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## Monopsony and Local Religious Clubs: Evidence from Indonesia

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# Monopsony and Local Religious Clubs: Evidence from Indonesia

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MAY 2024

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## ABSTRACT

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# Monopsony and Local Religious Clubs: Evidence from Indonesia\*

Participation in social groups ties members to local communities. Employers can capture these benefits as rents when geographically-specific club goods raise the cost of labor mobility. We measure ties to local clubs using the shares of households identifying with a minority religion, enrollment of children in Islamic schools, and membership in secular savings clubs. We identify larger wage markdowns where households have stronger ties to local club goods. Complementarity between labor market concentration and club goods offers an explanation of rising wage markdowns absent increasing concentration, while adding to the difficulty in separating monopsony rents from compensating wage differentials.

**JEL Classification:** J42, J31, J24

**Keywords:** monopsony, imperfect competition, club goods, religion

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# 1 Introduction

Monopsony power stems from limitations on employee outside options. These options manifest through two primary channels: employment with alternative local firms and relocation to other labor markets. Limitations on both were central to the canonical story of the “company town,” but as innovation and economic growth loosened the constraints on household mobility, labor market concentration became the dominant explanation for observed monopsony rents. Recent research has observed increasing markdowns on wages, but these increases have been concurrent with constant or declining labor market concentration (Bassier, Dube, & Naidu, 2022; Rinz, 2022; Yeh, Macaluso, & Hershbein, 2022).<sup>1</sup>

In this paper we consider the *social* cost of migration as a critical constraint on labor mobility and therefore a source of monopsony power. We hypothesize that participation in geographically-specific social clubs creates benefits from local employment that can be captured as rents by employers, increasing the markdown on wages relative to their marginal revenue product. We test our hypothesis by structurally estimating firm-level wage markdowns and then identifying the relationship of markdowns with local religious and secular club affiliations in Indonesia.

Any local social attachment increases the cost of migration.<sup>2</sup> Many attachments, such as extended family, are sufficiently universal that they are effectively internalized into the baseline migration costs facing any labor pool. Participation in clubs, by comparison, constitutes a choice and an investment. Social clubs, broadly conceived, constitute some of our most important, and most heterogeneous, social attachments.

Participation in a successful social club is not a passive endeavor, but requires the commitment of time, energy, and material resources. In return, club goods frequently provide indispensable resources, especially for poor households otherwise less resilient to negative economic shocks. Investment in local club goods, however, also stands as a trade-off against future mobility. As a household’s club-specific capital grows, so does the portion of that household’s wealth tethered to that club, rooting it to a locality. Where households invest more in club-specific social capital, their exit options weaken and workers’ bargaining power in the labor market will decline.

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<sup>1</sup>To be clear, it remains consistently observed in the cross-section that labor earnings are lower where employer market concentration is higher (Benmelech, Bergman, & Kim, 2022; Lipsius, 2018; Qiu & Sojourner, 2019). While these papers have focused on measuring monopsony power and employer rents within manufacturing, monopsony power has also been observed in the labor markets for teachers (Falch, 2010; M. R. Ransom & Sims, 2010), nurses (Matsudaira, 2014), engineers (Fox, 2010), baseball players (Humphreys & Pyun, 2017), and retail workers (A. Dube, Giuliano, & Leonard, 2019).

<sup>2</sup>Attachments don’t have to be social, of course. Blanchflower and Oswald (2013) observe labor mobility declining with home ownership, a correlation that could be a product of sentimental attachment as much as the transaction costs associated with selling and buying a home.

The most successful clubs, most notably religious communities, are often characterized by institutions that impose unproductive costs on members and weaken outside options by design (Aimone, Iannaccone, Makowsky, & Rubin, 2013; Iannaccone, 1992). Requirements designed to produce social stigma for their members outside of clubs are of particular relevance because they heighten the visibility of membership, further weakening the perceived exit options, and in turn bargaining power, of local workers. These costs serve to lower the shadow price of investing in club goods and associated social capital, subtly altering payoffs in a bid to mitigate free-riding. It is this mitigation of free-riding that allows any social club to collectively produce social goods of significant importance or scale, but the trade-off against member mobility is not without cost.

Religious communities routinely provide a variety of critical club goods to their members (Berman & Laitin, 2008; Berman & Stepanyan, 2003; Hungerman, 2005, 2013; Iannaccone, 1998; Iyer, 2016), but in developing countries the most important benefits can be characterized as insurance against exogenous shocks (Auriol, Lassebie, Panin, Raiber, & Seabright, 2020; Becker, Rubin, & Woessmann, 2023; Chen, 2007, 2010; O. Dube, Blumenstock, & Callen, 2022). Migration also offers a form of insurance against local shocks (Morten, 2019; Munshi & Rosenzweig, 2016), albeit through an almost mirror-opposite mechanism. Where migration offers insurance through exit, insurance via religious club goods demands households stay put. In this manner investment in religious club goods represents a trading of one type of insurance for another.

Indonesia is an ideal cultural and institutional setting for observing the salience of club goods to labor markets, exceptional in not just its religiosity, but also its religious diversity (Lerner, 2013; Tamir, Connaughton, & Salazar, 2020). While insurance and other club goods are inherently local for all religious communities, this geographic-specificity is stronger for minority faiths whose practitioners may not easily find coreligionists at alternative locations (Fealy & Ricci, 2019; Kanas, Scheepers, & Sterkens, 2015; Lussier, 2019). With Muslims constituting 87% of the population, the roughly 36.7 million Indonesians of minority faiths face a starkly uneven distribution of coreligionists across the archipelago.

The geographic-specificity of religious club goods is not limited to minority faiths. Strong personal attachments within local Muslim communities allow access to club goods, such as mutual insurance and support, that are particularly valuable during periods of economic distress. Chen (2010) demonstrates that while enrollment of children in *madrasahs* offers Indonesian children an education with weaker returns in the private market, enrollment also helps to better embed the family in the community and ensure access to club goods. This proved salient in the wake of the 1997 Asian financial crisis, when many Muslims responded to increased economic uncertainty by enrolling in their children in *madrasahs*. Similar to

Chen (2010), we use the the financial crisis as an exogenous shock that increased reliance on club goods, estimating an event study model of the effect of madrasah enrollment rates on wage markdowns in the local labor market.

While religious clubs are central to households in Indonesia, secular clubs offer similar opportunities to build geographically-specific social capital. *Arisans* are rotating savings clubs that provide a source of local microfinance (Anderson & Baland, 2002; Lasagni, Lollo, et al., 2011). Formed by groups of individuals with tight interpersonal bonds (such as family, friends, or work colleagues), arisans give individuals both an incentive mechanism to save and an opportunity to receive an injection of liquidity at a randomly determined time that they can use to make a large scale purchase or investment, such as a wedding, household repair, or equipment purchase. To be able to participate in an arisan requires being part of a sufficiently well-integrated social network that members can trust each other to make good on future contributions. Similar to our analysis of madrasah enrollment, we estimate the impact of local arisan contributions before and after the financial crisis. Unlike madrasahs, however, predominantly cash-based arisans were disrupted by the financial crisis as inflation rose in excess of 70%, undermining their salience to households rather than elevating it.

Our analysis starts with structurally estimating industry-specific production functions, the results of which are used to calculate firm-year level markdowns on wages relative to the marginal revenue product of labor. We then estimate reduced-form models of the relationship of wage markdowns to local household participation in geographically-specific religious and secular club goods. Combined with Indonesian Census and household-level data from the Indonesia Family Longitudinal Survey (IFLS), we test the hypothesis that firms are able to capture greater monopsony rents when drawing from a labor pool characterized by *i*) a concentrated population of religious minorities, *ii*) higher enrollment of Muslim children in Islam-focused schools (*madrasahs*), *iii*) and greater participation in secular local savings clubs (*arisans*). We find support for the hypothesis within our analysis of all three institutions.

Local attachment to both religious and secular club goods leads to less household mobility and larger markdowns on wages. The median firm in our sample earns an estimated marginal revenue product from its production workers 1.4 times the wages paid (i.e. the firm’s “wage markdown”). We find that a one standard deviation increase in the non-Muslim percentage share of the local community corresponds with to a 41% increase in a firm’s expected wage markdown. For comparison, a one standard deviation increase in the a firm’s share of the local labor market leads to a 22% increase in the markdown. The rent-generating effects of minority faith participation, however, is non-linear and demonstrates strong complementarity with labor market concentration. The predicted markdowns on wages at the 80th percentile

of minority faith concentration are five-times larger in the upper quartile of labor market concentration than the lower quartile. This observed complementarity highlights the *joint* importance of both local market concentration and costs of migration toward generating monopsony power.

We find that enrollment in madrasahs and participation in arisans provide geographically-specific amenities to workers that tie them local communities, reducing migration and increasing wage markdowns. Using an event study empirical strategy, we find that Madrasah enrollment has no observed impact on wage markdowns until the 1997 financial crisis, after which a 1 *sd* increase in enrollment corresponded with a 2.5% increase in wage markdowns. We observe the converse relationship within an event study model of arisan enrollment. Prior to the crisis, we find that a 1 *sd* increase in arisan participation corresponded with a 10% increase in wage markdowns. Subsequent to the crisis, when inflation rates in excess of 70% inflation disrupted the salience of arisans (Knowles, Pernia, & Racelis, 1999), we find that the effect of arisan participation on wage markdowns disappears.

Sources of monopsony power remain an open question in the current literature (Card, 2022; Manning, 2021).<sup>3</sup> Estimating a structural model of labor mobility, T. Ransom (n.d.) finds that workers preferences for non-market amenities significantly increase their reservation wage of migration, weakening the role of earnings and increasing labor market power. Non-market amenities are a “black box” in such a model, a remainder left unexplained by market, firm, or employee characteristics. Our paper contributes to the literature on modern monopsony by opening the black box of non-market amenities, establishing the impact of local club goods on employer rents and their complementarity with employer concentration in the labor market. While neither religious affiliation nor rotational savings clubs are narrowly universal, our findings are generalizable to the broader importance of social goods to local labor market conditions.

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<sup>3</sup>Beyond market concentration, recent work has pointed to employer collusion across recruitment (Krueger & Ashenfelter, 2022; Naidu, 2010), restrictions on migration and mobility (Brooks, Kaboski, Kondo, Li, & Qian, 2021; Naidu, Nyarko, & Wang, 2016) and the spread of non-compete agreements (E. Starr, 2018; E. P. Starr, Prescott, & Bishara, 2021). At the same time, industry-specific shocks to employment, dual-career households, occupational licensing, and job stickiness employment-based health insurance have all proven insufficient to explain recent declines in labor migration in the US and Europe (Dao, Furceri, & Loungani, 2014; Jia, Molloy, Smith, & Wozniak, 2023; Molloy, Smith, & Wozniak, 2017; Partridge, Rickman, Olfert, & Ali, 2012).



## 2 Club Goods and Labor Markets

### 2.1 Conceptual Framework

Monopsony originally served as the chalkboard explanation for lower wages in markets dominated by a single employer, but its explanatory status declined as economic growth and urban agglomeration emptied out these “company towns”. The revival of “New Monopsony” ([Hirsch & Schumacher, 2005](#)) within the body of workhorse models is due in no small part to an expansion of the model to include oligopsonistic competition amongst differentiated employers and the more general upward-sloping labor supply curves of imperfect competition ([Card, Cardoso, Heining, & Kline, 2018](#); [Robinson, 1969](#); [Sokolova & Sorensen, 2021](#)). While remaining inclusive of the physical or informational labor market isolation mechanisms that are the hallmark of traditional monopsony, imperfect competition allows for the non-monetary preferences of individual workers to create upward sloping labor supply curves.

Geographically-specific clubs increase the two-way heterogeneity in the matching of employers to workers and, in turn, foster an imperfectly competitive market characterized by an upward sloping labor supply curve ([Lamadon, Mogstad, & Setzler, 2022](#)). Benefits from location matching can be captured as monopsony rents when the clubs producing these benefits, such as religious communities, are external to employers, hard to replicate, and tie members to the local community. Framed slightly differently, access to geographically-specific club goods is a source of compensating wage differentials. The sources of these benefits are external to employers in terms of provision, but because access is heterogeneous across labor markets and requires physical proximity, employers can capture some portion of these benefits by marking down wages relative to the marginal revenue product of labor.

The high religiosity of Indonesian households combined with the diversity of their faiths make it an ideal setting for our analysis. While religious groups are arguably the most globally popular source of club goods, they are especially important in Indonesia, which by many measures can be considered one of the most religious countries in the world. In a 2020 Pew Survey ([Tamir et al., 2020](#)), 98% of Indonesian respondents indicated that religion was a “very important” part of their lives, the highest of the 34 countries surveyed (median = 24%). Indonesians ranked high in every dimension of religiosity asked, including assessments that belief in God (91%), the necessity of belief for morality (96%), and prayer (95%) were each “very important”.

## 2.2 Religious and secular clubs in Indonesia

The centrality of faith to daily life in Indonesia exists within a population of considerable religious diversity. While Indonesia’s 231 million adherents constitutes the largest Muslim population in the world, the Ministry of Religious Affairs legally recognizes six faiths: Muslim (87%)<sup>4</sup>; Catholic (3.1%); Protestant (7.6%); Hindu (1.7%); Buddhist (<0.5%), and Confucian (<0.5%). These six faiths, along with small populations of indigenous religious practitioners, are sufficiently differentiated that social capital of one faith is not easily re-applied in an alternative faith.<sup>5</sup>

Religious diversity, as it does in most places, does not come without a cost for minority practitioners diffused throughout Indonesia (Fealy & Ricci, 2019; Kanas et al., 2015; Lussier, 2019). To move to a location lacking in same-faith coreligionists is to endure both the opportunity costs of forgone relationships and club goods, as well as any costs potentially imposed by members of the majority. Adherents of non-Muslim faiths are spread throughout the archipelago (Figure 4) but also predictably “clumpy” in their distributions as established communities are more attractive to prospective migrants. Measured in both the number of adherents and the percentage of the population within local *kabupatens*,<sup>6</sup> the incentives for agglomeration by minority faith adherents produce a bimodal distribution of non-Muslim populations (Figure A1). The bimodality of the distribution of non-Muslim populations across the archipelago is beneficial to our analysis, allowing a difference-in-difference estimation to better identify the effect of minority religious population density on wage markdowns across locality, industry, and year.

Islamic schools (i.e. *madrasahs*) offer traditional and Islamic education at the elementary through senior-secondary levels and are subject to the same certification standards as secular degree-granting institutions. The Ministry of Religious Affairs requires that at least 70% of instruction must be dedicated secular subjects. Labor market returns to education in *madrasahs* are lower than at non-Islamic schools (Berman & Stepanyan, 2003). Chen (2010) found that enrollment shifted from secular schools to *madrasahs* in the wake of the 1997 financial crisis, and that affiliation with religious institutions smoothed consumption during economic distress. Families that experienced a \$1 decline in non-food expenditures were 1% more likely to move a child from a secular school to a *madrasah*, with an average household

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<sup>4</sup>The Indonesian Muslim population is predominantly Sunni.

<sup>5</sup>For point of contrast, Congregationalist Protestants in Massachusetts may find their club-specific capital does not perfectly translate when attending a Lutheran Church in Pennsylvania, but that difference is unto itself unlikely to inhibit migration in a way comparable to a Protestant household in northern Indonesia considering migrating to a Kabupaten without an active Protestant congregation.

<sup>6</sup>Kabupatens are roughly county-equivalent geographic regions, with populations between 23,816 and 14.5 million.

being 5% more likely to switch a child’s enrollment after the crisis. We exploit this shift in the salience of religious club goods to households by estimating an event-study model of wage markdowns and local madrasah enrollment before and after the financial crisis.

There are many non-religious club goods which may contribute to migration costs for households as well. One of the most prominent secular clubs is the *arisan*. Similar in structure to the rotating savings clubs observed in other developing countries, members agree to contribute a set amount of money to the group at a regular interval, and with a one person from the group receiving the entire sum in a random, turn-based system. This process repeats until every member of the group has had a turn receiving the payout. Households participating in arisans face higher migration costs until the cycle is completed, and also exhibit greater attachment to the local community. As cash-based savings clubs, however, the salience of arisan participation to households is highly susceptible to inflation. We exploit this susceptibility of arisan salience to inflation by estimating an event study model of wage markdowns and local arisan investment before and after the financial crisis and its unexpected leap from 6% to 70% inflation, decimating the role of arisans in local communities for years after the crisis (Knowles et al., 1999).

## 3 Data

### 3.1 Indonesia Annual Manufacturing Survey

Our data on firms comes from the Indonesia Annual Manufacturing Survey, *Survei Tahunan Perusahaan Industri Pengolahan*. It is a census of all the manufacturing establishments in Indonesia with at least 20 employees. Establishments are required to fill out the survey each year, and the dataset covers years 1993-2010. We use the variables on output (revenue), intermediate inputs, capital, wages, number of employees, location, and industry. We limit the sample to firms that do not have any government ownership stake and to firms that always have at least 10 employees.

To construct an average wage measure for each establishment, we add total wages to total benefits, and then divide by the number of employees in each establishment. We repeat this step for production and non-production workers, to get the average wage for each type of worker. Since prices are different for consumers than they are for industries, we deflate wages using Indonesia’s consumer price index to constant 2000 Rupiah and then deflate all other monetary values using industry specific wholesale price indices to constant 2000 Rupiah. The exchange rate in the year 2000 was about 8,400 Rupiah to 1 US Dollar.

We construct labor market share variables for each firm-year for each kabupaten and

kota<sup>7</sup>. This is done separately for production workers, so the assumption is that the relevant labor market for production workers is the local kabupaten.

Summary statistics for the data can be found in Table 1. Each observation is an establishment-year. Establishments have on average 171 employees, with about 84.7% of them working as production workers (as opposed to non-production, or white-collar workers). Production workers make on average 5,318,940 rupiah/year, which is about US \$633 (in year 2000 dollars). The non-production workers earn about twice as much.

Figures 1 and 2 show the average labor market concentration (Herfindahl-Hirsch Index) and wage markdowns within each kabupaten across Indonesia. There is some clustering of both markdowns and labor market concentration, but neither produces an immediately discernible pattern or pronounced measures on the island of Java. One could argue that the positive correlation between the two is visible within the map.

## 3.2 Population data

The census data is obtained from IPUMS International ([Minnesota Population Center, 2020](#)). The Indonesian census is conducted every ten years, and there is an intercensal population survey (SUPAS) conducted midway through each census period. We use the census data for the years, 1990, 2000, and 2010, and the SUPAS data for 1995 and 2005. We use data on population by religion and households with children at the kabupaten level. The kabupaten level data is linearly interpolated to get annual information.

Table 2 shows the summary statistics of this kabupaten level data. The average share of Muslims in each kabupaten is 91%, with the largest minority religion being Protestant.

Figure 4 shows the religion that is the majority in each kabupaten across Indonesia. As expected, most of the kabupatens are majority Muslim, but the majority Hindu island of Bali shows up as well as the majority Catholic province of East Nusa Tenggara. Other kabupatens are majority Christian (especially in Papua), but are more dispersed across the archipelago. There are no majority Buddhist and Confucist kabupatens in the data.

To control for the tightness of local labor markets, we use yearly unemployment rates for each province. This data is published by BPS-Statistics Indonesia ([BPS - Statistics Indonesia, 2021](#)), and is based on their labor force survey, SAKERNAS. We use data from years 1993 through 2010. SAKERNAS was not conducted in 1995, so we linearly interpolate to fill in the missing values. The average unemployment rate during this time period is 4.42%.

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<sup>7</sup>Indonesia is divided into provinces, and then each province is subdivided into regencies (kabupatens) and cities (kotas). We treat kabupatens and kotas similarly and therefore use ‘kabupaten’ to refer to both.

### 3.3 Indonesia Family Life Survey

The Indonesia Family Life Survey (IFLS) is an important household level longitudinal survey. The first wave was implemented in 1993/94 by RAND in collaboration with the University of Indonesia, with follow-up waves in 1997/98, 2000, 2007/8, and 2014/15. The survey includes information on household structure, demographics, and migration across waves. Our principal use of IFLS data is to supplement the census religion data, estimate local arisan participation, measure enrollment in madrasahs, and track household migration decisions.

Table 3 shows the summary statistics from this individual level data separately for non-Muslims and Muslims. The average age is about 34 years for both groups, with 57.8% of non-Muslims being married, and over 61% of Muslims being married. Both groups are comprised of about 51% females, about 57% live in households where someone has completed secondary school, and about 53% live in urban settings. Muslims are about twice as likely to send their children to madrasahs, and 8 percentage points more likely to participate in an arisan.

## 4 Empirical Models and Estimation

### 4.1 Structural estimation of wage markdowns

We measure labor market power as firm-year level wage markdowns, which is the ratio of a firm’s marginal revenue product of labor (MRPL) to its wages. This markdown is both in the spirit of Robinson’s (1969) formulation of monopsony, and also recent empirical work (Brooks, Kaboski, Li, & Qian, 2021; Yeh et al., 2022). This measure is agnostic about the source of the labor market power as it captures the gap between workers’ value to the firm and their cost. If the labor market is perfectly competitive, then the wage equals the MRPL and the wage markdown would be equal to one.

One concern with this raw wage markdown, is that it may be capturing effects of market power exhibited by the firm in the product market. If a firm has product market power, it can charge prices above cost, which would then also drive a wedge between its MRPL and wage. Recent work has controlled for this possibility by normalizing the wage markdown by the markup observed in the product market (Brooks, Kaboski, Li, & Qian, 2021; Yeh et al., 2022). These papers measure the output markup by looking at the markdown observed for an elastically supplied input. If an input market is indeed perfectly competitive, then any wedge observed between its marginal revenue product and its price can be attributed to wage setting behavior in the product market. Both Brooks et al. and Yeh, Macaluso, and Hershbein (2021; 2022) use the markdown on materials to normalize the markdown on

wages. This normalized wage markdown is then free of any influence of price setting behavior by the firm in the product market.<sup>8</sup> Recently, Raval (2023) has shown evidence that product markups are not consistently estimated by this production function approach. We therefore check the robustness of our results using the unnormalized markdowns in section 5.3.

Specifically, the normalized wage markdown is calculated as:

$$\nu_{fy} = \frac{\frac{MRP_{fy}^l}{w_{fy}}}{\frac{MRP_{fy}^n}{g_{fy}}} \quad (1)$$

for firm  $f$  in year  $y$  with  $MRP^n$  the marginal revenue product for input  $n$ ,  $w$  the average wage at firm  $f$  in year  $y$ , and  $g$  the price of input  $n$ . However, the firm data only provides the total amount of money spent on each input, and not input specific prices. We therefore use the equivalent representation of the markdown as the ratio of the output elasticity to its factor share of revenue.

$$\begin{aligned} \frac{MRP^l}{w} &= \frac{MRP^l * \frac{L}{pQ}}{w * \frac{L}{pQ}} \\ &= \frac{\frac{p \partial F_i}{\partial L} * \frac{L}{pQ}}{\frac{wL}{pQ}} = \frac{\frac{\partial F_i}{Q} * \frac{L}{\partial L}}{\frac{wL}{pQ}} \\ &= \frac{\theta^l}{\alpha^l} \end{aligned} \quad (2)$$

where  $\theta^l$  and  $\alpha^l$  denote a firm's output elasticity of labor and its labor share of revenue, respectively. An equivalent transformation is done for materials, so the normalized wage markdown is then a ratio of the output elasticities and factor shares.

The input factor shares are measured directly from the data, but the output elasticities need to be estimated. We estimate the necessary output elasticities by following standard practices for estimating Cobb-Douglas production functions. To allow for heterogeneity in the parameters, we estimate separate production functions for each industry ( $s$ ) and separately control for production workers ( $L^{PR}$ ) and non-production workers ( $L^{NP}$ ). We also include capital ( $K$ ), materials ( $M$ ), and electricity ( $E$ ) as inputs, so the corresponding Cobb-Douglas production function is:

$$Y_{fy} = F_s(PR_{fy}, NP_{fy}, K_{fy}, M_{fy}, E_{fy}, \omega_{fy}) \quad (3)$$

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<sup>8</sup>If the market for materials is not perfectly competitive, the normalized wage markdown is a lower bound estimate for the true wage markdown.

Output, capital, materials, and energy are all measured as values, deflated to the year 2000 using a wholesale price index. Capital is measured as the current replacement value of capital. Firm specific productivity is captured as  $\omega$ .

There are numerous approaches for estimating production functions. We follow the literature and use Akerberg, Caves, and Frazer’s (ACF)(2015) proxy-variable approach.<sup>9</sup> A primary concern when estimating production functions is that productivity ( $\omega_{fy}$ ) is unobserved to researcher, but known to the firm. ACF controls for this by imposing three assumptions. The first assumption is that productivity evolves according to a first-order Markov process. The second assumption is the ‘scalar unobservable’ assumption which assumes that the only unobservable to the researcher in the firm’s input demand function is idiosyncratic productivity. The third assumption is that the input demand function is invertible in productivity.

Together, these assumptions enable the researcher to control for unobserved productivity, and estimate the parameters of the production function. This method is called a ‘proxy variable’ method because it uses a proxy variable (sometimes called a control variable) to help separate out the influence of unobserved productivity on input choices. In so doing, allowing us to estimate the following equation:

$$y_{fy} = \beta_1 pr_{fy} + \beta_2 np_{fy} + \beta_3 k_{fy} + \beta_4 m_{fy} + \beta_5 e_{fy} + \omega_{fy} + \epsilon_{fy} \quad (4)$$

where the lowercase variables represent log transformations of the production function variables,  $\omega$  is the unobserved productivity parameter, and  $\epsilon$  captures unobserved idiosyncratic shocks. Estimation then follows the methods of Akerberg et al. (2015), Yeh et al. (2022), and Mollisi and Rovigatti (2018) to yield estimates of the  $\beta$ s separately for each industry.

Bond, Hashemi, Kaplan, and Zoch (2021) argue that the scalar unobservable assumption does not allow for firms to behave monopsonistically in the input markets because the market power is also unobserved and will be confounded with the unobserved productivity. They argue that production functions for firms with market power should be estimated with methods based on Blundell and Bond’s System GMM approach (2000). Yeh, Macaluso, and Hershbein (2022) perform Monte Carlo simulations and find that the proxy variable approach of ACF outperforms the System GMM method, even in the presence of monopsony.

Once the production function is estimated, we construct the product market markup as the markdown on materials using the estimated output elasticity for materials and the factor share observed in the data. To construct the wage markdown, we also need the output elasticity for labor ( $\theta_L$ ) and labor’s factor share ( $\alpha_L$ ). We construct the wage markdown

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<sup>9</sup>Brooks, Kaboski, Li, and Qian (2021); Yeh et al. (2022) show that results are robust to different estimation methods.



following both [Yeh et al. \(2022\)](#) and [Brooks, Kaboski, Li, and Qian \(2021\)](#). The two methods differ in that [Brooks, Kaboski, Li, and Qian \(2021\)](#) assumes a constant output elasticity of labor ( $\theta_L$ ), whereas [Yeh et al. \(2022\)](#) allow that parameter to vary across each industry. [Brooks, Kaboski, Li, and Qian \(2021\)](#) also estimates separate production functions for each 2-digit industry, where as [Yeh et al. \(2022\)](#) uses 3-digit industry codes.

Summary statistics for the wage markdowns are shown in Table 1. Averages are shown using both the methods of [Yeh et al. \(2022\)](#) (YMH) and [Brooks, Kaboski, Li, and Qian \(2021\)](#) (BKLQ). The mean markdown using YMH is greater than what [Yeh et al. \(2022\)](#) find in the United States, though the median reported in Indonesia is similar to the reported medians in the US. Our results using BKLQ find mean markdowns greater than found by [Brooks, Kaboski, Li, and Qian \(2021\)](#) in China and India, but the median for Indonesia is in between the medians for China and India.

## 4.2 Reduced form estimation of wage markdowns and migration

### 4.2.1 Migration

Using longitudinal data of individual respondents across 5 waves of the IFLS, we estimate a linear probability model of the effect of local club goods on whether an individual migrated within Indonesia since the previous survey wave:

$$\text{Migrated}_{iky} = \beta_0 + \beta_1 \text{Club}_{iky} + \beta_2 \mathbf{X}_{sky} + \beta_3 \mathbf{V}_{ky} + \alpha_s + \gamma_k + \delta_y + \varepsilon_{iky}. \quad (5)$$

where  $\text{Migrated}_{iky}$  is a binary indicator and  $\text{Club}_{iky}$  is the local club goods variable of interest, including the local population of local coreligionists of the respondent's faith, whether the household has at least one child enrolled in a madrasah, or the respondent is a member of an arisan.

Respondents report their religious affiliation (Muslim, Catholic, Protestant, Hindu, Buddhist, or Other) in the Census. Using this information, we count the number of same-faith coreligionists a person of a given faith enjoys within a kabupaten. The absolute counts, however, are less reflective of the opportunity cost of migration than the count of co-religionists *relative to* other kabupaten. As such, we include the coreligionist count quantile as a right-hand side variable, locating a kabupaten within in the distribution of kabupaten by percentage of the respondent's religion. Using IFLS responses, we similarly estimate the impact of arisan membership during the current wave and whether they are residing in a household with at least one child under the age of 18 is currently attending a madrasah. All estimated migration models include a vector of controlling covariates,  $\beta_2 \mathbf{X}_{sky}$ , that include quadratic age, education, and indicators for whether the individual is married, female, has



children under 18, and is in an urban setting. All specifications include kabupaten and year fixed effects. Given the longitudinal construct of the IFLS (i.e. repeated observation of the same individual) and that the key variables of interest vary at the individual level, robust standard errors are clustered at the individual level.

Additional specifications estimating migration decisions include interactions with year and stratifications by income. Year interactions allow for differentiation of club good salience before and after the 1997 financial crisis. Inclusion of income is limited by its relationship to religiosity. We cannot separately identify the effects of income and religious affiliation, but we are able to stratify estimated coefficients of club participation by household income quintile to observe differences in club goods across income strata.

#### 4.2.2 Wage Markdowns

We regress our previously estimated firm wage markdowns over the regional attributes reflecting religious and secular club good participation within the local population:

$$\begin{aligned} \text{Markdown}_{fsky} = & \beta_0 + \beta_1 \text{Club}_{ky} + \beta_2 \text{Share}_{fky}^{\text{Labor}} \\ & + \beta_3 \mathbf{X}_{sky} + \beta_4 \mathbf{V}_{ky} + \alpha_s + \gamma_k + \delta_y + \varepsilon_{fsky}. \end{aligned} \quad (6)$$

where  $\text{Markdown}_{fsky}$  is the  $\nu_{fsky}$  structurally estimated in section 4.1, and  $\text{Club}_{fky}$  is the local club goods variable of interest. All estimates of markdowns include the firms employment share of the manufacturing industry labor force,  $\text{Share}_{fsky}^{\text{Labor}}$ . A vector of controlling covariates,  $\mathbf{X}_{sky}$  includes  $\text{unemployment}_{ky}$ ,  $\log \text{population}_{rky}$ , the fraction of firm employees working in production-related occupations, and an indicator for whether the firm was ever foreign-owned within the observable window. All specifications include kabupaten, 3-digit industry code, and year fixed effects. Robust standard errors are clustered at the kabupaten level.

Our right-hand side variables vary considerably across our different club goods of interest. Our core estimates of minority religious participation on wage markdowns use census measurements of the population percent that self-identify as a member of a non-Muslim religious faith. Kabupatens vary in size, however, while religious communities are unconstrained by municipal borders. To better estimate local religious composition, we calculated “regional shares” of non-Muslims, where a region is defined as a radius of  $r$  miles.  $\text{Non-Muslim}_{ky}^r$  is the percent of the population living in all kabupatens whose geographic centroid is within  $r$  miles of the centroid of kabupaten  $k$ . In some models we will include this as a cubic polynomial and interact it with a cubic polynomial of firm labor market share. In these models we identify the impact on wage markdowns by observably similar firms, working in the same

industries and localities, but happen to be hiring in labor markets with larger or smaller non-Muslim populations. The coefficients of interest are identified off of changing religious demographics within regions and industries over time. Because estimates are both within-industry and within-region, our identification requires that the productivity of workers and firms are exogenous to religious demographics. We will address concerns over endogenous labor and capital output elasticities in section 5.3.

Our estimates of the madrasah and arisan participation effects on wage markdown employ an event study identification using the Asian financial crisis as a source of exogenous shock to the salience of both club goods to households in Indonesia. In these models the coefficient on the percent of local households with children enrolled in a madrasah ( $\text{Madrasah}_{ky}$ ) and the log of Rupiah invested in arisans per capita ( $\text{Arisan}_{ky}$ ) are both separately estimated by year:

$$\begin{aligned} \text{Markdown}_{fsky} = & \beta_0 + \beta_1 \left[ \sum_{t=1994}^{2000} \delta_y \times \text{Club}_{ky} \right] + \beta_2 \text{Share}_{fky}^{\text{Labor}} \\ & + \beta_3 \mathbf{X}_{sky} + \beta_4 \mathbf{V}_{ky} + \alpha_s + \gamma_k + \delta_y + \varepsilon_{fsky}. \end{aligned} \quad (7)$$

The effect of the financial crisis in Indonesia and its relevance to club goods is well documented in [Chen \(2010\)](#), increasing the dependence of Muslim families on the Islamic communities, manifested in many ways, including increased club good returns from enrolling children in madrasahs. In our analysis, our hypothesis predicts that the salience of madrasah enrollment within Muslim communities to the opportunity of migration and, in turn, mark-down on wages, will increase in the wake of the crisis. Conversely, our hypothesis would predict the opposite effect for arisan enrollment. Arisans are cash-based rotational savings clubs. Inflation in Indonesia skyrocketed from 6% to 70% in the first year of the crisis. This unexpected inflation spike was crippling for arisans ([Knowles et al., 1999](#)). Our hypothesis predicts the salience of arisans to decline immediately after the crisis and inflation take hold.

The samples on our madrasah and arisan event studies rely on data from the IFLS, which limits the samples relative to our broader analysis of religious minorities. The IFLS only began tracking arisan participation in the 1997 wave, resulting in 4 fewer years in the sample. Madrasah enrollment was tracked in the earliest waves, but we choose to restrict our sample to predominantly Muslim kabupatens to ensure salience in the labor market, excluding the 25% of the sample with largest portion of non-Muslims.

## 5 Results

### 5.1 Firm wage markdowns and labor market share

We first estimate multiple versions of equation 7, absent any measure of local club goods, to test the relationship between our estimated wage markdowns and a firm’s share of the local labor market. In Table 4 we observe markdowns consistently increasing with labor market shares. This result is robust to the inclusion of kabupaten fixed effects, industry fixed effects, and two different methods for estimating the wage markdown relative to the marginal product of labor. Columns 1-3 assume a constant output elasticity of labor (Brooks, Kaboski, Li, & Qian, 2021) (BKLQ), while columns 4-6 allow for industry-specific output elasticities of labor Yeh et al. (2022) (YMH). Using industry specific output elasticities allows for estimation out of sample and, in turn, nearly 40% more observations, producing coefficients on  $\text{Share}_{fsky}^{Labor}$  that are 2-3 times larger. The observed importance of controlling for between-industry variation corroborates similar findings by Rinz (2022).

In Table 4, column 6 we find that a 1% increase in a firm’s employment share of the local labor market corresponds with a 0.5% increase on the ratio of a firm’s marginal revenue product of labor to the wages it pays.<sup>10</sup> We treat this estimate as our empirical baseline, validating the relationship between wage markdowns and market concentration. This will serve as our point of comparison as we introduce measures of club goods and their salience to our reduced form model.

### 5.2 Religious Minorities

#### 5.2.1 Coreligionist density reduces religious minority migration

A key component of our argument is that participants in local clubs face higher opportunity costs of migrating to alternative labor markets. We test this assumption by estimating the effect of the number of local coreligionists on the probability a respondent in the IFLS has moved between waves, where coreligionists are defined within each of the following six categories: Muslim, Protestant, Catholic, Hindu, Buddhist, and Other. The opportunity of migration for religious minorities is not just about the size of the local coreligionist community, but rather the density of the community *relative* to alternative labor markets. To account for this, we include the current kabupaten population quantile for each individual’s religion share of the kabupaten population,  $\text{Coreligionists}_{iky}^{quantile}$ . In this manner, a Protestant household living within a 7% Protestant kabupaten (70th quantile) would face a lower

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<sup>10</sup>All estimated wage markdowns are normalized for firm price markups in the product market, but results are robust to the use of un-normalized wage markdowns (see Table 9).

opportunity cost of migrating than a Buddhist living within a 5% Buddhist kabupaten (95th quantile). This reflects not just the density and representation within their current local community, but what kind of community they would expect if offered a job in a randomly chosen kabupaten.

Results are reported in Table 5, with estimated models stratified by Muslim and non-Muslim. We find the probability that a non-Muslim individual moved to a new kabupaten during the preceding years since the last wave of the IFLS is declining with the number of coreligionists within the local population (column 1). In comparison, migration of Muslims is unrelated to the number of Muslims in their current location (column 4).

Consistent with the emphasis on religious club goods in the wake of the 1997 financial crisis (Chen, 2010), we observe differential effects in years before and after the crisis. Column 2 reports coefficients on coreligionist quintiles interacted with IFLS wave. After the financial crisis of 1997, the effect of local ties made it less likely for non-Muslims to migrate the more coreligionists were in their local community. Waves 3 and 4 of the IFLS did not have statistically different results than the first 2 waves.<sup>11</sup>

Columns 3 and 6 examine whether the impact of coreligionists on migration differed by income, stratifying coefficients by income quintile. We observe migration rates for non-Muslims consistently decreasing with the local coreligionist population for every level of income. The coefficient magnitudes are slightly smaller in the highest income quintile, but the difference in the coreligionist coefficients are only statistically significant between the highest and lowest income quintiles. There is no effect for Muslims, save the wealthiest 20% who are slightly more likely to migrate from places with larger Muslim populations.

Taken as a whole, the observed relationship between coreligionists and migration for non-Muslims support the hypothesis that participation geographically specific religious clubs increase the opportunity cost of migration.

### 5.2.2 Religious minority density increases wage markdowns

Having seen that local club goods (as measured by the number of coreligionists in your community) affects individual migration decisions, we next examine how local club goods relate to wage markdowns. We start by continuing to look at the impact of religious club goods, and the next two subsections examine the impact of religious education and a secular club good.

Table 6 examines the relationship between wage markdowns, the percent of the local community that is non-Muslim, and the firm’s share of the local labor market. We consider

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<sup>11</sup>Migration data in the IFLS is backwards looking, asking if they moved since the previous wave, so we can only observe migration in the 4 of the waves.

three different radii for “local community”, 0, 5, and 10 miles around the centroid of the kabupaten the firm is located in. For radii of 0, we consider the local labor market to be the individual kabupaten. The odd-numbered columns in Table 6 include the base controls of the percent of the local community that is non-Muslim and the firm’s share of the local labor market. The even-numbered columns additionally include the interaction effect between these two variables to explore complementarity of the effects.

In all six analyses, percent non-Muslim is positively correlated with wage markdowns. The impact of firm’s share of the local labor market is also positive and significant in all six columns. The coefficients estimated using religious minority percentage within a 5 mile radius (Table 6, column 3) yield a 41% increase in the wage markdown from a one standard deviation increase in the non-Muslim share. For comparison, a one standard deviation in the labor market share leads to a 22% increase the markdown.

The interaction between the two variables is also positive across all three specifications, but only statistically significant in column (4). These results suggest that both labor market concentration and the local club good contribute to greater wage markdowns, and that there is a complementarity between these two effects. This complementarity can be better visualized by looking at the average marginal effects across different groups of kabupatens as shown in Figure 5. This figure plots average marginal effects across 5 quintiles of the firm’s share of the local labor market and 4 quartiles of percent non-Muslim. The first quartile of percent non-Muslim is the omitted category. The first thing to note is that a higher share of non-Muslims in the local kabupaten is always associated with greater wage markdowns. This gap is greatest at low levels of firm’s labor market share. The figure also shows that the marginal effect on wage markdowns is decreasing at high levels of firm’s labor market share.

To see the cumulative effects more clearly, we present predicted wage markdowns by firm’s labor market share and percent non-Muslim in Figure 6. The percent non-Muslim is again divided by quartiles and the firm’s share of the labor market is grouped by quintiles. The first thing to notice is that at low levels of percent non-Muslim and low levels of firm’s share of the labor market, predicted wage markdowns near 1. Next, it is clear that the impact of increasing firm’s share of the labor market is greatest in kabupatens in the top quartile for percent non-Muslim. The other quartiles of percent non-Muslim also show complimentary effects with firm’s share of the local labor market, but to a lesser extent.

### 5.2.3 Madrasah enrollment

We next explore whether participation in the local religious community affects Muslims as well as non-Muslims. We measure participation in the local religious community for Muslims

as the percent of households that have a child enrolled in a madrasah. In Table 7 we examine the impact of madrasah enrollment on individual migration decisions. Column 1 finds no overall effect. However, this result masks heterogeneity both over time and across income levels. Column 2 examines the temporal heterogeneity and finds that in the first two waves of the IFLS, madrasah enrollment is negatively correlated with migration. However, by 2007, the result flips and is now positive.

The temporal impacts of madrasah enrollment is more clearly seen in Figure 7. This figure plots the effect of madrasah enrollment for the 3 years before the financial crises of 1997 and the 3 years after. The figure shows that madrasah enrollment had small and insignificant effects on wage markdowns before the crisis. However, after the crisis, we see madrasahs having a larger and increasing impact on wage markdowns, suggesting that families are placing a greater importance on maintaining connections to their local religious community. This increased salience of Madrasahs and other local Muslim club goods is consistent with the findings of Chen (2010), leading to larger benefits of local employment from which employers were able to capture greater rents. The last column of Table 7 examines the heterogeneity by income level. It shows that the negative effect of madrasah enrollment is largest for the poorest quintile and likely accounts for the bulk of the overall effect within the broader population.

#### 5.2.4 Arisans

In Table 8 we examine whether individuals are less likely to migrate between waves of the IFLS if they were also participating in an arisan. Columns 1 and 2 find precisely that. Column 2 shows the temporal heterogeneity of the effects and shows the negative impact of arisan participation was only negative before the financial crisis. This salience of arisan participation on individual migration decisions translates to larger wage markdowns, supporting our hypothesis. Figure 8 reports the coefficients on total investment in arisans within a kabupaten separately estimated in each of the three years before and after the financial crisis. We find that arisan participation is associated with larger markdowns before the crisis, but this effect largely disappears afterwards. This result is consistent with the hypothesis that the value of arisan participation greatly diminished after the financial crises because of the high inflation rates, eliminating the salience of arisans as a club good to migration decisions and, in turn, the ability of employers to extract rents from the benefits of arisan participation acquired through local employment.

### 5.3 Sensitivity Analysis and Alternative Explanations

We first consider the robustness of our results to variety of alternative specifications. [Raval \(2023\)](#) has shown that product market mark-ups are not consistent across various inputs, calling into question the reliability of their estimation. To see if this concern affects our results, we use the unnormalized wage markdown, which should be free of the impact of inconsistent product market mark-ups. Column 2 of Table 9 shows very similar results to our base results repeated in Column 1. The baseline estimate on the non-Muslim population share is less precise, and a share of it’s impact is attributed to the interaction term with labor market share, but the net effect on the mean of both values remains comparable. This likely also reflects that labor market share is now capturing some of the effect of the here purposefully omitted firm power in the product market. Figure 9 shows the predicted wage markdown for both our base specification, and using the unnormalized markdown and finds very similar results across the two specifications.

[Brooks, Kaboski, Li, and Qian \(2021\)](#) have also estimated normalized wage markdowns, but with slightly different specification choices. The biggest difference is that [Brooks, Kaboski, Li, and Qian \(2021\)](#) assume a constant output elasticity for labor which is then normalized so that firms with zero labor market share have a wage markdown equal to one. Column 3 of Table 9 shows these results which are qualitatively similar to the base results, though of lower magnitudes. The top-right panel of Figure 10 shows the predicted wage markdowns when we follow Brooks et al, and it also shows similar complementarity between labor market share and percent non-Muslim.

The next two variations on our base specification that we consider use a trans-log specification for the production function. The trans-log specification is a more flexible functional form, allowing for more heterogeneity in productivity across firms, but also creating more extreme results in the estimation. Because of these extreme results, we also apply a winsorization at the 10% level to focus attention on the middle of the distribution. Columns 4 and 5 of Table 9 show the results for the trans-log production function. The results in these columns are qualitatively similar to the results in the base specification, but smaller in magnitude. The results are more precise when using the 10% winsorization because of the reduced influence of the extreme values. The bottom two panels of Figure 10 show the predicted wage markdowns when using the trans-log production function, and finds qualitatively similar results to the base specification.

Firm labor market shares are negatively correlated with both the total count and share of the local population that adhere to non-Muslim religious traditions (Figure A5), mitigating concerns that endogenous labor market concentration effects may be independently driving observed effects on wage markdowns. Further, if we restrict the sample to kabupatens



that are at least 90% Muslim, there is no statistically significant increase in the observed coefficients on labor market concentration, though there is a small non-significant increase likely driven by the complementarity of all club and social goods with labor market share (Figure A7).

Recent research has shown the importance of self-employment as an important factor in shaping worker’s outside options (Amodio, Brancati, Brummund, de Roux, & Maio, 2024). This could be important in our context if members of minority religions are more or less likely to be self-employed or work within the informal market. To address potential sensitivity within our results, we constructed a measure of each kabupaten’s share of self-employment, which is inclusive of informal employment, from the Sakernas 2006. We find that kabupaten self-employment share is uncorrelated with the non-Muslim population share. We also added an indicator for high kabupaten self-employment share to our core specification, interacting it with the local non-Muslim population share. The coefficient on the interaction was very small (0.01,  $p = 0.08$ ) and sufficiently precise to suggest that the effect minority religious population density on wage markdowns is orthogonal to self-employment rates.

### 5.3.1 What about discrimination?

Non-Muslims are sometimes targeted for abuse and discrimination in Indonesia. It stands to reason that discrimination within the labor market may explain our observed patterns of monopsony rents. Isolating effects on monopsony power and the underlying elasticity of labor supply independent of demand-side forces, such as employer discrimination, is the principal motivation behind our emphasis on observing effects on wage markdowns (the *gap* between wages and productivity) rather than simply wages as the outcome variable of interest. Beyond the empirical strategy motivating our analysis, however, we also observe several patterns within the data that indicate that discrimination is unlikely to be an significant explanatory force behind our results.

In a simple, but direct, empirical test of the salience of discrimination, we interacted local non-Muslim population share with a firm-year level indicator for whether an employer was foreign-owned. While Indonesia’s population is 87% Muslim, most of the foreign-owned firms are based in countries that are not majority Muslim. It stands to reason that discrimination against non-Muslims is likely to be weaker within these firms. We do not observe any significant differences in the effect of non-Muslim population density on wage markdowns within foreign-owned firms (Table A4).

There are also more subtle empirical patterns that suggest that discrimination is not a first-order driver of our results. Firm discrimination in hiring non-Muslims reduces the size of the total labor pool considered for employment. This reduction in the relevant labor supply



would increase the wages paid (to non-Muslims), increasing the marginal revenue product of labor in equilibrium while leaving the wage markdown unchanged. What we observe instead, however, is marginal revenue product of labor uncorrelated with the non-Muslim population share within kabupatens (Figure A8). Carried further, the greater observed sensitivity of Muslim migration to wages suggests that discrimination against non-Muslims is likely to work against our core hypothesis. Employers discriminating against non-Muslims are shifting their hiring towards a more elastic supply of labor, which would have the effect at the margin of reducing monopsony power and *shrinking* wage markdown.

Concerns over discrimination and other potentially omitted variables also emphasize the importance of interacting non-Muslim percent with a firm’s employment share of the local labor market. The predicted wage markdowns from estimates over interacting polynomial measures give some insight into the effects of each firm labor market share and percent non-Muslim while holding the other constant at differing levels. Our ability to draw conclusions from these relationships is aided in part by the negative correlation between labor market share and the local non-Muslim share of the population (Figure A5), allowing for greater confidence that the effect of religious clubs is not just an underlying effect of labor market concentration.

The negative correlation observed in Figure A5 between labor market share and the local non-Muslim share of the population is one of a handful of observable differences between the more and less non-Muslim kabupatens in Indonesia. Table A3 includes summary statistics describing kabupatens by non-Muslims population quartile. The kabupatens with the highest non-Muslim share are often characterized by differences that are statistically significant. These differences, however, are either too small in magnitude to be salient to our outcomes of interest or are explicitly working *against* our hypothesis. Table A2 similarly includes summary statistics immediately before and after the 1997 financial crisis. Again, differences are observed, but none call into question the validity of our results.

## 6 Conclusions

We find that the wedge between wages and the marginal revenue product of employee labor is greater where the local population is characterized by greater participation in geographically-specific social clubs. When neither the club goods, nor the social capital accumulated in the service of such clubs, is portable, workers receive an implicit compensating wage differential from employment in their current location. A greater portion of these benefits can be captured as monopsony rents when the clubs producing these benefits, such as religious communities, are external to employers, hard to replicate, and enjoy sufficiently inelastic

worker demand.

Monopsony power is rooted in limitations on both local employment options and opportunities to migrate to a more favorable labor market. We find evidence of the importance of both types of limitations. Our results establish the importance of local club goods to continuing to corroborate the expectation of larger monopsony rents where the labor market is concentrated in a smaller number of firms. Just as importantly, however, our results also suggest that the capturing of these rents reflects a strong complementarity between firm labor market share and salience of local club goods, offering a channel through which observed monopsony rents can rise where and when employer concentration in the labor market may be falling.

We believe our results are generalizable to any context where households depend on formal and informal membership in clubs for access to important social goods, not limited to healthcare, household labor, marriage markets, or even emergency food or funds. Indonesia is an emerging economy, but lower income workers in wealthier economies similarly stand to enjoy large benefits from nominally modest changes in wages. This leads to the common expectation of higher wage elasticities of migration, but lower income households are also likely to be more dependent on the club goods they both consume and help produce with fellow members. For households facing economic uncertainty and limited faith in the stability of any prospective employment opportunity, the cost of migration may simply be too high. This limitation on employment options outside of their current employer and market create an opportunity for employers to capture rents from benefits produced by local sources outside of the firm. Non-market amenities can take the form of “black box” variables in models of migration and wages, a remainder left unexplained by market, firm, or employee characteristics. Our paper contributes to the literature on modern monopsony by opening the black box of non-market amenities, establishing the impact of local club goods on employer rents and their complementarity with employer concentration in the labor market. While neither religious affiliation nor rotational savings clubs are narrowly universal, our findings are generalizable to the broader importance of social goods in local labor markets.

Our analysis and results are, of course, characterized by several important limitations. While our data from individual firms allows us to structurally estimate the parameters of a production function, the data itself is not as fine-grained as what is available in some modern administrative data sets, limiting both the complexity of functional forms we can estimate and the reliability of out of sample estimates. We face similar limitations in our religious data, where regional and individual religious identifiers remain somewhat coarse. We cannot identify the narrow strictness or intensity of local congregations, mosques, or sects. Previous research would predict stronger effects in localities where stricter groups are

more prominent. This strictness, however, might also be correlated with weakened labor productivity (Aimone et al., 2013; Iannaccone, 1992). While we do not observe a correlation between the prevalence of religious minorities and the marginal productivity of labor in our sample (Figure A8), this could in part be because of the coarseness of our data.

We are also unable to observe and measure within our analysis the actual benefits accruing to households from access to club goods. This is not surprising as the data allowing for such information on benefits is hard enough to imagine, let alone acquire. The importance of it as a limitation on our analysis, however, is subtle. Because we cannot observe these benefits, we cannot estimate the compensating wage differentials being received by employees who procure local employment relative to employment at alternative locations. The markdown of wages relative to the marginal revenue product of labor is sufficient for estimating the rents accruing to employers and establishing local club goods as important sources of wage markdowns observed in both our data and potentially a variety of other settings. As for the net impact on workers, however, it is not simply the markdown on wages, but that markdown relative to the benefits of access to the club goods in question. The fraction of compensating wage differentials from club good access that are being captured by firms depends on both the competitiveness of the local labor market and the mobility of firms, and is not discernible within our data or analysis.

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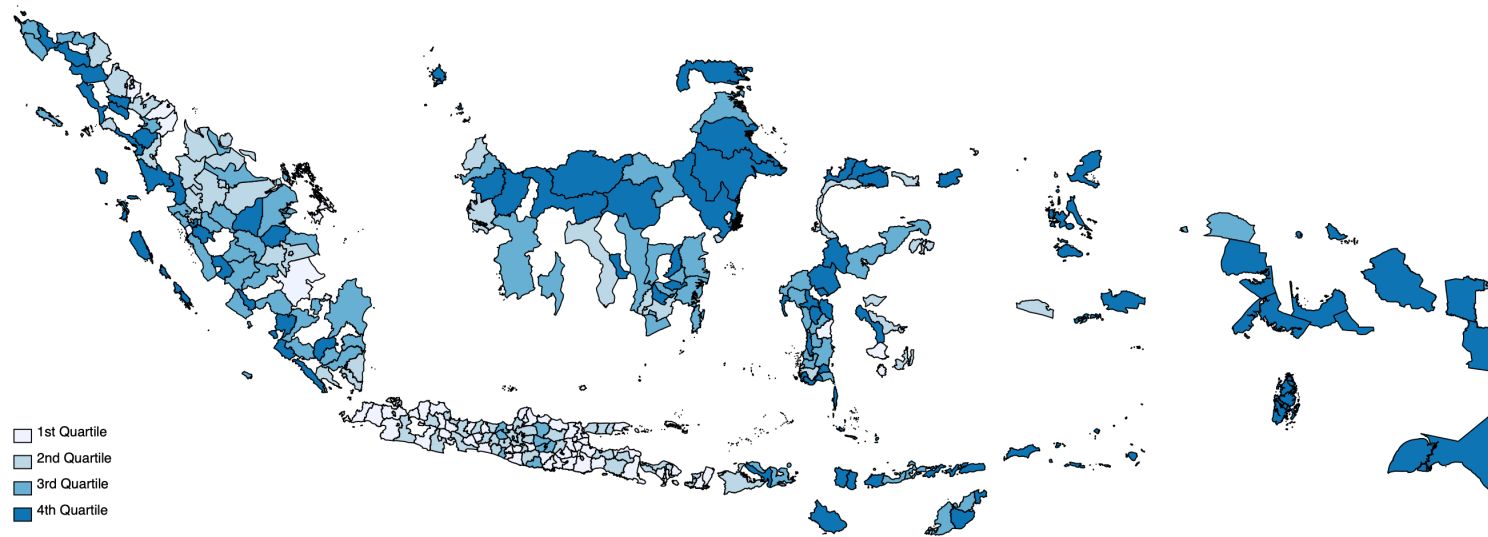
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## 7 Figures

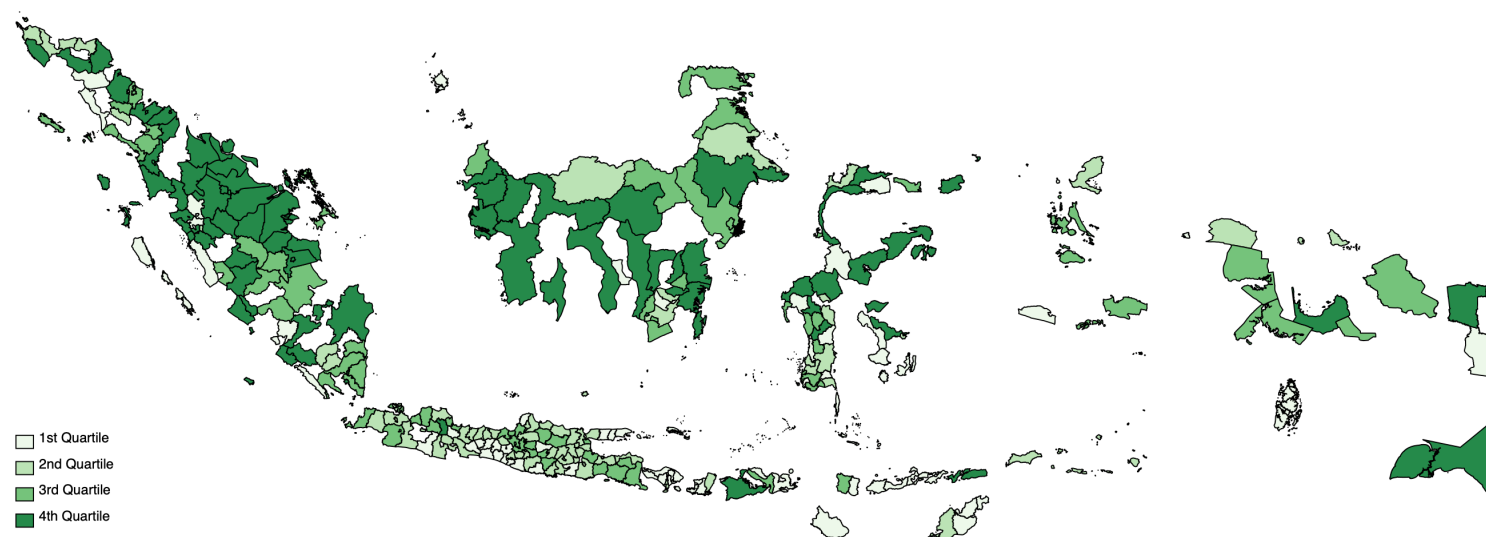


Figure 1: Map of Average Market Concentration of Production Workers (HHI) by Kabupaten



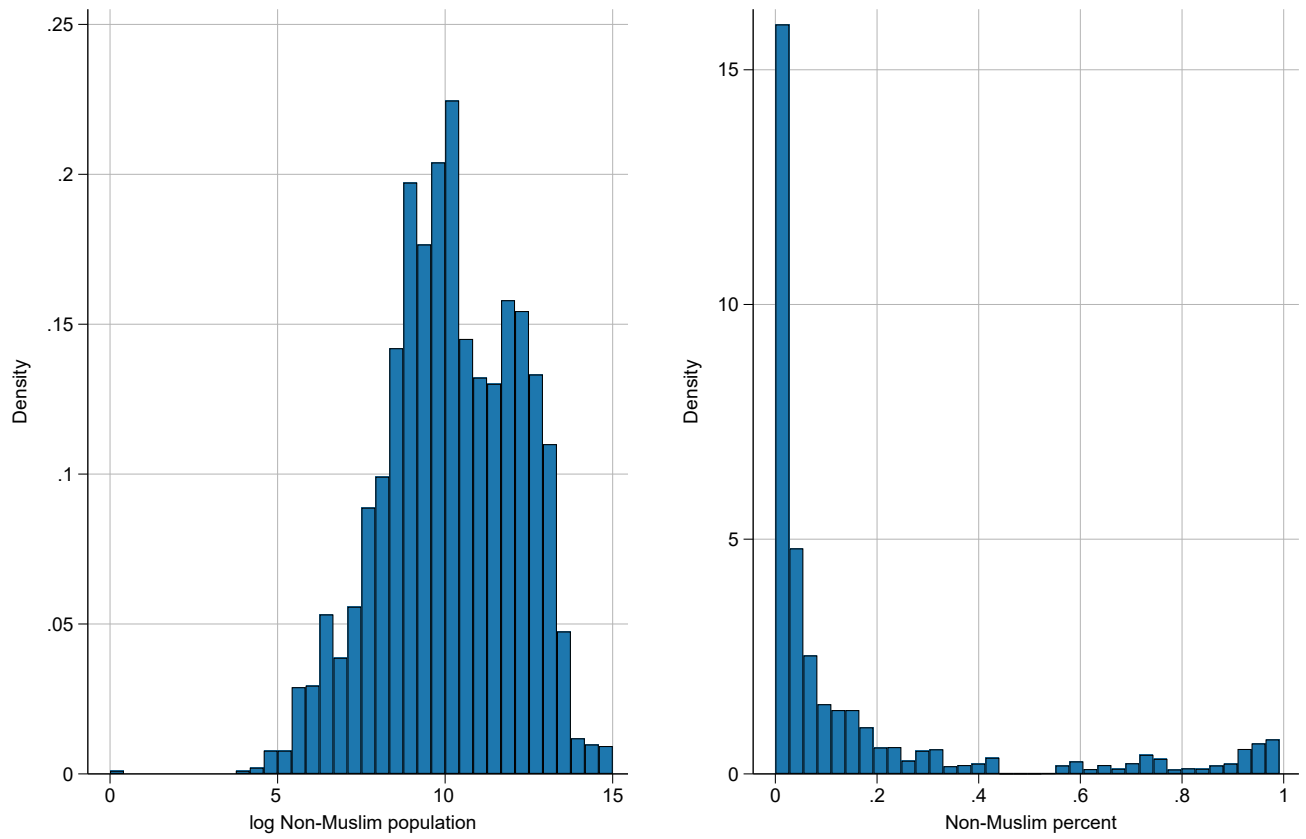
**Notes:** Data from the Indonesia Annual Manufacturing Survey, *Survei Tahunan Perusahaan Industri Pengolahan*, (SI) , 1993-2010. Firm labor market shares are mapped by kabupaten.

Figure 2: Average Wage Markdown Within Kabupatens in Indonesia



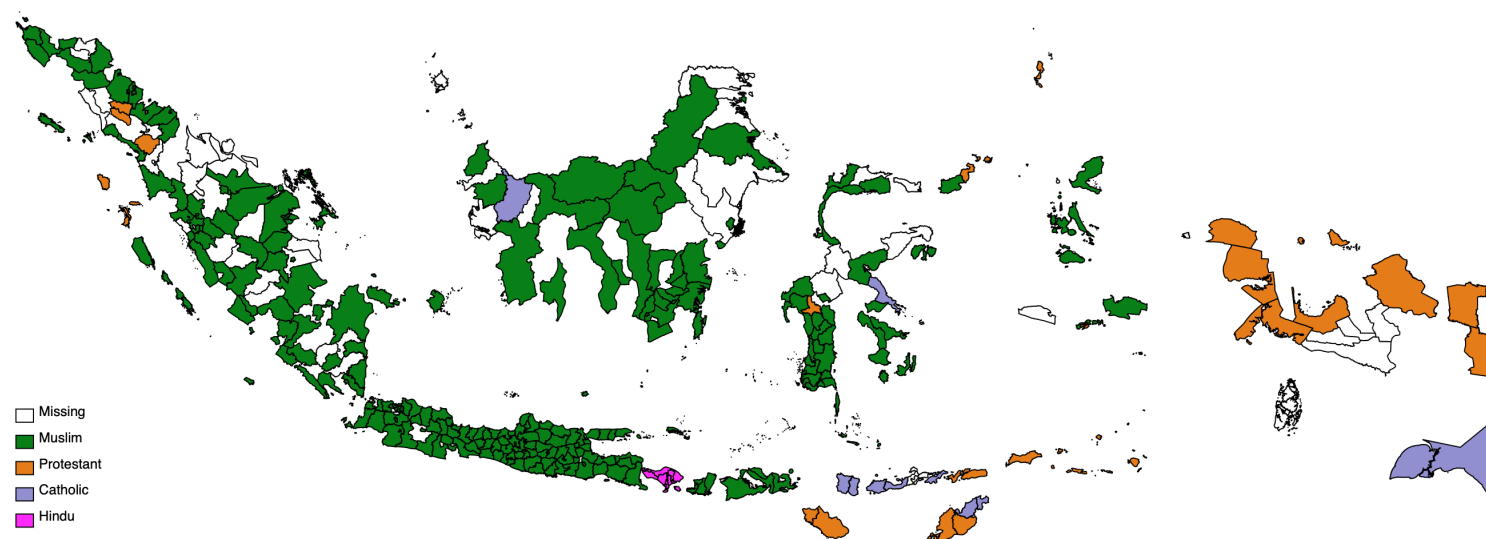
**Notes:** Data from the Indonesia Annual Manufacturing Survey, *Survei Tahunan Perusahaan Industri Pengolahan*, (SI) , 1993-2010. Firm labor market shares are mapped by kabupaten.

Figure 3: Distribution of Non-Muslim Kabupaten Populations



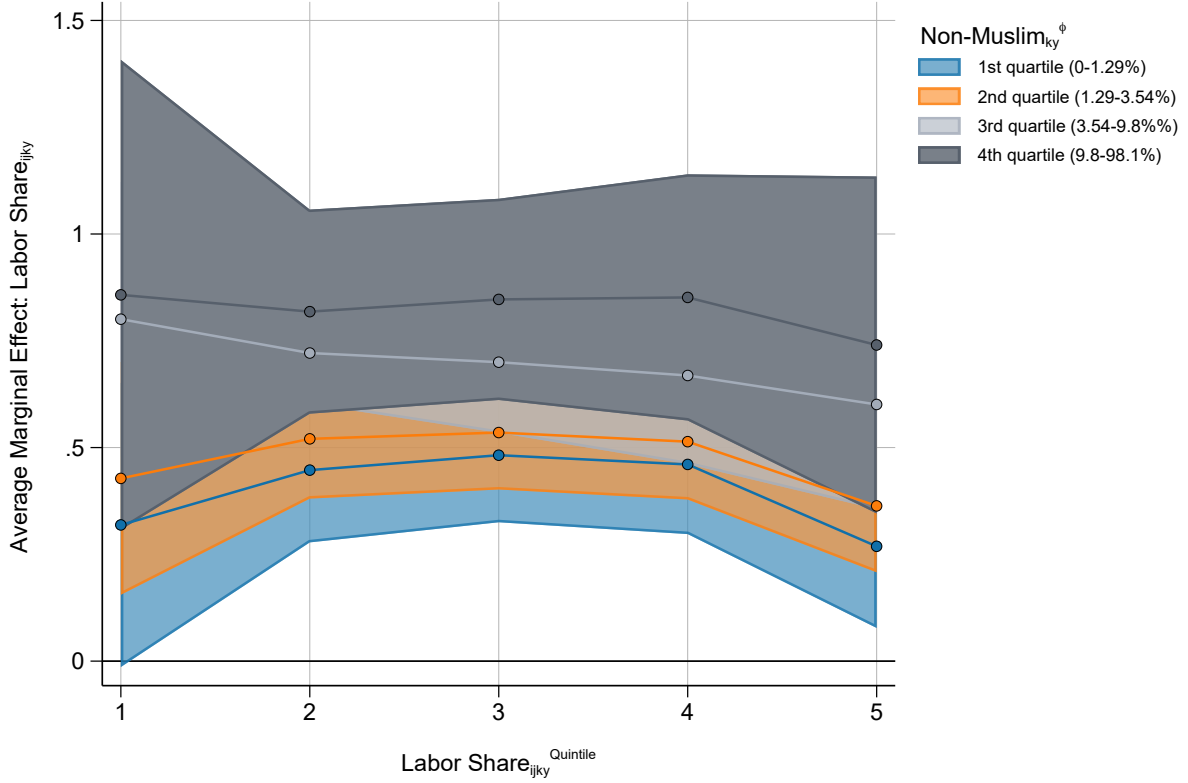
**Notes:** Histograms of Non-Muslim populations by kabupaten and year, Indonesian Census, 1990, 2000, and 2010

Figure 4: Map of Majority Religion Within Each Kabupaten



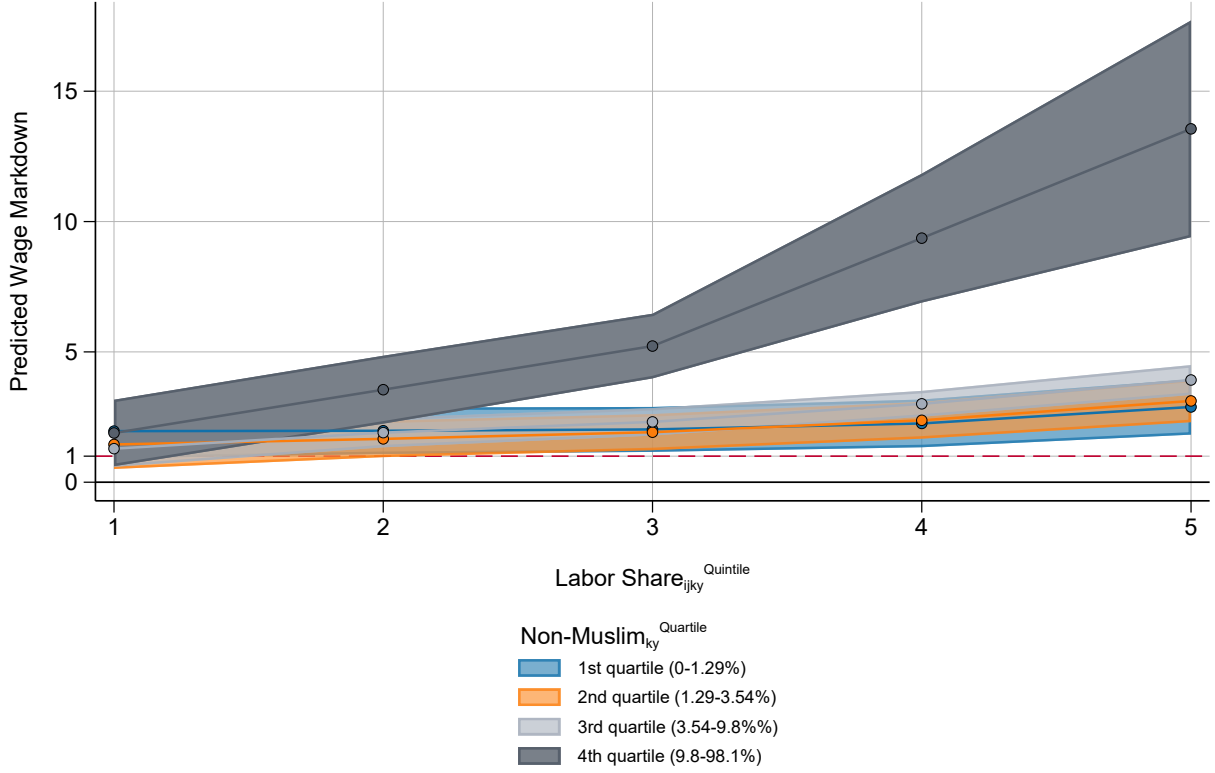
**Notes:** Majority religion within each kabupaten across all years. Data from the Indonesian Census, 1990, 1995, 2000, 2005, and 2010

Figure 5: Average Marginal Effect of Firm Labor Share on Wage Markdown Conditional on the Non-Muslim Share of the Local Population



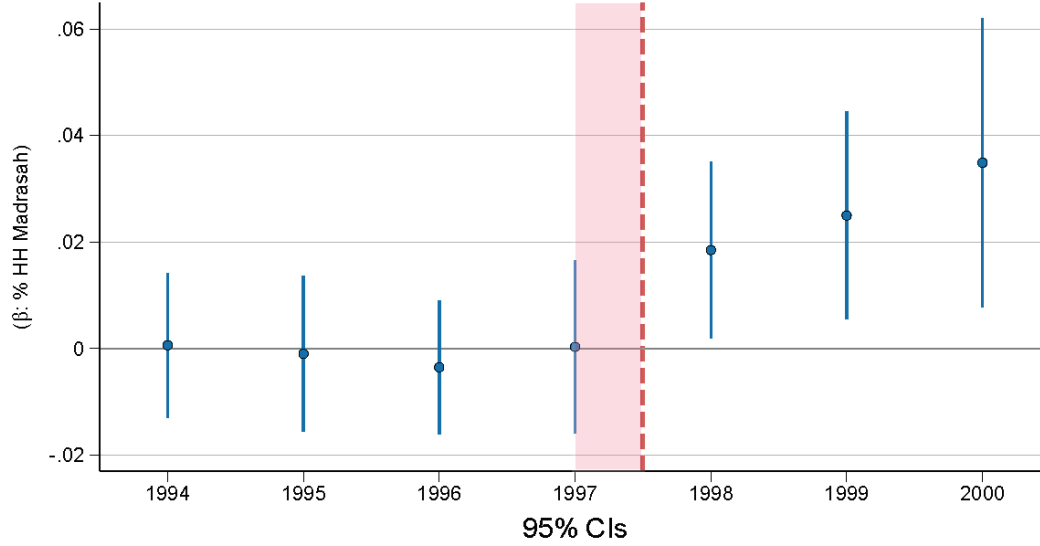
**Notes:**  $N = 288,070$ . Average marginal effect of firm labor market share stratified by non-Muslim regional share quartile ( $r = 20$  miles). X-axis is organized by labor market share quintiles to organize bins for average marginal effect calculations and ease visual scaling. Marginal effects calculated from coefficients produced using the same empirical specification and structural estimation of markdowns from Table 4, column 6, with the additional inclusion of firm labor market share and non-Muslim regional share as interacted 3rd-order polynomials. Controlling covariates include unemployment (by province), the fraction of firm employees with production occupations, whether the firm was ever foreign owned, as well as industry (3-digit), kabupaten, and year fixed effects. Confidence intervals are reported at the 95% level based on robust standard errors clustered over 208 kabupatens.

Figure 6: Predicted Firm Wage Markdown Over Labor Share Conditional on the Non-Muslim Share of the Local Population



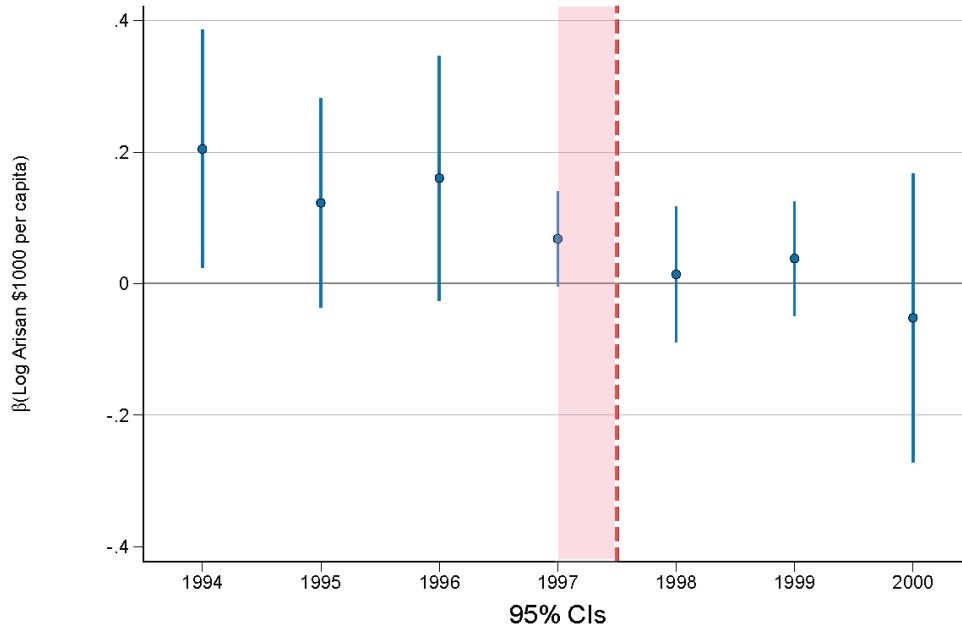
**Notes:**  $N = 288,070$ . Predicted Wage Markdowns over Labor Market Share, stratified by non-Muslim regional share quartile ( $r = 20$  miles). X-axis is organized by labor market share quintiles to organize bins for predicted wage calculations and ease visual scaling. Predicted wage markdowns calculated from coefficients produced using the same empirical specification and structural estimation of markdowns from Table 4, column 6, with the additional inclusion of firm labor market share and non-Muslim regional share as interacted 3rd-order polynomials. Controlling covariates include unemployment (by province), the fraction of firm employees with production occupations, whether the firm was ever foreign owned, as well as industry (3-digit), kabupaten, and year fixed effects. Confidence intervals are reported at the 95% level based on robust standard errors clustered over 208 kabupatens.

Figure 7: Event Study: Effect of Local Madrasah Matriculation on Firm Wage Markdowns Before and After the 1997 Asian Financial Crisis



**Notes:** N=263,482. Sample is limited to kabupatens surveyed in the IFLS. The y-axis charts the estimated coefficient on percentage of households with a child attending a Madrasah within a kabupaten each year,  $\beta(Madrasah_{ky})$ . A dashed vertical line between 1997 and 1998 is included to demarcate observations before and after 1997 Asian financial crisis, with shaded area as a reminder that a portion of survey respondents in 1997 would have already been treated by the shock. The regression specification and structural estimation of markdowns is the same used in Table 4, column 6. Controlling covariates include unemployment (by province), the fraction of firm employees with production occupations, whether the firm was ever foreign owned, as well as industry (3-digit), kabupaten, and year fixed effects. Confidence intervals are reported at the 95% level based on robust standard errors clustered over 156 kabupatens.

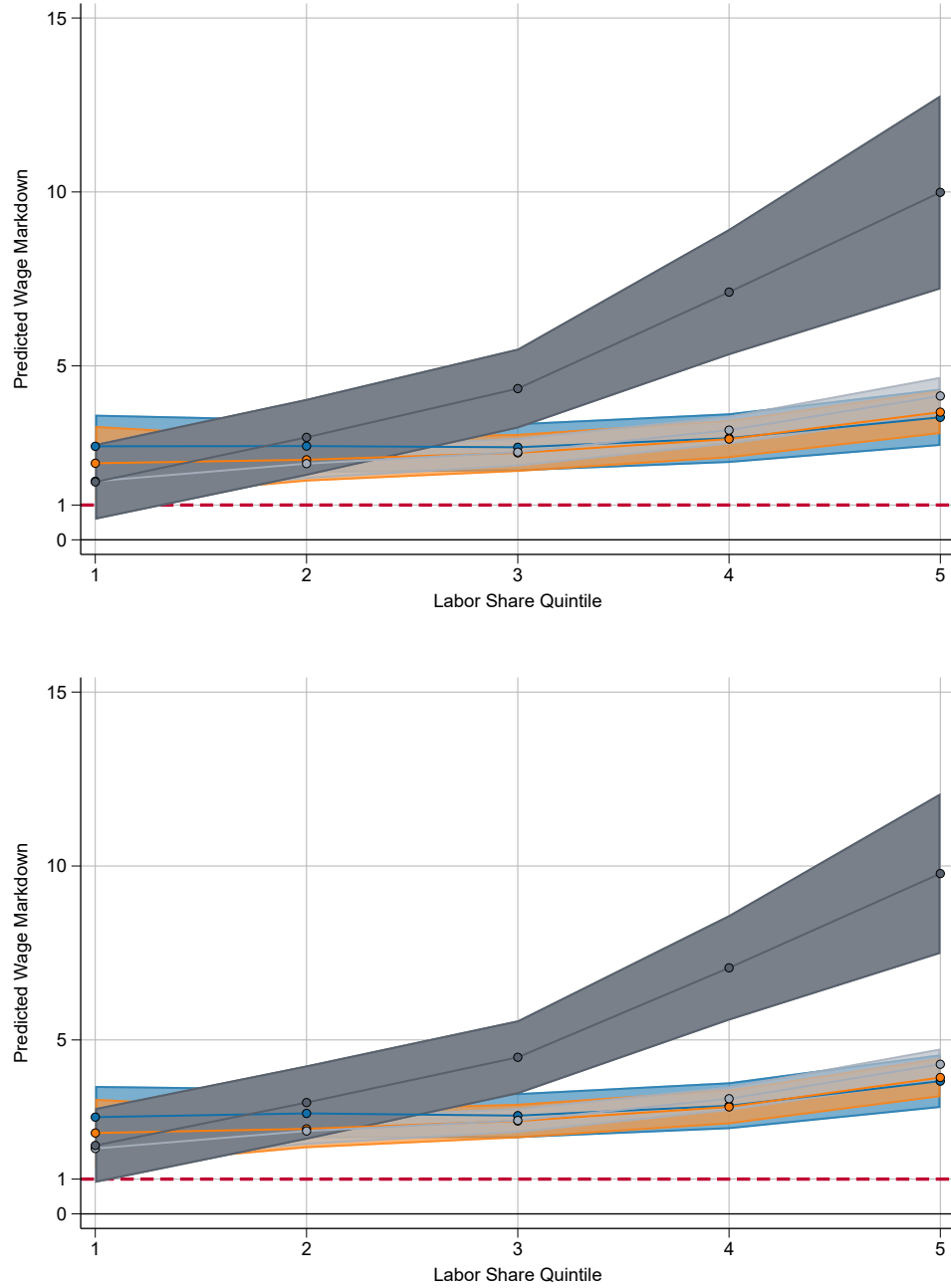
Figure 8: Event Study: Effect of Local Arisan Participation on Wage Markdowns Before and After the 1997 Asian Financial Crisis



Notes: N=188,328. Sample is limited to kabupatens surveyed in the IFLS with an at least 90% Muslim population. The y-axis charts the coefficient on log Rupiah per capita contributed to arisans within a kabupaten each year. A dashed vertical line between 1997 and 1998 is included to demarcate observations before and after 1997 Asian financial crisis, with shaded area as a reminder that a portion of respondents in 1997 would have already been treated by the shock. The regression specification and structural estimation of markdowns is that same as that used in Table 4, column 6. Controlling covariates include unemployment (by province), the fraction of firm employees with production occupations, whether the firm was ever foreign owned, as well as industry (3-digit), kabupaten, and year fixed effects. Estimation uses data is from IFLS, Census, and SI covering years 1993-2010. Arisan participation questions were added to the IFLS survey informing the 1997 reported data. Values are carried back from 1997 through 1994. Controlling covariates include unemployment (by province), the fraction of firm employees with production occupations, whether the firm was ever foreign owned, as well as industry (3-digit), kabupaten, and year fixed effects. Confidence intervals are reported at the 95% level based on robust standard errors clustered over 156 kabupatens.

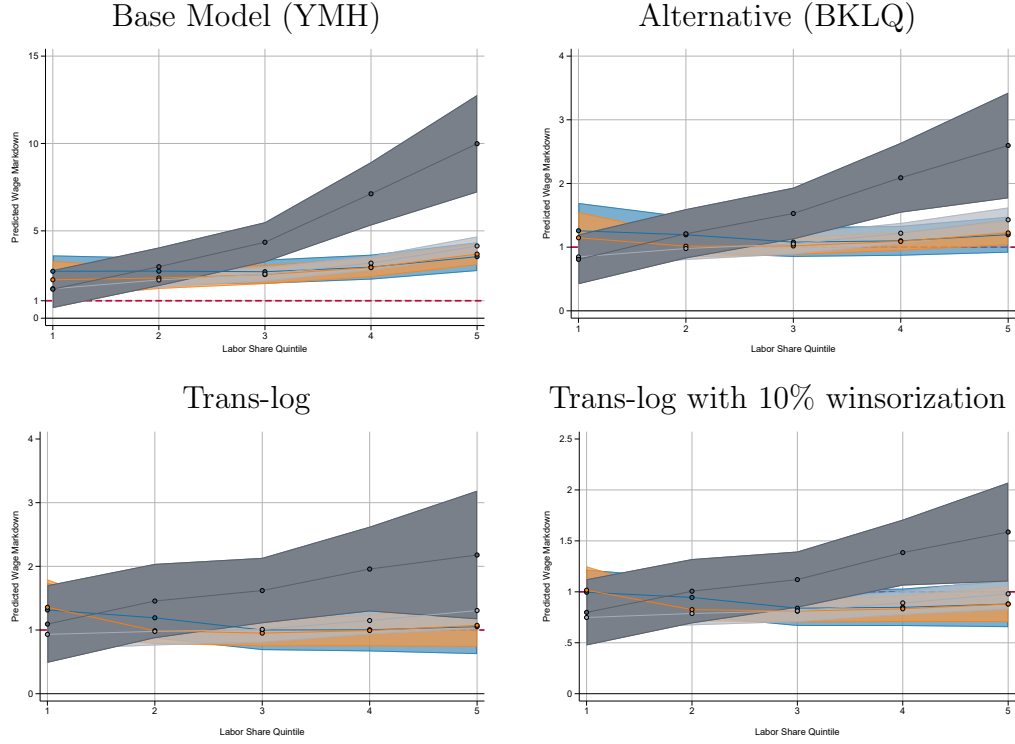


Figure 9: Normalized vs Un-normalized for Power in the Product Market: Predicted Firm Wage Markdown Over Labor Share Conditional on the Non-Muslim Share of the Local Population



**Notes:**  $N = 288,070$ . (Upper) Main Specification, normalized by product market share, compared to (Lower) un-normalized wage markdowns. Predicted Wage Markdowns over Labor Market Share, stratified by non-Muslim regional share ( $r = 20$  miles) quartile. X-axis is organized by labor market share quintiles to organize bins for predicted wage calculations and ease visual scaling. Predicted wage markdowns calculated from coefficients produced using the same empirical specification and structural estimation of markdowns from Table 4, column 6, with the additional inclusion of firm labor market share and non-Muslim regional share as interacted 3rd-order polynomials. Controlling covariates include unemployment (by province), the fraction of firm employees with production occupations, whether the firm was ever foreign owned, as well as industry (3-digit), kabupaten, and year fixed effects. Confidence intervals are reported at the 95% level based on robust standard errors clustered over 208 kabupatens.

Figure 10: Alternative Production Functions: Predicted Firm Wage Markdown Over Labor Share Conditional on the Non-Muslim Share of the Local Population



**Notes:**  $N = 288,070$ . Predicted Wage Markdowns over Labor Market Share quintiles, stratified by non-Muslim regional share ( $r = 20miles$ ) quartiles. Our base model (YMH) estimates industry-specific output elasticities (Yeh et al., 2022). The alternative model (BKLQ) estimates a constant output elasticity of labor by year (Brooks, Kaboski, Li, & Qian, 2021). Predicted wage markdowns calculated from coefficients produced by difference-in-difference estimates from equation 7 including interacted 3rd-order polynomials of firm labor market share and non-Muslim regional share. Independent variables include local unemployment, the fraction of firm employees with production occupations, whether the firm was ever foreign owned, as well as industry (3-digit), kabupaten, and year fixed effects. Confidence intervals are reported at the 95% level based on robust standard errors clustered over 208 kabupatens.

## 8 Tables

Table 1: Firm-level Summary Statistics from the Indonesia Annual Manufacturing Survey

	Mean	SD	p25	Median	p75
Total Employment	173.8	(683.6)	25.0	41.0	112.0
Production Workers Share	0.85	(0.15)	0.80	0.90	0.95
Average Wage of Production Workers (000s)	5,313	(39,363)	2,342	3,768	5,925
Average Wage of Non-Production Workers (000s)	10,843	(109,828)	2,985	5,572	10,071
Wage Markdown - Cobb-Douglas (YMH)	3.35	(7.54)	0.58	1.40	3.27
Wage Markdown - Cobb-Douglas (BKLQ)	1.26	(2.14)	0.25	0.57	1.27
Labor Market Share	1.24	(5.31)	0.06	0.19	0.57
Ever Foreign Owned	0.12	(0.32)	0.00	0.00	0.00
N	300,634				

**Notes:** Data is from SI for the years 1993-2010. Sample excludes firms that ever had less than 10 employees or had a government ownership stake.

Table 2: Kabupaten-level Summary Statistics from the Census and SAKERNAS

	Mean	SD	p25	Median	p75
Muslim population <sub>ky</sub> (%)	91.07	(14.66)	87.96	96.43	98.80
non-Muslim <sub>ky</sub> (%)	8.93	(14.66)	1.20	3.57	12.04
- Catholic <sub>ky</sub>	1.84	(3.31)	0.22	0.68	2.94
- Protestant <sub>ky</sub>	3.94	(6.71)	0.46	1.68	6.16
- Hindu <sub>ky</sub>	1.83	(11.52)	0.03	0.12	0.30
- Buddhist <sub>ky</sub>	1.20	(2.38)	0.04	0.16	0.90
- Other <sub>ky</sub>	0.08	(0.33)	0.01	0.03	0.08
Province unemployment rate	4.42	(57.77)	4.68	7.12	10.37
N	187,507				

**Notes:** Data is from the Indonesian census for the years 1990-2010. Unemployment data is at the province level from SAKERNAS.

Table 3: Individual-level Summary Statistics from the Indonesian Family Life Survey,

	non-Muslim		Muslim	
	Mean	SD	Mean	SD
Average Age	34.79	(10.86)	34.15	(10.60)
% Married	57.76	(49.40)	61.21	(48.73)
% Female	51.67	(49.98)	51.39	(49.98)
% of households completing secondary school	57.16	(49.49)	57.75	(49.40)
% Urban	53.54	(49.88)	52.71	(49.93)
% of households with children	74.02	(43.85)	72.31	(44.75)
% of households enrolling children in Madrasah	3.14	(8.21)	6.02	(9.98)
% of households participating in Arisans	22.06	(41.47)	30.68	(46.12)
Rupiah (\$) in Arisans per capita	15,221	(46,927)	17,528	(55,261)
N	6,998		57,410	

**Notes:** Data is from the Indonesian Family Life Survey, waves 1-5 (1993-2014) and sample is limited to working age population (between 18 and 55 years old).

Table 4: Structural Estimates of Firms' Wage Markdowns Increase with Their Shares of the Local Labor Market

	(1)	(2)	(3)	(4)	(5)	(6)
Log Share <sup>Labor</sup> <sub>fk<sub>y</sub></sub>	0.132*** (0.008)	0.068*** (0.006)	0.159*** (0.009)	0.578*** (0.030)	0.333*** (0.022)	0.600*** (0.031)
Structural Model	BKLY	BKLY	BKLY	YMH	YMH	YMH
Region FE	No	No	Yes	No	No	Yes
Industry FE	No	2 digit	2 digit	No	3 digit	3 digit
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Level	Firm	Firm	Firm	Firm	Firm	Firm
R <sup>2</sup>	.1	.254	.278	.0595	.214	.238
N	189310	189310	187507	304457	304457	300634

**Notes:** Data is from SI and Census, 1993-2010. Independent variables include local unemployment, the fraction of firm employees with production occupations, whether the firm was ever foreign owned, as well as industry (3-digit), kabupaten, and year fixed effects. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$  based on robust standard errors clustered over 42,372 firm establishments.

Table 5: Non-Muslim Households' Probabilities of Migration Decrease Where the Density of Local Coreligionists is Larger Relative to Other Kabupatens

	Non-Muslims			Muslims		
	(1)	(2)	(3)	(4)	(5)	(6)
Coreligionists $_{iky}^{quantile}$	-0.052*** (0.012)	-0.047*** (0.012)		-0.010 (0.008)	-0.018** (0.008)	
1997 $\times$ Coreligionists $_{iky}^{quantile}$		-0.018* (0.010)			0.021*** (0.004)	
2000 $\times$ Coreligionists $_{iky}^{quantile}$		-0.010 (0.009)			0.008*** (0.002)	
2007 $\times$ Coreligionists $_{iky}^{quantile}$		0.007 (0.009)			0.009*** (0.003)	
Income $_{iy}^{quintile}=1 \times$ Coreligionists $_{iky}^{quantile}$			-0.075*** (0.014)			0.001 (0.010)
Income $_{iy}^{quintile}=2 \times$ Coreligionists $_{iky}^{quantile}$			-0.067*** (0.014)			0.010 (0.010)
Income $_{iy}^{quintile}=3 \times$ Coreligionists $_{iky}^{quantile}$			-0.057*** (0.014)			0.015 (0.010)
Income $_{iy}^{quintile}=4 \times$ Coreligionists $_{iky}^{quantile}$			-0.056*** (0.014)			0.019* (0.010)
Income $_{iy}^{quintile}=5 \times$ Coreligionists $_{iky}^{quantile}$			-0.046*** (0.014)			0.031*** (0.010)
$R^2$	.318	.318	.354	.177	.177	.175
N	8715	8715	6972	69336	69336	57407

**Notes:** Dependent variable is the adjusted probability a respondent moved per year since the previous survey wave. Data is from IFLS covering years 1996-2010. Migration data in the IFLS is backwards looking, so we can only observe migration in the first 4 waves. All regressions includes year and Kabupaten fixed effects. Controlling covariates include quadratic age, education, indicators for whether the respondent is married, female, has children, and is living in an urban area, as well as industry (3-digit), kabupaten, and year fixed effects. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$  based on robust standard errors clustered over 281 kabupatens

Table 6: Structural Estimates of Firms' Wage Markdowns Increase with Larger Minority Religious Shares of the Local Population

	(1)	(2)	(3)	(4)	(5)	(6)
Non-Muslim $_{Region}^{\%}$	0.076*	0.083 * *	0.109 * *	0.118 * **	0.119 * **	0.124 * **
	(0.041)	(0.039)	(0.044)	(0.042)	(0.041)	(0.040)
Non-Muslim $_{Region}^{\%} \times \text{Log Share}_{fky}^{Labor}$		0.005		0.007*		0.006
		(0.003)		(0.004)		(0.004)
Log Share $_{fky}^{Labor}$	0.602 * **	0.561 * **	0.611 * **	0.552 * **	0.610 * **	0.558 * **
	(0.053)	(0.054)	(0.055)	(0.057)	(0.055)	(0.058)
Structural Model	<i>YMH</i>	<i>YMH</i>	<i>YMH</i>	<i>YMH</i>	<i>YMH</i>	<i>YMH</i>
radius r			5 miles	5 miles	10 miles	10 miles
Industry FE	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Year FE	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Cluster Level	<i>Kabupaten</i>	<i>Kabupaten</i>	<i>Kabupaten</i>	<i>Kabupaten</i>	<i>Kabupaten</i>	<i>Kabupaten</i>
R <sup>2</sup>	.238	.238	.237	.237	.236	.236
N	300634	300634	287718	287718	287926	287926

**Notes:** Dependent variable is wage markdown estimated in the Cobb-Douglas model. Key RHS variables are log labor employer share of the local labor market corrected for power in the product market; log religious population by each minority faith category; log Arisan  $rp$  per capita; and the percent of the local population that self-identifies with an ethnic minority group. Data is from Census and SI, 1993-2010. Independent variables include local unemployment, the fraction of firm employees with production occupations, whether the firm was ever foreign owned, as well as industry (3-digit), kabupaten, and year fixed effects. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$  based on robust standard errors clustered over 281 kabupatens.

Table 7: Muslim Households' Probabilities of Migration Decrease if They Have a Child Enrolled in a Madrasah

	(1)	(2)	(3)
Madrasah <sub>i</sub>	0.000 (0.001)	-0.002* (0.001)	
1997 × Madrasah <sub>i</sub>		-0.009*** (0.003)	
2000 × Madrasah <sub>i</sub>		0.003 (0.003)	
2007 × Madrasah <sub>i</sub>		0.005*** (0.002)	
Income <sub>iy</sub> <sup>quintile</sup> =1 × Madrasah <sub>i</sub>			-0.006** (0.002)
Income <sub>iy</sub> <sup>quintile</sup> =2 × Madrasah <sub>i</sub>			-0.000 (0.002)
Income <sub>iy</sub> <sup>quintile</sup> =3 × Madrasah <sub>i</sub>			-0.000 (0.002)
Income <sub>iy</sub> <sup>quintile</sup> =4 × Madrasah <sub>i</sub>			0.002 (0.002)
$R^2$	.181	.181	.184
N	47282	47282	38617

**Notes:** Longitudinal data is from IFLS covering years 1993-2007, with values interpolated between waves. Dependent variable is the weighted probability a respondent moved per year since the previous survey wave. Migration data in the IFLS is backwards looking, so we can only observe migration in the first 4 waves. Controlling covariates include quadratic age, education, indicators for whether the respondent is married, female, has children, and is living in an urban area, as well as industry (3-digit), kabupaten, and year fixed effects. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$  based on robust standard errors clustered over 156 kabupatens.



Table 8: Households' Probabilities of Migration Decrease if They Participate in an Arisan

	(1)	(2)	(3)
Arisan <sub>iy</sub>	-0.002*** (0.001)	-0.004** (0.002)	-0.001 (0.003)
2000 × Arisan <sub>iy</sub>		0.003 (0.002)	
2007 × Arisan <sub>iy</sub>		0.002 (0.002)	
Income <sub>iy</sub> <sup>quintile</sup> =1 × Arisan <sub>iy</sub>			-0.003 (0.004)
Income <sub>iy</sub> <sup>quintile</sup> =2 × Arisan <sub>iy</sub>			-0.001 (0.004)
Income <sub>iy</sub> <sup>quintile</sup> =3 × Arisan <sub>iy</sub>			0.001 (0.004)
Income <sub>iy</sub> <sup>quintile</sup> =4 × Arisan <sub>iy</sub>			-0.001 (0.004)
$R^2$	.181	.181	.183
N	47320	47320	44766

**Notes:** N=263,482. Longitudinal data is from IFLS covering years 1997-2007, with arisan participation values interpolated between 1993 and 2010. Dependent variable is the adjusted probability a respondent moved per year since the previous survey wave. Controlling covariates include quadratic age, education, indicators for whether the respondent is married, female, has children, and is living in an urban area, as well as industry (3-digit), kabupaten, and year fixed effects. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$  \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$  based on robust standard errors clustered over 209 kabupatens

Table 9: Robustness: Structural Estimates of Wage Markdowns Increase with Minority Religious Shares of the Local Population within Four Alternative Production Functions

	(1)	(2)	(3)	(4)	(5)
Non-Muslim $_{Region}^{\%$	0.118 * ** (0.042)	0.029* (0.017)	0.025 * * (0.012)	0.027* (0.014)	0.029* (0.017)
Non-Muslim $_{Region}^{\%} \times \text{Log Share}_{fky}^{Labor}$	0.007* (0.004)	0.033 * ** (0.005)	0.003 * * (0.001)	0.003 * * (0.001)	0.033 * ** (0.005)
Log Share $_{fky}^{Labor}$	0.552 * ** (0.057)		0.140 * ** (0.020)	0.141 * ** (0.024)	
Variation	<i>Base(YHM)</i>	<i>Unnormalized</i>	<i>BKLQ</i>	<i>Trans – log</i>	<i>TL, 10%Wins.</i>
R <sup>2</sup>	0	1	0	0	1
N	287, 718	300, 537	179, 286	166, 636	300, 537

**Notes:** Dependent variable is wage markdown estimated in the Cobb-Douglas model. Key RHS variables are log labor employer share of the local labor market corrected for power in the product market; log religious population by each minority faith category; log Arisan  $rp$  per capita; and the percent of the local population that self-identifies with an ethnic minority group. Data is from Census and SI, 1993-2010. Independent variables include local unemployment, the fraction of firm employees with production occupations, whether the firm was ever foreign owned, as well as industry (3-digit), kabupaten, and year fixed effects. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$  based on robust standard errors clustered over 281 kabupatens.

# A Appendix

Table A1: Census Summary Statistics by Respondents' Religion

	Muslim mean	Protestant mean	Catholic mean	Hindu mean	Buddhist mean	Other mean
Age	32.2	34.4	35.2	32.7	36.5	35.8
Female	0.43	0.43	0.56	0.55	0.27	0.48
Number of children in hhld	1.2	1.3	1.4	1.2	1.5	1.7
Years of schooling	5.83	8.42	7.36	4.90	7.87	3.97
Literacy	0.88	0.93	0.85	0.77	0.95	0.68
Speak Indonesian	0.14	0.41	0.28	0.02	0.47	0.16
Migrated	0.13	0.28	0.22	0.02	0.29	0.09
Urban	0.48	0.63	0.49	0.25	0.86	0.37
Works in Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
Wage and salary income	3,654,182	3,657,628	6,103,020	6,582,134	3,963,315	8,041,553
Number of Obs.	1,334,025	50,573	24,762	28,710	11,854	3,610

Table A2: Summary Statistics before and after 1997 Asian Financial Crisis

	(1)	(2)	(3)	(4)
	Full sample	Pre	Post	Difference Post - Pre
Wage Markdown - Cobb-Douglas (YMH)	3.350 (7.539)	3.452 (8.001)	3.869 (8.322)	0.417*** (0.06)
Labor Market Share	1.245 (5.311)	1.355 (5.459)	1.232 (5.139)	-0.124*** (0.04)
Wage of Production Workers (thousands R)	5.313 (39.363)	4.235 (7.391)	4.718 (44.538)	0.483* (0.21)
MRPL (thousands R)	20.688 (141.372)	16.449 (94.845)	18.782 (104.202)	2.333*** (0.67)
Production worker fraction of firm employees	0.847 (0.152)	0.846 (0.147)	0.847 (0.146)	0.001 (0.00)
Unemployment Rate	7.902 (3.589)	5.097 (2.060)	6.781 (3.178)	1.684*** (0.02)
Age	28.268 (2.438)	26.779 (2.101)	27.555 (2.170)	0.775*** (0.01)
Population (thousands)	1901.626 (2310.706)	1776.638 (1800.698)	1953.205 (2573.955)	176.567*** (14.87)
% population foreign-born	0.000 (0.001)	0.001 (0.001)	0.000 (0.001)	-0.000*** (0.00)
% secondary school education	0.179 (0.099)	0.144 (0.087)	0.171 (0.096)	0.027*** (0.00)
% post-secondary school education	0.024 (0.021)	0.015 (0.014)	0.018 (0.016)	0.003*** (0.00)
Observations	300634	47452	39803	87255

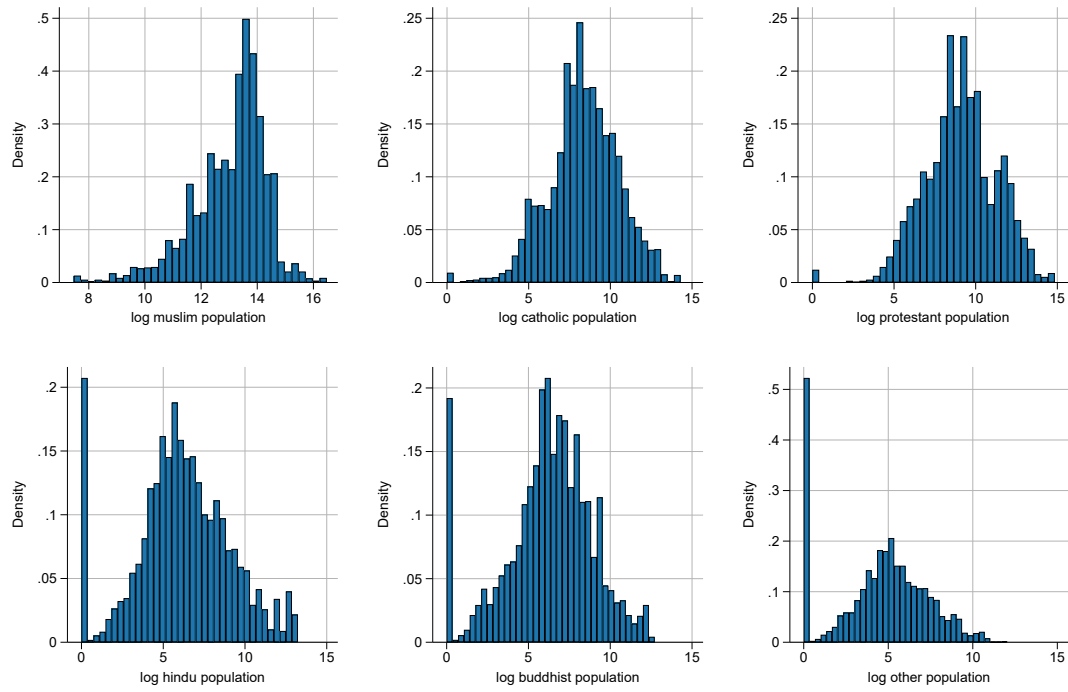
Table A3: Summary Statistics by Non-Muslim Population Quartiles

	(1)	(2)	(3)	(4)	(5)
	Full sample	q1	q2	q3	q4
Wage Markdown - Cobb-Douglas (YMH)	3.350 (7.539)	3.044 (5.675)	3.127 (6.456)	3.665 (8.535)	3.534 (9.800)
Labor Market Share	1.245 (5.311)	1.403 (5.216)	1.075 (4.448)	0.913 (4.035)	2.625 (9.804)
Wage of Production Workers (thousands R)	5.313 (39.363)	4.764 (36.653)	4.710 (28.930)	5.883 (41.118)	6.255 (60.390)
MRPL (thousands R)	20.688 (141.372)	18.118 (162.778)	17.777 (108.013)	24.345 (159.009)	21.837 (114.361)
Production worker fraction of firm employees	0.847 (0.152)	0.864 (0.148)	0.859 (0.152)	0.830 (0.153)	0.837 (0.144)
Unemployment Rate	7.902 (3.589)	8.618 (3.735)	7.317 (3.130)	8.004 (3.692)	7.861 (3.918)
Age	28.268 (2.438)	28.467 (2.552)	28.940 (2.215)	27.944 (2.348)	26.958 (2.438)
Population (thousands)	1901.626 (2310.706)	1660.432 (1897.968)	2488.305 (3546.457)	1690.561 (949.633)	1354.658 (977.907)
% population foreign-born	0.000 (0.001)	0.000 (0.000)	0.000 (0.000)	0.001 (0.001)	0.001 (0.002)
% secondary school education	0.179 (0.099)	0.085 (0.030)	0.125 (0.051)	0.259 (0.076)	0.256 (0.089)
% post-secondary school education	0.024 (0.021)	0.008 (0.005)	0.014 (0.009)	0.040 (0.023)	0.034 (0.019)
Observations	300634	63814	95022	110756	31042

Table A4: Estimated Wage Markdowns and Foreign Firm Ownership

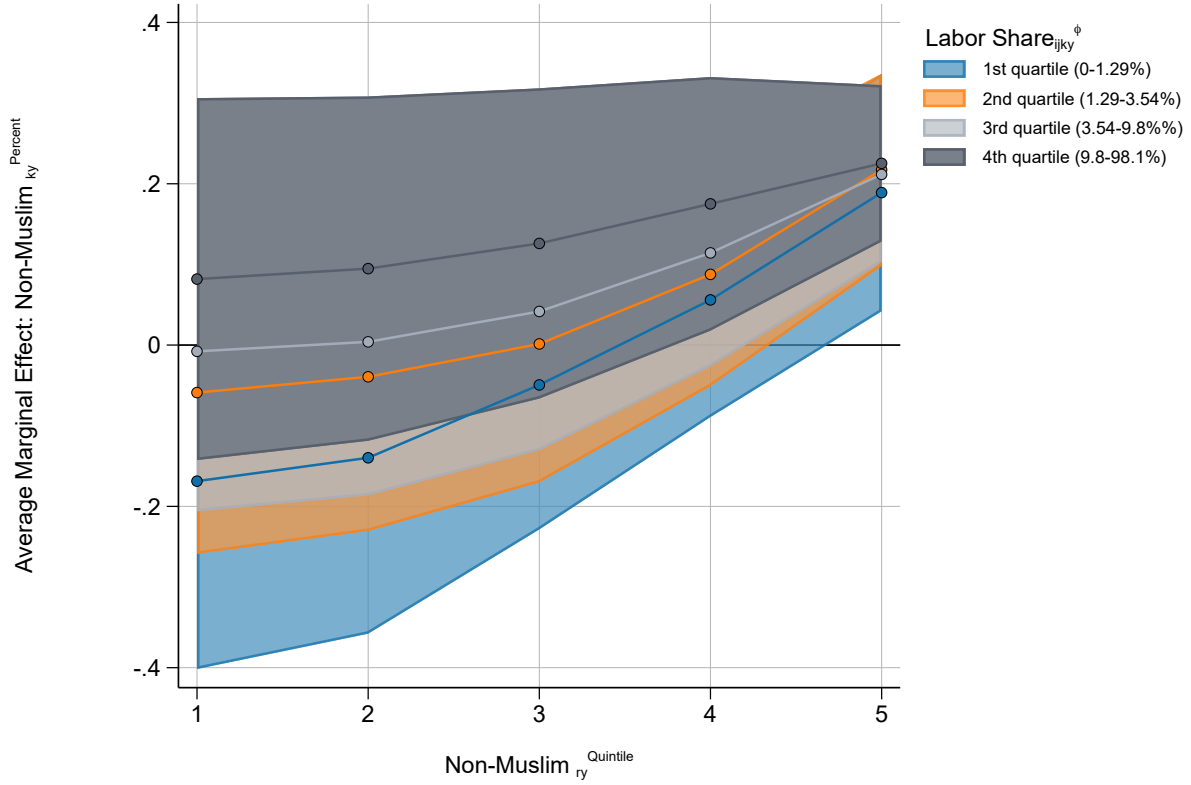
Non-Muslim <sup><i>Percent</i></sup> <sub><i>region</i></sub>	0.063 (0.038)	0.096 * * (0.041)	0.111 * * (0.044)
Share <sup><i>Non-Muslim</i></sup> <sub><i>region</i></sub> × Foreign <sub><i>iy</i></sub>	0.008 (0.025)	0.019 (0.032)	0.017 (0.031)
Share <sup><i>Labor</i></sup> <sub><i>jky</i></sub>	0.382 * * * (0.052)	0.388 * * * (0.054)	0.388 * * * (0.054)
Foreign <sub><i>iy</i></sub>	2.472 * * * (0.312)	2.466 * * * (0.333)	2.483 * * * (0.337)
Structural Model	<i>YMH</i>	<i>YMH</i>	<i>YMH</i>
radius r	10	10	10
Industry FE	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Year FE	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Cluster Level	<i>Kabupaten</i>	<i>Kabupaten</i>	<i>Kabupaten</i>
R <sup>2</sup>	.223	.221	.221
N	300634	287718	287718

Figure A1: Histograms of Logged Kabupaten Populations by Religion



**Notes:** Data from Indonesian Census, 1990, 2000, and 2010

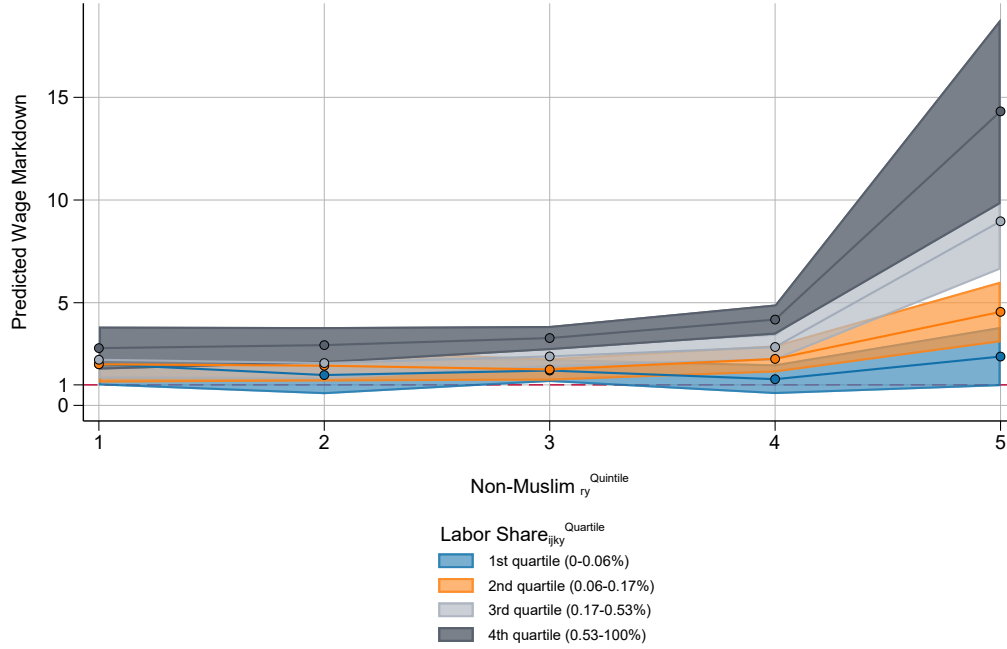
Figure A2: Average Marginal Effect of Non-Muslim Percentage of the Local Population on Wage Markdown Conditional on Firms' Share of the Local Labor Market



**Notes:**  $N = 288,070$ . Average marginal effect of non-Muslim regional share ( $r = 20miles$ ), stratified by firm labor market share quartile. X-axis is organized by non-Muslim share quintiles to emphasize relative opportunity cost and ease visual scaling. Marginal effects calculated from coefficients produced using the same empirical specification and structural estimation of markdowns from Table 4, column 6, with the additional inclusion of firm labor market share and non-Muslim regional share as interacted 3rd-order polynomials. Controlling covariates include unemployment (by province), the fraction of firm employees with production occupations, whether the firm was ever foreign owned, as well as industry (3-digit), kabupaten, and year fixed effects. Confidence intervals are reported at the 95% level based on robust standard errors clustered over 208 kabupatens.

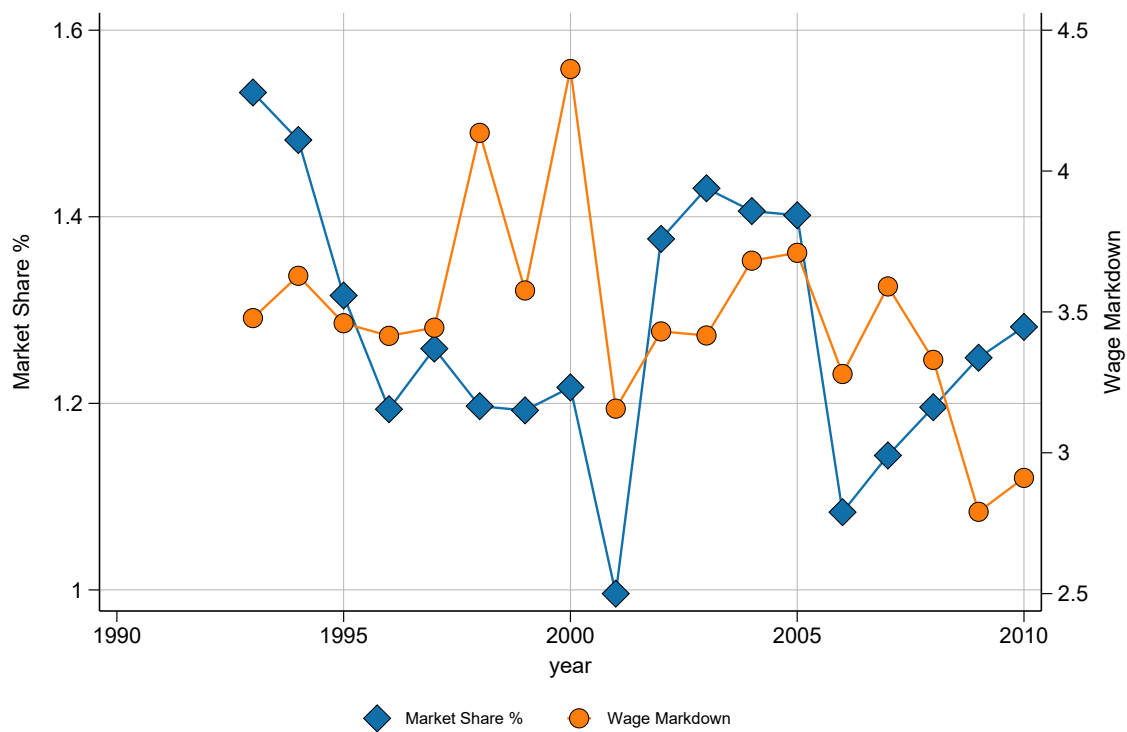


Figure A3: Predicted Firm Wage Markdown Over Non-Muslim Share of the Local Population Conditional on Firms' Share of Local Labor Market



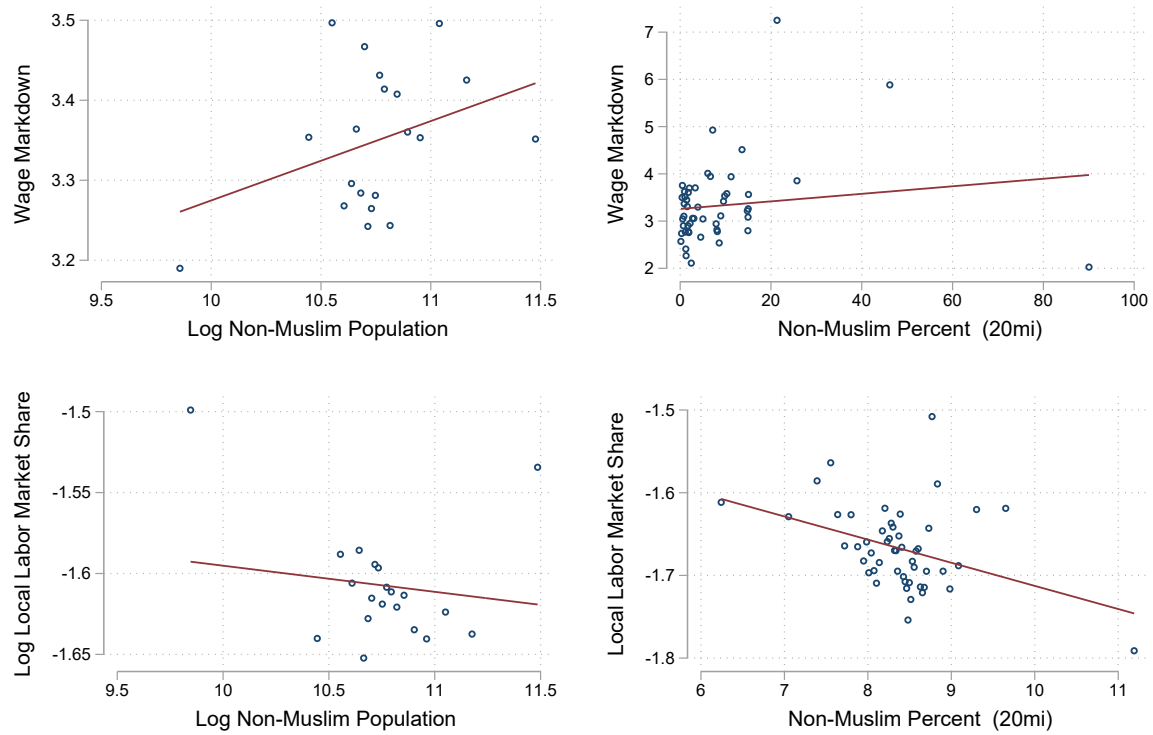
**Notes:**  $N = 288,070$ . Predicted Wage Markdowns over non-Muslim regional share of the local population ( $r = 20miles$ ), stratified by Labor Market Share quartiles. X-axis is organized by non-Muslim share quintiles to emphasize relative opportunity cost and ease visual scaling. Predicted wage markdowns calculated from coefficients produced using the same empirical specification and structural estimation of markdowns from Table 4, column 6, with the additional inclusion of firm labor market share and non-Muslim regional share as interacted 3rd-order polynomials. Controlling covariates include unemployment (by province), the fraction of firm employees with production occupations, whether the firm was ever foreign owned, as well as industry (3-digit), kabupaten, and year fixed effects. Confidence intervals are reported at the 95% level based on robust standard errors clustered over 208 kabupatens.

Figure A4: Labor Market Share and Wage Markdowns across years



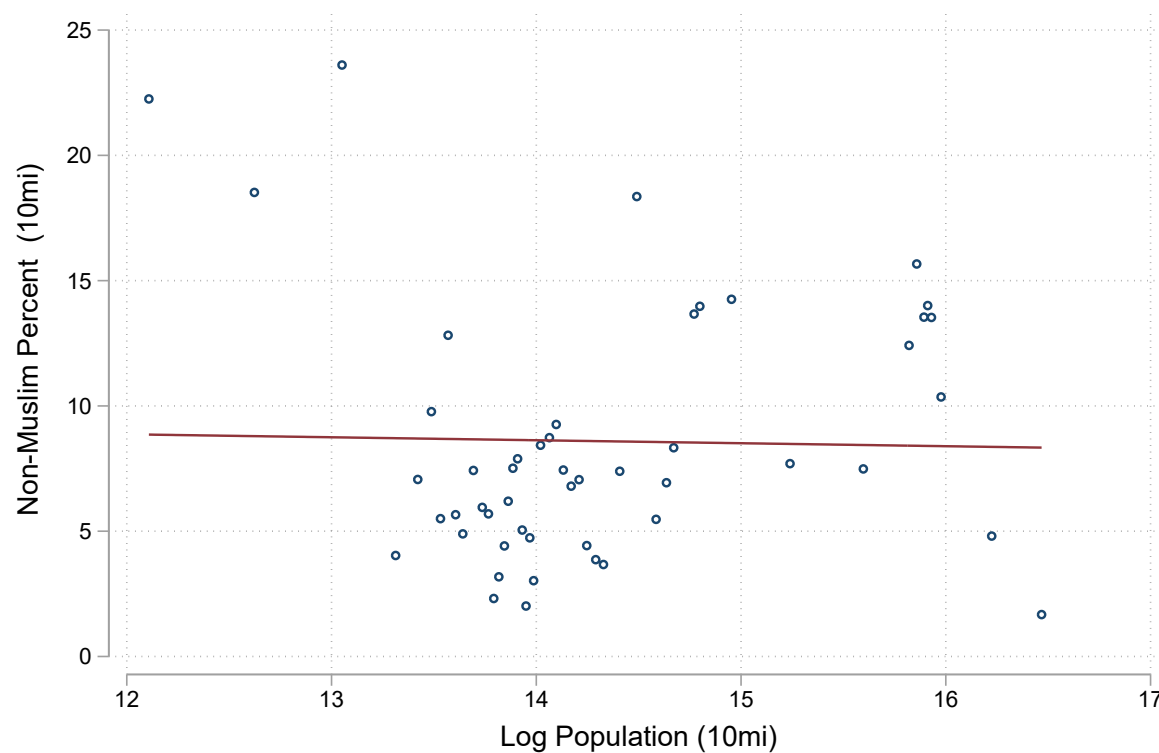
Notes: Mean firm labor market and wage markdown across Indonesia by year, 1993-2010.

Figure A5: Labor Market Share and Wage Markdowns over Non-Muslim Populations



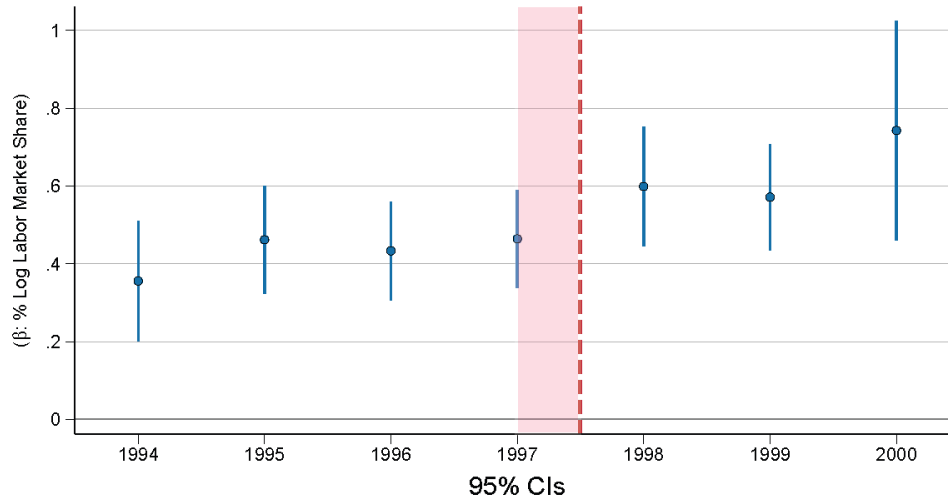
**Notes:** Binscatter plot of firm wage markdowns over kabupaten population Non-Muslim percentage(50 quantile bins), 1993-2010.

Figure A6: Percent Non-Muslim over Local Population Size



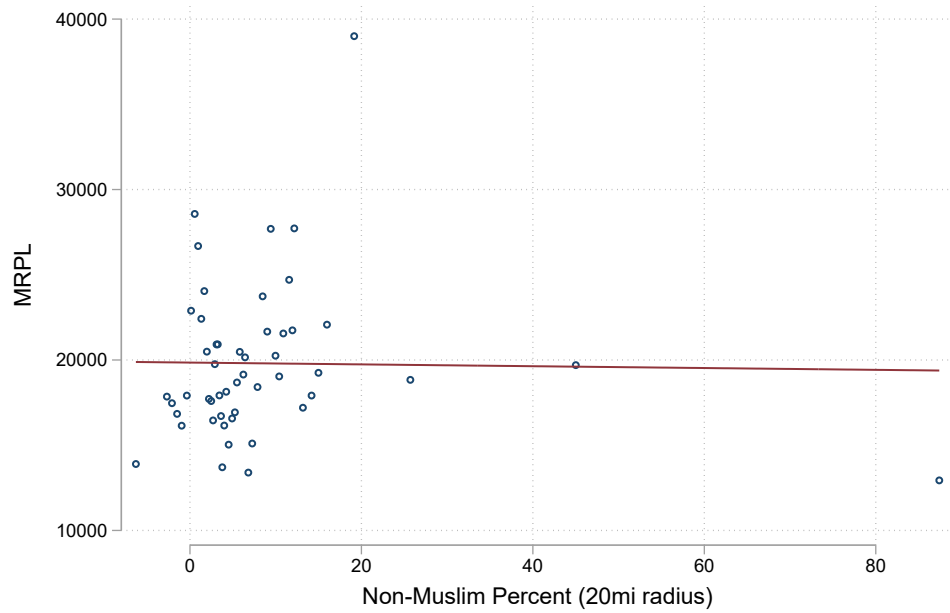
**Notes:** Binscatter plot of kabupaten population Non-Muslim percentages over kabupaten population (50 quantile bins), 1993-2010.

Figure A7: Event study: Effect of Firms' Shares of the Local Labor Market on Wage Markdowns Before and After the 1997 Asian Financial Crisis



**Notes:** N=205,590. The y-axis charts the estimated coefficient on share of the local labor market employed by an each firm in a given year. A dashed vertical line between 1997 and 1998 is included to demarcate observations before and after 1997 Asian financial crisis, when inflation rose from 6% to 70% during the year, before falling back below 10% the subsequent year. The regression specification is identical to equation 7, with the additional inclusion of  $\%Share_{fsky}$  interacted with calendar year as the variable of interest. Dependent variable is structurally estimated wage markdown. Estimation uses data is from IFLS, Census, and SI covering years 1993-2010, though only the years reported here are the three before and after the crisis. Independent variables include local unemployment, the fraction of firm employees with production occupations, whether the firm was ever foreign owned, as well as industry (3-digit), kabupaten, and year fixed effects. Confidence intervals are reported at the 95% level based on robust standard errors clustered over 156 kabupatens.

Figure A8: Firm Marginal Revenue Product of Labor over Kabupaten Non-Muslim Population



**Notes:** Binscatter plot of Marginal Revenue Product of Labor over kabupaten population Non-Muslim percentages (50 quantile bins), 1993-2010.