# Labor and Product Market E ects of Mergers

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November 1, 2024

Abstract

We use a two-level vertical supply chain model to forecast the labor and product market impact of mergers. In the model, rms and workers collectively bargain over wages upstream, and rms sell di erentiated products and engage in Bertrand competition downstream. We illustrate how the model can be used to simpr be

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# 1 Introduction

The recent

for labor.[5] In these simulations, we assume that the wages of nurses and pharmacists are negotiated, and examine how mergers of hospitals that compete in both the product and labor market change negotiated wages.[6]

Next, we consider mergers that directly a ect the labor market but not the product market also using data from the hospital industry. In this scenario, we assume that the geographic market for inpatient services is highly localized as in the rst case, but that the geographic market for labor is broader (roughly corresponding to a commuting zone rather than the narrow draw area of hospitals). In this case, we simulate mergers between hospitals in di erent geographic markets for the product market but assume that both hospitals hire nurses and pharmacists from a common labor market.

Finally, we examine mergers that directly a ect the product market but not the labor market. This situation can occur in industries where the product produced by the merging rms is tradeable: consumption of the merging rms' product can take place in regions di erent than those where the product is produced. In this scenario, we simulate mergers between Colombian manufacturing rms in the same industry but limit the set of mergers simulated to those with of rms with production facilities in di erent parts of Colombia. That is, mergers where the merging rms are not direct competitors in the labor market.[7] In these simulations, we assume that only skilled workers' wages can be a ected by mergers.[8]

[5] In all of the simulations, we use publicly available data describing market shares, margins, employment levels and wages to calibrate the demand parameters of our model and determine the relative bargaining power of workers to rms. Using the calibrated model, we then simulate the impact of randomly generated mergers on downstream prices and the wages of a ected workers using our model. In the simulation study, we examine the set of all possible mergers between two competing rms within the speci ed geographic markets where we have su cient data, and where the merger would increase HHI by at least 100 and result in a post-merger HHI of at least 1500.

[6] Prager and Schmitt (2021b) nd that nurse and pharmacist wages are the most negatively a ected by mergers. For this reason, we focus on nurses and pharmacists as the group most likely to be a ected by mergers.

[7] To be clear, our model can accommodate tradeable goods mergers could involve rms with production facilities in the same labor market. We limit the set of mergers here to isolate a mechanism a ecting bargaining in our framework.

[8] Prager and Schmitt (2021b) also nd that skilled workers but not unskilled workers were a ected by hospital mergers suggesting that skilled workers are more likely to have industry speci c human capital. For this reason, we model skilled workers as those most likely to be harmed by mergers in manufacturing industries.

To illustrate the di erent mechanisms that cause mergers to a ect worker welfare, we rst simulate mergers using our full model and two alternative nested models. We begin with the canonical merger simulation model that assumes that mergers only directly a ect product market and only a ect workers through a reduction in employment in what we call the `downstream only' model, see e.g., Werden and Froeb (1994). Next, we allow mergers to also a ect workers' negotiated wage, but assume that the threat point of the worker is exogenously determined as in Horn and Wolinsky (1988). Finally, we simulate the merger using the full model, where the merger removes an option from the workers threat point, further a ecting the negotiated wage. In our simulations, we nd that mergers have negative, though relatively small, impacts on worker surplus in the rst two models where workers do not lose an option from their threat point.[9] By contrast, the predicted labor market impact of mergers is typically much larger in the full model for all three con gurations of product and labor markets we examine. We take this nding as providing suggestive evidence that mergers can harm workers by reducing workers' leverage (through losing a rival employer in the labor market) as well as through reducing labor demand and increasing employer leverage (through allowing the rm to recapture sales at another outlet should negotiations fail).

We next examine how the change in worker surplus under our full model is related to the change in labor or product market concentration ($HHI_L$, $HHI_P$). For each of the labor and product market con gurations we study, we nd that

are predicted to result in large reductions in worker surplus following large changes in market structure ( $HHI_P > 1000$).

We then separately examine the e ects of mergers on employment and wages for each of the three cases we study. For the hospital mergers that only a ect the labor market, we nd that mergers only reduce wages. Moreover, the reduction in wages is strongly negatively associated with the $HHI_L$.[10] The simulated hospital mergers that a ect both the product and labor market are always predicted to lower wages and output. In principal, these mergers could increase worker wages. While employment falls (because of the reduction in product market competition), workers may bene t as increased rents are partially passed through as higher wages. In this case, however, the reduction in worker leverage caused by the merger more than o sets any bene t the workers from the increased rents transferred from consumers. The ndings from the simulations of manufacturing mergers from the Colombian Manufacturing Census are, perhaps, the most interesting. Here we see that for mergers with smaller impacts on competition ( $HHI_P < 1000$) the change in wages is very small and in some cases positive. In this case, where mergers only a ect the product market, the increase in rents available to workers e ectively o sets the increase in rm's leverage in bargaining when the mergers impact on competition is relatively modest.[11] However, as the mergers become more competitively signi cant, i.e., $HHI_P$ increases, we see that simulated wages begin to fall substantially.

The results of our merger simulations indicate that if wages are determined by a bargaining process like ours, traditional `downstream only' merger screens will underestimate, often severely, the welfare e ects of mergers for workers. However, it does not follow that traditional downstream only merger simulation models cannot play an important role in identifying the mergers that would harm workers. In our nal analysis, we estimate the

[10] In principal, these mergers could have increased labor demand (as reduced wages are passed through to lower inpatient prices). However, because nurse and pharmacist wages account for a very small fraction of a hospital's costs (2%) the change in labor demand caused by the reduction in wages was e ectively zero.

[11] In our model, a rm's leverage increases in this case because post-merger the rm will continue to make sales at its newly acquired plant should negotiations fail at its original plant (and vice-versa).

e cacy of a conventional merger screen in identifying mergers that would harm workers. In cases where hospital mergers directly a ect the product and labor market (the geographic markets for inpatient services and

Berger et al. (2023) take a very di erent (and complementary) approach to simulate the e ects of mergers on workers. They examine mergers between rms that each produce a single, undi erentiated product with heterogeneous production technologies who compete strategically for workers. Their model directly allows for the upward sloping labor supply curve common in many monopsony models.[14] By contrast, in our model we analyze how mergers between rms producing di erentiated products in either overlapping or disjoint product and labor markets a ect wages and product prices through a model of e cient bargaining. [15]

# 3 Model

The e ect of horizontal mergers in the product market are well known. Ab

there are i) multiple labor markets but only a single product market and ii) each product is manufactured in exactly one labor market. We do illustrate below di erent labor and product market sizes(i.e. di erent market elasticities.

We assumethat product demand follows a standard logit demand framework. There is a nite set of products, $n$ 2 $N$. Each consumerchoosesa single unit of one product, or instead choosesan outside option, which could be a product outside the product market, or not consumingat all. Product market sizeis denoted as S. Consumer $i$ receivesutility

$$V_n^i = \delta_n \quad \alpha p_n + \quad {}_{in}$$

from choosinggood $n$ 2 f $N;$ 0g, where $\delta_n$ denotesthe value of the good $n$ to all consumers, $p_n$ the price of good $n$, $\alpha$ the dis-utility of spendingmoney, and ${}_{in}$ the idiosyncratic taste of consumer $i$ for good $n$, which is not observedby the rm.

We assumethat ${}_{in}$ is distributed according to the Gumbel distribution. We also normalize utility from the outside option ($n$ = 0) to be zero. Therefore, the consumerdemand for product $n$ is given by $s_n$, where

$$s_n = \frac{\exp(V_n)}{\sum}$$

a single unit of labor and non-labor input, using constant marginal cost technology. Each unit of labor costs $w_n$, while each unit of non-labor input costs $c_n$. This assumption implies that labor and non-labor inputs are perfect complements, and each unit of product $n$ costs $c_n + w_n$ to produce.[18]

Firm $j$ maximizes prices over all the products that it owns, $h \in Z_j$, solving the following:

$$\max_{\{p_h\}_{h \in Z_j}} \sum_{h \in Z_j} (p_h - w_h - c_h) q_h. \tag{1}$$

Rearranging the firm's first order condition for product $n$ yields the following expression for margin:

$$p_n - w_n - c_n = \frac{1}{\alpha(1 - \sum_{h \in Z_j} s_h)} \tag{2}$$

The Bertrand equilibrium is the set of prices $p_n$ for $n \in N$ such that Equation 2 is satisfied for all $n$.

## 3.3 Wage Setting Through Bargaining

Wages are set using the Nash-in-Nash bargaining concept of Horn and Wolinsky (1988). Below we outline the payoffs and threat points of firms and workers, and the bargaining solution.

### 3.3.1 Firm Payoff

For each product that is produced, workers collectively bargain for a single wage, $w_n$, to be paid per unit of output produced. If a firm reaches an agreement with the workers in labor

[18] While $w_n$ will be allowed to adjust in equilibrium following the bargaining framework, for tractability we assume that other inputs are sold in a competitive market, meaning $c_n$ will be held fixed.

market $k$ producing product $n$, the rm is able to produce product $n$ and receives pro t:

$$\pi_n = S(p_n \quad w_n \quad c_n)q_n$$

where $w_n$ is the wage solving the bargaining game outlined below, and $p_n$ solves the Bertrand game outlined above.

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labor market, where $0_m$ is an outside option speci c to labor market $m$ whose wage $w_{0_m}$ is exogenously determined and could represent the payo from not working at all, or working in a job outside the labor and product markets. For each $n$ 2 $N$, the $s_n^m$ workers who produce product $n$ collectively bargain over the wage $w_n$. Under Leontief production technology, the number of workers who product $n$ equals the number of units of $n$ produced, meaning that the labor market share must be equal to the product market share up to the relative market sizes: $s_n^m S^m = s_n S$.[19]

Workers care about both the wage paid and the output, their payo from an agreement

$^m S$ the s and n

producing substitute products. Workers who had previously worked at the rms producing product $n$ 2 $Z_j$ can only consider working at other rms located in their labor market or the outside employment option. Since consumer demand follows the Gumbel distribution, diversion from product $n$ to product $l$ is given by $\frac{s_l}{1-s_n}$. Second, as noted above, following a merger, if workers fail to reach an agreement with the rm, they can only seek employment with non-merging rms. This assumption will tend to make workers worse o following a merger, since post-merger $Z_j$ expands. The workers' threat point is as follows:

$$X \quad w_l \frac{s_l(p)\frac{S}{S^m}}{\phantom{x}} s_n(p)S$$

$$\max\left(w_n s_n(p)S\right) \quad X \quad w_l \frac{s_l(p)\frac{S}{S^m}}{} s_n(p)S\,w^{1-\frac{}{m}}$$

# 4 Model Implementation

In this section of the paper, we show how our model may be used to forecast the labor and product e ects of mergers in di erent labor and product market con gurations that frequently confront antitrust agencies. For example, markets where rms [illegible] tradable goods, such as healthcare or retail services, where the geographic [illegible] the labor

## 4.1 Market Con gurations

The rst step in simulating the price and wage e ects of mergers is to specify the geographic and product markets for both the good being produced and the type of labor used in production. In our simulations, we focus on three con gurations that illustrate the di erent mechanisms whereby mergers can a ect negotiated wages in our model. The rst corresponds to the non-tradable goods case when the geographic market corresponding to the product market and the labor market completely overlap (see Panel 1 of Figure 1). That is, the workers producing the product live and work in the same region where the product is consumed. This case likely corresponds to many non-tradable goods industries, such as the inpatient hospital market we examine, where the nal good (health services) is produced and consumed in the same region. In this scenario, the merger of rms 1 and 2 will a ect both the product market and the labor market. We de ne the product market as hospitals providing acute inpatient care, such as childbirth, major surgeries, or the treatment of serious illnesses.[20] In general, patients

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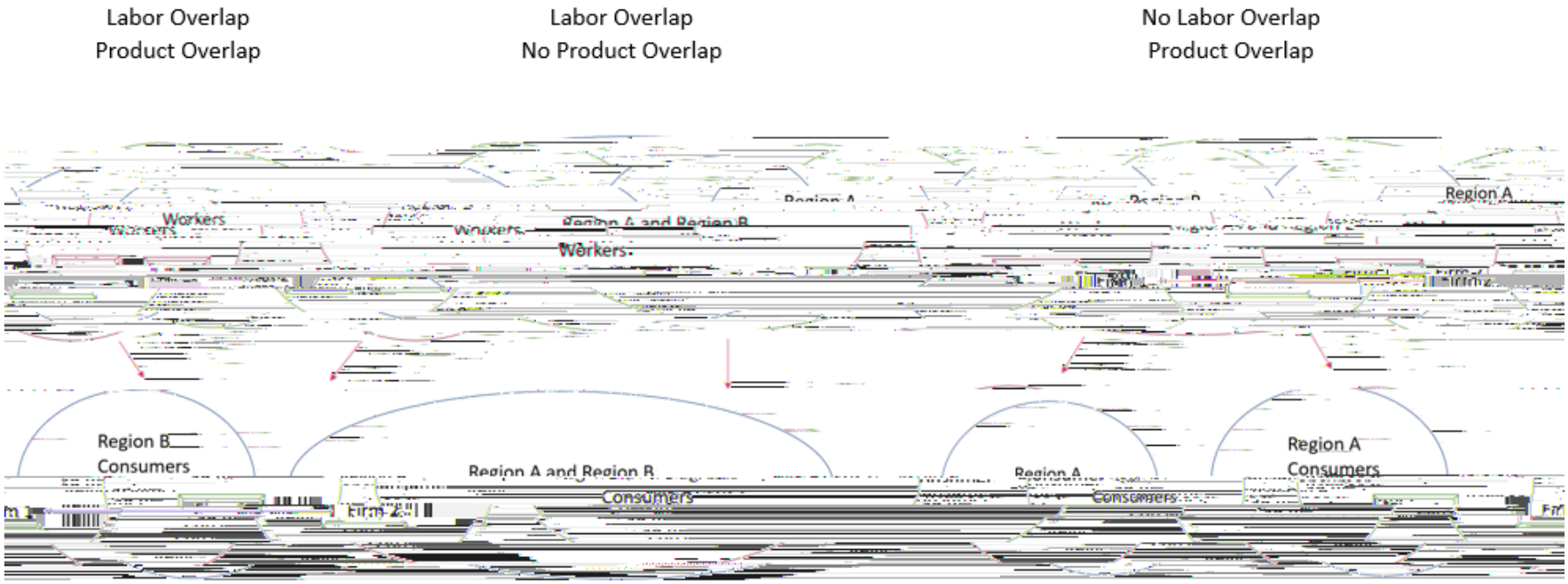


Figure 1 Product and labor market con gurations.

We next specify the type of labor affected by the merger and the size of the geographic market for that type of labor. While hospitals directly employ many different types of employees, it is unlikely that all workers would be equally affected by mergers. In particular, workers with human capital specific to the hospital industry would likely benefit more from competition between potential hospital employers than unskilled workers (janitors) that could provide similar services in other industries. Prager and Schmitt (2021b)'s examination of the wage effects of hospital mergers found that in highly concentrated markets skilled workers, especially those with human capital specific to medical industries (nurses and pharmacists), fell most following mergers while unskilled workers with general human capital were unaffected. For this reason, we define the labor market affected by the merger to that for nurses and pharmacists.[22] In the first scenario, we define the geographic size of the labor market to be identical to that for the product market, the HSA, and only consider the mergers of hospitals located in the same HSA. This assumption implies that workers are willing to travel as far for employment as patients are willing to travel for inpatient hospital care.

The second non-tradable goods case we examine is mergers of firms that do not compete in the product market but do compete in the labor market (Panel 2 of Figure 1). In this case, the merger can affect the wages of workers, but only through changes in the labor market, as there is no reduction in product market competition because firms are selling to consumers in distinct geographic markets.[23] We again use data from the

geographic market for labor is larger. Speci cally, we assume workers consider all hospitals within a Hospital Referral Region (HRR) as being potential employers. The HRR is an aggregate of contiguous HSAs and typically corresponds to a metropolitan area.[24] In this scenario, we consider mergers of hospitals in di erent HSAs (di erent product markets) that are located in the HRR (the same labor market).

The nal case we examine are mergers in tradeable goods where there is no overlap in the labor market, but there is an overlap in the nal goods market (Panel 3 of Figure 1). Here, we limit the merger simulations to those involving merging rms operating in the same industry but that hire labor in di erent regions and do not compete directly for workers.[25] In this case, the merger can a ect the wages of workers, but only through changes in the product market (less output, but higher pro ts). This case most clearly corresponds to tradeable goods such as manufactured products. We analyze this case using data from the 1991 Census of Colombian Manufacturing.[26] This data set identi es the industry (as measured by an SIC code) of approximately 7,000 plants located in 27 di erent regions of Colombia. In simulating mergers for this scenario, we de ne the product market as the 27 di erent regi

region the plant is located in. The mergers we consider are of plants in the same industry but di erent regions within Colombia.[29]

## 4.2 Parameter Calibration

Having speci ed the markets for products and labor, we now show how we can use observable information describing markets to construct the variables to calibrate the model's parameters. Our rst task is to identify the demand parameters $\alpha$ and $\delta_j$ as a function of margins and shares, assuming the market is in the pre-merger equilibrium described by our model. To do so we exploit

## 4.3 Data Inputs

We obtain our inputs from

Table 1: Pre-Merger Summary Statistics for Simulated 2006 Health Service Area Mergers (n=855), Products (n=1044), Markets (n=325), Product and Labor Market Overlap

| | 50% | 5% | 25% | 75% | 95% |
|---|---|---|---|---|---|
| **Calibration Inputs** | | | | | |
| Margin (%) | 58 | 25 | 47 | 68 | 78 |
| Hospital Cost per Worker ($100k/year) | 30 | 14 | 23 | 41 | 94 |
| Number of Workers per Hospital | 30 | 1.3 | 8.8 | 63 | 162 |
| Hospital Wage ($100k/year) | 0.65 | 0.51 | 0.59 | 0.71 | 0.81 |
| **Calibration Outputs** | | | | | |
| Hospital Outside Wage ($100k/year) | 0.39 | 0.32 | 0.36 | 0.41 | 0.46 |
| Hospital Margin per Worker ($100k/year) | 28 | 5.1 | 14 | 52 | 116 |
| Hospital Price per Worker ($100k/year) | 65 | 28 | 46 | 96 | 187 |
| Market Price Sensitivity ($\alpha$) | -0.069 | -0.39 | -0.14 | -0.037 | -0.014 |
| **Merger Conditions** | | | | | |
| Market Bargaining Power ($\lambda$) | 0.99 | 0.97 | 0.99 | 0.99 | 0.99 |
| Merger $HHI_L$ and $HHI_P$ | 4,371 | 2,093 | 2,917 | 5,716 | 8,821 |
| Merger $HHI_L$ | 798 | 131 | 284 | 2,379 | 4,781 |
| Merger $HHI_P$ | 798 | 131 | 284 | 2,379 | 4,781 |

and shares for both primary sources may be found in Appendix A.

## 4.4 Calibration Inputs and Outputs

Tables 1-3 contain descriptive statistics describing the calibration inputs and outputs used in our simulations. Table 1 describes the rst scenario where we analyze hospital mergers that have both a product and geographic overlap. Our sample consists of 325 HSA markets with a total of 1044 hospitals and 855 simulated mergers.[32] We highlight a few important characteristics from the table. First, hospitals tend to have relatively high margins: in the median market margins are estimated to be 58%. Second, the mergers we simulate lead to large increases in market concentration in already concentrated markets. The median merger increases $HHI_P$ (=$HHI_L$) by about 798 resulting in a post-merger $HHI_P$ ($HHI_L$) of 4371. Third, our model predicts that rms have most of the bargaining power: $\lambda$ is estimated

[32] We simulate all pairwise combinations of hospital mergers likely to have a meaningful impact on competition. Speci cally, we only include simulated mergers with a post-merger HHI of at least 1500 and a HHI change of at least 100. See Appendix for further details on the set of mergers.

Table 2: Pre-Merger Summary Statistics for Simulated 2006 Hospital Referral Region Mergers (n=324), Products (n=526), Markets (n=62), No Product Market Overlap, Labor Market Overlap

| | 50% | 5% | 25% | 75% | 95% |
|---|---|---|---|---|---|
| **Calibration Inputs** | | | | | |
| Margin (%) | 60 | 26 | 49 | 68 | 81 |
| Hospital Cost per Worker ($100k/year) | 30 | 14 | 22 | 40 | 92 |
| Number of Workers per Hospital | 26 | 1.2 | 8.1 | 59 | 178 |
| Hospital Wage ($100k/year) | 0.64 | 0.52 | 0.59 | 0.71 | 0.82 |
| **Calibration Outputs** | | | | | |
| Hospital Outside Wage ($100k/year) | 0.38 | 0.34 | 0.36 | 0.4 | 0.46 |
| Hospital Margin per Worker ($100k/year) | 25 | 5.1 | 13 | 48 | 100 |
| Hospital Price per Worker ($100k/year) | 61 | 27 | 46 | 90 | 179 |
| Market Price Sensitivity ($\alpha$) | -0.081 | -0.4 | -0.15 | -0.039 | -0.015 |
| **Merger Conditions** | | | | | |
| Market Bargaining Power ($\lambda$) | 0.99 | 0.98 | 0.99 | 0.99 | 0.99 |
| Merger $HHI_L$ | 2,428 | 1,579 | 2,163 | 3,082 | 4,673 |
| Merger $HHI_L$ | 357 | 110 | 171 | 691 | 1,869 |
| Merger $HHI_P$ | 0 | 0 | 0 | 0 | 0 |

to be very close to 1. This low level of worker bargaining power, however, does not imply that workers do not gain from bargaining. Because the margin the typical hospital earns per nurse/pharmacist is large, roughly $2.8 million per nurse/pharmacist, capturing even a small amount of surplus can dramatically bene t nurses/pharmacists. Finally, while nurses and pharmacists are an important input into inpatient care, they account for a relatively low share of a hospital's marginal costs, roughly 2%.[33]

Table 2 describes the second scenario where we examine mergers that a ect the labor market but not the product market. That is, where hospitals in the same HRR but in di erent HSAs merge. In this case, we simulate the impact of 324 mergers taking place in 62 HRRs. The calibration inputs and outputs in this scenario are very similar to those above because we are using data from the same industry. The primary di erence is that the mergers have a much smaller impact on the labor market. Because HRRs have many more

[33] At the median hospital, a nurse/pharmacist is estimated to earn $65,000 a year while the hospital's other marginal costs per nurse/pharmacist are estimated to be about $3 million.

Table 3: Pre-Merger Summary Statistics for Simulated 1991 Colombia Manufacturing Mergers (n=423), Products (n=252), Markets (n=41), Product Market Overlap, No Labor Market Overlap

| | 50% | 5% | 25% | 75% | 95% |
|---|---|---|---|---|---|
| **Calibration Inputs** | | | | | |
| Margin (%) | 26 | 7.5 | 18 | 36 | 49 |
| Plant Cost per Worker ($100k/year) | 0.67 | 0.14 | 0.37 | 1.3 | 4.2 |
| Number of Workers per Plant | 70 | 7 | 32 | 140 | 362 |
| Plant Wage ($100k/year) | 0.063 | 0.03 | 0.047 | 0.081 | 0.11 |
| **Calibration Outputs** | | | | | |
| Plant Outside Wage ($100k/year) | 0.029 | 0.006 | 0.02 | 0.035 | 0.043 |
| Plant Margin per Worker ($100k/year) | 0.26 | 0.077 | 0.14 | 0.53 | 0.99 |
| Plant Price per Worker ($100k/year) | 1.2 | 0.35 | 0.75 | 1.9 | 4.5 |
| Market Price Sensitivity ($\alpha$) | -5.1 | -15 | -8.1 | -2.5 | -1.2 |
| **Merger Conditions** | | | | | |
| Market Bargaining Power ($\lambda$) | 0.92 | 0.71 | 0.88 | 0.96 | 0.97 |
| Merger $HHI_P$ | 1,955 | 1,559 | 1,708 | 2,629 | 3,794 |
| Merger $HHI_L$ | 0 | 0 | 0 | 0 | 0 |
| Merger $HHI_P$ | 334 | 115 | 196 | 582 | 1,402 |

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hospitals in them than HSAs, both the level of market concentration and change in market

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concentration are much smaller for these hypothetical mergers. The median merger raises

$HHI_L$

point in negotiations with employers.

At rst glance, it might seem surprising that the simulations do not show much change in either consumer or employer surplus despite the

wagesmake up such a small fraction of hospital costs, the reduction in worker wagesis not large enoughto signi cantly impact consumeror producer welfare.

Finally, we examinethe third casewhere the mergerdirectly a ects the product market but not the labor market. In this scenario,we simulate the impact of mergersof Colombian manufacturing plants in the sameindustry (4 digit SIC code), but locatedin di erent regions of Colombia. In thesesimulations, we assumethat rms are competingin the samenational nal goodsmarket, but are hiring workers at plants located in di erent regions. As was the casein rst scenario,we seesmall predicted reductions in worker welfare resulting from a reduction in labor demand from the merger. We also seethat in the full model, where the rm's bargaining leveragechanges,that rms are able to reduce wages(and worker's welfare) more than in either the HW or downstream only model. However, for the set of mergerswe examinethe e ects are all fairly small: the medianmergerreducesworker welfare by lessthan 1% in all three of the models. This result is in part due to the distribution of mergersbeing lessconcentratedthan in the previous cases,and in part due to the limited e ect of product market overlap on the bargaining outcome. We will further disentangle these mechanismsbelow. As in the secondcase, becauseworkers are estimated to have relatively low bargaining power, the predicted wage changeis small, and total labor costs are, on average,only 13% of Colombian manufacturers' costs, meaningthe passthrough of reducedwagesinto either consumeror producer welfare is quite small.

The ndings shown for producer and consumersurplus in Figure 2 are consistent with traditional modelsof mergersim0 1 Tf 3.14atTj /T1_0 1 Tf 1.264 0 Td (the)Tj /T1_1 1a72 4.3wf Tf 1.1u

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the relationship between the $HHI_P$ or $HHI_L$ and the percentage change in worker surplus from our merger simulations for each of the three types of mergers we have studied using our full model. The results are shown in Figure 3. In the rst panel, we plot results from hospital mergers that a ect both the labor market and the product market. Because the two geographic markets coincide, the $HHI_P$

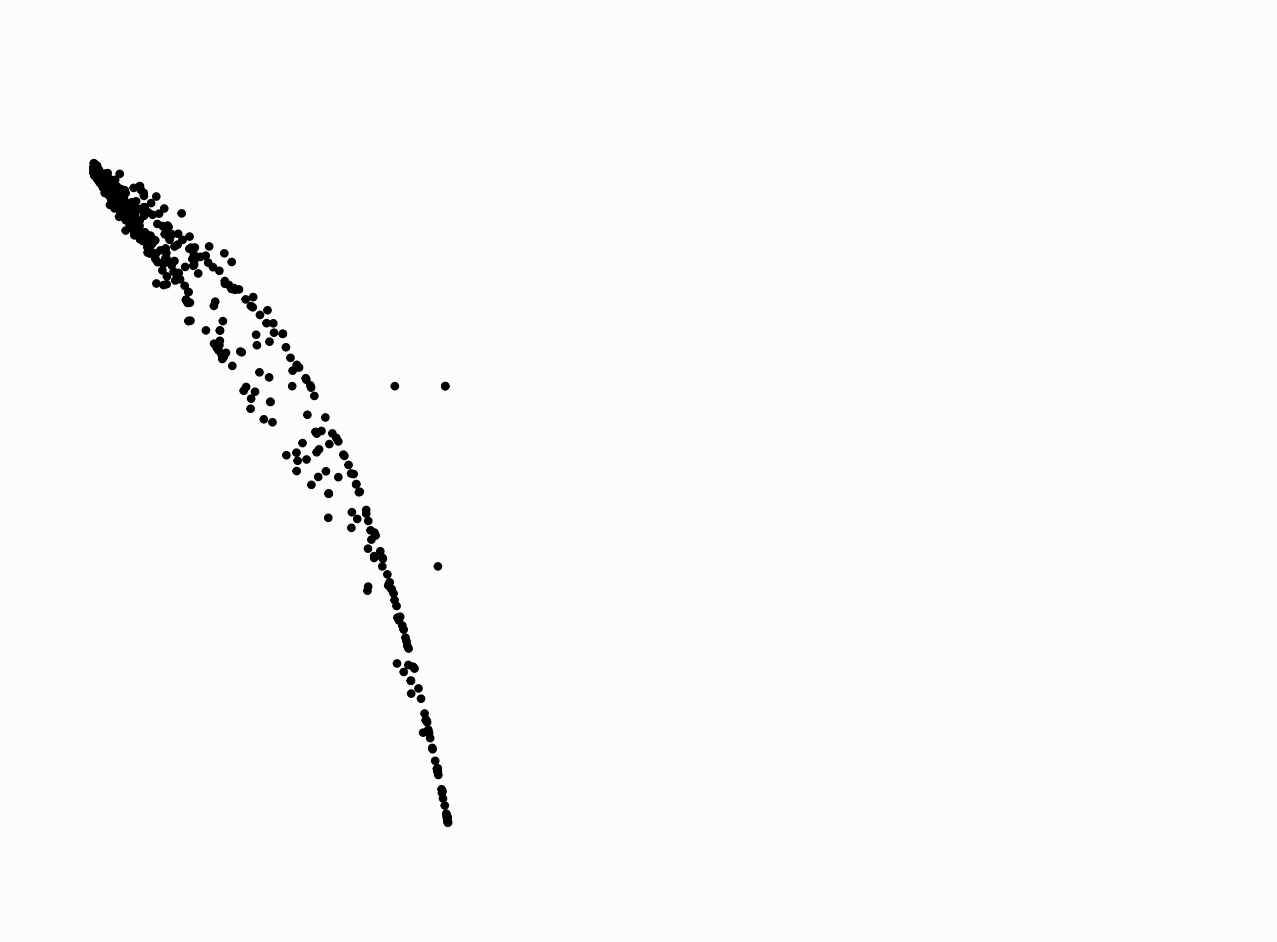

Figure 3 The gure displays worker surplus e ects of the mergers in percentage terms, including the e ect of changes to shares. Each dot represents one merger. All e ects are plotted against HHI, where HHI in the rst panel is $HHI_P$ which is equal to $HHI_L$, in the second panel $HHI_L$ since $HHI_P = 0$, and the third panel $HHI_P$ since $HHI_L = 0$.

Figure 4 The gure displays wage, price, and output e ects of the mergers in percentage terms, weighting by pre-merger shares. Each dot represents one merger. All e ects are plotted against HHI, where HHI in the rst row is $HHI_P$ which is equal to $HHI_L$, in the second row $HHI_L$ since $HHI_P = 0$, and the third row $HHI_P$ since $HHI_L = 0$.

merger also results in a price increase that increases the rents to be split between workers and the rm that may increase wages. In the third row of Figure 4, we see that for mergers with relatively small increases in concentration ($HHI_P < 500$), the wage e ects of mergers are very small and in some cases actually positive. This suggests that for small changes in $HHI_P$ the wage bargaining e ects of the merger e ectively o set each other. However, as mergers become more anticompetitive ($HHI_P > 1000$), simulated mergers almost always lower wages in addition to employment.

# 5 Screens

The results from the merger simulations show that if a bargaining model like ours describes wage setting, then mergers that a ect the relative bargaining position of workers and their employers can have large impacts on worker welfare. As a result, merger simulation generated using conventional merger simulations focusing only on downstream competition may dramatically underestimate the impact of consummated mergers on worker welfare. However, while downstream only merger simulations may fail to accurately measure wage e ects, it is possible that these merger simulation tools still can play an important role in identifying mergers that harm workers. In this section of the paper, we test the e cacy of the most commonly used merger simulation screen (the downstream only model) in identifying mergers that harm workers in the three market con gurations we have studied.

The results of this analysis are shown in Table 4. The rst row of the table evaluates the e cacy of screens where the geographic market for labor and products are the same (HSA). In our simulations, we nd that 78% of mergers that were not agged as being harmful to consumers using a downstream only model were predicted to reduce would worker welfare by at least 1% using the full model.[46] However, this same screen would only miss 2% of mergers that would reduce worker welfare by more than 5%. We also identify the fraction of all simulated mergers that would harm workers that would be identi ed by the traditional downstream only screen, and nd that 77% of mergers that would reduce worker surplus by 1% and essentially all of mergers that would reduce worker surplus by 5% would be agged as anti-competitive. Collectively, we take this as suggestive evidence that when the product and labor markets completely overlap, as is often the case for non-tradeable goods, that product market screens likely identify the mergers most harmful to workers.

Similarly, we nd that product market screens are very e ective in identifying mergers that harm workers where there is only a direct overlap in the product market, as is common

[46] In our screen, we ag all mergers that are predicted to lower consumer surplus by at least 1% as anticompetitive.

Table 4: Fraction of mergers that harm workers missed and caught, using a downstream only model and a 1%, 5% enforcement threshold, by market con guration

| Setting | Type of Merger | Mergers Missed | | Mergers Caught | |
|---|---|---|---|---|---|
| | | > 1% | > 5% | > 1% | > 5% |
| Hospitals | Product Overlap, Labor Overlap | 0.78 | 0.02 | 0.77 | 0.99 |
| Hospitals | No Product Overlap, Labor Overlap | 0.90 | 0.27 | 0.00 | 0.00 |
| Manufact. | Product Overlap, No Labor Overlap | 0.28 | 0.00 | 0.45 | 1.00 |

*Note:*
`Harmful Mergers Missed' denotes the fraction of simulations where the full model predicts that a merger harms workers by either at least 1% or 5%, conditional on a downstream only model predicting no more than 1% consumer harm. `Harmful Mergers Caught' denotes the fraction of simulations where the partial model predicts that a merger yields more than 1% consumer harm, conditional on the full model predicting that consumer yields

rms produced differentiated products and engage in Bertrand price competition downstream. In our modeling approach, there are four mechanisms associated with mergers that can change worker welfare: the leverage of workers or employers in wage negotiations, labor demanded by employers, and the rents to be shared. In our simulations, we have focused on different configurations of the product and labor markets to highlight when and how these different effects impact worker welfare. For example, when mergers affect only the product market, e.g., involve manufacturing plants producing tradeable goods located in different local labor markets, mergers increase manufacturer's leverage in negotiations (harming workers), and increase the total rents for workers and the firm to share in negotiations (potentially benefiting workers). In our simulations, we found that these types of mergers had little effect on worker wages when the HHI $_P$

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(2009) and Garmon (2017). Margins predicted to be > 1 or < .01 are marked as missing. We convert the percent margin of the acquiring rm into a level margin using information on operating costs and wages from HCRIS. Note that in converting the percent margins following Dafny (2009) and Garmon (2017) calculations to level margins at the worker year level, we remove the costs associated with nurse and pharmacy wages from the hospital's marginal costs because those wages are endogenously determined in our model. In calibrating α, we use the margin of the largest rm in the HSA for which margin is available. From there we obtain the margins of all other rms in the market from the downstream rst order conditions.

### A.2.2 Colombian Manufacturing

These data report variable costs that include industrial expenditures such as parts and fuel, raw materials, wage bill and worker bene ts (excluding skilled workers), and total energy consumed.[52] Other expenditures such as rent and royalties we consider to be xed. We assume that all costs are allocated between domestic and export production according to the share of exports, so, for example, the domestic wage bill for a rm that exports 10% of its sales will be 90% of the total wage bill.

We take the most recent year of data available which is 1991. We drop all industries that are non-speci c, e.g. include \miscellaneous" in the title. We also drop synthetic textiles since the margins of the largest rm is too small for calibration. We drop plants that have 100% of sales as exports. We also drop plants with extremely small shares (< 3%), or no skilled workers, to avoid outliers. We drop plants with margins less than 1%, which occurs for 10% of the plants. We drop textiles, aircraft, and sporting goods industries because the margins of their largest rms are too low for the model to rationalize.

[52] We convert dollar values from Colombian pesos to US dollars using the average conversion rate of 633:1 for 1991 from FRED `https://fred.stlouisfed.org/series/COLCCUSMA02STM`.

## A.3 Wages

### A.3.1 U.S. Hospitals

To calibrate our model, we need to observe wages within the market where wages are endogenously determined and also specify the outside wage. Measuring the wages of workers within the a ected industry is straightforward. Using the cleaning code of Prager and Schmitt (2021b), we pull wages and employment of nurses and pharmacists from HCRIS for the hospital merger simulations. We de ne a hospital's wage as the ratio of total wages paid for nurses and pharmacists assuming each full-time-equivalent works 40 hours a week in a calendar year divided by the number of full-time-equivalent nurses and pharmacists employed by the hospital.

Measuring the wage of the outside option for workers is more involved. Here we need to forecast the wage a worker would earn if they were forced to work outside the industry being studied. We use a di erent approach to forecast this outside wage to match the likely institutional characteristics of the nurse and pharmacist market and that of industrial workers. We assume that a worker who had to leave the hospital setting would work in a di erent sector but would continue to work as a nurse or pharmacist. However, by being forced to change sectors, the displaced nurse/pharmacist would likely face some wage penalty when moving to the new industry. That is, the worker would not enter the new industry at that industry's mean wage, but at some fraction re ecting some displacement e ect in the years immediately following separation. To construct this measure, we rst use the BLS OES to estimate (at a national level) the relative wage of nurses and pharmacists working in hospitals relative to those working in all other sectors which is 0.93. We then apply the displacement wage scarring estimates Lachowska et al. (2020) to the worker's out-of-market outside option. Speci cally, we assume that having to nd employment outside of the hospital market will lead to a displacement wage penalty of 40%, but our reu assume

robust to penalties of 30% to 50%.[53] We then multiply this fraction by the mean nurse and pharmacist wage in hospitals operating in the HSA.

### A.3.2 Colombian Manufacturing

For each Colombian manufacturing plant, we take the total wage bill for skilled workers and divide by the total number of skilled workers to get the average yearly earnings of a skilled worker. We assume that skilled workers forced to leave an industry (4-digit SIC code) would seek employment in a similar industry (a plant in the same 2-digit SIC code but di erent 4-digit SIC code).[54] We do not have an estimate of wage scaring e ects for Colombian workers from this time period. Instead, we use a measure of displacement that would result in a period of unemployment when nding new employment. Eslava et al. (2010) nd that Colombian workers experience a period of unemployment of, on average, 3.8 months following a plant closure. Using this information, we estimate the outside wage as the mean wage in the plants in the outside option reduced by 32% to re ect the expected time spent searching for new employment.

# B Simulated Mergers

## B.1 U.S. Hospitals

We simulate all possible mergers between active, short-term, critical access, or children's hospitals where we observe su cient data and where mergers are possible[55] within the local

[53] Earnings in another sector may also have a di erent utility value by revealed preference.

[54] The 2-digit SIC labor market allows workers to consider jobs that are similar, but not identical to their current job, and avoids scenarios where there may only be one plant within a 4-digit SIC in a given region. For example, this means that a worker at a plant that makes \fertilizers and pesticides" may threaten to switch to plant that makes \paint varnish and lacquer" since both are chemicals industries, assuming these plants are in the same region. Wages are share-weighted.

[55] Our universe of hospitals consists of all hospitals appearing in the HCRIS data in 2006 that are active, short-term, critical access, or children's hospitals.