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By

PHAM PHUONG NGOC
DAINN WIE
HANOL LEE

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Pham Phuong Ngoc,[a] Dainn Wie,[b] and Hanol Lee[c]

[a]Diplomatic Academy of Vietnam
 Address: 69 Chua Lang Street, Dong Da, Hanoi, Vietnam]
 Phone: 84-902278557
 phuongngoc-gvkkt@dav.edu.vn
 [ORCiD: 0009-0004-0186-5249]

[b]National Graduate Institute for Policy Studies
 Address: 7-22-1, Roppongi, Minatoku, Tokyo, Japan, 106-8677
 Phone:81-3-6439-6168
 wie-dainn@grips.ac.jp
 [ORCiD: 0000-0003-2223-2198]

[c]Southwestern University of Finance and Economics
 Address: 555, Liutai Avenue, Wenjiang District, Chengdu, Sichuan, People's Republic of China, 611130
 Phone: 86-28-8709-2103
 hanollee@swufe.edu.cn
 [ORCiD: 0000-0003-2292-0919]

[b]Corresponding author

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Abstract

This study investigates the impact of a large demand shock on the timing of women's marital decisions and first childbirth experiences in Vietnam. Using the US-Vietnam Bilateral Trade Agreement (BTA) in 2001 as an exogenous shock, we hypothesize that the reduction in women's and men's self-employment would delay family formation and childbirth, with the ultimate impact on marriage remaining ambiguous. Analyzing data from the Vietnam Household Living Standards Surveys, we find that both men and women are less likely to be self-employed in the face of a substantial trade shock. Notably, the decreasing impact on women's self-employment becomes more pronounced than that for men post-2012, a decade after the agreement's enforcement. Employing the Multiple Indicator Cluster Survey and survival analysis, we empirically demonstrate that increased exposure to trade postpones women's timing of marriage and first childbirth. On average, in 2013, the BTA resulted in a 4.43- and 4.45%-point decrease in the probability of entering marriage and becoming a mother, respectively. We also present suggestive evidence that increased exposure to trade liberalization eventually increases the likelihood of marriage and the number of children among women over 40.

1. Introduction

Delayed marriage and decreasing fertility rates have become increasingly prevalent in many developing countries over the last few decades. Factors such as the rising opportunity costs of childbearing (Becker, 1981), heightened career aspirations (Doepke et al., 2023), the demands and expenses associated with child-rearing, as well as labor market institutions, have been identified as causes contributing to declining fertility rates, among many others (Guinnane, 2011).

In this study, we focus on the large-scale labor demand shocks in Vietnam, driven by the US-Vietnam Bilateral Trade Agreement (BTA), and their implications for women's marital and first childbearing decisions. According to Becker (1981), an increase in women's paid employment diminishes the benefits of marriage derived from gender-based specialization. Oppenheimer (1998) on the other hand, suggested that improvements in women's employment would result in a delay in the timing of marriage, but may not necessarily decrease marriage rates, depending on several other factors in the marriage market.

Testing the theoretical predictions presents several empirical challenges. Often, increases in women's employment opportunities coincide with broader social changes, including shifts in gender norms and the provision of maternity benefits and childcare facilities. Therefore, isolating the exclusive impact of women's employment on family formation, unconfounded with other factors, proves challenging. Furthermore, childbearing and marriage affect women's careers, making it difficult to establish the direction of causality.

To overcome these empirical challenges, we utilize the US-Vietnam BTA as an exogenous shock to examine the relative increase in women's participation in the labor market. The BTA came into effect on December 10, 2001, substantially expanding Vietnam's access to the US market. In many developing countries, trade liberalization often results in more substantial economic changes than domestic policies alone. The US-Vietnam BTA was no exception. McCaig (2011) and McCaig and Pavcnik (2018) demonstrated that the BTA significantly contributed to reducing poverty and promoting the formalization of employment.

The BTA provides a unique opportunity to isolate the impacts of a large demand shock on family formation in the setting of a rapidly growing transition economy. Conventionally, trade liberalization involves reductions in tariffs by all the parties joining, creating several mechanisms that affect the participants' economies. The reduction in import tariffs stimulates domestic competition (Autor et al., 2019; Black and Brainerd, 2004) and promotes the adoption

of imported inputs and embedded technologies, leading to technological upgrading (Amiti and Konings, 2007). Furthermore, tariff reductions by trade partners can expand the participating country's export opportunities. However, the BTA only resulted in a reduction in import tariffs imposed by the US on Vietnamese products, as Vietnam was already applying Most Favored Nation (MFN) tariffs to products from the US.

Vietnam provides an interesting setting for studying the impacts of changes in economic structure on women's marriage and fertility decisions. Throughout our chosen sample period, from 2001 to 2018, the country underwent rapid economic growth exemplified by an eightfold increase in its GDP per capita by 2018 compared to the 2001 figure.[1] Notably, Vietnam implemented a two-child policy in the 1980s, resulting in a total fertility rate of 2.1 by the year 2000.

We employ the Vietnam Household Living Standard Survey (VHLSS) to empirically test whether improved access to the US market had differing effects on the employment of Vietnamese women and men. Trade liberalization may have varying impacts on women and men, influenced by factors such as the human capital of the women and men workforces, underlying social norms, and labor market institutions. In this empirical analysis, we calculate the measure of trade exposure as suggested by McCaig (2011), across provinces, treating each province as an independent marriage market.

We then utilize the Multiple Indicator Cluster Survey (MICS) conducted in Vietnam during 2013-2014 to examine the impact of trade shocks across provinces on the timing of women's marriage and first childbirth experiences. The cross-section data is converted into individual-year panel data, allowing us to conduct survival analysis. This enables us to examine the dynamic effects of trade exposure on the timing of women getting married and having their first child. Additionally, we utilize several rounds of MICS data and focus on women aged over 40 to assess whether exposure to trade had any contemporaneous impacts on their marital outcomes and the number of children they had.

We examine almost two decades of household data to observe the evolution of the impacts of trade liberalization on women's and men's employment and family formation. Additionally, we construct individual-panel data spanning over ten years following the implementation of the BTA. This extended timeframe allows us to capture significant events, as entry into a first

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[1] In 2001, Vietnam's GDP per capita in nominal terms was 409.50 USD. In 2018, it increased to 3267.23 USD in nominal terms.

marriage can only be observed once for each individual. Furthermore, we opt for a long sample period because our interest extends beyond merely observing the postponement of marriage and fertility. We subsequently aim to explore the eventual effects of women's employment on marital outcomes and fertility rates over their life cycles. Distinguishing between the postponement of marriage and non-marriage is crucial, as each necessitates distinct theoretical frameworks for explanation and presents varied policy implications.

The examination of long-run outcomes following the introduction of the BTA requires some caution. The US-Vietnam BTA resulted in immediate changes in US import tariffs against Vietnamese products. Vietnam was obliged to gradually lower its trade barriers, including tariffs on agricultural products, and provide national treatment to US companies. Kis-Katos et al. (2018) and Oishi and Wie (2023) demonstrated that changes in output and input tariffs affect women's labor market outcomes in Indonesia. Therefore, in this study, we not only control for various fixed effects but also consider changes in Vietnam's output and input tariffs using its MFN tariffs and annual Input-Output Tables.

This study speaks to the growing literature examining the gendered impacts of trade on family formation. Juhn et al. (2014), Do et al. (2016), and Oishi and Wie (2023) documented how trade affects women and men workers differently. This study adds to the limited but growing body of literature that examines the impact of trade on marriage, women's roles, and fertility. Notably, Kis-Katos et al. (2018) demonstrated that trade liberalization in Indonesia resulted in increased female labor force participation while reducing domestic duties, particularly when exposed to input tariff reductions. Autor et al. (2019) found that shocks to male relative earnings due to import competition from China decreased marriage and fertility rates. Additionally, Giuntella et al. (2022) revealed that import competition from Eastern Europe, driven by globalization, led to declines in fertility and marriage rates in Germany. Of particular interest, to the best of our knowledge, no prior study has examined Oppenheimer's predictions concerning the timing of marriage and childbirth within the context of trade liberalization. Our study is also closely related to the literature exploring the impacts of trade liberalization and relevant household responses in Vietnam (Vo and Nguyen, 2021; Vo and Truong, 2023).

The remainder of this paper is organized as follows. Section 2 presents the conceptual framework that our empirical analysis is based on. We explain various measures of trade liberalization and tariffs in Section 3. Section 4 is devoted to the empirical analysis of

Vietnam's labor force categorized by sex. We examine how trade exposure affects women's marriage and fertility in Section 5. Section 6 concludes the paper.

2. Conceptual Framework

In this section, we present the conceptual framework illustrating how trade impacts marriage and fertility decisions in Vietnam by reducing labor market informality. The shift from informal to formal employment carries diverse implications for individuals' lifestyles (Dix-Carneiro and Kovak, 2019; Koujianou Goldberg and Pavcnik, 2003). Informal and self-employed individuals frequently operate in proximity to their residences, affording them flexible work hours. Conversely, formal employees are obliged to adhere to predetermined working schedules. Formal workers benefit from stable wages and social protection, whereas informal workers experience greater fluctuations in their labor income without any corresponding social safeguards (Ngoc and Wie, 2023).

McCaig and Pavcnik (2018) demonstrated that the BTA contributed to a reduction in informal employment as greater access to the US market encouraged the growth of the manufacturing sector. According to Juhn et al. (2014), trade liberalization and the growth of the manufacturing sector provide a relative advantage to women. Automated production processes in the manufacturing sector reduce the demand for physically demanding labor, thereby improving women's opportunities for formal sector employment in the labor market. Therefore, we hypothesize that Vietnam's trade liberalization has a greater impact on women's employment. Concerning the differences between formal and informal employment, such transition entails changes in decisions regarding family formation and may also influence marital stability. Given the rarity of divorce in Vietnam, our study primarily focuses on the impacts of trade and the reduction of informal employment on marriage and its timing.

Drawing from the existing literature, predicting the directional impact of trade liberalization on women's marriage proves challenging. Building on Becker's (1973) theory, an increase in women's formal employment and economic independence is posited to decrease marriage as the expected gains from marriage decline for women. Traditionally rooted in the division of labor, marital gains rely on men specializing in income generation, while women specialize in domestic production. The relative improvement in women's economic independence is thus expected to lower marriage while potentially increasing marital instability concurrently.

Nevertheless, as highlighted by Oppenheimer (1988), women's commitment to their careers is frequently perceived as temporary and discounted in the initial phases of economic expansion. Despite the relative improvements in women's formal employment, men's heightened income prospects may assume a more significant role in the marriage market during this transitional period. The increased earning capacity of men renders them more attractive for marriage and fosters a higher incidence of marital unions. Concurrently, the early employment of young wives at the outset of marriage, even if not consistently sustained thereafter, may paradoxically contribute to fostering marriages. This is because unions become less reliant on the often transiently low earnings of young men.

Drawing from Oppenheimer (1988), we predict that increased exposure to trade and the decrease in women's informal employment are likely to result in a delay in the timing of marriage. Oppenheimer (1988) employed job search theory from the labor market and applied it to the marriage market to explain the timing of individuals' decisions to marry, as these two markets share many similarities, with a few exceptions. Additionally, the achievement of a successful marriage is assumed to occur through two processes: selection and post-marital socialization.

Search theory can be applied to both labor and marriage markets as follows. In both markets, there is a distribution of potential offers, where only a small portion represents minimally acceptable matches. Consequently, individuals engage in costly searches until the benefits and costs of further searches are equalized. A notable difference in the marriage market search is that the shape of the offer distribution is heavily influenced by age, leading to corresponding changes in uncertainty about the important attributes of offers. Furthermore, in the marriage market, accepting a specific match precludes the opportunity to continue searching and potentially forming a different, and potentially better, match later on. Consequently, both accepting and rejecting offers involve an opportunity cost, which is often greater for women.

Let's assume that a woman's labor market attachment and probability of being hired as a paid worker rises following increased trade exposure. Engaging in paid formal employment also boosts women's economic independence, encouraging them to take greater risks in continuing their search by setting higher standards for potential partners. The rise in two-career households, a result of women participating in paid work, demands a significantly higher level of compatibility in lifestyles compared to scenarios where only one person pursues a career. This highlights the significance of pre-marital selection over post-marital socialization in

achieving compatible matches. Such a shift towards pre-marital selection is likely to lead to further delays in the timing of marriage.

3. Construction of Measures of Trade Liberalization

3.1. Construction of the Measure of BTA

To assess the impacts of improved access to foreign markets on men's and women's labor market outcomes and decisions on family formation, we utilize tariff changes resulting from the US-Vietnam BTA, which came into effect in December 2001. Following McCaig (2011), we calculate the provincial-level change in trade exposure before and after the BTA using Equation (1) as follows:

$$\Delta\tau_p = \tau_p^{Before} - \tau_p^{After} \quad (1)$$

where provincial tariff is calculated as the weighted sum of tariffs in each industry[2] (i) and the proportion of individuals employed in industry i in each province[3] p. The weight ω_{ip} is derived from the 1999 Census, as represented in Equation (2). Using this pre-BTA weight is essential as the share of employment in the later period is highly likely to be endogenous as a result of trade liberalization.

$$\tau_p = \sum_i \omega_{ip}\tau_i \quad (2)$$

As argued in McCaig (2011), the tariff changes are plausibly exogenous since tariffs posed by the US on Vietnamese products transitioned from Column 2 to MFN status once the BTA was ratified. Therefore, these changes are unlikely to be influenced by industry-level lobbying efforts or unobserved time-varying factors.

[Insert Table 1 Here]

Table 1 provides an overview of the changes in US tariffs on Vietnamese products, computed for each of the 61 provinces. The data reveals significant variability in US tariff adjustments across provinces. The most substantial change occurred in Ho Chi Minh City, with a notable 14.9% points shift in tariffs before and after the BTA. In contrast, Ca Mau province exhibited

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[2] Each tariff line is matched to a 3-digit International Standard Industrial Classification, Rev. 3 (ISIC) code, using concordance provided by World Integrated Trade Solution database.

[3] We use province codes, which identify 61 provinces based on the 1999 Census, for consistency over different time periods.

the smallest tariff change, with a modest 6.2%-point difference. Notably, within the Red River Delta region, there is considerable variation, exemplified by Hanoi's 9.3%-point tariff changes before and after the BTA. In contrast, the Central Highlands and Northern Midlands and Mountains regions experienced relatively minor fluctuations in tariff adjustments.

3.2. Construction of Input and Output Tariffs

The BTA involved not only US tariff cuts on Vietnamese products but also the relaxation of regulations and tariff cuts by Vietnam as well. Vietnam had previously extended MFN status to US products, resulting in limited tariff cuts on agricultural products (McCaig, 2011). Nevertheless, Vietnam gradually reduced its import tariffs over time, reducing both tariffs on final goods and intermediate goods.

To avoid bias in our estimates, we control for input and output tariffs. According to Becker (1981) and Black and Brainerd (2004), a decrease in output tariffs increases domestic competition and may diminish costly discrimination against women workers. Not controlling for changes in output tariffs would thereby bias our estimation as the BTA might incorrectly capture the impacts of a reduction in later output tariffs. Additionally, Kis-Katos et al. (2018) demonstrated that reductions in input tariffs and increased imports in intermediate goods favor female-intensive sectors, which eventually leads to an increase in women's labor market participation, delayed marriage, and lower fertility.

For output tariffs, we use Vietnam's import tariff collected by the World Bank (2023) and distributed through the World Integrated Trade Solution. We use the concordance provided by the World Bank to calculate the simple mean MFN tariffs within each 3-digit industry for each year. Then output tariff is calculated for each province using the share of people employed in each industry in each province according to the 1999 Census.[4] For the calculation of input tariffs at the provincial level, we employ Input-Output Tables[5] provided by the Organisation for Economic Co-operation and Development, whose industry codes are manually matched against the industry codes in the tariff data. For each industry and each year, input tariffs are calculated by weighting import tariffs by nationwide input share in each output industry. Finally, provincial-level input tariffs for each year are calculated by weighting each industry's

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[4] For industries with no matching international trade products, tariffs were coded as zero.
[5] We utilized three editions of tables: the 2015 edition for the years 2000-2011, the 2018 edition for the years 2012-2015, and the 2021 edition for the years 2016-2018.

input tariffs with the share of people employed in each industry according to the 1999 Census. Summary statistics of output and input tariffs are presented in Appendix Table A1, showing significant reduction over time for output tariffs and variation across provinces for input tariffs.

4. The Impacts of Trade Liberalization on Women and Men's Employment

4.1. Vietnam Household Living Standards Surveys

The VHLSS is a comprehensive national survey conducted by Vietnam's General Statistics Office (GSO). It gathers information on households and their members, covering demographic characteristics, education, and labor market outcomes. Conducted biennially since 2002, this study utilizes data from seven rounds of the survey conducted in 2002, 2004, 2006, 2012, 2014, 2016, and 2018. The years 2008 and 2010 are excluded from the analysis to eliminate potential confounding effects resulting from the global financial crisis.

To ensure an ample sample size throughout our study period, we consider all observations surveyed in each round of the VHLSS, disregarding the rotating panel feature that retains 50% of previously surveyed households in each round (Brandt and Tarp, 2017). For data consistency during our sample period, we reclassify provinces and industries.

In this Section, the outcome variable is whether the individual is self-employed during the preceding 12 months. Self-employment is one form of informal employment, characterized by being unregulated by labor market legislation and not visible to the government (Dix-Carneiro and Kovak, 2019; Koujianou Goldberg and Pavcnik, 2003). The status of self-employment in Vietnam's context is different from being an informal worker (McCaig and Pavcnik, 2018). In Vietnam, informal worker status depends on a firm's registration status and includes workers employed by unregistered firms, often household businesses in agriculture and aquaculture. However, this study's focus is on whether this type of employment is near workers' residences and offers flexibility in work schedules. Therefore, in our analysis, workers employed by other households are treated as non-self-employed since they work away from their homes.

Appendix Table A2 presents summary statistics derived from the VHLSS, focusing on individuals aged between 15 and 40, whom we classify as young individuals. Out of the 223,117 young individuals, 76% of women and 79% of men were employed in the preceding 12 months. For our regression analysis, we select a subset of 173,182 observations of individuals who worked in the preceding 12 months. Over the entire analysis period, 66% of

workers were self-employed. This figure declined from 66.5% in 2002 to 60.7% in 2018. On average, individuals have 8.42 years of education and approximately 20 years of working experience. Approximately 25% of the population resides in urban areas, with minorities[6] constituting 21% of the sample.

4.2. Empirical Specification

To estimate the dynamic impacts of exposure to trade on young workers' self-employment status, we estimate the following equation for each individual i living in province p in year t.

$$Y_{ipt} = \alpha + \sum_{1 \leq k \leq 8, k \neq 3,4} \beta_{2004+2k} \Delta\tau_p \times I[Year = 2002 + 2k]$$
$$+ \sum_{1 \leq k \leq 8, k \neq 3,4} \delta_{2004+2k} \Delta\tau_p \times I[Year = 2002 + 2k] \times Female_{ipt}$$
$$+ \sum_{1 \leq k \leq 8, k \neq 3,4} \eta_{2004+2k} Z_{p2002} \times I[Year = 2002 + 2k]$$
$$+ \gamma H_{it} + \theta^O OT_{pt} + \theta^I IT_{pt} + Province_p + Year_t + \varepsilon_{ipt}$$

(3)

The dependent variable Y_{ipt} represents an indicator of whether an individual is self-employed. The measure of trade liberalization, denoted as $\Delta\tau_p$, signifies the provincial-level change in trade exposure before and after the BTA, computed using Equation (1) outlined in Section 3.1. To observe the dynamic impacts of trade liberalization over time, we introduce an interaction between this measure and the indicator for each survey round, excluding 2002, which serves as the baseline year for comparison. To further test whether the impacts of trade exposure varied between men and women workers, we include an interaction term between the dynamic impacts of trade liberalization and an indicator for women. These divergent impacts are represented by coefficients δ_{2004+} .

The measure of trade liberalization is derived from the exogenous shock induced by the BTA and the pre-BTA labor market conditions in each province. To estimate the causal impacts of trade exposure on the labor market outcomes unconfounded with such initial conditions, we incorporate provincial characteristics (Z_{p2002}) in the baseline year 2002, immediately after the tariff reduction. These provincial characteristics, which include employment rates and average

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[6] Minority refers to ethnic groups other than the Kinh and Chinese.

wages, are further interacted with indicators of each survey round. This flexible approach allows us to capture their varying impacts on the outcome variable over time.

We further account for H_{it}, which represents a set of covariates including years of schooling, working experience, household size, urban status, minority status, and gender. To address the influence of additional trade liberalization efforts by Vietnam, we control for provincial-level input and output tariffs. To capture variations across provinces and time trends in our dependent variable, we introduce province and year fixed effects into our model. Error terms are clustered within each province to account for potential correlated variations within provinces.

4.3. Results and Interpretation

Table 2 presents the estimates of Equation (2) on two samples: all young workers and married young workers. To enhance interpretation, we multiply the estimated coefficients by the means of tariff changes. Column (1) shows that the probability of being self-employed declined by an average of 19.04% point (=-3.174×0.060) due to trade liberalization in 2004. The magnitude of the reduction impacts increased to 25% point (=-4.186×0.060) in 2018. It should be noted that the impact of trade liberalization on women is the sum of the two coefficients ($\beta + \delta$) in each year. In 2004, the impact for women was 21.8% lower (=0.693/3.174), showing that trade liberalization reduced women's self-employment by a smaller degree. However, estimated coefficients in later years are negative and statistically significant, showing that women experienced a greater reduction in self-employment rates. Specifically, in 2018, women experienced notably higher reductions in self-employment, averaging 37.43% (=1.567/4.186). This confirms the argument presented in Section 2 that the BTA has a significant impact on women's employment.

The results using only the married sample, as shown in Column (2), are similar to those shown in Column (1). However, the effect is less pronounced for married men compared to the rest of the young men in Column (1). In Column (2), married women once again demonstrate that they experienced a greater reduction in their self-employment rates compared to married men. The results shown in Columns (3) and (4) remain consistent when input and output tariffs are further controlled.

[Insert Table 2 Here]

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5. The Impacts of Trade Liberalization on Women's Marriage and Childbirth

5.1. Vietnam Multiple Indicator Cluster Survey

To observe the impact of the BTA on women's timing of marriage and childbirth in Vietnam, we employ data from the MICS collected from December 2013 to April 2014. The MICS has been conducted every 4 or 6 years since 1996 by the Vietnam GSO and the United Nations Children's Fund through face-to-face interviews with household members. We select the MICS conducted in 2013-2014 as it represents the most recent wave conducted before the onset of the global pandemic. The Vietnam MICS (2013–2014) dataset provides demographic information on education, marriage status, and other variables pertaining to the status of children and women at national and regional levels. As this study focuses on women's marriage and childbirth rates, we restrict our sample to women aged 15-40 years. Using the cross-section MICS data, we duplicate and convert it to women-year panel data, which contains observations from 2000 to 2014, to conduct survival analysis. The data is then matched to the provincial-level tariff changes as constructed in Equation (1).[7]

A unique feature of the MICS dataset is that it provides the year of first marriage as well as the year of birth of first-born children. We utilize this information to construct our main variables of interest, namely an indicator denoting the birth of a first child and an indicator of women's marital status over time. As we are interested in the effect of the BTA on the timing of women's marriage and fertility experiences, we exclude the observations from the sample once outcome "1" is achieved, as any further change in tariff will not have any further impact on the achieved outcome beyond that point.

Appendix Table A3 presents comprehensive summary statistics of key indicators for all unique women surveyed in the MICS (2013–2014), as well as those for women-year panel data. The average age of women in our sample is 27.47, with an average age of marriage at 20.89. On average, women in our sample experience their first childbirth at age 21.98 and have 1.23 children. Analyzing the women-year panel data constructed for survival analysis, we observe an average probability of 13.3% for women entering their first marriage and 12.2% for women experiencing their first childbirth between ages 15 and 40.

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[7] We convert the province code reported in the MICS dataset to the 1999 Census's province code to match the two data sets.

5.2. Empirical Strategy and Results

To estimate the impacts of tariff changes driven by the BTA across provinces on women's entrance into first marriage and childbirth, we use the survival analysis as follows:

$$M_{i,c,a} = \delta + \sum_{k=2}^{2013} \beta_k \Delta\tau_p I_k [Year = k] + \theta^o OT_{pt} + \theta^I IT_{pt} + Age_a + \gamma_p + \pi_c + \varepsilon_{i,c,a} \qquad (5)$$

where $M_{i,c,a}$ denotes the individual outcome of interest, represented by a dummy variable indicating that woman i born in cohort c is married (or has her first baby) at age a. I_k is the year indicator (from 2002 to 2013), while $\Delta\tau_p$ denotes the tariff changes driven by the BTA, defined as in Equation (1) for each province p. Our main variables of interest are the interaction terms between tariff changes ($\Delta\tau_p$) and year indicators (I_k). The set of coefficients β_k represents the dynamic impacts of the BTA on women's marriage and first childbirth over time. Since we study the period from 2002 to 2013, potential confounding factors such as Vietnam joining the WTO in 2007 should be considered. Therefore, we control for the output (OT_{pt}) and input tariffs (IT_{pt}) for each province p in year t, defined as in Section 3.2. The specification also includes the province (γ_p), age (Age_a), and cohort (π_c) fixed effects. Standard errors are clustered at provincial level to account for heteroscedasticity and serial correlation in the error terms.

[Insert Table 3 Here]

Table 3 presents the regression results regarding the impact of the BTA on the timing of marriage and first childbirth for Vietnamese women. In Column (1), the results without controlling for input and output tariffs reveal statistically significant impacts of the BTA on women's timing of marriage from 2005—four years after the implementation of the BTA. The coefficients remain significant and increase in magnitude until 2013, eleven years after the BTA. In Column (2), estimates remain consistent when controlling for output and input tariffs. To assess the magnitude of the coefficients, we multiply the average (0.06) in tariff changes by the coefficients. This calculation reveals that in 2005, on average, trade liberalization decreased the likelihood of entering marriage by 2.71% point (=0.451×0.06). The magnitude gradually increased, reaching a peak of 4.43% point in 2013 (=0.739×0.06).

Columns (3) and (4) in Table 4 present the estimates of Equation (5) using first childbirth as the outcome variable. In Column (4), which controls for output and input tariffs, the results indicate that the BTA immediately influenced women's fertility behavior. The reduction in US

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import tariffs led to a decrease in the probability of the first childbirth by 1.05% point in 2002 (=0.175×0.06). The impact magnitudes increase over time, and by 2013, the BTA decreases the probability of becoming a mother by 4.45% point (=0.742×0.06).

5.3. *The Marriage and Fertility for Women over 40*

In this subsection, we broaden our analysis to investigate whether exposure to trade liberalization influenced fertility and marriage outcomes for women over 40 years old. We utilize data from four rounds of the MICS (2000, 2006, 2010–2011, and 2013–2014) collected over six years. In Vietnam, instances of women marrying or giving birth after the age of 40 are infrequent. Consequently, this analysis allows us to discern whether the delays in women's marriage and first childbirth observed in the previous section ultimately impact their overall family formation or the total number of children throughout their entire lives.

We estimate the following equation on women over the age of 40 in each round of the survey as follows:

$$M_{ipt} = \alpha + \sum_t \beta_t \Delta\tau_p I_t[Year = t] + \theta^o OT_{pt} + \theta^I IT_{pt} + \delta X_{ipt} + \gamma_p + \vartheta_t + \varepsilon_{i,p,t}$$

(6)

where M_{ipt} denotes the individual outcome of interest, for women i living in province p in year of survey, t. The individual outcome we are interested in this analysis is number of children and women being ever married. As we interact the measure of trade liberalization with the indicator of each year of the survey except for 2000, the coefficient β_t captures the differential impacts of trade exposure on such outcomes over time compared to the year 2000. Additionally, we control for output (OT_{pt}) and input tariffs (IT_{pt}) measured at provincial level to capture additional trade liberalization implemented by Vietnam. The specification also includes the province (γ_p) and year of survey (ϑ_t) fixed effects. Standard errors are clustered at the provincial level.

[Insert Table 4 Here]

In Column (1) of Table 4, the presented estimated results of Equation (6) reveal the number of children as the dependent variable. The coefficients of the interaction terms between tariff changes and the year indicators from 2006 to 2013 are statistically insignificant. The only notable coefficient is associated with the interaction terms between tariff changes and the 2014

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indicator. The estimated coefficient implies that in 2014, the BTA led to an increase of 0.44 children per woman when the coefficient 7.276 is multiplied by the average tariff changes of 0.06.

Regarding women's marital status as an outcome, the coefficients for the interaction terms between tariff changes and the year indicators for 2006 and 2013 are statistically insignificant. However, the coefficients for the years 2010, 2011, and 2014 are statistically significant. Specifically, when we multiply the estimated coefficient for the year 2011 (1.797) by the average tariff changes of 0.06, the magnitude of the coefficient suggests a 10.78%-point increase in the likelihood of marriage for women over 40.

It is important to note that the women who influenced the shift in the timing of marriage and first birth in Section 5.2 may differ from those who drove the increase in the number of children and marriages in this Section. If trade liberalization impacted the timing of marriage for young women in their early 20s during the 2000s, they would not be included in the sample of women over 40 in this analysis yet. As shown in Appendix Table A4, we estimate the relationship between tariff changes and the overall proportion of married women in each province. The coefficients are insignificant, implying the possibility that the delay in the timing of marriage and increased marriage driven by women over 40 might cancel each other out. To comprehend the connection between the delay in the timing of marriage and eventual marital outcomes and completed fertility, we require longitudinal data that tracks the same women over an extended period.

6. Conclusion

This study utilized the VHLSS to investigate the impact of Vietnam's trade liberalization on the employment status of both women and men. Additionally, it employed the MICS to explore how exposure to trade influenced women's decisions regarding marriage and childbirth. We hypothesized that trade liberalization in the manufacturing sector improves women's relative employment status and influences their decisions regarding marriage and childbirth.

The empirical results reveal that access to the US market, facilitated by the BTA, significantly influenced women's transition from self-employment to working for other households or engaging in paid employment. By employing survival analysis and utilizing MICS data, we demonstrate that women exposed to greater trade liberalization tend to postpone

marriage and childbirth. Furthermore, when focusing on women over 40, we find a positive association between trade exposure and both the number of children and marital status for this subgroup.

While this study represents the first empirical evidence of the impact of the BTA on women's decisions related to marriage and childbirth, it is important to acknowledge several limitations. One notable constraint is the absence of information to determine whether women who postponed marriage and first childbirth eventually had a higher number of children. This limitation raises the possibility that the observed results could be influenced by women in different cohorts with diverse reactions to trade liberalization and associated economic changes.

Trade liberalization, particularly in developing countries, often results in substantial transformations in the economy. Future studies should delve into more detailed household behaviors, such as the division of labor in household chores, childrearing responsibilities, and the relative empowerment of women and men. Understanding how such economic changes reshape overall societal dynamics requires careful attention in future research.

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Tables

Table 1. Summary of Changes in US Tariffs Applied to Imports from Vietnam

Provinces	No. of provinces	Smallest change [province]	Largest change [province]	Mean Change [STD]
All	61	0.062 [Camau]	0.149 [Hochiminh]	0.081 [0.014]
Red River Delta	12	0.062 [Quangninh]	0.093 [Hanoi]	0.084 [0.008]
Northern Midlands and Mountains	12	0.069 [Laocai]	0.081 [Phutho]	0.074 [0.004]
North and South Central Coast	14	0.071 [Quangtri]	0.103 [Hue]	0.080 [0.009]
Central Highlands	4	0.074 [Kontum]	0.082 [Lamdong]	0.077 [0.003]
Southeast	5	0.079 [Binphuoc]	0.149 [Hochiminh]	0.110 [0.029]
Mekong River Delta	13	0.062 [Camau]	0.088 [Longan]	0.075 [0.007]

Table 2 The Impacts of Tariff Changes on Self-employment

	(1) All	(2) Married	(3) All	(4) Married
Tariff Changes $(\Delta\tau_p) \times I[Year = 2004]$	-3.329***	-2.529**	-3.609***	-2.654**
	(0.948)	(1.142)	(1.040)	(1.246)
$\Delta\tau_p \times I[Year = 2006]$	-3.798***	-3.967***	-4.106***	-4.124***
	(0.932)	(1.068)	(1.036)	(1.188)
$\Delta\tau_p \times I[Year = 2012]$	-4.275***	-3.603***	-4.127***	-2.965***
	(1.207)	(1.182)	(1.110)	(1.110)
$\Delta\tau_p \times I[Year = 2014]$	-3.632***	-3.939***	-3.492***	-3.317***
	(1.177)	(1.215)	(1.074)	(1.235)
$\Delta\tau_p \times I[Year = 2016]$	-4.468***	-4.455***	-4.424***	-3.883***
	(1.223)	(1.347)	(1.160)	(1.353)
$\Delta\tau_p \times I[Year = 2018]$	-4.449***	-4.221***	-4.402***	-3.641**
	(1.368)	(1.535)	(1.284)	(1.566)
$\Delta\tau_p \times I[Year = 2004] \times Female$	0.694***	0.769***	0.693***	0.770***
	(0.193)	(0.201)	(0.193)	(0.200)
$\Delta\tau_p \times I[Year = 2006] \times Female$	0.438	0.588*	0.437	0.586*
	(0.344)	(0.312)	(0.344)	(0.312)
$\Delta\tau_p \times I[Year = 2012] \times Female$	-1.074**	-1.172**	-1.074**	-1.171**
	(0.486)	(0.528)	(0.486)	(0.527)
$\Delta\tau_p \times I[Year = 2014] \times Female$	-1.404***	-1.331**	-1.405***	-1.331**
	(0.511)	(0.585)	(0.511)	(0.585)
$\Delta\tau_p \times I[Year = 2016] \times Female$	-1.399**	-1.545***	-1.399**	-1.544***
	(0.542)	(0.579)	(0.542)	(0.579)
$\Delta\tau_p \times I[Year = 2018] \times Female$	-1.555**	-1.743***	-1.555**	-1.743***
	(0.608)	(0.632)	(0.608)	(0.632)
Female	0.072**	0.102***	0.072**	0.102***
	(0.034)	(0.037)	(0.034)	(0.037)
Output tariffs			0.017	0.027
			(0.022)	(0.020)
Input tariffs			-0.020	-0.011
			(0.020)	(0.022)
Mean of Y	0.658	0.680	0.658	0.680
Mean of tariff changes	0.061	0.061	0.061	0.061
Observations	173,182	112,032	173,182	112,032
R-squared	0.263	0.275	0.263	0.275

Notes: The outcome variable is a binary indicator indicating whether the respondent is self-employed. The regression is based on a sample of young workers aged 15-40. Covariates controlled for in this regression include: years of schooling, working experience, the square of working experience, household size, urban residence, minority status, and sex. Additionally, the regression incorporates provincial-level employment rates and average wages in the baseline year 2002, interacted with indicators of each survey round. Additionally, input and output tariffs, as well as province and year fixed effects are controlled for. Standard errors are clustered at province level. ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 3. Impact of BTA on Women's First Marriage

Dependent var.	(1)	(2)	(3)	(4)
	Women's entrance into marriage		Women's first childbirth	
Tariff changes ($\Delta \tau_p$)	-0.036	-0.092	-0.074	-0.175*
× I[Year = 2002]	(0.079)	(0.094)	(0.071)	(0.088)
$\Delta \tau_p \times$ I[Year = 2003]	-0.027	-0.155	-0.048	-0.271**
	(0.093)	(0.115)	(0.085)	(0.128)
$\Delta \tau_p \times$ I[Year = 2004]	-0.106	-0.260	-0.113	-0.349***
	(0.142)	(0.159)	(0.075)	(0.106)
$\Delta \tau_p \times$ I[Year = 2005]	-0.257*	-0.451***	-0.044	-0.343**
	(0.138)	(0.165)	(0.084)	(0.137)
$\Delta \tau_p \times$ I[Year = 2006]	-0.304*	-0.548**	-0.103	-0.487***
	(0.169)	(0.218)	(0.111)	(0.158)
$\Delta \tau_p \times$ I[Year = 2007]	-0.429***	-0.733***	-0.186*	-0.684***
	(0.159)	(0.227)	(0.104)	(0.184)
$\Delta \tau_p \times$ I[Year = 2008]	-0.465***	-0.538***	-0.222	-0.347***
	(0.141)	(0.130)	(0.146)	(0.129)
$\Delta \tau_p \times$ I[Year = 2009]	-0.489***	-0.554***	-0.402***	-0.522***
	(0.182)	(0.182)	(0.133)	(0.139)
$\Delta \tau_p \times$ I[Year = 2010]	-0.495***	-0.564***	-0.512***	-0.654***
	(0.174)	(0.167)	(0.144)	(0.156)
$\Delta \tau_p \times$ I[Year = 2011]	-0.403*	-0.528***	-0.374**	-0.618***
	(0.204)	(0.193)	(0.158)	(0.189)
$\Delta \tau_p \times$ I[Year = 2012]	-0.563**	-0.691***	-0.132	-0.385*
	(0.232)	(0.245)	(0.165)	(0.202)
$\Delta \tau_p \times$ I[Year = 2013]	-0.557*	-0.739***	-0.395*	-0.742***
	(0.283)	(0.270)	(0.220)	(0.252)
Input tariffs		-0.001		-0.003
		(0.003)		(0.003)
Output tariffs		0.007		0.013**
		(0.006)		(0.006)
Observations	34,254	34,254	37,343	37,343
R-squared	0.101	0.101	0.112	0.113
Age FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes
Year Born FE	Yes	Yes	Yes	Yes

Notes: The table is estimated using women-year panel data derived from the MICS (2013–2014). The sample is restricted to women aged 15 to 40 years old. Standard errors are clustered at the province level. Age, province, and birth year fixed effects are controlled for in all regressions.

Table 4. Trade and Fertility and Marriage for Women over 40

Dependent Variable	(1) Number of children	(2) Ever Married
Tariff Changes ($\Delta\tau_p$) $\times$ I[Year = 2006]	5.975	0.157
	(5.976)	(0.514)
$\Delta\tau_p \times$ I[Year = 2010]	6.818	0.835*
	(5.309)	(0.426)
$\Delta\tau_p \times$ I[Year = 2011]	8.043	1.797***
	(6.185)	(0.512)
$\Delta\tau_p \times$ I[Year = 2013]	5.659	0.739
	(4.518)	(0.534)
$\Delta\tau_p \times$ I[Year = 2014]	7.276*	0.804*
	(3.839)	(0.425)
Observations	8,964	9,178
R-squared	0.293	0.030
Year FE	Yes	Yes
Province FE	Yes	Yes

Notes: The table is estimated using three waves of the MICS (2000, 2006, 2010–2011, 2013–2014). The sample is restricted to women over 40 years old. Survey sampling weights were also included. Standard errors are clustered at the province level. Province and year fixed effects are controlled for in all regressions. All regressions control for age, education, and input and output tariffs.

Appendix

Table A1 Summary of Changes in Vietnam's Input and Output Tariffs

A. Output Tariffs			
Provinces	2000	2010	2018
All: Mean	0.160	0.114	0.112
[Standard	[0.017]	[0.015]	[Hochiminh]
Deviation]			
The highest tariffs	0.182	0.131	0.129
[Province]	[Hanam]	[Hungyen]	[Hungyen]
The lowest tariffs	0.105	0.068	0.0651
[Province]	[Angiang]	[Danang]	[Danang]
B. Input Tariffs			
Provinces	2000	2010	2018
All: Mean	0.112	0.010	0.113
[Standard	[0.003]	[0.008]	[0.010]
Deviation]			
The highest tariffs	0.117	0.108	0.123
[Province]	[Dongnai]	[Bacgiang]	[Bacgiang]
The lowest tariffs	0.096	0.068	0.073
[Province]	[Quangninh]	[Hochiminh]	[Hochiminh]

Table A2 Summary statistics of VHLSS individual level data

	Mean	Std. Dev.	N
Full sample regardless of employment			
Employed (1:Yes, 0:No)	0.78	0.42	223,117
Female	0.76	0.43	109,987
Male	0.79	0.49	113,130
Regression sample			
Self-employed (1:Yes, 0:No)	0.66	0.47	173,182
Female	0.66	0.47	83,298
Male	0.66	0.48	89,884
Years of schooling	8.42	4.19	173,182
Years of working experience	20.29	8.30	173,182
Household size	4.60	1.67	173,182
Urban (1:Yes, 0: No)	0.25	0.43	173,182
Minority (1:Yes, 0:No)	0.21	0.41	173,182
Female (1:Yes, 0:No)	0.48	0.50	173,182

Notes: Regardless of employment status, the full sample comprises workers aged 15 to 40, with a sample size of 175,586. The regression sample consists of workers aged 15 to 34 who have worked in the past 12 months, with a sample size of 127,295. The categorical variables such as self-employed, urban, minority, female are converted into dummy variables.

Source: Author's calculation from VHLSS 2002, 2004, 2006, 2012, 2014, 2016, and 2018.

Table A3 Summary Statistics of the MICS Sample of Women

	Mean	Std. Dev	Observations
Panel A: Unique individuals			
Age	27.47	7.49	7,634
Age of first marriage	20.89	3.73	5,062
Age of first childbirth	21.98	3.68	4,706
Number of children	1.23	1.17	7,326
Panel B: Survival data (Women-year sample)			
The average annual hazard of marriage	0.133	0.339	34,271
The average annual hazard of first childbirth	0.122	0.328	37,350

Notes: The Panel A of the Table is estimated using MICS 2013-2014, while Panel B is estimated using women-year panel sample constructed from MICS 2013-2014. The sample is restricted to women from 15 to 40 years old.

Table A4 Impact of BTA on Provincial Marriage Rate

Dependent var.	(1)	(2)
	The Share of Married Women in Each Province	
Tariff change	0.046	-0.133
	(0.431)	(0.637)
Input tariff		-0.001
		(0.011)
Output tariff		-0.011
		(0.015)
Observations	315	315
R-squared	0.406	0.407
Year FE	Yes	Yes
Province FE	Yes	Yes

Notes: The table is estimated using three waves of MICS 2000, 2006, 2010-2011 and 2013-2014. The dependent variable is the share of married women over total women in each province. Standard errors are clustered at the province level. Province and year fixed effects are controlled in all regressions.