}}{\sum_{s'} \varphi_{s'} \times \frac{\partial^2 \log(a+w(a,v_{s'}))}{\partial a^2}\big|_{a=a_{s'}^*} \times \frac{(w_{s'}+a)n_{s'}}{(w_{s'}+a)n_{s'}+p_{l s'} l_{s'}}} a_s^*. \tag{20}$$

Thus,

$$a^f \approx \sum_s \widetilde{\omega}_s a_s^*, \qquad \widetilde{\omega}_s = \frac{\omega_s}{\sum_{s'} \omega_{s'}}, \tag{21}$$

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

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

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^*.

□

A.5 Derivation of Equation (6)

This section derives the relative price of employees as shown in equation (6) for an arbitraty skill level s. I express the traditional firm's labor price as a function of the health plan it chooses, $w(a_s^f, v_s) + a_s^f$, where $w(a_s^f, v_s) = argmin_{w \in R^+}\{w | v(a, w) \geq v_s\}$. Take a second order taylor approximation of $w(a_s^f, v_s) + a_s^f$ around the cheapest compensation package:

$$w(a_s^f, v_s) + a_s^f \approx w_s^* + a_s^* + \frac{\partial w(a, v_s)}{\partial a}|_{a=a_s^*}(a_s^f - a_s^*) + \frac{\partial^2 w(a, v_s)}{\partial^2 a}|_{a=a_s^*}(a_s^f - a_s^*)^2.$$

By construction the middle term equals 0 since the cheapest compensation package minimizes costs. Algebra yields a simple expression for $(a_s^f - a_s^*)$:

$$\begin{aligned} a_s^f - a_s^* &= \sum_k \widetilde{\omega}_k a_k^* - a_s^* \\ &= \sum_{k \neq s} \widetilde{\omega}_k a_k^* + \widetilde{\omega}_s a_s^* - a_s^* \\ &= (1 - \widetilde{\omega}_s)\bar{a}_{-s}^* + a_s^*(\widetilde{\omega}_s - 1) \\ &= (1 - \widetilde{\omega}_s)(\bar{a}_{-s}^* - a_s^*) \end{aligned}$$

where $\bar{a}^*_{-s} \equiv \sum_{k \neq s} \frac{\widetilde{\omega}_k}{(1-\widetilde{\omega}_s} a^*_k$ is a weighted average of all the cost-minimizing health plans except that for type s.

Altogether, the relative price of employees is approximatelly equal to:

$$\rho_s \approx \quad 1 + \underbrace{\left(\bar{a}^*_{-s} - a^*_s\right)^2}_{\substack{\text{Distance between cost-}\\\text{minimizing plans}}} \times \underbrace{\left(\frac{\partial^2 w\left(a, v_s\right)}{\partial a^2} \bigg|_{a=a^*_s} \right)}_{\substack{\text{Sensitivity of } w^*_s \text{ to}\\\text{change in health plan}}} \times \underbrace{(1-\widetilde{\omega}_s)^2}_{\substack{\text{Weight on}\\ \bar{a}^*_{-s} \text{ in } a^f}} \times \frac{1}{\underbrace{w^*_s + a^*_s}_{\substack{\text{Cheapest low-skill}\\\text{compensation cost}}}}$$

A.6 Proof: the economy without IRS frictions is efficient

I prove the baseline economy **without** the IRS frictions is Pareto Efficient. First, I characterize the efficient equilibrium of the social planner's problem. Then, I characterize the competitive equilibrium of the baseline economy without the IRS frictions. The equations that characterize these two equilibrium are identical, thus proving the competitive equilibrium is as efficient as possible given the tax on wages.

The social planner's problem is:

$$\max_{c_s, m_s, n_s, l_s} \sum_s \omega_s u(c_s, m_s) \tag{22}$$

$$s.t. \sum_s c_s + X \leq y(\{n_s, l_s) \tag{23}$$

$$M \leq z_m X \tag{24}$$

$$\sum_s m_s \leq M \tag{25}$$

$$o_s \leq O_s \quad \forall s \tag{26}$$

$$O_s + n_s \leq N_s \quad \forall s \tag{27}$$

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, and M is the total quantity of medical care produced. The solution is characterized by the following equations:

$$u_c(c_s, m_s) = \frac{\lambda}{\omega_s} \quad \forall s \tag{28}$$

$$u_m(c_s, m_s) = \frac{\lambda}{z_m \omega_s} \quad \forall s \tag{29}$$

$$\frac{\partial y}{\partial n_s} = \frac{\partial y}{\partial l_s} \quad \forall s \tag{30}$$

$$o_s + n_s = N_s \quad \forall s \tag{31}$$

$$\sum_s c_s + \frac{1}{z_m} m_s = y \tag{32}$$

where λ is the lagrangian multiplier on the reseource constraint.

Now I turn to the competitive equilibrium without the IRS frictions. From the medical care firm's profit maximization problem I get $p_m = \frac{1}{z_m}$.

Firms are unconstrained by the anti-discrimination constraints, so their choices for compensation packages is only constrained by the market prices v_s. Given market prices firms solve for and offer the cost-minimizing compensation packages defined by Equation (4). This package implies:

$$u_c(c_s, m_s) = \lambda_s \quad \forall s \tag{33}$$

$$u_m(c_s, m_s) = \frac{\lambda_s}{z_m} \quad \forall s \tag{34}$$

$$\tag{35}$$

where λ_s is the lagrangian multiplier from the s-skill worker's utility 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

$$\frac{\partial y}{\partial n_s} = \frac{\partial y}{\partial o_s} \tag{36}$$

The equilibrium allocation is characterized by equations (34), (35), (36) 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:

$$\omega_s = \frac{\lambda}{\lambda_s} \tag{37}$$

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.7 Extensions: Estimating the Outsourcing Elasticity

This Section discusses a more intensive estimation of the Outsourcing elasticity, resulting in an estimate close to that from the simple cross-sectional regression discussed in Section 5

There are two main issues when confronting Equation (9) with the data. The first is the presence of the weight parameter α_l^j. In my main outsourcing elasticity estimation strategy, I simply assume this weight parameter is constant across industries. Here, I weaken this assumption, and allow it to vary across industries. 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

Table 9: 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 A.7.

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, 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. In Section 8, I find this is in fact the case when I calibrate the utility function.

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

$$\log \frac{p_l o_l^j}{n_l^j} = \theta_l \log(w_l^j + a^j) + \beta_0 + \beta_1 X^j + \epsilon^j. \tag{38}$$

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 9. I find that the elasticity of substitution θ_l is large, positive, and statistically significant. The first two columns of Table 9 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 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. The midpoint between these two estimates is 6.2, which is very close to my baseline estimate in Section 5.

A.8 Estimating the Relative Price of Employees in 2012

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. The main disadvantage is that the employer-premium data is imputed (Janicki et al., 2013). Nevertheless, it is the only publicly-available dataset with these measures. As an accuracy check, I estimate the relative price with the cross-industry data from Section A.7 and get similar results.

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.[17] A janitor, guard, or laborer is considered outsourced if they 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 8, I find that when a firm increases the health plan of a low-skill worker, it allows them to decrease their

[17] 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.

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 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 A.7. 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.