

Why Veil? Religious Headscarves and the Economic Role of Women

Naila Maya Shofia
National University of Singapore

Abstract

We show that the emergence of new economic opportunities that draw women away from their traditional domestic roles has significantly influenced the adoption of religious veiling. We measure the prevalence of veiling among young women across Indonesia’s districts for more than two decades by hand-coding around a quarter million photographs attached to Indonesia’s public high school registers. To establish causality, we exploit exogenous variation generated by international demand for Indonesia’s products, interacted with the gender and sectoral composition of local industries. Districts exposed to stronger positive economic shocks—and thus greater economic opportunities for women—exhibit higher rates of veiling adoption. Our findings suggest that veiling facilitates young women’s participation in formal labor markets while safeguarding their personal and social image in society.

Keywords: Female Labor Supply, Gender Norms, Economic Development, Veiling, Religious Identity

JEL Codes: J16, Z12, O12, F63

I Introduction

Economic development has delivered unprecedented opportunities for women, including new, appealing, and lucrative jobs, especially for those who are skilled or highly educated. This fact strongly characterizes the Indonesian labor market in the past decades ([Schaner & Das, 2016](#)). However, this new type of employment typically requires workers to leave their homes to engage in the workplace over an extended period. In societies where women are designated as the primary bulwark

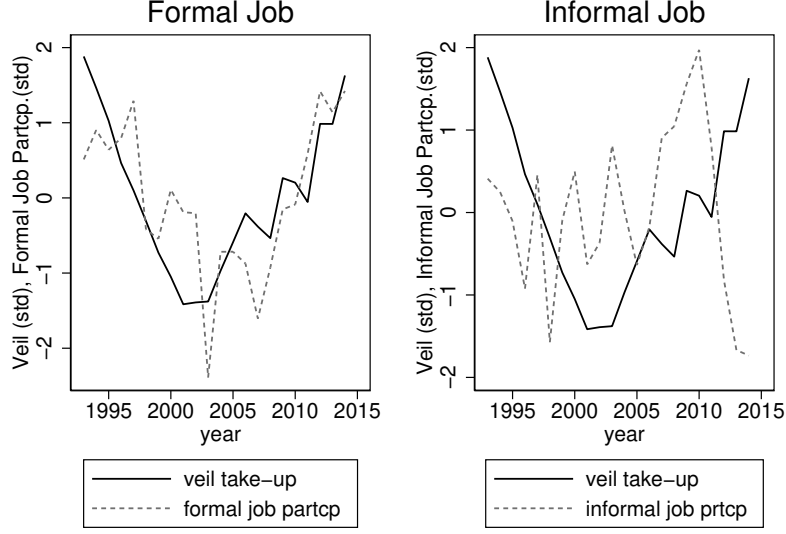
of public morality and traditional family institutions, taking these types of jobs may be costly to one’s personal and social image, despite the economic benefits they offer.

In light of this dilemma, some women may devise strategies to lower the cost of participating in this type of employment using culturally compatible tools. Religious veiling appears to be one of these tools. Particularly effective in the context of Indonesia’s highly religious society, some women adopt veiling in order to benefit from new economic opportunities while at the same time protecting their dignity and reputation in society.

This study aims to document this phenomenon. In particular, we find that the participation of young women in the formal labor market has driven the adoption of veiling. The plot in Figure 1 motivates this conjecture: Over more than two decades of the observation period, the fraction of young women adopting religious veiling has evolved hand-in-hand with the fraction of young women participating in formal employment. This contrasts, for instance, with their participation in informal occupations.

We use an original method to measure the prevalence of veiling among young women by directly observing the portraits of students attached to Indonesia’s public high school registers. The main data in this paper is based on the human coding of around a quarter of a million of these photographs. This data enables us to trace the evolution of veiling across districts for more than two decades. This new measure sets this study apart from previous research which has mostly relied on surveys. Survey data on this social practice may not only suffer from reporting and social-desirability bias, but is also not systematically available across space and time. To our knowledge, there is no comparable data on veiling of this scope available to date, and the data collected for this study fills this gap.

FIGURE 1 – (CO-)EVOLUTION OF VEILING AND FEMALE PARTICIPATION IN DIFFERENT TYPES OF EMPLOYMENT



Notes: The figure displays the veiling rate among female high-school students alongside the formal and informal employment rates of young women aged 20–24 across all sample districts. All variables have been detrended to remove secular time trends and standardized (Mean = 0, SD = 1) to facilitate comparison across measures.

To estimate the causal effect of economic opportunities on veiling, we build a Bartik-style instrumental variable exploiting exogenous variation generated by the interaction between international demand for Indonesia’s products and the sectoral and gender composition of local industries. This instrument creates a plausibly exogenous shock in the availability of economic opportunities for women by assigning a higher “dosage of treatment” to districts that specialize in female-intensive industries as opposed to districts that specialize in male-intensive industries. Hence, it allows the identification of the causal effect of economic opportunities on veiling.

Using this method, we find that young female participation in formal occupations has a positive, significant effect on veiling. In particular, the 2SLS estimates indicate that each percentage point increase in the formal job participation of young women causes an increase in veiling of about 2.3–2.6 percentage points. This effect is equivalent to about one-eighth of the mean value of veiling in the whole sample. Importantly, the estimates are robust to controlling for various combinations of fixed effects, district-specific time trends, as well as additional controls at the school, district, and national levels. The results are also robust to alternative measurements of the instrument, alternative measures of economic opportunities, different shock timings, and an alternative standard-error estimation method to

ensure the robustness of the inference.

Our analysis of potential mechanisms strongly suggests that veiling in this context functions as a negotiation tool, enabling women to access expanding opportunities in formal employment while preserving their personal and social image in society (Carvalho, 2013).¹ We find that veiling adoption is particularly responsive to types of employment that may jeopardize a woman’s personal or social reputation. Specifically, our results show that veiling increases in response to formal, paid work—where workers are typically required to be present at a work site for extended periods—while it does not respond to informal employment. In the Indonesian context, informal work is often home-based or unpaid (e.g., as family labor), allowing women to fulfill domestic responsibilities alongside income-generating activities. Because such work does not entail the same degree of public exposure or reputational risk, it does not elicit a similar veiling response.

Additionally, our analysis shows that the veiling response to economic shocks is significantly stronger in environments with low gender segregation. Specifically, the estimated effects in districts below the median of the segregation index distribution are more than twice as large as those in districts above it. When we further disaggregate the sample into quartiles, the effect is most pronounced and statistically significant in districts within the first quartile—where the likelihood of cross-gender interactions is highest. By contrast, the effects in the upper quartiles are smaller and/or statistically imprecise. These findings suggest that veiling functions as a mechanism to mitigate social stigma in contexts where interactions with unrelated male coworkers are more likely.

The evidence also indicates that veiling functions as a signaling mechanism to navigate social norms. Veiling responses are strongest in areas where gender norms are neither highly rigid nor exceptionally flexible, indicating that veiling facilitates negotiation, a process that can only occur or is only necessary when social norms exhibit some degree of ambiguity. Importantly, the veiling effects are more pronounced in districts with a higher proportion of the Muslim population, suggesting that its role as a social signal is amplified in communities where religious norms exert greater influence. Additionally, independent qualitative studies, along with our analyses of two distinct surveys, consistently reveal a positive correlation between education and veiling in Indonesia. We interpret this as evidence that more educated women, who face higher social stigma and opportunity costs of labor mar-

¹In Carvalho’s (2013) model, veiling serves two key functions: first, as a commitment device, it helps women uphold the values they adhere to; second, as a signaling tool, it communicates the adopter’s adherence to social norms, thereby shielding them from potential stigma associated with working outside the domestic sphere.

ket exclusion, are more likely to adopt veiling as a strategy to facilitate workforce participation. Collectively, these findings provide strong evidence that veiling functions as a strategic adaptation, enabling women to pursue economic opportunities while maintaining their personal and social standing within the community.

Our analysis considers and systematically rules out several alternative explanations for the observed relationship between economic opportunities and veiling. While religion provides a moral and cultural foundation for veiling, the effect of religiosity seems to work at the communal rather than at the personal level. While we find evidence that social norms and shared religious values may influence how economic shocks affect the degree of veiling, we find inconclusive evidence on the relationship between personal religiosity and veiling. This suggests that individuals with low personal religiosity may nonetheless adopt the veil when they perceive social benefits from the practice, thereby attenuating the relationship between personal religiosity and veiling. Consistent with the model in [Carvalho \(2013\)](#), veiling need not reflect an *increase* in personal religiosity; instead, it may also arise in response to changes in the socio-economic environment that induce women to signal their type to the community. In sum, veiling appears to function as a targeted response to evolving economic opportunities for women, rather than moving in lockstep with other forms of religious expression.

Moreover, we provide evidence showing that veiling does not appear to be a reactionary response or a conservative backlash driven by familial pressures. We also rule out an income-based explanation, as veiling shows no correlation with informal employment, nor do economic shocks in male-dominated sectors affect veiling rates. Furthermore, controlling for female high-school enrollment does not alter our results, suggesting that changes in student composition are unlikely to drive the findings. Taken together, these results argue against various alternative explanations for the relationship in question.

In the robustness analysis, we confirm that our main results remain consistent even after accounting for potential outliers and variations in the dataset. Specifically, the estimated coefficients remain stable even when excluding schools where 100% of students wear the veil, as this may reflect institutional mandates rather than individual choices. The findings also hold when removing high-variance observations and using Jackknife resampling, which systematically excludes data from a single year, a single district, or a single industrial sector, one at a time. Additionally, our results remain robust to alternative instrument specifications, variations in the timing of economic shocks, and the exclusion of the textile-related industries—where Indonesia may act as a price-setter. To support the robustness of our

inference, we also rerun the analysis using three different alternative standard-error specifications. These robustness checks collectively strengthen the credibility of our empirical strategy.

This study contributes to several strands of social science literature. Our theoretical framework builds on prior work by [Carvalho \(2013\)](#) and [Patel \(2012\)](#), reinforcing their argument that veiling is shaped by identity and reputational concerns in a rapidly modernizing society. Identity considerations have been identified as a crucial element shaping economic decision-making in the seminal work by [Akerlof and Kranton \(2000\)](#). Empirically, our findings align with [Abdelgadir and Fouka \(2020\)](#), who show that veiling facilitated Muslim girls' access to education in France, as well as [Meyersson \(2014\)](#) and [Corekcioglu \(2021\)](#), who demonstrate that accommodating Muslim female preferences in public spaces increased women's participation in Turkey. This study also relates to [Obermeyer \(2016\)](#), who examines veiling and modernization in North Yemen. Moreover, although the underlying mechanisms differ, the link between economic opportunities and heightened religious commitment has been anticipated by [Iannaccone \(1992\)](#). In his club goods model, this relationship arises from religious sacrifice rather than labor market integration or responses to modernization.

This study engages with the empirical literature on veiling, including [Aksoy and Gambetta \(2016\)](#), who test veiling theories using cross-country survey data but find limited support for certain predictions among less religious women, and [Jacquet and Montpetit \(2023\)](#), who investigate the cost of veiling for Muslim women in France. However, our study is the first to empirically link veiling practices with the transformation of female labor markets in a developing country. Beyond introducing original data, it advances previous work by establishing a causal relationship between economic opportunities and veiling through a credible identification strategy while systematically ruling out alternative mechanisms.

This study contributes to the literature on the evolution of female economic participation, particularly the role of culture and social norms, as emphasized by [Boserup \(1986\)](#), [Goldin \(1990\)](#), and [Fernández \(2013\)](#). Our findings align with this perspective by showing how gender norms interact with economic transformations. Specifically, we build on research on social norms and female labor force participation in Muslim-majority societies (e.g., [Burszty, González, and Yanagizawa-Drott \(2020\)](#)), extending this literature by illustrating how existing social norms evolve in response to new economic forces, giving rise to new behavioral patterns. In particular, we show that the increasing adoption of veiling is both a consequence of economic modernization and a reflection of local traditions, highlighting the dy-

namic interplay between cultural norms and structural economic change.

This study also contributes to the broader debate on the relationship between religion and economic development (e.g., [Bénabou, Ticchi, and Vindigni \(2015\)](#); [Binzel and Carvalho \(2017\)](#); [Guiso, Sapienza, and Zingales \(2003\)](#); [Squicciarini \(2019\)](#)). Specifically, it offers a re-examination of the secularization hypothesis, which associates economic development with declining religiosity. While prior work (e.g., [Norris and Inglehart \(2004\)](#); [Voas and Crockett \(2005\)](#)) finds evidence of declining religiosity in Western Europe, others ([Iannaccone \(1998\)](#); [Stark \(1999\)](#)) challenge this view, arguing that religiosity can persist despite modernization. Our study contributes to this debate by demonstrating that economic modernization does not necessarily lead to secularization or the marginalization of religion.

Focusing on the relationship between female economic outcomes and Muslim women’s religious practices, this study also engages with research on religion and economic outcomes in Indonesia (e.g., [Bazzi, Hilmy, and Marx \(2020\)](#); [Bazzi, Koehler-Derrick, and Marx \(2020\)](#)), India (e.g., [Borooah, Dubey, and Iyer \(2007\)](#); [Field, Levinson, Pande, and Visaria \(2008\)](#); [Iyer \(2018\)](#); [Iyer, Velu, and Weeks \(2014\)](#); [Mitra and Ray \(2014\)](#)), Bangladesh (e.g., [Asadullah, Chakrabarti, and Chaudhury \(2015\)](#); [Asadullah and Chaudhury \(2010\)](#); [Devine, Hinks, and Naveed \(2017\)](#)), and the broader Southeast Asian region (e.g., [Ariff \(1991\)](#); [de la Croix and Delavallade \(2018\)](#); [Fischer and Jammes \(2019\)](#); [Koning and Njoto-Feillard \(2017\)](#); [Permani \(2011\)](#)). By highlighting how veiling adapts to economic change rather than strictly being a marker of religious conservatism, this study provides evidence that religious practices can coexist with economic modernization without being eroded by it.

We discuss the socio-economic background of the study in Section II. The conceptual framework, which outlines the theoretical reasoning of the article is elaborated in Section III. The measurement of veiling and other variables is discussed in Section IV. We then elaborate on the empirical framework, the construction of the instrument, as well as the main results in Section V. We explore several plausible mechanisms in Section VI. The discussion on robustness checks is presented in Section VII, while Section VIII concludes.

II Contextual Background

Indonesia provides an excellent ground to study the interaction between religious culture, gender norms, and economic development. First, the country currently hosts over 230 million Muslims, more than any other nation on earth. Moreover,

Indonesia is arguably one of the most religious nations in the world.² Second, despite enjoying relatively greater autonomy than women in the neighboring regions of South and East Asia, Indonesian womanhood in the past decades has been shaped significantly by the ideology propagated by the New Order regime. Through regular women’s meetings (PKK-Pemberdayaan Kesejahteraan Keluarga, or the Family Welfare Empowerment program), the regime emphasized and glorified the domestic role of women and assigned them the role of guardians of the traditional family institution.³

At the same time, Indonesia has experienced strong economic growth over the past decades—with the temporary exception of the East Asian Financial Crisis in 1997–1998. This growth has been accompanied by structural shifts in the economy, including a transition from agriculture to manufacturing and services, as well as broader trends of industrialization and urbanization (Elias & Noone, 2011). In 1999, Indonesia transitioned from a military autocracy to one of Asia’s most dynamic emerging democracies. This transformation has driven rapid social and economic changes, including the expansion of universal education (including for girls), a decline in the total fertility rate, and a significant shift in women’s participation in the workforce.

Importantly, despite strong social norms regarding women’s roles in society (Cameron, Suarez, & Rowell, 2020; Cameron, Suarez, & Setyonaluri, 2024), there has been a clear trend toward the *formalization* of women’s participation in the labor force. This process involves two parallel developments: first, younger women, particularly in urban areas, have increasingly entered the formal sector through wage employment. At the same time, younger women in rural areas have withdrawn from informal, unpaid work (Schaner & Das, 2016).⁴ This shift is largely driven by the expanding access of young, highly educated women to attractive and

²The 4th and 5th waves of the World Values Survey (WVS) reveal that over 94% of respondents stated that religion is “very important” in life. In 2008, a survey by the Pew Research Center showed that 80% of Indonesian Muslims perform five daily prayers, higher than other Muslim countries covered in the survey, including Egypt, Jordan, Pakistan, and Turkey. Using the Indonesian Family Life Survey (IFLS), Masuda and Yudhistira (2020) show that the proportion of Muslims who only eat *halal* food in Indonesia is high and stable across periods at over 95%.

³These politically-driven gender norms still have strong impacts in many parts of Indonesia today. A UNDP survey in 2010 revealed that 94% thought that women should not work outside the home without prior permission from their husbands. The same survey showed that 95% thought that men should be leaders of households. Another poll by CSIS shows that 86.3% agreed that “women’s primary responsibility was to take care of the household” and 83.6% thought that women should not work at night (Robinson, 2018). A recent survey about gender roles in the Indonesian household revealed that only 8% think that earning a living is part of the ideal role of a wife and 70% agree that doing household chores are the wife’s responsibility (Jakpat, 2020).

⁴Because these two opposing trends offset each other, aggregate statistics show little change in Indonesia’s overall female labor force participation during this period (Cameron et al., 2020).

well-paying job opportunities. [Schaner and Das \(2016\)](#) also documented a significant narrowing of the gender wage gap: in 1990, the median woman earned only 57% of a man’s earnings, but by 2011, this figure had risen to 84%.

A The practice of veiling in Indonesia

While religion plays a significant role in the lives of Indonesian Muslims, veiling among Muslim women has not historically been a deeply entrenched cultural practice.⁵ Moreover, the contemporary practice of veiling in Indonesia, particularly since the 1970s, represents a relatively *recent* phenomenon, differing substantially from earlier styles. Traditionally, veiling in regions such as Java often involved translucent fabrics draped over the head, leaving the neck, as well as parts of the hair and ears, visible. In contrast, modern veiling is more encompassing, typically made from opaque materials that cover the hair, neck, and ears, leaving only the face exposed ([Brenner, 1996](#); [Smith-Hefner, 2007](#)).⁶ Additionally, while veiling in the past was typically limited to a small group of older, traditional women, often residing in rural areas, the modern veil has been widely embraced by young, educated, urban middle-class women ([Smith-Hefner, 2007](#)).⁷

These patterns are corroborated by several recent studies. For instance, [Fossati, Hui, and Negara \(2017\)](#) find that the proportion of Muslim women who respond “yes” when asked if they wear a headscarf is higher among those with higher education (94.5%) compared to those with lower education levels (78.4%). Additionally, the same survey indicates that veiling is more prevalent among high-income individuals (84.9%) than among those in lower-income groups (75.6%). Similarly, a study by [Utomo, Reimondos, McDonald, Utomo, and Hull \(2018\)](#) examining predictors of veiling in the Greater Jakarta area finds a significant positive correlation between veiling and higher education levels. Collectively, these findings suggest that, in the

⁵In contrast, veiling has a long tradition among women in the region now referred to as the Middle East. This practice predates Islam, with Jewish and Christian women having adopted veiling customs both before and after the emergence of Islam in the 7th century CE ([Amer, 2014](#)).

⁶While the term “veil” in English refers to a fabric covering a woman’s hair and, in some cases, her face, veiling practices vary widely across different cultural contexts. In Indonesia, veiling practices resemble those found in other Southeast Asian countries, such as Malaysia and Brunei Darussalam. The headscarves commonly worn in Indonesia often feature colorful patterns, embroidery, or decorative beads, in contrast to styles such as the *burqa*, worn by women in Taliban-controlled areas of Pakistan and Afghanistan; the *chador*, a black cloak worn by some women in Iran; or the *niqab*, a face veil that leaves only the eyes visible, commonly worn in parts of Saudi Arabia.

⁷This shift may seem counterintuitive given prevailing narratives that often associate veiling with female subjugation or religious extremism. Literary critic [Said \(1979\)](#) argues that such perceptions originated during the colonial period as part of the “orientalist” narrative in the West and gained further traction in the aftermath of the 9/11 terrorist attacks.

Indonesian context, veiling does not seem to indicate a lack of education or low socio-economic status.

The politics of the veil. During its rule, the New Order regime underwent a significant shift in its stance toward veiling. In the early 1980s, the regime viewed the veil as a symbol of political dissent and, consequently, sought to restrict its use. This was evident in policies such as the issuance of a decree regulating high school student uniforms,⁸ which discouraged veiling in educational institutions. As a result, many parents disapproved of their daughters adopting the veil. Until the 1990s, veiling remained a marginal practice in Indonesia and was often associated with an extreme form of religious piety in the eyes of the general public (Brenner, 1996).

However, in the early 1990s, President Suharto shifted his political strategy. While continuing to ban formal political movements based on Islamic ideology, he sought to co-opt various Muslim groups by adopting a more conciliatory approach toward the Muslim community. One notable gesture was the issuance of a regulation in 1991 that lifted the ban on headscarves in public high schools.⁹ Following this regulatory change, the stigma surrounding the veil began to fade, and its popularity grew. Veiling became increasingly common, especially among university and high-school students, and was gradually adopted by older generations as well.

III Conceptual Framework

To understand how the emergence of new economic opportunities for women may influence veiling, it is essential to first examine the shifts in employment patterns that accompany economic development over time.

As economies develop and become more sophisticated, newly created jobs tend to be more cognitively demanding than physically intensive (Jayachandran, 2020).¹⁰ This shift is often accompanied by the relocation of production sites from households to factories or offices, requiring workers to leave their homes to participate in the

⁸Decree SK 052/C/Kep/D.82, issued on March 17, 1982 (Johari, 2020).

⁹The decree, SK No.100/C/Kep/D/1991, was issued in 1991. That same year, Suharto also undertook a pilgrimage to Mecca and, upon his return, changed his official name to Haji Mohammad Suharto.

¹⁰A typical economic transformation involves a shift from traditional sectors such as agriculture, fisheries, and forestry to manufacturing industries, and eventually to the service sector. Early-stage employment in traditional sectors is often physically demanding (e.g., farming, fishing, and collecting forest harvests). In contrast, as the economy develops, jobs in manufacturing and services—such as tailoring, fine goods crafting, accounting, and administrative services—require more cognitive skills and are thus more accessible to women.

labor market.

At the same time, economic development has significantly expanded women’s access to education, allowing younger generations to seize new employment opportunities. As a result, an increasing number of educated young women aspire to enter the formal labor market. Taken together, these forces have led to a growing number of women stepping beyond the domestic sphere to pursue professional aspirations, reshaping patterns of female labor force participation.¹¹

Unfortunately, social norms often do not evolve at the same pace as economic transformation.¹² As a result, women entering these new forms of employment may encounter personal and social stigma. While the degree of these challenges varies across cultural contexts, their common underlying sources are examined here.

First, women who engage in formal employment may experience personal costs, such as feelings of guilt, stemming from the belief that a working mother could negatively impact the intellectual and emotional development of her children (Fernández, 2013) or jeopardize the stability of family life.¹³ Second, pursuing formal, high-paying jobs may convey women’s ambition and autonomy—traits often perceived negatively in the marriage market (Bursztyn, Fujiwara, & Pallais, 2017). Third, as economies develop and lower-income families become more affluent, a woman’s decision to work may imply an inability of her husband or father to adequately provide for the family, thereby creating social stigma (Goldin, 1990). Lastly, in some contexts, formal employment is sometimes regarded as “dirty” (Jayachandran, 2020), as it requires women to interact with male coworkers who are not family members.¹⁴

Faced with this dilemma, some women may seek culturally compatible strategies to mitigate the costs of entering the formal labor market. In a religious, Muslim-majority society like Indonesia, wearing the veil appears to be one such solution. The veil can reduce the personal and social costs of working outside the home in at least two ways. First, at the personal level, the veil serves as an anchor—a

¹¹A similar argument was originally proposed by Becker (1981), who posited that the emergence of new economic opportunities for women altered the opportunity cost of remaining at home. This shift encouraged women to join the workforce and, in turn, contributed to declining fertility rates—a trend widely observed in Western countries during the 1970s.

¹²In agrarian or traditional economies, employment opportunities for women are typically limited. Within such contexts, it is often considered socially acceptable to adhere to traditional gender norms, where men serve as primary breadwinners while women are confined to domestic roles. However, as economies modernize, a wider range of employment opportunities becomes available to women, challenging these established norms.

¹³In the Indonesian context, the women in this study grew up under a regime that idealized women as the guardians of public morality and family institutions—a view heavily promoted during the New Order era from the early 1980s to the late 1990s.

¹⁴This may also involve commuting on crowded public transportation, increasing their vulnerability to harassment.

commitment device in Carvalho’s (2013) terms—for the beliefs and norms that the women highly value. The veil binds sincere believers via their own statement of modesty, which helps them avoid behaviors (or even thoughts) that conflict with religious morality and values (Bénabou & Tirole, 2011; Carvalho, 2013). Second, the veil serves as a signal (albeit an imperfect one) to the broader community about the type of woman who wears it—even if her sincerity varies (Carvalho, 2013; Patel, 2012). Specifically, if the qualities signaled—such as faithfulness, adherence to rules, and femininity—are considered desirable within the prevailing norms, the veil can help counteract the potential stigma associated with women working outside the home. Consequently, *as the economy develops and there are more economic opportunities for women, more of them adopt the veil* as they attempt to reconcile their desire to benefit from these opportunities with their desire to avoid the negative personal and social image this act may generate.

It is important to recognize that negative social attitudes toward working women are not exclusive to Muslim societies; they have also characterized the historical evolution of female labor force participation in the West. For instance, the stigma described by Goldin (1990), Fernández (2013), and Bursztyn et al. (2017) pertains to experiences in the United States. What is particularly noteworthy, however, is how cultural context influences the resolution of the tension between social norms and women’s public roles. In the case of Muslim-majority societies like Indonesia, the veil appears to function as an effective negotiation tool, allowing women to navigate this conflict in a culturally compatible manner.

IV Data Source and Descriptive Statistics

Data on veiling. Measuring a cultural practice such as veiling is not a simple endeavor. Previous studies rely on surveys to elicit information about veiling by directly asking female respondents whether they wear a veil. Alternatively, veiling is measured by simply observing if the respondent is wearing it during the interview. There are several issues associated with these methods. First, they might suffer from measurement error. For instance, if the surveyors are female themselves or if they conduct the survey at home, then a respondent who regularly wears a veil in public may not put the headscarf on during the survey.¹⁵ Second, the traditional method may also suffer from reporting bias. For instance, if the surveyor is perceived by the respondents as having a certain degree of religious commitment (e.g., if the

¹⁵Commonly, headscarves are only worn outside the home, where interaction with males who are not family members is pertinent.

surveyor is wearing a headscarf herself), then this may result in biases in respondent answers.¹⁶ Another major limitation of currently available data is that no source systematically traces the evolution of this practice across regions over time. Most of the surveys are ad hoc and conducted at different times by different institutions.

To address these limitations, we measure the adoption of headscarves by directly observing the portraits of female students featured in public high school register books. This approach captures revealed preferences for veiling, supported by official records containing the students' personal details. In Indonesia, public high schools are generally required to maintain student records for approximately 30 years in large register books, each containing 3×4 cm photographs of individual students.

Most students are between 16 and 19 years old, and the photographs are primarily taken for documentation purposes related to the national final examination. As such, these photos are typically captured toward the end of the second year or the beginning of the final year of high school, a time when most students are likely to have a clear idea of their post-graduation plans, such as pursuing higher education or entering the workforce.¹⁷

The sample of schools in this study was selected through a two-stage random sampling process. First, 49 districts were randomly chosen from a sampling frame comprising all 267 districts located on the islands of Java and Sumatra.¹⁸ The number of districts sampled in each province was proportional to the province's population, ensuring that the sample was more representative in terms of population distribution. Consequently, provinces with larger populations had a greater number of districts included in the sample. Table E.1 in the appendix provides a comparison of the characteristics of sampled and non-sampled districts using data from the Indonesia Database for Policy and Economic Research ([The World Bank Group, n.d.](#)). Apart from differences in population size, there are no systematic disparities between the sampled and non-sampled groups.

The second stage involves randomly selecting two schools from the sampling

¹⁶This phenomenon has been documented, for instance, in [Blaydes and Gillum \(2013\)](#).

¹⁷There may be concerns that these photographs do not fully reflect the students' daily behavior. For instance, students may occasionally alternate between wearing and not wearing a veil, or they might strategically choose to wear (or not wear) a veil during the photo session. However, we argue that this is unlikely, as Indonesian public schools mandate school uniforms, which include a consistent dress code for each day of the week. Furthermore, these portraits are intended for official identification purposes, similar to passport or ID photos, and therefore are expected to accurately represent students' typical appearance.

¹⁸The initial plan was to sample 50 districts, but one district was dropped due to logistical challenges. The number of districts was determined based on the budget constraints of the project. The focus on Java and Sumatra was intended to maximize the efficiency of data collection, as these islands accounted for 78.7% of Indonesia's population according to the 2010 census by Statistics Indonesia.

frame of all public high schools within each district chosen in the first stage. Public madrasahs (Islamic schools) are excluded from the sampling frame because all female students in these schools wear veils, providing no additional variation that could be utilized in the statistical analysis. Similarly, private schools are excluded, as they are predominantly religious institutions—such as Catholic schools, where veiling is extremely rare, or Islamic schools, where all female students wear headscarves—offering no meaningful variation for this study.¹⁹ Enumerators are provided with a randomly ordered list of schools and are instructed to visit them in sequence. The detailed procedure for data collection is outlined in Appendix E, which also includes the list of sampled districts and their geographic distribution across the study area using administrative boundaries from the GADM database (2015).

The photographs of female (and male) students attached to the register books are, in most cases, of high quality, allowing us to clearly determine whether a student is wearing a veil. This enables us to reliably code veiling status by directly examining the images. Based on this information, we construct a measure of the veiling rate, defined as the proportion of female students in a given school and graduation year who are wearing a veil.

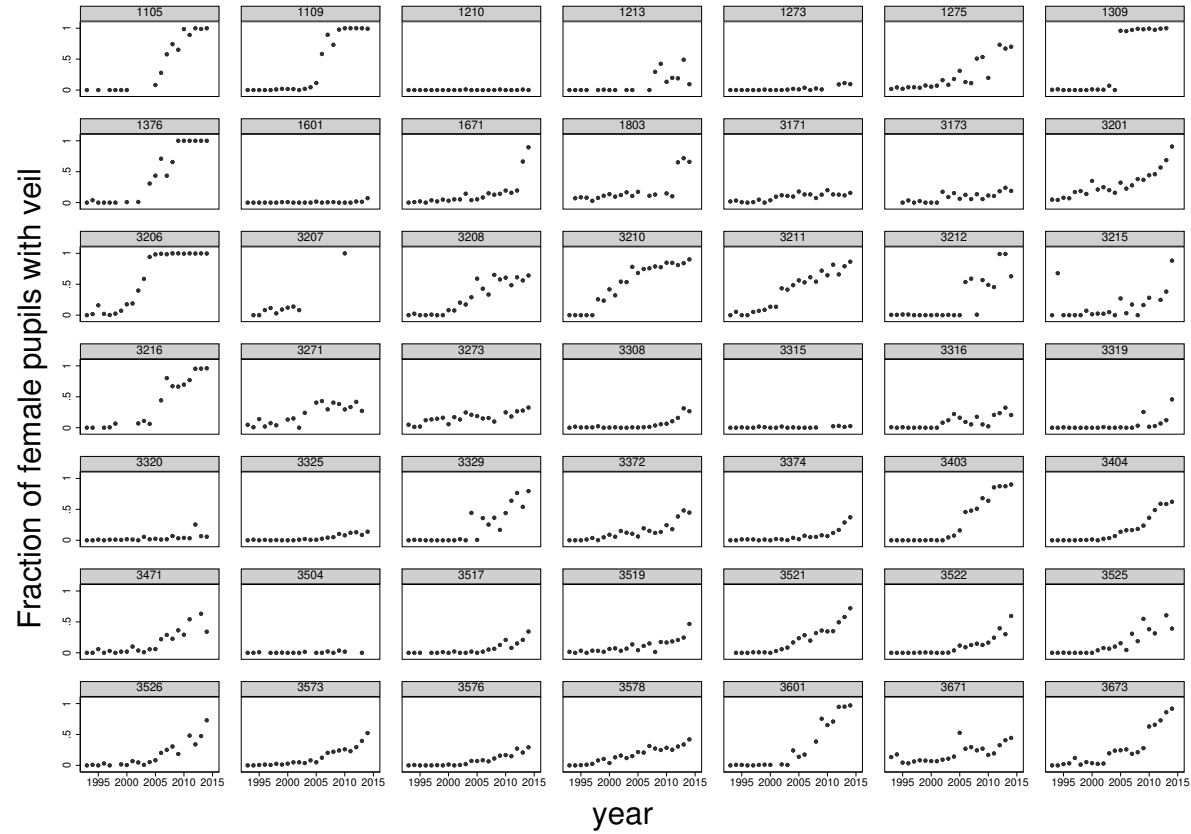
The evolution of veil adoption by district is depicted in Figure 2. The graph reveals significant variation across districts, not only in the starting point of the upward trend, but also in the trajectory of its progression. Some districts experienced an initial rise in veiling rates as far back as the early 1990s, while others began later, after the year 2000. A few districts show little to no increase. In some districts, veiling prevalence reaches 100%, whereas in others, it plateaus before reaching even half of the female population.²⁰ A key contribution of this paper is to explain part of this variation in veiling rates as a function of economic opportunities.

Labor force information. The data on female and male participation in the economy are obtained from the Annual National Labor Force Survey (SAKERNAS) (Statistics Indonesia (BPS — Badan Pusat Statistik), n.d.-b). This survey provides comprehensive information on work, education, and other activities performed by

¹⁹Future research could incorporate qualitative studies to understand how the narrative of veiling has changed within these private institutions/Islamic schools, which may affect societal views about the practice.

²⁰Because of this temporal dynamic, the mean veiling rate derived from school data is relatively lower than that from general population surveys. This discrepancy arises because the surveys were conducted in more recent years—when veiling was already widespread in many districts—whereas the school-based average includes data from earlier years, when veiling was still uncommon. However, when comparing veiling rates from school records and general population surveys for the same year, the values are very similar, bolstering our confidence in the reliability of the school data.

FIGURE 2 – FRACTION OF FEMALE STUDENTS ADOPTING RELIGIOUS HEADSCARVES, BY DISTRICT



Notes: The figure shows the evolution of veiling among female high-school students across districts over time. Each dot represents the fraction of female students wearing a veil in a given district-year.

respondents representative of the working-age population. It also includes detailed data on job characteristics, such as hours worked and whether the job is paid, as well as personal attributes of respondents, including age, education level, and marital status. Additionally, it captures information on respondents' locations and living conditions, such as whether they reside in urban or rural areas. This dataset is used to construct key variables of interest, including female and male participation rates in both formal and informal employment.

In this paper, formal employment is defined as work categorized as “worker/employee,” while informal employment includes all other work categories, such as family/unpaid work, self-employment (with or without assistance), and casual labor in both agricultural and non-agricultural sectors. This categorization aligns with the approach used by [Schaner and Das \(2016\)](#) in their ADB-commissioned technical report. While this definition may not perfectly distinguish formal jobs from informal business operations, it is adequate for the purposes of this study. It effectively captures key dimensions, such as the likelihood of protection under labor laws, the (in)flexibility of working hours and locations, and the degree of integration into the formal sector ([Schaner & Das, 2016](#)).²¹

District sectoral and gender composition. These variables are used to construct the instrument and are calculated using the information from the Medium and Large Manufacturing Census ([Statistics Indonesia \(BPS — Badan Pusat Statistik\), n.d.-a](#)). This census is performed annually by Statistics Indonesia and covers the universe of firms with at least 20 employees. It provides rich information about industrial establishments, including the composition of industrial inputs, such as the number and gender composition of labor; electricity and fuel used; and the detailed composition of products/industrial output categorized by standardized classification (which can be matched to the ISIC—International Standard Industrial Classification). Using the information from this survey, we calculate the industrial composition of a district as well as the gender composition of workers employed in a given industrial sector.

International demand for Indonesian products. We use the information on international trade values to proxy the international demand for Indonesia's products, sourced from the UN Comtrade ([The World Bank, n.d.-b](#)). These trade values are adjusted using the GDP deflator from the Penn World Table ([Feenstra, Inklaar,](#)

²¹In any case, the imprecision of this measure is unlikely to threaten the analysis. If anything, the direction of misclassification implies that some observations coded as “treated” are in fact “untreated” (i.e., some individuals classified as informal workers are actually employees). As a result, any estimated effect is more likely to be attenuated toward zero, rendering our estimates conservative.

& Timmer, 2015, 2019). To construct the instrumental variables, the trade values by standardized industrial classification (nomenclature) are matched with the data from the industrial census previously discussed.

In Table A.1 of the appendix, we report the summary statistics of the main variables of interest. The mean value of veil take-up is around 20% in the whole sample, with a fairly large standard deviation of around 29%.²² The fraction of the female population (ages 20–24) who participate in the formal sector is 21% on average, while the average participation in the informal sector is around 13%. These three variables are quite dispersed; they exhibit considerable variation across districts and time. Similarly, the export shock is also highly dispersed around its mean value.

Panel B of the table presents the components of the instrumental variable: The average real value of exports in the sample is around 7 times its value in 1990 and is very dispersed, with a standard deviation of 12. The average share of a single sector is around 7%. This implies that the districts in the sample have a relatively diversified industrial composition. On average, female workers constitute around 38% of labor in all units of observation covered in the analysis; the lowest fraction of female labor is employed in iron and steel basic industries (5%) and the highest fraction is employed in tobacco manufacturing (79%).

Independent surveys and other controls. We also perform analyses using independent survey data from the Pew Research Center (2012), the World Values Survey Association (n.d.), and the local polling firm Jakpat (2016), as well as the Indonesia Family Life Survey (IFLS) (Strauss, Witoelar, & Sikoki, 2016; Strauss, Witoelar, Sikoki, & Wattie, 2009). In the main analysis, we include additional controls constructed using district-level characteristics from IPUMS International (Minnesota Population Center, 2017), Indonesia’s annual GDP growth from the World Development Indicators (The World Bank, n.d.-a), and Islamist-party vote shares from legislative election returns (The Indonesian General Elections Commission (KPU — Komisi Pemilihan Umum), n.d.). The complete list is reported in Appendix D.

²²Please note that this mean is calculated for all observations, meaning that it computes across different years. The mean value across districts in the early years tends to be lower than the mean in the later years. Importantly, this measure is in line with the national survey data: the mean value of veiling at the national level in 2014, based on our data collection from high schools, is around 65%, which is very close to the value estimated by a recent survey in 2016 at around 70%, e.g. Fossati et al. (2017) or the data from the Jakpat polling firm in the same year, which will be discussed in the following sections.

V Estimating Equations and Empirical Results

A OLS estimates

To explore the relationship between veiling and young female participation in formal occupations, we estimate the following equation as a starting point:

$$Veil_{sdt} = \beta_1 FemJob_{dt} + \mathbf{X}'_{s,d,n;t} \boldsymbol{\Gamma} + \delta_d + \tau_d T + \epsilon_{sdt} \quad (1)$$

$Veil_{sdt}$ denotes the fraction of female students who wear a veil at school s , in district d , and year t . The main explanatory variable, $FemJob_{dt}$, denotes the fraction of young women (aged 20–24 years) who work in the formal sector in district d , and year t . We do not use the employment measure for the younger age group (16–19 years old) for an obvious reason: this group is mostly still in high school, so the employment measure of this group will be biased, especially in the recent years. Importantly, since the picture is taken toward the end of high school, the employment measure we use is the best proxy for job market opportunities for women captured in the pictures.

$\mathbf{X}'_{s,d,n;t}$ denotes a vector of control variables at different levels of observation, the details of which are discussed below, when the results are presented. These controls include variables at the school ($\mathbf{X}'_{st}$), the district ($\mathbf{X}'_{dt}$), and the national level ($\mathbf{X}'_{nt}$). The inclusion of this set of variables aims to control for time- and unit-varying information that may also explain veiling. In order to control for non-time-varying characteristics specific to the districts, we also include district fixed effects, δ_d . Meanwhile, $\tau_d T$ is meant to capture district-specific linear time trends, and ϵ_{sdt} is an error term.

Given this specification, we exploit the variation within districts over time, after partialing out the drift from the increasing time trend of veil take-up specific to the district. This specification is motivated by the observation from Figure 2, where we observe that different districts experience different levels of (increasing) time trends throughout the observation period. Moreover, since the treatment is applied at the district level, we cluster the standard errors for all regression specifications at the district level.

Since the treatment, i.e., the export shock, is most likely to take effect over multiple time periods, and the effect is likely to be heterogeneous at different points in time, we do not simultaneously control for time fixed effects.²³ As demonstrated

²³Nonetheless, we also conduct an alternative analysis using firm data and the original version of the instrument, controlling for both year and unit fixed effects. This analysis is detailed in Section E.

by de Chaisemartin and D’Haultfoeuille (2020), Goodman-Bacon (2021), Imai and Kim (2020), and Abraham and Sun (2021), among others, in this setting, using two-way (unit and time) fixed effects may not represent the best estimation strategy for causal inference.²⁴

The main analysis in this study uses a dataset with school-district-year as the unit of analysis, containing 93 schools located in 49 districts over the time span of 1993 to 2014.²⁵ The estimates for Equation 1 are presented in the top panel of Table 1. The coefficient β_1 is positive, highly significant, and stable across different model specifications. From the second column onward, we also control for a vector of possible confounders at different levels of observation. At the school level, veiling choices may be influenced by the gender composition of the classroom. The proportion of female to male students could shape social dynamics and perceptions among peers, potentially influencing students’ decisions on attire. In settings with heightened social engagement, students may be more conscious of their appearance and how they present themselves within their peer group across genders. Moreover, the size of the student cohorts may also affect veiling. A larger student body may reduce the visibility of individual students within the school, potentially affecting the decision to veil. The geographic location of schools may also affect veiling because this defines the climate in the area, influencing how people dress to adjust to the weather. Controlling for this set of variables at the school level does not significantly change the magnitude of the effect of interest.

Several controls at the district level are also included: First, the fraction of the population living in urban areas may affect veiling through the level of social surveillance experienced by the women in the study. In rural areas, people may know the members of their community better, so women in these areas might experience a higher degree of scrutiny over their actions. This could affect their decisions regarding attire and whether to adopt the veil. Moreover, we control for young male employment, because male and female employment rates may be correlated. As a consequence, if male employment is the true driver of veiling, then the interpretation

²⁴Using time and unit fixed effects in panel data is often seen as equivalent to a difference-in-differences estimator. In a setting where the treatment is applied at various points in time and there is heterogeneity in the effect, using this technique could lead to an incorrect average treatment effect estimate due to possible negative weighting. The studies cited show that the two-way fixed-effects specification for estimating ATE in a panel data structure is best applied in the simplest setting of panel data (two groups, two time periods).

²⁵The reasoning for this period is twofold: first, the information on gender labor composition from the Manufacturing database is only available from 1993 onward. This starting year also avoids the censoring effect of the government regulation on public high school uniforms, which was lifted only in 1991. Meanwhile, the end of the data period reflects the limits of veiling data available at the time of collection.

of the effect would be different, as discussed in the next section, where alternative mechanisms are evaluated. By including this variable in the specification, the effect we observe from female employment is free from the confounding effect of male employment. In addition, we also control for the high school enrollment rate of the female population of the relevant age groups. This variable might capture the effects of socio-economic background and the composition of the student body across different district-years. For instance, when schools are more accessible, a higher attendance rate indicates that the socio-economic composition might be closer to the actual socio-economic characteristics of the general population. Meanwhile, this might not have been the case in the past, when high schools were only accessible to daughters of families from high socio-economic backgrounds. Another control included at the district level is the share of votes for Islamist parties. This variable is meant to capture changing social preferences for outward religious expression, which may simultaneously affect the population’s views on veiling. Finally, at the national level, we include the national economic growth rate to control for possible time-specific confounders related to economic growth that affect all districts in a similar manner. For instance, a national economic crisis or years of recovery could affect the year-specific standard of living of the population in all districts. The inclusion of these possible confounders does not substantially alter the magnitude or the precision of the estimates.

B Shift-share instrumental variable

The estimate of β_1 in Equation 1 might be biased due to unobserved characteristics that cause districts with greater female job opportunities to also have a higher prevalence of veil take-up. For instance, districts with more vibrant economic activity may also be inhabited by more religious individuals, so we simultaneously observe more veiling.

To address this problem, we build a Bartik-style instrumental variable (IV) to instrument female participation in the formal sector. This strategy has been widely used in economics and social sciences, for instance, by [Autor, Dorn, and Hanson \(2013\)](#) to estimate the effect of imports from China on local US labor markets, by [Card \(2009\)](#) to understand the impact of immigration on local labor markets in the US, and by [Tabellini \(2020\)](#), who uses this type of IV to identify the political and cultural explanations for the backlash against immigration. The essence of the identification strategy is to exploit plausibly exogenous shocks coming from international sources to predict their effects on local labor markets. In line with the spirit of this strategy, we use international demand shocks for Indonesia’s products,

weighted by district-specific industrial and gender labor composition, to predict female labor demand, or more precisely, female participation in formal employment.

The logic is as follows: assume there is an increase in the demand for tobacco products in international markets. This induces tobacco industries to hire more labor. Importantly, tobacco industries systematically hire more women than men. As a result, districts with a larger share of tobacco industries experience higher demand shocks than districts that specialize in other commodities. Since international demand is largely exogenous, the resulting changes in female labor demand are also plausibly exogenous.

In particular, the instrument, *export shock*, is calculated as the summation of normalized real values of exports for different industries weighted by their historical gender and industrial composition:

$$Export\ shock_{dt} = \sum_{k=1}^K value_{k,t} \underbrace{\frac{L_{k,d,t=1993}}{L_{d,t=1993}}}_{\text{sector share}_{kd}} \underbrace{\frac{L_{f,k,t=1993}}{L_{k,t=1993}}}_{\text{female score } k} \quad (2)$$

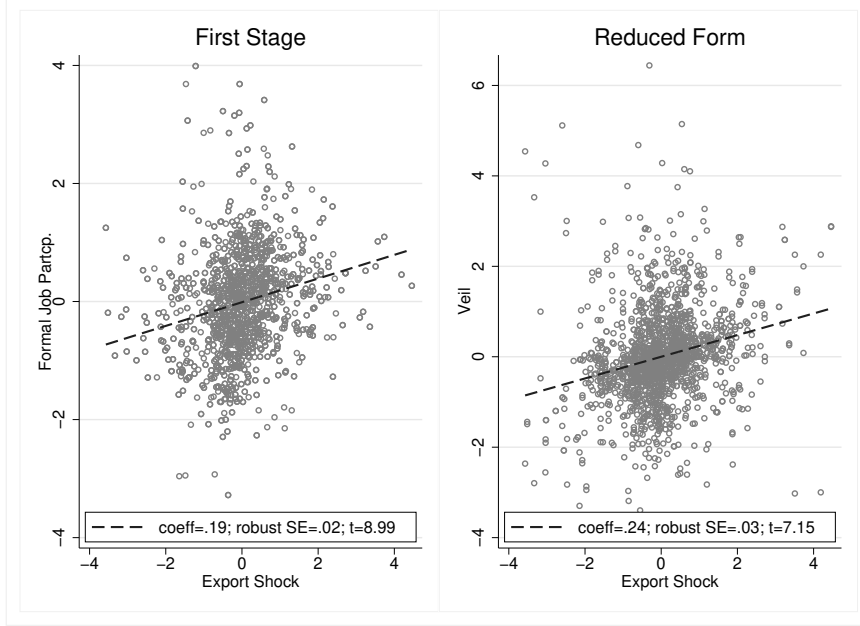
The subscript notation d is the identifier for the district, t is for time, k refers to the sector in the economy, and K is the total number of sectors in the economy. The first component, $value_{kt}$, is the normalized real value of export commodities produced by sector k at time t .²⁶ Since this variable is measured at the national level, it varies across years but is constant across districts in a given year. The second component, $sector\ share_{kd}$, is the historical share of sector k in district d in 1993 (the base year). This value captures the relative importance of industry k in a given district, so it varies across districts but is constant for each district over time. The third component, $female\ score_k$, is an index which captures the relative importance of female (as opposed to male) labor in a given industry k . For instance, textile and tobacco manufacturing tend to have a higher female share, while steel and heavy machinery manufacturing tend to have a lower female share. It is calculated as the fraction of female workers in the industry in the base year, 1993. This index is constant across districts and time, but varies across sectors.²⁷

Given its structure, *export shock* affects different districts in different years based on the fluctuation in international demand which is amplified by the gender char-

²⁶This value denotes a real increase, as it is adjusted for inflation and normalized to have a value of 1 in 1990.

²⁷We do not use district-specific female scores because they may be endogenous to the characteristics of the labor force of the district; national-level scores are more exogenous. Regardless, we perform a robustness check with district-specific female scores in Table A.2 of the appendix, and this exercise does not change the results.

FIGURE 3 – THE FIRST STAGE AND THE REDUCED FORM



Notes: The figure illustrates key correlations: the left panel shows the first-stage relationship, while the right panel presents the reduced-form correlation. All variables are residualized to account for district fixed effects and district-specific time trends, and standardized (Mean = 0, SD = 1) to facilitate comparability across measures.

acteristics of the industry and the share of that industry in a given district. The summary statistics of the components of the instrument are presented in panel B of Table A.1. The step-by-step calculation of this instrumental variable is discussed further in Appendix D.

In Figure 3, we show the scatter plot of the instrument and the two variables of interest. First, *export shock* exhibits a clear positive and significant relationship with formal job participation for females (first stage). Similarly, *export shock* is positively and significantly associated with veil take-up (reduced form). Importantly, these relationships are obtained after partialing out time-invariant district characteristics and district-specific time trends.

C The causal effect of economic opportunities on veiling

To identify the causal effect of shocks in economic opportunity on veiling, we estimate the following model with two-stage least squares (2SLS):

$$FemJob_{dt} = \alpha Export\ shock_{dt} + \mathbf{X}'_{s;d;t} \boldsymbol{\Omega} + \eta_d + \theta_d T + \varepsilon_{dt} \quad (3)$$

$$Veil_{sdt} = \beta_2 \widehat{FemJob}_{dt} + \mathbf{X}'_{s;d;t} \boldsymbol{\Gamma} + \delta_d + \tau_d T + \epsilon_{sdt} \quad (4)$$

Export shock denotes the instrumental variable introduced earlier, and the rest of the notation corresponds to Equation 1. Our parameter of interest here is β_2 : a positive value indicates that the increase in economic opportunities for women increases the prevalence of veil use.

We run the 2SLS regression following model 4 and report the estimates in Table 1. The 2SLS estimates indicate that, on average, every percentage point increase in formal employment participation by females is associated with about a 2.3–2.6 percentage point increase in veiling. These estimates are highly significantly different from zero at 99% confidence. To put these numbers in perspective, this effect is equivalent to about 11–13% of the average veiling in the sample.²⁸

Moreover, from the table, the reader can observe that the first-stage relationship is strong and significant: when the weighted average of export value increases to twice its value in 1990, formal job participation is expected to increase by about 2.2–2.7 percentage points. This represents around 12% of the average female employment in the sample. Meanwhile, the reduced-form regression indicates that an increase in the weighted average export value to twice its 1990 value is associated with about a 6.2 percentage point increase in veiling. Moreover, both the first-stage and reduced-form coefficients are significantly different from zero at the 1% level. Importantly, the reported Kleibergen-Paap Wald F-statistics are greater than 10 in all specifications, attesting to the strength of the first-stage regression.

Comparison to OLS estimates. While the results from the two estimation methods are qualitatively similar, the magnitudes of the coefficients differ. Several factors may account for these discrepancies.

First, the aggregation of local treatment effects across districts may contribute to the observed differences. As demonstrated in the first-stage regression analysis (reported in Supplementary Figure A.1), there is substantial heterogeneity across districts. This heterogeneity may attenuate the estimated effect in the OLS regression, as OLS averages across all observations. In contrast, the 2SLS estimator primarily captures the local treatment effect, emphasizing the impact of job opportunities driven by export-induced economic fluctuations (“booms” and “busts”) in regions specializing in female-intensive industries.

Second, measurement error may play a role. The theoretical construct we aim

²⁸We can also gauge the extent of this magnitude by referring to Table A.1. From this table, we observe that while the mean values of both veiling and female formal employment are about the same (20%), the standard deviation of veiling is twice that of female employment. Therefore, since the breadth of the veiling variable in this sample is about twice as wide as the range of the female employment variable, and they have the same unit, the effect of about 2.5 percentage points is within a reasonable range.

TABLE 1 – VEIL AND FORMAL JOB PARTICIPATION

	<i>Veil</i>				
<u>OLS</u>					
<i>Formal job participation</i>	0.178*** (0.062)	0.176*** (0.062)	0.166*** (0.053)	0.167*** (0.061)	0.154*** (0.052)
<u>2SLS</u>					
<i>Formal job participation</i>	2.298*** (0.684)	2.285*** (0.680)	2.615*** (0.846)	2.279*** (0.714)	2.622*** (0.927)
K-P Wald F-statistics	22.04	21.80	18.51	21.05	16.01
Observations	1,772	1,772	1,772	1,772	1,772
<u>Reduced forms</u>	<i>Veil</i>				
<i>Export shock</i>	0.062*** (0.012)	0.061*** (0.012)	0.060*** (0.013)	0.059*** (0.012)	0.057*** (0.014)
<u>First-stage</u>	<i>Formal job participation</i>				
<i>Export shock</i>	0.027*** (0.006)	0.027*** (0.006)	0.023*** (0.005)	0.026*** (0.006)	0.022*** (0.005)
Observations	1,772	1,772	1,772	1,772	1,772
School-level controls		✓	✓	✓	✓
District-level controls			✓		✓
National-level controls				✓	✓

Notes: The top panel of the table reports OLS and 2SLS estimates corresponding to Equations 1 and 4, respectively, while the bottom panels present the reduced-form and first-stage estimates. *Veil* denotes the fraction of female students who wear a veil, *Formal job participation* refers to the fraction of the female population aged 20–24 working in the formal sector, and *Export shock* is the instrument. School-level controls include the male to female student ratio, the size of the student body, the latitude and longitude of the school location; district-level controls include the fraction of the population who live in urban areas, the fraction of the male population aged 20–24 who are working, the vote share of Islamist parties, and the female high-school enrollment rate; the national-level control includes the national economic growth rate. All regressions include district fixed effects and district-specific time trends. Standard errors are clustered at the district level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

to capture is female labor demand, which is only imperfectly proxied by female participation in formal employment. This observed variable reflects an equilibrium between labor demand and supply. On the supply side, for example, social movements advocating for women’s rights and emancipation could influence female labor participation. However, if such movements are negatively correlated with veiling, this could introduce a downward bias in our estimate of interest.

Finally, omitted variable bias—such as unobserved factors related to religiosity—could also influence the results. However, given the broad range of potential omitted variables, identifying their precise impact remains a challenge.

D Validity of the instrument

Recent work on shift-share instrumental variables (SSIV) can be broadly classified into two perspectives. The first argues that SSIV validity primarily depends on exogenous variation from common shocks affecting districts, even if sectoral shares are endogenous (e.g., [Adao, Kolesár, and Morales \(2019\)](#); [Borusyak, Hull, and Jaravel \(2022\)](#)). In contrast, the second perspective asserts that SSIV validity hinges on the exogeneity of sectoral shares (e.g., [Goldsmith-Pinkham, Sorkin, and Swift \(2020\)](#)).

A thorough review of these works suggests that, in our case, it is necessary to make an a priori assumption that the primary source of variation stems from external shocks rather than sectoral composition. Unlike previous studies that use common shocks generated by national production serving local markets as a proxy for labor demand (e.g., [Bartik \(1991\)](#), [Blanchard and Katz \(1992\)](#), [Autor and Duggan \(2003\)](#), and [Diamond \(2016\)](#)), our approach leverages shocks originating from international markets. This source of variation is arguably more exogenous, as it is less susceptible to influence from local market conditions.

To validate this assumption, we conduct two robustness checks. First, in Table A.3 of the appendix, we substitute export values with global imports of commodities (excluding Indonesia) as an alternative instrument. Since this measure is driven by global demand rather than domestic market conditions, it is more likely to satisfy the exogeneity assumption. Second, in Appendix Table A.4, we re-estimate the effect after excluding the textile-related industries, where Indonesia may have some price-setting power.²⁹ If domestic labor market conditions influence prices in this sector, it could compromise the exogeneity of our instrument. Our results remain

²⁹We also conducted an additional robustness check in which we re-estimate the main results while iteratively excluding one industry at a time. The results, presented in Appendix Figure A.4, confirm that our results are not sensitive to the exclusion of any particular industry.

robust across both exercises, although the estimated effect is somewhat smaller in the second case due to the expected reduction in the source of variation being exploited.

Furthermore, to ensure the validity of our inferences, we re-estimate our effects using the procedure outlined in [Borusyak et al. \(2022\)](#). This approach restructures the dataset to use industry-level shocks instead of district-level shocks. As elaborated in [Borusyak et al. \(2022\)](#), this estimator addresses potential issues arising from correlations between industry shares across districts, which could otherwise lead to an underestimation of standard errors (see [Adao et al. \(2019\)](#)). The results, presented in Table A.5 of the appendix, confirm the robustness of our findings across three different standard-error specifications: BHJ robust, clustering at the 3-digit ISIC code, and clustering at the 2-digit ISIC code.

Additionally, since we fix industrial shares in the base year, one might be concerned about the plausibility of the design, where we assume that the export shocks are independent of the initial features of the district. This assumption could be violated if certain characteristics of the districts lead them to persistently receive higher (or lower) shocks in the long run due to the initial features of the districts. To gauge the validity of this assumption, we perform several checks:

1. We add several potential confounders at the district level in the main analysis and show that the estimate of interest remains robust. The goal is to show that the relationship between the instrument and the outcome of interest does not depend on the variation from these pertinent socio-economic features of the district. We report the results in Table 1, from the second column onwards.
2. We show that future export shocks cannot predict past veil take-up. The idea is the following: If there is any systematic correlation between past veil take-up and distant future economic shocks, it would suggest that the instrument is not independent of the initial conditions of the districts, including the local industrial sectoral composition, because it is fixed at the base year. For this purpose, we rerun the IV estimates of Table 1, using a lead instrument. In particular, the lead instrument is calculated as follows:

$$Export_shock_{d,t+10} = \sum_{k=1}^K value_{kt+10} \underbrace{\frac{L_{kd,t=1993}}{L_{d,t=1993}}}_{sector_share_{kd}} \underbrace{\frac{L_{fk,t=1993}}{L_{k,t=1993}}}_{female\ score_k} \quad (5)$$

Here, $value_{kt+10}$ denotes the 10-year lead of normalized real values of national exports, while the rest of the notation follows Equation 2. In essence, this

lead instrument captures the future economic shocks that the district would experience in 10 years.³⁰

We report this analysis in Table A.6 of the appendix. The future export shock is not correlated with past veil take-up, both in the reduced form and in the 2SLS regression, despite the fact that the first stage still holds. The coefficients are small and unstable across different specifications, and importantly, they are not statistically different from zero.

3. We show that economic shocks are balanced across several past characteristics of the district. The intuition behind this exercise is to show that future economic shocks are not correlated with the initial characteristics of the district. We report the results in Supplementary Table A.7 and show that there is no systematic correlation between future shocks and the initial characteristics of the district, such as the fraction of the population living in urban areas, female high school attendance rate, male job participation, votes for Islamist parties, gender ratio in the population, etc.

These results strengthen the argument that the instrument is indeed plausibly exogenous.

E Alternative model: firm data and two-way fixed effects

As discussed earlier, in the presence of staggered treatment timing and potential treatment effect heterogeneity, a two-way fixed-effects (TWFE) estimator may be biased; accordingly, we do not rely on this approach in our main analysis. Nevertheless, in this section we present an alternative specification with district and year fixed effects. Despite the potential biases noted above, this analysis serves as a descriptive benchmark and provides an additional robustness check for the main results.

In this analysis, we are using firm data and define firm entry and existence as the treatment variable. Specifically, firms are coded as existing from their initial entry into the district until their record is no longer present in the dataset. Our specification is as follows:

³⁰The main aim of this exercise is to examine if there are unobserved characteristics of the district in the base year that persist in the long run, such that future shocks become correlated with these past characteristics. To test this, we need to use a sufficiently long time span (e.g., 10 years or more) to ensure that any such dependencies (if any) do not carry through into the distant future. Using a shorter time span for the lead instrument would not be ideal, since companies typically use short- to medium-term plans for their activities (e.g., over 3- or 5-year ranges), there might be stickiness, as firms may need to follow the prescribed plans within this time span.

$$Veil_{sdt} = \zeta_1 Active\ firms_{dt} + \mathbf{X}'_{sdn;t} \xi + \nu_d + \theta_t + \epsilon_{dt} \quad (6)$$

Where $Veil_{sdt}$ represents the fraction of veiled students in school s district d at time t , $Active\ firms_{dt}$ is the number of manufacturing firms actively operating in district d at time t , and $\mathbf{X}'_{sdn;t}$ is a vector of controls at the school, district, and national level. Additionally, we control for district fixed effects (ν_d), which account for time-invariant unobserved characteristics of the district, as well as year fixed effects (θ_t), which capture time-varying unobservable factors that affect all districts uniformly in a given year.

The results, presented in Table 2, show a strong and statistically significant positive association between firm presence and veiling. A one standard deviation increase in the number of firms operating in a district is associated with an estimated increase of approximately 0.18 standard deviations in veiling. Interpreting firm presence as a proxy for the emergence of economic opportunities, this analysis provides additional evidence of a positive association between veiling and economic opportunity.

Importantly, the middle and lower panels of the table report two-way fixed-effects estimates using the original instrument employed in the main analysis. Under this alternative specification, we again find a positive and statistically significant association between veiling and the export shock. While subject to the limitations discussed above, these results are consistent with the main findings and provide complementary evidence that supports the overall conclusions of the analysis.

VI Potential Mechanisms

Thus far, we have provided evidence indicating that an exogenous increase in the availability of formal job opportunities for women has a causal effect on the adoption of religious veiling across districts in Indonesia. In this section, we present additional evidence to investigate several potential underlying mechanisms driving this relationship.

A Veil as a negotiation device

As outlined in Section III, the veil may serve as a negotiation tool for addressing the tension between women's public and domestic roles within a rapidly modernizing yet deeply religious society. By triangulating multiple sources of evidence, we identify this as the most plausible underlying mechanism driving the observed patterns.

TABLE 2 – VEIL AND ECONOMIC OPPORTUNITIES: PANEL TWO-WAY FIXED EFFECTS

	<i>Veil (std)</i>				
<i>Active firms (std)</i>	0.188** (0.080)	0.192** (0.081)	0.173** (0.080)	0.192** (0.081)	0.173** (0.080)
District FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Observations	1,772	1,772	1,772	1,772	1,772
	<i>Veil (std)</i>				
<i>Export shock (std)</i>	0.103** (0.044)	0.114** (0.044)	0.093** (0.045)	0.114** (0.044)	0.093** (0.045)
District FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Observations	1,772	1,772	1,772	1,772	1,772
	<i>Veil</i>				
<i>Export shock</i>	0.020** (0.009)	0.022** (0.009)	0.018** (0.009)	0.022** (0.009)	0.018** (0.009)
District FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Observations	1,772	1,772	1,772	1,772	1,772
School-level controls		✓	✓	✓	✓
District-level controls			✓		✓
National-level controls				✓	✓

Notes: The upper panel of the table reports two-way panel estimates based on the specification in Equation 6. *Active firms* denotes the number of manufacturing firms actively operating in the given district-year. *Veil* denotes the fraction of female students adopting the veil in a given school-district-year. The middle and lower panels report the same two-way panel specifications, but replace the number of active firms with the original instrument used in the main analysis. In the upper and middle panels, both the outcome and the key explanatory variable are standardized to facilitate comparison across variables, whereas in the lower panel they are reported in their original units. All control variables mirror those used in the main specifications. Standard errors are clustered at the province-year level and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

TABLE 3 – VEILING AND TYPES OF FEMALE JOBS

	<i>Veil</i>					
<u>OLS</u>						
<i>Formal job participation</i>	0.178*** (0.062)	0.154*** (0.052)				
<i>Any informal job</i>			-0.019 (0.076)	-0.032 (0.067)		
<i>Family worker</i>					-0.018 (0.047)	-0.003 (0.048)
<u>2SLS</u>						
<i>Formal job participation</i>	2.298*** (0.684)	2.622*** (0.927)				
<i>Any informal job</i>			-37.190 (144.327)	-12.678 (18.397)		
<i>Family worker</i>					33.694 (55.178)	19.213 (16.390)
K-P Wald F-Statistics	22.04	16.01	0.06	0.50	0.33	1.32
Observations	1,772	1,772	1,772	1,772	1,772	1,772

Notes: The table reports OLS and 2SLS estimates of the relationship between veiling and various types of female occupations. *Veil* is the fraction of female pupils wearing a headscarf, *Formal job participation* is the fraction of the female population aged 20–24 working in the formal sector, and *Any informal job* is the fraction of the female population aged 20–24 working in the informal sector, including family workers. *Family worker* denotes the fraction of the female population aged 20–24 working as family workers. Specifications in columns 2, 4, and 6 also control for a set of covariates at the school, district, and national levels. Consistent with the main specification, all regressions include district fixed effects and district-specific time trends, and standard errors are clustered at the district level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Specifically, our findings reveal that *the adoption of veiling is more pronounced in response to types of employment that may jeopardize women’s personal and social reputation*. The underlying mechanism, as discussed in [Carvalho \(2013\)](#) and [Patel \(2012\)](#), revolves around maintaining respectability while participating in public spaces. In the realm of paid employment, veiling serves as a visible marker to the community, signaling that women engaged in financially rewarding occupations do so through “legitimate” means that uphold their dignity.

A compelling illustration of this function is provided by [Lindquist \(2004\)](#), whose ethnographic study in Batam, Indonesia—a rapidly industrializing region—examines the experiences of young female workers in the manufacturing sector. Lindquist argues that these young women wear veils to delineate moral boundaries in their workplace, distinguishing themselves from commercial sex workers. The stigma associated with young working women being misidentified as prostitutes is further supported by ethnographic research conducted in an export processing zone in South

Sulawesi (Silvey, 2000). These studies underscore the role of veiling as a strategic response to the reputational challenges faced by women in emerging labor markets.

To test this hypothesis, we conduct several analyses. *First*, we demonstrate that veiling is responsive exclusively to formal employment and not to informal work.³¹ Informal employment may not trigger a veiling response for two key reasons: a) such jobs often do not require women to leave their domestic compound, and b) particularly in the case of family workers, the absence of monetary exchange eliminates concerns about undignified economic transactions. Table 3 presents the comparison between formal and informal employment. Both the OLS and 2SLS specifications reveal a stark contrast between the estimates for formal jobs and those for informal occupations. The coefficients for informal and family worker participation are very unstable, have never reached statistical significance, and, in some cases, are even negative. Conversely, the estimates for formal job participation remain consistently positive, stable, and highly significant across specifications.³²

Second, we perform a heterogeneity analysis based on the level of gender segregation in the workplace. In work environments with low gender segregation, female workers are more likely to adopt veiling due to the increased likelihood of interacting with male coworkers who are not family members. To quantify this dynamic, we construct a gender segregation index to estimate the probability of such interactions.³³ A higher value of the index corresponds to a lower likelihood of female workers encountering male coworkers in the workplace.

The results of this analysis are presented in Table 4. The 2SLS estimates indicate that the veiling response to economic shocks is more than twice as strong in

³¹In the Indonesian context, informal work performed by women typically takes place in or around the home, enabling them to balance domestic responsibilities—such as childcare and household chores—with income-generating activities (Robinson, 2009). While some forms of informal work may require leaving the house, such as selling food in a nearby market, the key assumption here is that formal employment is significantly more likely to necessitate travel away from home. To validate this assumption, Table A.8 of the Appendix uses data from the 2014 Sakernas to show that formal jobs are more frequently associated with the use of transportation to commute (as opposed to walking) and involve longer travel distances. Additionally, we also analyze the family worker category, a type of work that is often unpaid and typically performed in close proximity to the home or other family members (Robinson, 2009). Sakernas codes family workers differently across years: as category 5 before 2001 and category 7 thereafter, though both are defined as “Family/unpaid workers.”

³²Additionally, we conduct a heterogeneity analysis by occupational field and find that veiling responses tend to be strongest and statistically significant in the construction and transportation sectors. This aligns with the notion that veiling is more prevalent in occupations where women spend substantial time away from home as required in construction and transportation sector. Due to space constraints and the lack of precision of the measures, this analysis is included in Appendix Table A.9. Nevertheless, the observed pattern in this supplementary analysis further underscores the relationship between public exposure and veiling, reinforcing the broader implications of gendered dynamics in formal employment.

³³Details on the construction of this index are provided in Appendix B.

districts below the median segregation index compared to those above it. To further explore this pattern, the bottom panel of Table 4 divides the analysis into quartiles. The findings consistently support the interpretation that lower levels of gender segregation are associated with stronger veiling effects. Specifically, the effect is most pronounced and statistically significant in districts within the first quartile of the segregation index distribution, where the likelihood of cross-gender interaction is the highest. By contrast, in the upper quartiles, the effects are smaller and/or lack precision.

To further clarify this pattern, we triangulate these findings with observations from several studies, which consistently highlight that the contemporary trend of veiling in Indonesia has been initiated and championed by young, urban, educated, middle-class women (Brenner, 1996; Fossati et al., 2017; Smith-Hefner, 2007; Utomo et al., 2018).³⁴ Although these findings are observational in nature, the consistency across multiple studies and analyses strongly suggests that this trend aligns with the veiling model proposed by Carvalho (2013). Consistent with the model, this group of women faces the strongest incentives to adopt veiling practices for two key reasons: a) As higher earners, they are more likely to attract social stigma, creating a stronger incentive to adopt veiling as a signal of respectability and moral standing. b) They face the highest opportunity cost of not participating in the labor force, as it would mean underutilizing their educational investment and forfeiting access to higher-paying jobs.

This alignment between theoretical predictions and empirical findings—which demonstrate that veiling is more pronounced in occupations that may pose a higher risk to women’s personal and social reputation—reinforces the hypothesis that veiling functions as a strategic adaptation to the nature of women’s employment.

B Veiling and social norms

Building on the evidence presented in the previous section, we find further support for the hypothesis that veiling functions as a signaling mechanism for navigating

³⁴To substantiate this observation, we conducted logistic regression analyses using data from two sources: one collected by a local polling firm and another by an American-based polling firm. Both analyses reveal a strong positive correlation between educational attainment and the likelihood of wearing a veil in Indonesia. Table A.10 in the appendix shows that the education coefficients are positive and highly significant across both datasets, with comparable coefficient values. Furthermore, Table A.11 in the appendix illustrates veiling rates among women with varying levels of education, using data from the local polling firm. Additionally, Table A.12 in the appendix compares veiled and non-veiled respondents from Pew Research on several sociodemographic characteristics. The two groups are broadly similar, except for two notable differences: veiled women tend to be more educated and less likely to be married, which may imply higher financial independence. These differences are even more pronounced among younger respondents.

TABLE 4 – HETEROGENEITY BY GENDER SEGREGATION

	<i>Veil</i>			
Segregation index	$\leq Median$		$> Median$	
<u>OLS</u>				
<i>Formal job participation</i>	0.181* (0.096)	0.218*** (0.074)	0.173** (0.076)	0.126* (0.063)
<u>2SLS</u>				
<i>Formal job participation</i>	3.250*** (1.075)	3.814*** (1.334)	1.387** (0.557)	1.474** (0.732)
K-P Wald F-Statistics	18.84	13.79	12.96	8.17
Observations	934	934	838	838

	<i>Veil</i>			
Segregation index	<i>Q1</i>	<i>Q2</i>	<i>Q3</i>	<i>Q4</i>
<u>OLS</u>				
<i>Formal job participation</i>	0.268* (0.131)	0.121 (0.121)	0.122 (0.091)	0.205 (0.115)
<u>2SLS</u>				
<i>Formal job participation</i>	3.611*** (1.286)	2.175* (1.145)	1.167** (0.505)	1.704 (1.238)
K-P Wald F-Statistics	28.24	1.98	19.86	2.91
Observations	517	417	404	434

Notes: In the upper panel, the first two columns report estimates for districts with gender segregation indices below or equal to the median, and the last two columns present estimates for those above the median. The first and third column present estimates without controls, while the second and the fourth columns include them. The control variables follow the main specification with the full set of covariates at the school, district, and national levels. The lower panel further explores heterogeneity by dividing districts into quartiles based on the gender segregation index. This index is constructed as a weighted average of sector-level segregation measures within each district, using 1993 sectoral employment shares as weights; additional details on the index construction are provided in Appendix B. Consistent with the main specification, all regressions include district fixed effects and district-specific time trends, and standard errors are clustered at the district level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

social norms. Consistent with signaling theory, we propose that the signaling value of veiling varies depending on the prevailing strength of gender norms in a given area. To test this, we used data from the base year (1993) to calculate the proportion of male respondents who reported performing housework in the past week. Districts were then categorized into quintiles based on this measure, and the effects were re-estimated for each quintile group. The results offer valuable insights into how veiling behavior adapts to different levels of gender norm rigidity, reinforcing the idea that social context plays a critical role in shaping veiling practices.³⁵

The results of this analysis are presented in Table 5. Despite variation in the strength of the first stage—driven primarily by the reduction in sample size following the split—the pattern of the estimates suggests an inverse U-shape, with the effects of veiling most pronounced in districts characterized by moderate gender norms, rather than in the most restrictive or the most lenient contexts. Specifically, the benefits of veiling as a signaling device appear to be maximized when gender norms are more ambiguous, offering room for negotiation in women’s public and domestic roles. Interestingly, there is little or no effect on veiling in areas with the strictest gender norms. This finding indicates that, despite increased economic opportunities for women, societal rigidity limits the number of women who can capitalize on these opportunities. In contrast, in districts with the most relaxed gender norms, the analysis shows that veiling effect is also non-existent; the estimate for the top quintile of the gender norms distribution is effectively zero. This result highlights that when gender role segregation is not deeply embedded in society, veiling as a signaling mechanism may not be needed in the first place.³⁶

³⁵In many societies, including Indonesia, housework is traditionally regarded as a female responsibility. Therefore, the proportion of male respondents reporting housework can serve as a useful proxy for the flexibility of gender norms. However, it is important to note that the range of this variable in the sample is narrow, between 0 and 2.4%. Consequently, findings based on this measure should be interpreted with caution, as there is likely severe under-reporting. The low values and limited variation may suggest that housework carried significant stigma for men during this period, leading many to refrain from reporting their participation, even when unemployed.

³⁶We also find that veiling behavior aligns with the logic of signaling: as veiling becomes more widespread, its role as a distinctive social signal weakens, as it no longer serves to differentiate individuals. This suggests that the impact of economic shocks on veiling should decline as its prevalence increases, eventually becoming negligible once veiled women constitute the majority. Figure C.1 of the appendix illustrates this relationship by plotting the marginal effects of economic shocks against the prior period’s veiling prevalence. The results show that as more women adopt the veil, the effect of economic shocks diminishes. Notably, when the proportion of veiled students in the previous period reaches approximately 60%, export shocks no longer have a significant impact. In essence, once veiling becomes widespread, its function as a social differentiator fades within the community.

TABLE 5 – HETEROGENEITY BY INITIAL GENDER NORMS

Initial norms	<i>Veil</i>				
	<i>Q1</i>	<i>Q2</i>	<i>Q3</i>	<i>Q4</i>	<i>Q5</i>
<u>OLS</u>					
<i>Formal job participation</i>	-0.007 (0.049)	0.219 (0.141)	0.298* (0.153)	0.433** (0.166)	0.178 (0.128)
<u>2SLS</u>					
<i>Formal job participation</i>	1.981 (2.082)	3.363*** (1.133)	4.573* (2.473)	3.349** (1.341)	0.025 (0.676)
K-P Wald F-Statistics	0.99	12.75	3.53	14.76	8.54
Observations	290	333	354	367	343

Notes: The table presents the main OLS and 2SLS specifications split by quintiles of initial gender norms in the district. Gender norms are measured as the fraction of males who declared doing house chores in the past week in the survey year of 1993. Following the main model, all regressions include district fixed effects and district-specific time trends. Standard errors are clustered at the district level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

C Veiling and religiosity

A central question in this context concerns the role of religion—and behaviors typically associated with “genuine” religiosity—in the veiling phenomenon. While it is essential to recognize that religion provides the underlying moral and cultural framework for veiling, our analysis suggests that the rise in veiling in our study does not seem to be driven by shifts in personal religiosity. Instead, veiling appears to be shaped by broader changes in the economic and social environment. Its effectiveness as a signaling mechanism derives in part from the strong communal attachment to religious values and ideals. Yet the decision to adopt the veil is better understood as a response to environmental pressures rather than a direct reflection of deepening religious belief.³⁷

First, the evidence indicates that personal religiosity is not a strong predictor of veiling. For example, Appendix Table A.12 shows no significant differences in daily prayers or support for Islamist parties between veiled and non-veiled respondents. This is in-line with the idea that veiling can serve as both a personal expression

³⁷This does not mean, however, that veiling does not reflect one’s attachment to religious values. For example, [Carvalho \(2013\)](#)’s model does not require an increase in personal religiosity for veiling to occur. Instead, what matters is the shift in the socio-economic environment, which prompts religious individuals to visibly signal their identity and demonstrate their commitment to the values they uphold.

of piety and a social signal. Crucially, even non-religious individuals (non-sincere adopters) may adopt the veil if they perceive social or economic benefits, such as greater acceptance or respectability.

Second, we control for vote shares of Islamist parties—another proxy for outward religiosity—and find that this inclusion does not meaningfully alter the estimated effects of veiling. We further examine multiple alternative measures of religiosity using data from the Indonesian Family Life Survey (IFLS). As shown in Appendix Table A.13, there is no significant correlation between economic shocks and a range of religiosity indicators, including self-reported religiosity, frequency of daily prayers, and preferences for religious candidates. These findings cast doubt on the hypothesis that increased veiling merely reflects a broader rise in religiosity triggered by economic shocks.

Despite inconclusive evidence linking veiling to personal religiosity, interestingly, we find that veil adoption is significantly influenced by the religious composition of the community. Specifically, as shown in Table 6, the effect of veiling is more pronounced in districts with a higher share of Muslims. In such settings, veiling signals adherence to shared moral norms and is associated with greater social rewards. This pattern aligns with the interpretation of veil as a social signal, particularly in environments where community norms and approval strongly shape individual behavior (Carvalho, 2013).³⁸

Taken together, these findings suggest that religiosity matters more at the communal than at the personal level. This distinction reflects the dual nature of veiling—it conveys both personal values and perceptions of its social significance. Thus, individual religiosity is not a necessary condition for veiling, so long as the practice is perceived to carry social value within the broader community.

Moreover, we argue that veiling, as a form of religious behavior, constitutes a context-dependent response to specific socio-economic transformations. Prior research has shown that religious expression is often shaped by context. For example, negative economic shocks can lead to increased participation in religious gatherings, which may function as informal insurance mechanism (Chen, 2010). Similarly, disasters or unpredictable life events often trigger a rise in private religious practices, such as prayer, as a psychological coping mechanism (Bentzen, 2019, 2021).³⁹

³⁸An alternative interpretation, consistent with the survey evidence, is that the religious veil is used as a signal of education and social status. As discussed in Section A and again in this section, the survey data consistently show a positive correlation between veiling and education/socio-economic status. If this association is common knowledge, high-school students may emulate veiling practices in order to signal such status.

³⁹While economic shocks and religiosity are sometimes positively correlated—as in Buser (2015)—other studies, such as Bentzen (2019, 2021) and Chen (2010), find a negative relationship.

In a similar vein, the adoption of the veil appears to be a targeted response to the emergence of new economic opportunities, rather than evidence of a broader shift in religious behavior.⁴⁰ Unlike other forms of religious expression—such as prayer frequency or voting for religious parties—veiling operates as a specific signaling mechanism to convey moral standing and respectability in environments where such traits are socially or economically rewarded.

In conclusion, veiling reflects a sophisticated interplay between religiosity, social norms, and economic dynamics. While religion provides the cultural foundation for veiling, the evidence shows that its adoption may be triggered by external factors, such as economic opportunities and community-level expectations. These findings highlight that veiling operates as a strategic, context-dependent response, rather than simply a direct expression of increasing personal religiosity. This underscores the diverse ways in which religious norms interact with societal change.

D Cultural backlash

As more economic opportunities emerge, compelling more women to abandon their traditional roles, there may be a cultural backlash from conservative groups in society. Below, we discuss evidence related to this mechanism.

Backlash by the family. While part of the mechanism we propose involves young women adopting the veil as a means of gaining community approval, the evidence does not suggest that this behavior is primarily driven by direct backlash from spouses or parents, for example, due to shifts in intra-household bargaining power. First, as shown in Appendix Table A.14 and Table A.15, male and female employment tend to move in tandem in response to economic changes. There is no indication that women are systematically displacing men in the workforce during the observation period. Second, data from a nationally representative survey (Table A.16) show that approximately 90% of veiled women report doing so by personal choice, even when given explicit alternatives such as “requested by parents” or “requested by spouse”.⁴¹ Together, these findings suggest that the increase in veiling

The mechanisms vary and, importantly, are not necessarily stable across cultural or institutional contexts; Bettendorf and Dijkgraaf (2010) provides a useful overview of these heterogeneous patterns.

⁴⁰As discussed earlier, our estimates remain robust when controlling for Islamist-party vote shares. In addition, economic shocks do not significantly predict support for Islamist parties. These patterns suggest that political expressions of religiosity may be driven by distinct factors, such as institutional dynamics or state-religion relations (Bazzi, Hilmy, & Marx, 2020).

⁴¹A potential concern is that responses may be biased if women feel pressured to answer in a socially desirable way, particularly if they are under the surveillance of parents or husbands. However, this is unlikely to be a significant issue since the survey was conducted via a mobile

TABLE 6 – HETEROGENEITY BY MUSLIM SHARE

Muslim share	<i>Veil</i>			
	All	< 0.5	0.5 – 0.9	≥ 0.9
<u>OLS</u>				
<i>Formal job participation</i>	0.154*** (0.052)	0.011 (0.017)	0.156 (0.112)	0.152** (0.064)
<u>2SLS</u>				
<i>Formal job participation</i>	2.622*** (0.927)	0.313*** (0.119)	1.406* (0.852)	3.345** (1.333)
K-P Wald F-Statistics	16.01	8.65	4.44	10.63
Observations	1,772	64	416	1,292

Notes: The table presents the main OLS and 2SLS specifications split by the share of Muslims in the district, grouped into minority (< 0.5 Muslim), majority (0.5 – 0.9 Muslim), and supermajority (≥ 0.9 Muslim). All models include district fixed effects, district-specific time trends, and the set of control variables used in the main analysis. Standard errors are clustered at the district level for all regressions, except in the second column, where clustering is not applied due to the small number of clusters. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

is less likely to be the result of coercion within the household, and more plausibly reflects individual strategies to navigate social expectations in the context of rapid economic change.

Additionally, as shown in Table A.17, data from the same survey indicate that veiling prevalence is relatively similar across age groups. While this finding is suggestive rather than conclusive, it does not support the argument that veiling is primarily driven by familial pressure. If that were the case, we would expect veiling to be significantly lower among older women, who tend to have greater autonomy and agency over personal decisions.⁴²

Protest by conservative women. A potential form of backlash could come from conservative groups of women who purposely veil to express their disapproval of more women leaving their homes to work. If this were the case, we would expect veil adopters to be more likely to be those staying at home (because they disagree with women who abandon their traditional roles) rather than those who are taking advantage of economic opportunities themselves. However, there is no strong evidence to support this reasoning. First, as previously shown in Table A.10, two different surveys confirm that education is positively associated with the probability of female respondents wearing a veil. This implies that veil adopters tend to be those who would face higher costs for staying at home. Second, an analysis presented in Table A.19 of the appendix shows that, relative to women who are working or going to school, women who stay at home are significantly less likely to wear a headscarf. These analyses show that this alternative mechanism lacks strong support in empirical patterns.

E Compositional effect

An alternative mechanism that could explain the observed pattern is a compositional effect. Several recent studies, e.g., [Heath and Mobarak \(2015\)](#); [Jensen \(2012\)](#), have documented that increasing economic opportunities will induce an increase in

phone app, ensuring anonymity and minimizing social desirability bias.

⁴²To further examine parental attitudes toward female employment and veiling, we analyze multiple rounds of the World Values Survey (WVS). As presented in Table A.18 in the appendix, our findings indicate that while being a parent is associated with more traditional views on gender roles, these views are primarily driven by concerns about children’s well-being rather than power dynamics within the household. Notably, both male and female parents do not express strong opposition to wives earning more than their husbands, nor do they overwhelmingly endorse the belief that being a housewife is as socially fulfilling as paid work. Importantly, parents are not more likely to consider veiling an essential trait for women. This suggests that while parents may hold more conservative views on female employment due to concerns about their off-springs, their views on gender roles within the household and veiling itself do not appear to be significantly more traditional than non-parent respondents.

the demand for female education. As a result, girls who were previously staying at home begin to attend high schools. If these girls are positively selected from conservative religious families, we would observe a compositional effect, with more girls from religious families attending public high school.

Unfortunately, our data do not contain information about the religiosity of the students or their families. Hence, direct evidence for this reasoning is difficult to obtain.⁴³ However, several analyses do not support this interpretation. First, in some specifications of the main analyses, we include the female high school enrollment rate, and its inclusion does not change the main effect.⁴⁴ Second, in Appendix Table A.20, we show that veiling does not have a significantly positive correlation with female high school attendance. If it were true that the increase in veiling is simply a consequence of an ex-ante selection from religious families into high school, we should see a correlation between veiling and female high school attendance, with higher attendance rates associated with higher levels of veiling.⁴⁵ The evidence, however, does not support this reasoning. Third, if this type of compositional effect were the primary driver of veiling, we should not see “conversion” into veiling among the older generation of women, since they are already out of high school. From the survey data presented in Table A.17 of the appendix, we see that veiling is also an observable phenomenon among the older cohort of women. It is unlikely that veiling among these groups of older women would be driven by self-selection into high school.

Another possible compositional effect may come from the fact that economic opportunities might compel high school pupils to drop out in order to take advantage of newly available jobs. Consequently, if the students who remain in school are positively selected from conservative religious backgrounds, our estimates may capture this compositional effect instead. However, this scenario is highly unlikely in the Indonesian context. Data from Statistics Indonesia shows that the average national dropout rate for general high school attendance is very low, under 2%. Moreover, the likelihood of obtaining formal employment for a high school dropout is very low

⁴³The IFLS contains information about the educational history of respondents. Unfortunately, there are not enough observations in the data to construct a reliable measure of the fraction of public high school attendees who have an Islamic educational history (e.g., Islamic elementary or Islamic junior high school) at the cohort-district-year and gender levels.

⁴⁴A higher enrollment rate means that the composition of the student body is closer to the socio-economic composition of the population. This implies that the composition of students in terms of religiosity changes with the enrollment rate.

⁴⁵In contrast, the results in the table from the second column onward include the main variable of interest, i.e., female formal job participation and export shocks. The analysis shows that when combined, the coefficients for the female high school enrollment rate are unstable and not different from zero, while the main variables of interest remain positive and significantly different from zero across different specifications.

for most formal jobs, including blue-collar occupations, such as those in manufacturing industries (Robinson, 2009). Therefore, we can rule out the possibility that our main results are driven by this type of confounding.

F Income effect

An alternative explanation is that the positive effect of economic opportunities on veiling could simply be the consequence of income effects on women’s preferences for fashion. As the economy develops and women’s incomes improve, they may begin to prioritize expenditures beyond necessities, such as fashion. If the veil is considered a normal good, its consumption would increase as income increases. Alternatively, income effects might also be channeled through household income. If family income is pooled, and women are permitted to spend from this pool, the increase in veiling may be due to the household income effect, e.g., from the increasing income of male family members.

To address this concern, we performed the following exercises. First, we added a measure of economic growth in some of the main specifications. This inclusion does not significantly alter the coefficient of interest, supporting the interpretation that veiling is not driven by increases in general income or wealth. Second, the analysis presented in Table 3 shows that veiling has no correlation with informal job participation. This suggests that an increase in women’s income per se (via informal employment, which typically does not require women to leave their domestic compound) does not necessarily induce adoption of the veil. Third, in some specifications of the main analyses, we also control for young male labor force participation, and this inclusion does not change the main estimates. Moreover, in Table A.21, we show estimates of male labor force participation on veiling. Despite a relatively strong first stage effect, the second stage effect of male labor force participation on veiling is not only much smaller, but is also barely significantly different from zero. This is consistent with the interpretation that an income increase for male members of the household, which potentially increases the disposable income for women, does not have a similar effect on veiling.

VII Robustness Analyses

In this section, we summarize several robustness checks to support the validity of the analyses. The corresponding tables can be found in the appendix.

Removing outliers. A potential concern is that some districts may mandate female pupils to wear headscarves, such as under *sharia* law, which requires public servants and female pupils in public schools to wear headscarves on Fridays. If these areas also display high economic participation in the formal sector, we might be capturing the effect of these regulations instead. To address this concern, in Table A.22, we reran the analysis from Table 1, removing the district-years where 100% of female pupils wear a veil. This serves as a good proxy for the existence of mandatory veil regulations in schools or districts, and helps remove outliers from our sample. The results are robust to the exclusion of these observations, with the coefficient of interest actually increasing.

Removing observations with higher variance. In some districts, where data was collected from a single high school, there is greater variance in the veiling measure. To address this, we perform the analysis excluding district-year observations with only one high school and report the results in Table A.23. The estimates are very similar to those in the main analysis.

Jackknife resampling estimation. We perform a jackknife re-sampling procedure to ensure that the results reported above are not driven by a single district or year of observation. This procedure is performed by iteratively estimating the main model while leaving one set of observations out of the sample (i.e., all observations from a given district or year). We present the results in Figures A.2 and A.3 of the appendix. This analysis corroborates the main results: the coefficients are similar to the main results, stable, and systematically different from zero. Moreover, we also perform a robustness check in which we iteratively remove the source of export shocks from each industrial sector in the sample. This exercise aims to ensure that the results are not driven by a single sector in the observation sample. The results are presented in Appendix Table A.4 and we can see that the results are also robust to this exercise.

Timing. In the main model, we assume that the response to labor market shocks happens simultaneously.⁴⁶ However, there may be a delay in the response to the economic shocks. As a robustness check, in Table A.24 of the appendix, we show that the relationship still holds with the lagged value of export shocks. However, the estimates become weaker and less significant as the lag increases.

Instrument with district-specific female score. The instrument used in the main analysis uses the national-level female score, which is constant across districts. One might be concerned that this approach overlooks heterogeneity coming from

⁴⁶Veiling is neither a very costly act nor time-consuming, like building a school. Therefore, one can respond to the incentives as soon as the opportunity arises.

different levels of technological advancement across districts when using a national-level female score index. As a robustness check, we rerun the main 2SLS regression using a district-specific female score index, and the results are presented in Table A.2 of the appendix. There is no significant change in either the magnitude or the significance of the results.

Alternative IV with global imports. The IV in the main analysis uses the value of Indonesia’s export as the main element of the common economic shock. As discussed in Section D, the validity assumption requires that this element of the IV is exogenous. This assumption is likely to be satisfied since we exploit variation from international markets. We conduct a robustness check by running the analysis using an alternative IV based on global imports, instead of the country’s export value.⁴⁷ The results are reported in Appendix Table A.3 and are robust to this alternative instrument.

VIII Discussion and Conclusions

Economic development has delivered unprecedented opportunities for women in the form of appealing and lucrative employment. However, prevailing social norms, especially those that govern the division of labor between men and women both inside and outside the home, may create hurdles for women in taking advantage of these opportunities.

In the face of this dilemma, religious veiling may provide an effective and culturally compatible solution in a highly religious society like Indonesia. It could serve as a tool for navigating entry into the formal sector of the economy, while also protecting women from potential personal and social stigma associated with working outside the home.

⁴⁷This alternative instrument closely follow the fundamental logic of the original instrument, but instead of using the value of Indonesia’s exports, we use the global demand for traded commodities, i.e. the total value of global imports from all countries except Indonesia. Hence, it is computed based on the formula below:

$$global_demand_shock_{dt} = \sum_{k=1}^K global_import_{kt} \underbrace{\frac{L_{kd,t=1993}}{L_{d,t=1993}}}_{sector_share_{kd}} \underbrace{\frac{L_{fk,t=1993}}{L_{k,t=1993}}}_{female\ score.k} \quad (7)$$

$$global_import_{kt} = \sum_{n=1}^N import_{knt} - import_{kt_Indo} \quad (8)$$

Where $\sum_{n=1}^N import_{knt}$ is the sum of global imports of commodity k at time t by all countries; $import_{kt_Indo}$ is the value of imports of commodity k by Indonesia at time t ; and N is the total number of countries importing commodity k at time t .

In this paper, we document this phenomenon by collecting new data on veiling based on revealed preferences from photographs of public high school students. This method makes it possible to trace the evolution of veiling across districts in the country over more than two decades. We use a Bartik-style instrument to show that female participation in the formal sector has driven the adoption of veiling. The instrument leverages historical district industrial composition, the female labor composition of sectors, and plausibly exogenous shocks in international demand, allowing us to identify the causal effect of shocks in economic opportunities for women on veiling.

Our analysis of potential mechanisms strongly suggests that veiling, in this context, functions as a negotiation device, enabling women to access expanding formal employment opportunities while maintaining their personal and social image in a religious society. Moreover, we show that this effect is unlikely to be the result of concomitant increases in religiosity, income effects on fashion preferences, compositional effects of the student body, or a conservative backlash.

There remain open questions that our design cannot address directly. Our data cannot trace the relationship between veiling and life-cycle decisions of women. For instance, our data does not allow us to determine whether women who veil are more likely to delay marriage, have fewer children, or maintain employment. Are they more likely to exit the labor market once they have children or get married, as they signal more commitment to family life? Future studies can focus on understanding these decisions made by women at later stages in life.

Nevertheless, the results in this paper may shed some light on the increased popularity of veiling in Indonesia in particular, and in other Muslim-majority countries in general. However, our aim is not to convince readers that female employment is the only driver of veiling among women in contemporary Muslim societies. Indeed, there are multiple interpretations and motivations behind why Muslim women choose to veil. What we document in this paper is a phenomenon highlighting that veiling may operate as a strategic response to economic modernization, rather than solely a direct expression of increasing personal religiosity. This illustrates the various ways in which religious norms interact with societal change.

Finally, the results presented in this paper may provide an alternative perspective on the meanings and motivations behind this religious practice, and potentially serve as a reference for designing relevant policies in the developed world, such as those related to the assimilation or integration of minority groups. Importantly, cultural values and social norms might shape the process of economic development in ways that appear counterintuitive at first glance.

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Data Availability

The data and code underlying this research is available on Zenodo at <https://doi.org/10.5281/zenodo.20383941>

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