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Occupation and Fertility: Evidence from Fishing communities in Vietnam

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Abstract:

Fishing communities in Vietnam facing many difficulties due to unstable livelihood. To deal with that, they take advantage of employing marine resources using family labors. Therefore, large family size and son preference is prevalent social norms in this occupational group. This study measure the impact of families engaging in fishing sector on fertility behavior using instrumental variable approach. Study show that as the distance from commune to nearest coastline increase, the probability of household being in fisheries rise, and fishing families also have higher fertility than other occupations. The mechanism not only lie in economic factors, but also in social factors. The patriarchal system, an institution embedded in both factors, play an important role. Under the lens of capability approach, effective policies should increasing individual well-being, especially for women, by addressing not only in income and assets, but also in challenging institutions limiting individual autonomy and freedom to live the life of their choice.

Keywords:

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Chapter 1: Introduction and positionality

1.1   Introduction

Fishing communities in developing countries are among the most vulnerable group because their livelihood entirely depend on the climate and marine resources. Across many developing countries, marine and coastal resources are being rapidly depleted due to overfishing, habitat destruction, and weak regulatory systems. According to the Food and Agriculture Organization (FAO), over one-third of global fish stocks are exploited beyond sustainable levels (FAO, 2022). In Asia and the Pacific regions, the fisheries sector faces major challenges: stagnating wild fish production, environmental degradation, habitat loss, limited access to capital and modern fishing technology, and weak institutional management, all threatening both livelihoods and long-term sustainability. In dealing with the risky and unstable livelihood, Households with ample labor availability are better positioned to exploit fishing resources, and a higher number of offspring supports a strategy of income diversification. (FAO, 2000). Therefore, the characteristics of these fishing communities are often a family-based, labor-intensive occupation. Household members, including children, contribute directly to fishing or related activities such as net repair and fish processing. A study across the Philippines, Bangladesh, Tanzania, and Senegal found that fishing households often exhibit larger family sizes and higher fertility rates than agricultural households, despite similar or even higher income levels (Tietze et al. 2000). Because catching fish offshore is physically demanding and dangerous so it usually conducted by male, their works are primarily offshore while women's works are mainly onshore. Therefore, the economic value of children, especially son, is intensified in fishing community. The perception that male labor is very important for the family intensifies son preference, who are expected to inherit and continue the fishing occupation. There-fore, driven by the need for labor force security, having large family size and ensuring at least one son is a common social norm in these regions.

Vietnam, with more than 3,200 km of coastline accounting for about 50 percent of the country's total area, has long relied on marine resources for economic development and food security. There are more than four million workers working in fishing industry, focusing on coastal provinces, and contribute about 10% to total national export revenue and 5% Vietnam's GDP in 2024. Seafood and aquatic exports are valued at around 10 billion USD, with a total volume of 9.5 million ton (VASEP, 2024). Fishing is not only an important source of national income but also a traditional way of life that sustains entire families along the coast. However, the characteristics of Vietnam's fisheries sector closely resemble those of other developing countries: low technological development, small-scale operations, labor-intensive methods, and high dependence on family labor (Thuy San, 1988). Fishing crews are often composed of male relatives—fathers, sons, and brothers—working together on small boats for extended off-shore trips (WorldFish Centre, 2001). Fishing livelihoods are marked by income uncertainty and variable returns, which depend heavily on weather conditions, fish stock availability, and market prices. These uncertainties encourage house-holds to maintain a large family labor force as a buffer against shocks—a strategy widely observed in small-scale fisheries globally (Tietze et al., 2000). Consequently, many households value having multiple children, particularly sons, both to ensure labor continuity and to provide old-age security. The preference for sons in fishing communities reflects and perpetuates patriarchal social norms common in many Asian societies.

The fertility in Vietnam is declining below replacement level with 1.91 birth per women in 2023 (World bank, 2023). However, the varying fertility rate among regions in Vietnam is substantial due to cultural attitudes and access to services. North-erns Midlands and Mountains showed the highest total fertility rate (TFR) with 2.43, followed by Red River Delta, Central Highlands, North and South Central Coast with TFR were 2.37, 2.36, 2.32 respectively. Mekong River Delta and Southeast had lowest TFR, TFR is 1.82 and 1.61 respectively for each region (GSO, 2022). High fertility rates focus on regions which remain to have strong traditional values (patriarchal structures). Patriarchal values favour the present of son over daughter for the reasons that lineage continues through the male line, son are expected to care for aging parents, and family inheritance and rituals often pass through sons. This lead to sex-selective practices to ensure a male heir

and results in imbalanced sex ratios at birth with 111.8 boys per 100 girls (GSO, 2024). This reflect persistent son preference and the growing use of prenatal sex selection technologies (Guilmoto, 2012). In fishing communities, this gendered occupational structure—where men's labor is eco-nomically prioritized—reinforces patriarchal ideology and undervalues women's contributions, exacerbating gender inequality and reproductive burden. Women in these households often bear multiple roles: income generation through shore-based activities, unpaid domestic work, and childrearing responsibilities, all while having limited decision-making power in reproductive choices (Hao, 2018).

Fishing community in Vietnam share the same conditions as other fishing communities in developing countries. Moreover, Vietnam has some unique elements that make it an appealing case to study because the socio-economic factors of the fishing sector in Vietnam are shaped by a unique combination of cultural traditions, economic transitions, gender dynamics and regional diversity. Vietnam's culture is influenced by Confucian values, which emphasize a hierarchical and patriarchal social structure. Economic transition happened after Doi Moi (renovation period) in 1986, when the Communist Party transform the economy from a centrally planned economy toward a socialist-oriented market economy. The open of the economy moving fishing industry from subsistence and small-scale fishing to commercial and export-driven operations, which facilitate the rapid demographic and socioeconomic transition. Gender dynamics reflected in the perception that men are traditionally seen as breadwinners and women are relegated to supportive or secondary roles. Therefore, women are underrepresented in decision-making process and fisheries management institutions, their labor is often undervalued or invisible in official statistics, despite being crucial to post-harvest processes and family economies. Regional diversity is reflected in the degree of Confucianism and patriarchal influence across different areas, where the North regions are more strongly affected by these ideas than the South. Moreover, the available of a large scale and qualified dataset also support for the analysis.

Most existing research on fishing communities' fertility behavior is qualitative, which based on small-scale ethnographic studies or interviews to explore peceptions of family size, son preference, and reproductive norms. For example, studies in the Philippines, Malaysia, Tanzania, Senegal, Bangladesh, and India have

documented similar cultural patterns: fishing households tend to prefer larger families and male offspring to support labor-intensive livelihoods and maintain family continuity (Tietze et al., 2000). However, to date, no study has systematically quantified the causal effect of engaging in fishing as a primary occupation on fertility outcomes. Most analyses remain descriptive and cannot account for endogeneity, that is the possibility that both occupation choice and fertility are influenced by unobserved factors such as cultural norms or local economic conditions. Therefore, this study aims to empirically estimate the causal effect of fishing occupation on fertility behavior in Vietnam. To address potential endogeneity arising from omitted variables or reverse causality, an instrumental variable (IV) approach will be applied. By leveraging regional variation in fishing opportunities and socioeconomic characteristics, the study con-tributes new quantitative evidence on how traditional, male-dominated livelihoods shape fertility behavior and gender inequality in developing coastal economies. For the reason that fertility behavior in fishing communities is not just a private or biological issue, it reflects broader economic structures, gen-der norms, labor dynamics, and access to services. As such, understanding this intersection is vital for designing inclusive coastal development, gender policy, and reproductive health interventions.

1.2 Positionality

I am a second-generation migrant from a northern rural province who moved to a southern city. While my family holds strong traditional views about gender roles, being born and raised in a culturally open, dynamic and progressive city has made me constantly aware of the tension between traditional values and modern perspectives, that the reason why gender study always capture my interest. Although I have no connection with people working in fishing sector, the idea for my paper come from a newspaper recommended by my teacher and then I checked the data to see if they told the same story about large family size and son preference. When researching people working in the fisheries sector from a gender perspective, I realized that women face so many barriers that prevent them from having autonomy over choices related to their own lives. As a women, I share something in common with them, being affected by patriarchy, because in order to pursue higher education, I had to struggle against it myself.

I am deeply moved by the fact that they are among vulnerable group in society, with low income, limited education and restricted access to healthcare and reproductive services. On the journey to uncover the barriers they face, I hope that as an outsider researcher, I can identify the underlying mechanisms and offer meaningful recommendations to empower them, and women in general, like myself.

1.3 Scope of the study

This study using three sources of data, including Population and Houses Census 2009, Global Administrative Areas database and OpenStreetMap spatial data. There are 1,600,967 observations in the sample for the analysis. This study collected sample data form various regions across Vietnam, thereby ensuring broad representativeness and enabling cross-regional comparability. Two software programs were used for data analysis, Stata and Python. Python was employed to calculate the coastline distance for the instrument variable dataset. Stata was used for data filtering, descriptives statistics and model regressions. This study aim to answer two questions: Do a family member (wife and/or husband) working in the fishing industry affect women's fertility behavior? And which mechanisms behind the potential effect? In order to answer these questions, two hypothesis are constructed to quantify the effect of fishing occupation on fertility, using distance from commune to nearest coastline as instrumental variable. Hypothesis 1 states as the distance from the commune centre to the coastline decrease, the likelihood of engaging in fishing activities increase. Hypothesis 2 proposes that fishing households have a higher average number of children than non-fishing family.

1.4 Structure of the thesis

This thesis include five chapter. Chapter 1 introduce the context of fishing communities in developing countries and Vietnam and show how it affect fertility behavior. From there, the research gap is identified and the contribution of this study to addressing this gap is discussed. It also present standpoint of the researcher, scope of the study and structure of the thesis. Chapter 2 present an

overview of how occupational structure link to fertility behavior, provide an introduction of theoretical frameworks explaining the mechanisms, evaluating the circumstances of fishing communities and summarizing theoretical framework with a diagram. It also show some empirical studies addressing the relationship between fishing and fertility. Chapter 3 provide methodology, including the process of data collection, disclosure about the use of AI, descriptive motivating evidence on the relationship between fishing sector and fertility behavior, construction of variables and empirical strategies. Chapter 4 is empirical analysis, presenting the results of the study. It provide descriptive statistics of variables, baseline result and robustness check, as well as heterogeneity analysis. The interpretation and explanation of the results are also presented in this chapter. Chapter 5 summarize key findings, evaluate the socioeconomic conditions of fishing sector through the lens of capability approach, from there it provide some discussions and recommendations. Finally, conclusions and limitations of this research is also included in this chapter.

Chapter 2 : Literature review and analytical framework

2.1 Review of fertility by occupational structure

Theoretical background show that occupation reflect socioeconomic status which can have an impact on reproductive choice. Occupation reflect more than just a job, it correlate with opportunities in accessing resources, facilities, services and information, it also define appropriate norms and aspirations within social networks. Colen (1995) developed the concept of stratified reproduction, which showed that occupation, as part of a broader system of socioeconomic status, creating privilege for some group of profession while undermining the reproductive rights and labor of another group. This is responsible for causing unequal reproductive opportunities for different groups. Weber (1946) and Bourdieu (1984) introduced the concept of "status groups", and showed that how social structure in which occupational status plays a role, form individual life choices, including fertility decisions. This choice is not independent but under effect of institutional constraints, status norms, and economic conditions. Wright (1997) reasoned that occupation is not merely a job, it represent a position in a class structure defined by authority, ownership, and skill. People in different class positions have different levels of control, autonomy, and economic security, which shapes their values, aspirations, and behaviors—including family size.

Evidence from other countries or regions show that people in managerial or professional position tend to have lower fertility due to longer training time, high living expensive in urban area increase children's raising cost, high opportunity cost for family and high job commitment,. Therefore they delay childbearing due to economic and career pressure. Albertini et al. (2024) show that occupation is a marker for social class, after controlling for income and education, profession still have additional impact on number of children. People in higher occupational class tend to have fewer birth, whereas people work in primary sector have shorter training time and start to make money early, hence having family earlier. They more likely to hold traditional view and expect more children for old age support.

2.2 Theoretical framework

2.2.1: Framework explaining the mechanism

2.2.1.1: Economic mechanism

Three microeconomic theories of fertility: The "Chicago School Model" by Becker (1960, 1973), "Leibenstein's Model" by Leibenstein (1975) and "Easterlin's Theories" by Easterlin (1968, 1969) attempt to explain the fertility behavior of families and assume that parents are rational when weighing the cost and benefit of having children. In Becker's model, children are assumed to be consumer durable goods (diminishing marginal utility) and parents maximize utility among a range of goods and services with budget constraint, Leibenstein and Easterlin assume children are commitment goods (increasing marginal utility up to a point and then decreasing, reflect expenditure on children is commitment made by parents). All theories reach the same conclusion that higher income lead to higher fertility. However evidence suggest that as income rise fertility fall, as in developed and developing countries. Becker explain this negative correlation is because of indirect cost incurred by women as their increased employment opportunities and education, Leibenstein and Easterlin point to relative cost (the expenditure for higher social class maintaining "status goods" increases so they limit the cost for childrearing, leading higher-status families to limit family size) as the main reason. Although Leibenstein and Easterlin include social factors in their model, it is in static terms. All theories focus on the core idea of economics, assuming the rationality of individual, but the main drawbacks is lack of interaction between economics and social factors, which is necessary for analyzing the transition of fertility (Fulop, 1977). They also fail to recognize the gendered dynamics behind fertility decision.

Notestein (1945) develop the demographic transition theory, describing the shift from high to low fertility and mortality as part of modernization. In his theory, economic development play the key role in population dynamics. Development process gradually reduce population growth through dearth rate and birth rate. In the pretransition period, birth rate and death rate remain very high in agrarian economies, where children was seen as source of labor, fertility was high to offset for high infant mortality. During the transition, development lead to improve

in food supply, medical and sanitation first lead to reducing death rate. The expansion of industrialization and urbanization lead to increase the cost of raising children in term of direct cost (increased living standard) and indirect cost (opportunity cost in education and employment), hence fertility decline rapidly and small family size is more favorable. After the transition, the widespread of contraception technology and social norms favor small family size keep fertility at low level, even lower than replacement level for some societies. He argue that it is the process of development and modernization drive fertility decline, emphasizing the relationship between economic growth and demographic transition. However, some sociologist and demographer later point out that the link between them is weak and vary widely across contexts, because his theory miss other important factor affecting fertility, social interaction. (Bongaarts et al., 1996; Davis et al., 1956)

2.2.1.2: Social effect mechanism

Classical demographic transition theory (Notestein, 1945) predict social and economic development affect the transition of fertility. However empirical evidence show weak link between economic conditions and fertility behavior (measured by real GDP per capita and Human development index) (Bongaarts et al. 1996). Microeconomic theory with cost-benefit model by Gary Becker (1960, 1981), Easterlin (1975) and John Caldwell (1982) also fail to recognize gender perspective within family. Therefore, other important factors responsible for variable in fertility pattern among regions come from social effect, as suggested by many demographers.

Davis et al. (1956) provide a classification of proximate determinants, which through these elements, many types of social organization have varied effect on fertility behavior. The mechanism that cultural factors influence fertility can only through three "intermediate variables", exposure to intercourse, exposure to contraception methods, pregnancy and childbirth. They show that how different societies, the underdeveloped and industrial society, favor different social norms that either enhance or constraint fertility outcomes, and show how this happen through this mechanism. The underdeveloped society have higher fertility because they encourage early union by younger age at marriage, they not actively use contraception unless facing the harsh living conditions or close to

the end of reproductive period, they favour for high fertility because the infant mortality is quite high in this society. The industrialized society, on the other hand, support low fertility because schooling delay age at marriage, higher usage of contraception and low infanticide rate, so no need for high fertility to offset for that. The fertility of industrial societies is often reduced via the contraception route rather than by abstinence like in pre-industrial societies.

The theory about social effect and social interaction explain the link between occupation and fertility. Here occupation, consider as social proximity, create a group of people with the same characteristics which shape fertility behavior. Occupational group can shape social norms about fertility behavior due to the characteristics of that job. Social learning and social influence are defined and modelized by Montgomery and Casterline (1996). Social learning is modelized to include 5 main factors when a person weighting alternative choices and making decisions. These include the known prices of a range of goods and services, individual's knowledge, here it is important to separate interpersonal from impersonal sources of information (ex: a rumour of a new contraceptive method with a clinic counsellors), a record of other individuals whose might have an impact on the decision of person in the model, the individual's expected future command over resources and any other constraints or costs that have not yet been mentioned. Social learning takes place interpersonally when other actors in the personal social network affect the information and subjective belief that shape individual's decision, or impersonally through mass media, markets or other social media that individual expose. Social influence is reflected in individual's preferences and information sets and is motivated by social conformity or conflict avoidance. The combination of social learning and social influence is what the authors term social effects.

Bongaarts et al. (1996) also emphasize the important of social interaction process in fertility transition. This theory based on the groundwork of diffusion effects which narrowly focused on contraception methods and then the authors broaden diffusion concept further to include a wide range of socioeconomic factors. Although there is a declining trend in fertility, the variations in the timing and pace of fertility within regions in a countries and among countries is substantial. Factor explaining this variation is social interaction, especially the per-

sonal network of small communities. According to these authors, social interaction contain three aspects: the exchange of information and ideas, the joint evaluation of their meaning in a particular context, and social influence that constrains or encourages action. The channel facilitate for social interaction consists of groups defined by spatial proximity (villages, regions) and/or social proximity (ethnicity, education, occupation), three level of channel is community, nation and global. Ideas about fertility can be exchanged within group, and jointly evaluated by member of this group, the formulation and behavior justification of these ideas will create the socials norms to consider what is appropriate in the local context, and thus create social influence. Social influence can be a factor for maintaining high fertility if having a large family size is the social norms in the local context. Social influence is crucial in setting the direction of fertility behavior. For the fishing communities with the same socio-economics factors like occupation, location and education, the effect of social norms can be substantial and explain why fertility remain higher and more son-biased despite national trends toward lower birth rate.

2.2.1.3: Combined effect mechanism

While some scholar focus on economic factors, Becker (1960, 1973) with individual behavior (microeconomics) and Notestein (1945) with economic structure (macroeconomics), these theories only show weak interaction between economic and demographic factors (Fulop, 1977). Other scholars focus on social factors like Bongaart et al (1996) proposed that fertility change is not purely economic phenomenon but reflect "social revolution". But it more likely that the interplay between economic and social factors affect fertility decision, and some scholar attempt to combine both factors in explaining fertility behavior, like Kohler (2000), Durlauf et al., (2001). They believe that fertility decision is not just about individual cost and benefit analysis or the conditions of the economy but the impact of social, what other are doing and expecting, is also matter. Economic factor can identify a prerequisite in which the role of social factors enhance or constraint fertility, making the onset and pace of fertility different across different context (Rossi and Xiao, 2014). Structural changes alone may not be enough unless social dynamics align.

Kohler (2000) argued that fertility decline is not just economic problem of personal choices but rather as a coordination problem among individuals embedded in social networks. Therefore he developed a model which show that fertility decision not only depend on the rational choices in weighing cost and benefit of children, but also depend on the expectation of what other people think and do. The transition of fertility create coordination problem because in deciding between high or low fertility, individual is uncertain about the behavior of other people and how an exogenous shock affect fertility pattern. Two types of social network can help to solve that problem. The first one is information network, which allow individual to get the information about fertility of other member through interacting and update her fertility preferences. However, this network only accelerate the transition of fertility when it is on the way. If the high fertility equilibrium is entrench and become social norms in the society, even if information about methods controlling reproduction, attitudes toward low fertility and adoptions of family planning are available, the persistence of social norms will render the comprehensive transition. The second one, coordination network, can solve this problem by collective action. Social integration, geographic proximity and cultural homogeneity create the bond between members and they make decision on collective scale. Empirical evidences show that the onset and pace of fertility transition is faster for those groups, who play a key role in the diffusion process to other groups with close culture and language, as the case in European and contemporary developing countries. However, collective action only happen if sufficient economic incentives to reduce fertility exist, which emphasizing the interplay between economic conditions and social influence in determining individual's fertility decision.

Durlauf et al. (2001) show that no single theory, either solely economics or cultural factors, can fully explain the historical fertility transitions in every context. The diversity of empirical evidences show that while it can capture the main part in some local context, there is always counterexample that this theory fail to explain the mechanism. Therefore, they developed analytical framework integrate economic incentives of individual with social factors, emphasizing the role of social interaction. Their contribution was develop a structural modelling approach preserving the core ideas from economics and sociology in describing

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demographic transitions. The social interaction model, which account for heterogeneous effect experienced by diverse context, better explain why countries with similar levels of development might have very different fertility patterns. Social interaction is operated through non-market mechanism, in which individual's range of choices and preferences is affected by the action and expectation of other individuals within social groups. They integrate social interaction in utility function, in which decision of individual to choose high or low fertility depend on the strength of her private incentives and social interaction. In equilibrium, since everyone influences everyone else, the group's average choice must be consistent with individuals' decisions. If the social influence parameter is weak, there's only one equilibrium, everyone's decision is mostly determined by their private incentives. If this parameter is large enough, the equation can have two stable equilibria: an equilibrium when only a few people adopt low fertility and an equilibrium when most people adopt low fertility. The transition from high to low fertility rapidly or gradually depend on a tipping point, below that threshold the change is very slow, but once the threshold is overcome, fertility declines quickly. Therefore, policies or socioeconomics conditions that change a few people's incentives can have amplified effects through social interactions. Because this effects is varied across different group, understanding local reference groups and interaction networks becomes important.

2.2.2: Evaluative framework

2.2.2.1: Capability approach

Capability approach first developed by Amartya Sen (1980, 1985), it is a multidimensional, comprehensive evaluative framework in accessing individual well-being, policies and social arrangements. The core idea of capability approach focus on what people are able to do and be, which is their set of capabilities, and our main goal should be eliminating all the obstacles which hamper the freedom allowing people, upon reflection, to live the live they have reason to value. Therefore, it is important to differentiate between means and ends. While classical economics has paid attention on the scarcity of resources that we own or how to maximize our utility given limited resources, capability approach emphasize that we should focus on means instead of ends. Because ends is the ultimate goal that have intrinsic value, while means is valued as instrument to achieve our

goal. Here means in broad term mean goods and services, both in market and non-market term, that can be used to achieve our goals. Ends mean the expansion of people's capabilities, or a range of freedom to achieve potential functioning (what people can do and be). The ability to convert resources into achieved functioning (what they can actually do with the available options ai their disposal) not only depend on non-market and market resources but also on the conversion factors, which include personal characteristics (physical condition, sex, intelligence), institutional factors (social norms, gender roles, public policies) and environmental factors (climate, geographical location) (Robeyns, 2005). In evaluating capability, conversion factors, especially institutions, play the central role, because the understanding of social and institutional context that affects the conversion factors and the capability set directly allow us to know which functioning he/she can achieve. The difference between capabilities or achieved functioning and the real outcomes is due to lack of resources or constraining conversion factors inhibit them to reach their full potential. In this paper, the theory about capability approach is used as evaluative framework to see how institutional factors, specially gender norms, may enhance or restraint individual's capability set of choices and opportunities, access to resources and thus influence the personal well-being.

2.2.2.2: Capability approach through feminist economics perspectives

Nussbaum's (2000) work on capability approach build on the framework of Sen, but she developed it as an foundation for theory of justice and feminism perspectives. She established a well-defined list of central capabilities, her list provided universalistic and foundational approach in accessing human well-being and dignity. Her list of capabilities were divided into 10 categories, including life; bodily health; bodily integrity; senses, imagination and thought; emotions; practical reason; affiliation; other species; play; control over one's environment. She emphasizes that a just and enabling society must secure a threshold level in each of these capabilities for every single individuals. In gender study, Nussbaum's framework show that there is a deprivation in some of capabilities (e.g., bodily integrity, affiliation, control over one's environment) due to gendered institutions, norms and practices.

The enhancement and application of capability approach in gender study were also carried out by other scholars, such as (Robeyns 2003, 2021), she developed a procedure approach which choosing relevant capabilities necessary for analyzing study at interest. She help to elucidate how capability approach align and enrich feminist work by aiming at the same goals and accounting for the diversity of individual well-being, hence considering gender norms as influential factor in women's well-being. (Alkire 2008, 2016) applied capability framework in empirical works in multidimensional poverty and measure of capabilities, made it possible to assess gender gaps not only in income but also in opportunities, functioning, and agency. Therefore providing practical guidance for future research and doable policy. (Agarwal, 2006) engage Sen's capability approach from a gender perspective, using this reasoning to evaluate on women's property rights, resource access, and empowerment, especially in South Asia. She also shown how social institutions and gendered power relations impede women's capability sets.

2.2.2.3: The role of institution

Institution are considering here is social norms relating to fertility, a result of a process of social effect and social interaction. Institution is important in the analysis of capability approach for two reasons. First it affect the way resources can turn into capabilities as conversion factors and second it affect the agency (institution shape the preference and determine the degree of freedom of choice an individual can have). The including of institution is very crucial because from a capability approach perspective, removing material deprivation alone is insufficient. Without addressing restrictive social norms, many individuals will still lack the real freedom to live the life they have reason to value. This is why social change, including challenging harmful norms and encouraging enabling ones, will enhance the analysis of Capability approach (Staveren, 2024). (Robeyns, 2021) share the same point about the important of circumstances the person is living in by proposing that the social context that shape people's opportunity set and influence the choices they make should be central to capability evaluations. The relationship between occupation and fertility involves assessing how different occupations either expand or restrict women's real freedom to make choices

about child bearing. Fertility outcomes reflect capability difference, not just personal preference. For women in labor intensive job and patriarchal system, fertility is higher due to constrained agency and limited capabilities, not because of explicit choice.

Women in male-dominated, patriarchal occupations often lack both the resources (economic resource and time) and agency (autonomy) to pursue non-traditional life paths. As a result women internalize traditional roles, in which (Nussbaum, 2000) call adaptive preference, which explores how women's aspirations are often shaped—or distorted—by oppressive environments, limit their capacity to envision or pursue possibilities beyond what they have internalized as "possible". They choose the type of job that fit patriarchal norms and family roles (flexible hour and low income job). Patriarchal occupational structure reflect gender norms, it restrict women's freedom and channel life choices toward motherhood. Because preferences of women also reflect how institutional factors shaped their values, is it freely chosen or imposed to them. She highlight that ensuring women's freedom means more than respecting whatever they say they want; it means ensuring they have real capabilities to make meaningful choices.

2.3 Empirical study on the relationship between fishing industry and fertility

In the case of rural Bangladesh, fertility remain very high over recent decades, due to economic values for large family size. Socioeconomic characteristics and social influence have shaped that rate, even though social organization is structured to oppose that high rate. In identifying institutional determinants of fertility change, (McNicoll 1980) highlighted how both deliberate policies and unintentional institutional features can shape fertility behavior and cause demographic change. In the case of Bangladesh, he show how strong familial and clan networks slowed the impact of national policies, showcasing how resilient local social institutions shape reproductive behavior.

Teye (2012) conducted a qualitative study to show how cultural factors affect fertility preference. The result show that demand for labor, expectations of long term security, and gendered power relations have contributed to preferences for

high fertility levels. The result imply that significant fertility decline in the area will only occur when fertility preferences of men have changed and economic status of women have improved, which will contribute to the transition of fertility behavior.

(Freedman and Guo, 1988) researched a case study in China to show the resistance of government family planning program due to traditional familial values, which support relatively high fertility. Population that live in rural area, low education and poor show the strongest resistance, with a rigid gender division of labor. The adherence to cultural values and social norms present a challenge for government policy in pursuing a comprehensive demographic transition.

2.4: Theoretical framework with a diagram
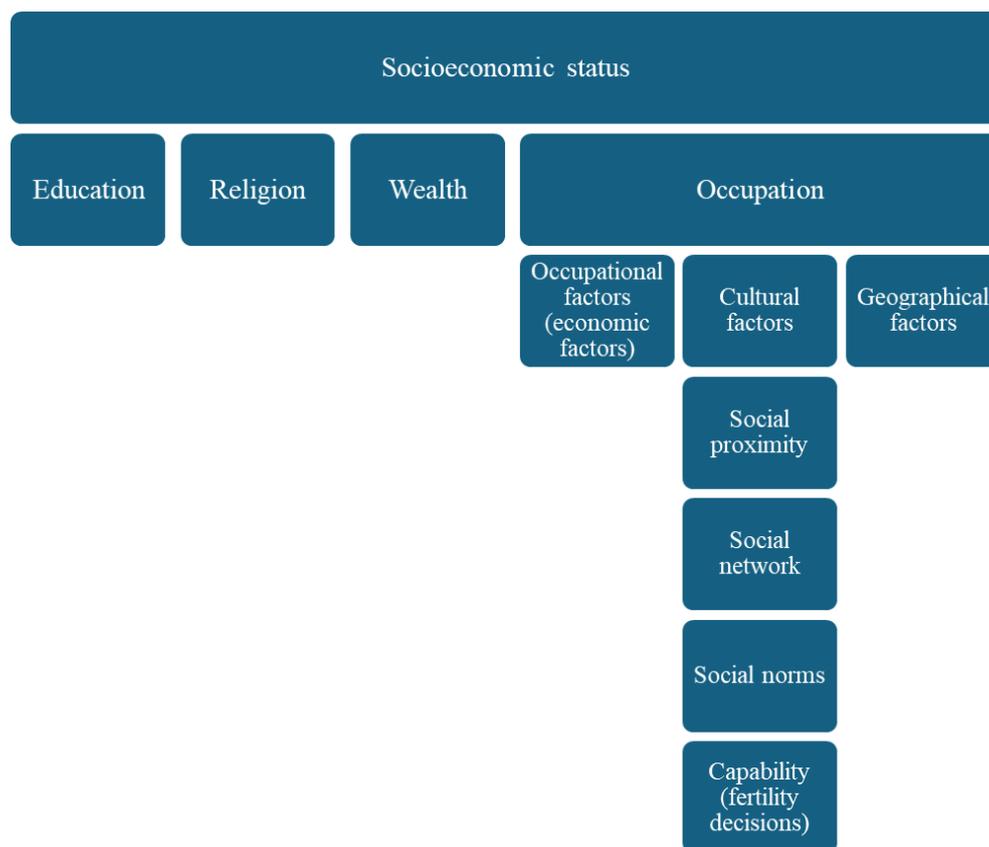
Graph 1: diagram of theoretical framework

The diagram above show that occupation is a part of socioeconomic status, along which education, religion, wealth. Within occupation, it include occupational factors (or economic factors), cultural factors and geographical factors for a specific group of people whose share common socioeconomic characteristics

in term of employment, perception and living environment. These shared factors define social proximity which create social network (or institution) for those within this group, in this case fishing community along coastline of Vietnam is the subject for researching. People in this network will learn from and interact with each other, creating social norms. The effect of social norms not only narrow to shaping preference and directing action for insider but also defining a set of norms which encouraging conformity and even sanctioning violation. For this reason, the impact of social can either helps to expand or causes to constraint capability set and the evaluation of well-being. This research specifically focus on the influence of the economic characteristics of the fisheries industry and gender norms on fertility decision and behavior for people working in this sector.

The relationship between fishing occupation and fertility is essentially the relationship among people who share the same socio-economic context, in which fishing broadly represents those socioeconomic factors. The commonality lies in the fact that individual are shaped by the nature of fishing work, have similar educational levels and hold traditional views on family and fertility. Social interaction and influence within this group of people, who share close social proximity, form attitudes that value large families and male preference. Studying the group of people engaged in fishing and their fertility pattern is, therefore, a study of the socio-economic factors reflected in this occupation and how these factors influence fertility decision.

Chapter 3: Methodology and model

3.1 Data sources and sample selection

This research employ the data from Population and Houses Census 2009 (Census 2009) for the main analysis, these dataset was conducted every 10 years by the General Statistics Office of Vietnam. It was collected to represent comprehensive data on demographics, housing, labor, and other socio-economic indicators to inform policy-making and development planning in Vietnam. This is the largest micro dataset accessible in Vietnam. The sample size of Census 2009 is over 14 million elements, account for about 15 percent of total population. The large sample size which span across various regions and ethnic groups help to better reflect the whole country.

The analytical sample for the analysis draw from fertility information of women from 25 to 49 years old and other available information correspond to women in that age group, including information of her husband on age, education, and occupation, her information on age, education, occupation, religious affiliation, region, ethnicity group, her children information on age, gender and number of children. Although fertility information is available for women from 15 to 49 years old, women under 25 might have potential selection bias for married (will be explain in construction of fertility variable). Because fishing is measured at the family level in which husband and/or wife working in fisheries, the sample narrow to married women and those who can identify corresponding information for husband by the relationship with head of household (be the head of household or be the wife/ husband of head). After the data filtering process (eliminate missing and invalid observations) there were 1,991,221 valid couples. These were then matching with the information from the IV dataset (which will be explained in detailed in variable construction section), resulting in 1,600,967 observations for the final analytical sample, accounting for 62% of the fertility information available in the Census dataset.

In order to construct the IV, this research use the spatial database GADM version 3.6 for Vietnam (Global Administrative Areas database, established in 2018). This is a high-resolution spatial database which provide geographic information containing all level of administrative boundaries of municipalities. The

coastline spatial data draw from OpenStreetMap, this is an open, and community-built collection of geographic information, which includes a wide variety of data like roads, buildings, trails, and points of interest, which can be used for applications such as navigation, mapping, and data analysis. It is the most comprehensive source of volunteered geographic information.

Specification for construction of variable will be presented in subsequent section.

3.2 Disclosure about the use of AI

In order to better present my idea in English, some parts of the literature review section have been modified to polish writing (about sentence structure and/ or grammar) and to express the write's ideas more effectively in written style. It should be emphasized that the support provided by AI relating to the way ideas are expressed, not the content itself. The content is the result of the writer's own process of reading, researching and reflecting on theoretical frameworks, data and previous studies, from which the main ideas of this research are integrated and developed. AI also facilitated in finding source of paper in section 2.1 and key papers relating to how feminist economics apply capability approach concept. The author has read those studies, verified the validity and relevance to the content of my own research and decided to include them in the theoretical foundations for this paper.

In the data analysis section, the author used AI to suggest code for filtering the variables required for the analysis, especially for the instrumental variable relating to spatial data. However, all code recommended by AI was reviewed, verified and the author take full responsibility for its appropriateness and validity in producing results for this research. The conclusions drawn from data analysis are grounded in the combination of previous studies and the author's reasoning.

3.3 Descriptive motivating evidence on the relationship between fishing industry and fertility
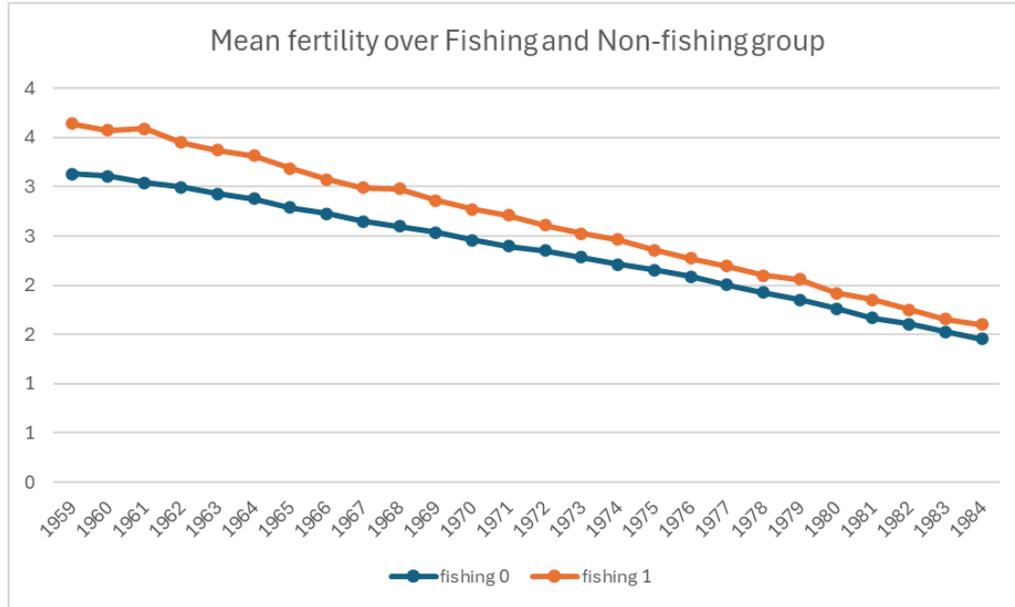
Graph 2: Mean fertility over fishing and non-fishing group across birth cohort

Sources: calculated from Census 2009

Comments: the socioeconomics of fishing communities explain that having large family size is still favourable in every single cohort. The mean fertility of oldest group is 3.64 births per women for fishing and 3.13 births per women for non-fishing, making the gap of children is 0.5 children per women. Whereas, the youngest cohort have mean fertility is 1.6 births per women for fishing and 1.45 births per women non-fishing, making the gap of 0.15 children for each women. The gap of mean fertility for older cohort is larger than younger cohort, showing that younger generation increasingly aware the advantage of smaller family size, or because of the pressure from deplete fishing resources and children's cost increase so they tend to have fewer children compare to previous generation (Tietze et al. 2000). Younger generations are moving toward smaller families and shifting away from traditional livelihoods, which may narrow these differences in the future. This demographic change also see by fishing communities in India by Shinoj et al. (2020) and Asean countries. However, in general there is still a gap between two group
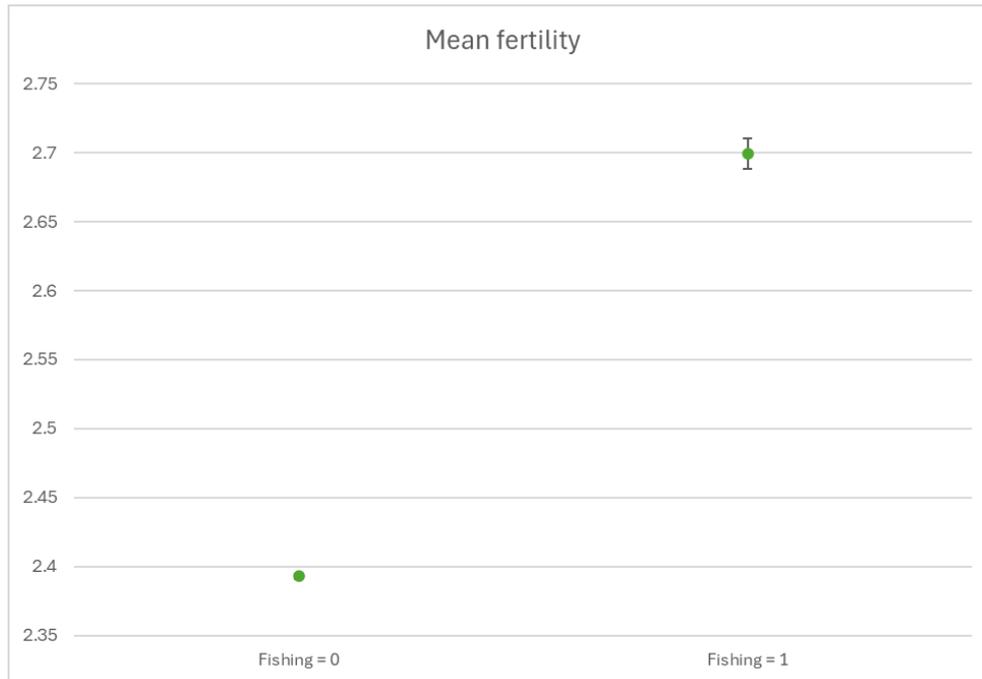
Graph 4: Mean fertility of fishing and non-fishing group

Sources: calculated from Census 2009

Comments: This graph show mean fertility of two group, fishing on average have 2.7 children per women while non-fishing women on average have 2.39 children per women. Confidence interval show that the spread of fertility is bigger for fishing group while for other occupations, mean fertility is cluster around 2.39. This imply that variation of fertility within those family working in fishing sector is significantly higher than non-fishing household. Using t-test to compare mean of fertility of wife between those who work on fishing and non-fishing occupation show significant different of the two group at one percent. The difference on average for the two group is 0.31. (Calculated from Census 2009)
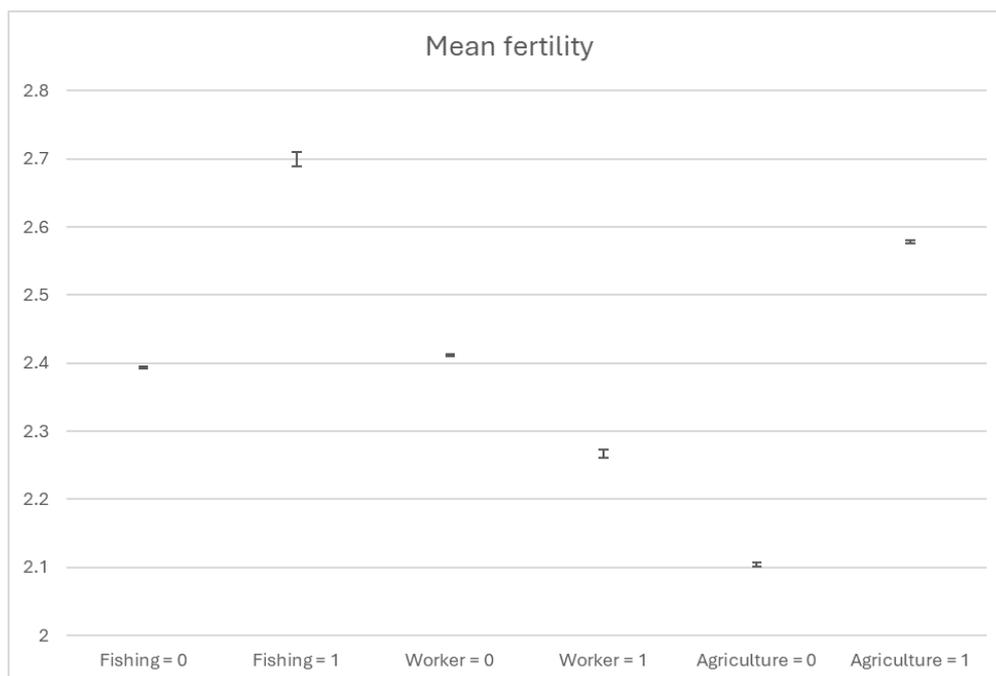
Graph 5: Mean fertility with confidence interval comparing fishing with agriculture and labor workers

Sources: calculated from Census 2009

Comments: Other occupation that focus on labor intensive is agriculture. However, fishing communities show slightly higher fertility than agriculture communities. Whereas mean fertility is 2.7 for fishing household, family who work in agriculture have on average 2.58 children per women. Study by (Tietze et al., 2000) also show that compare with other labor intensive area like agriculture, fishing communities have slightly higher fertility. Across some developing countries, especially in Senegal and Tanzania, fisherfolk showed a stronger son preference than farming households. Although in both sectors, children can be seen as benefit contributing to the labor force of family economy, there are some difference in socioeconomics conditions between two areas that provide possible explanation for this observed outcomes. As pointed out by (Tietze et al., 2000), fishing communities, especially male, want to have more son which may lead to higher "desired number of children" and thus higher fertility. The desire for more children come from uncertain livelihood (seasonal, dependent on stocks, market, weather) compared to settled agriculture family. In high-risk livelihoods, parents may "hedge" by having more children to increase chances some will survive, help in old age, or provide labor support. The economic value of

children therefore is considered more important in relative to children in agricultural family. The settlement of agriculture household can support for accessing in schooling system of children and prolong studying time, while in fishing household children can become labor at early age because the continuous mobility between inland and the sea of fishing families may discourage the attendance of school, which require regular participation over a long period of time.

Although fishing, agricultural, and unskilled labor households are all "working-class", labor workers show the lowest fertility among the three groups. The difference in socioeconomics conditions of workers communities provide some reasons for this difference. Labor workers tend to work in factory which mainly focus on urban area, they face higher living cost in urban and hence higher cost for raising children. Moreover the characteristics of their work is individual employment, and child labor is strictly prohibited in more developed areas, so children is not seen as benefit but vice versa, as economic costs. The accessible of health and social services also facility for the controlling of family size and thus explain the lowest fertility for that group.

3.4 Construction of variables

To construct variables of interest, this research employ both the Census 2009 and Census 2019 and create 2 separate cross-section dataset for analysis.

The dependent variable (Y) take information of fertility for women from 25 to 49 years old (those who was born from 1959 to 1984). The baseline analysis take the total number of children (including the total number of children living in the same household, the number of children not living in the same household and the number of children were born and passed away), labeled as fertility1. The robustness analysis using fertility variable exclude the number of children who have died, labeled as fertility2. While the information about fertility is available for women from 15 to 49 years old, women under 25 might be subjected to potential selection for marriage. Because women in fishing community tend to married at early age than non-fishing women, the share of women from that age group will be overrepresented for fishing women and underrepresented for non-fishing women, compare to the ratio of other age group in the sample over entire

population for these age group. Therefore, narrowing down to sample of women from 25 to 49 can help to minimize this potential selection bias.

The explanatory variable (X) take the information of occupation for fishing at the family level, which mean that wife and/ or husband who work in fishing sector will take the value of one, and zero if both of them not working in fisheries. Fishing data are compiled at the family level because fishing communities in Vietnam typically rely on all available family labor. Additionally, while men's work is usually recorded in official statistics, women's contributions are often considered supplementary or part-time, and therefore may not be counted as formal employment. (Fabinyi et al. 2022; Hao 2018)

The instrumental variable (Z) is used in the model to address endogenous problem. Because the type of work can affect fertility decision, and fertility also affect the choice of occupation which cause reverse causality. Additionally, there might be unobserved characteristics both affecting fertility and occupation, like personal preference, family background. To capture the causal impact of fishing on fertility, this research use the distant from location of family (represented by the center of commune where family living in) to the nearest coastal line. Reason behind choosing this variable is that as the shorter the distance from a household to the coastline, the higher the probability that the household engages in fishing-related occupations. This influences the household's decision to pursue a livelihood in fisheries and has no correlation with fertility decisions, instrumental variable only affect fertility through the choice of wife and/or husband to work in fishing industry. The shapefile of communes in Vietnam from GADM and the shapefile of coastline form OpenStreetMap provide resources for calculation the distance. For each polygon of commune, the algorithm will identify a center point. Because in the global Coordinate Reference System (CRS), coordinates are in degrees (longitude and latitude), to calculate the distance both shapefile will be reprojected to a suitable CRS (namely meter), using World Geodetic System 1984 (WGS 84), which is the projection method used to transform the Earth's curved surface (latitude/longitude) into a flat, rectangular map. Then the minimized function is employed to find the nearest distance from each commune point to the coastline. Because the unit code of official national administration in the Census is different with the code system provided by GADM, hence to connect two dataset this research based on the report by Nguyen et al.

(2018). After matching with the main dataset using the same common code for province, district and commune, the IV is standardized with mean equal 0 and standard deviation equal 1. The standardization help all variable to be on the same scale, because the large value of the IV can dominate the model without standardization.

Control variables include individual characteristics, urban and variables proxy for gender norms, summarize as controls in the model, including:

-        Education gap between wife and husband: by taking the difference in highest level of education of husband and wife

-         Age gap between wife and husband: by taking the difference in age of husband and wife

-        A dummy for urban, which take value of one if individual live in urban and zero if she live in rural area

-        Dummies for ethnicity, including four dummies for Kinh, Tay, Thai, Hoa ethnicity, and other ethnicities is used as reference.

-        Dummies for religious affiliation, including 3 dummies for Buddhism, Catholic and other religious, individual not follow any religious will be used as reference

Dummies for age to control for time-invariant age characteristics between fishing and non-fishing women within the same age groups (age fixed effects)

Dummies for province to control for time-invariant area characteristics, which mean removing all time-invariant regional differences between fishing and non-fishing women within the same province, holding constant the province's cultural and economic background. (province fixed effects)

Additionally, son preference and large family size is still a prevalent social norm in fishing communities, this study construct variable for large family size preference and son preference as mediating outcomes explain the mechanism of fishing occupation on fertility. The preference for large family size is measured by wife's age at first birth, which taking the difference between the age of wife and her oldest children, for the reason that as women having first child at younger age, their fertility lifetime is expanded and the probability of having more children is higher. The preference for son is measured by dummy if women have at

least one son. If the probability of having at least one son is higher for fishing women compare to non-fishing women, this suggest that fisheries women tend to find son relative to non-fishing women, this comparison is within age cohort given age fixed.

3.5 Empirical strategy

Estimation method:

For the baseline analysis, this research employ 2 stages procedure, with first stage run the Linear probability model (LPM) for the endogenous variable (fishing) on instrumental variable (distance from commune to nearest coastline) and use the predicted value from the first stage to regress for dependent variable (fertility), also using LPM model, as specified below:

First Stage (Fishing equation)

$$X_{icp} = \pi_0 + \pi_1 Z_{icp} + \pi_2 W_{icp} + \delta_a + \mu_p + u_{icp}$$

Second Stage (Fertility equation)

$$Y_{icp} = \beta_0 + \beta_1 \hat{X}_{icp} + \beta_2 W_{icp} + \delta_a + \mu_p + \varepsilon_{icp}$$

The subscripts identify for women i, living in commune c, located in province p. The outcome variable, Y_{icp} is fertility1, X_{icp} is binary variable take the value of 1 if household (wife and/or husband) engages in fishing, Z_{icp} is instrumental variable. Vector of control variables W_{icp}, including individual characteristics of women (dummies for ethnicity group (Kinh, Tay, Thai, Hoa and other ethnicities), dummies for religious affiliations (Buddhism, Catholic, other religions and no religions), dummy for urban and variables proxy for gender norms (age gap and education gap for the difference between wife and husband). δ_a is age fixed effects, μ_p is province fixed effects. u_{icp} is the error term in the first stage and ε_{icp} in the second stage, standard errors are clustered at the commune level (c) to account for within-commune correlation.

For the robustness check, this research employ control function approach to estimate the impact of fishing on fertility because the inclusion of predicted value to control for endogeneity can lead to inconsistent estimate for discrete variable (Wooldridge, 2015). Therefore, this research also employ two-stage residual inclusion (2SRI) method with first stage run LPM model and second stage use residual from first stage as another control variable to control for endogeneity with Poisson model. The Linear Probability Model (LPM) is used in the first stage because it gives consistent estimates of the linear projection of the endogenous dummy on instruments and controls. Using models like Probit/Logit in

the first stage can create complications because residuals from nonlinear models are not independent from the endogenous regressor.

Step 1. First stage (fishing equation)

$$X_{icp} = \pi_0 + \pi_1 Z_{icp} + \pi_2 W_{icp} + \delta_a + \mu_p + u_{icp}$$

Step 2. Second stage (fertility equation)

Include the first-stage residual to correct for endogeneity:

$$E[Y_{icp}|X_{icp}, W_{icp}, \hat{u}_{icp}, \delta_a, \mu_p] = \exp(\beta_0 + \beta_1 X_{icp} + \beta_2 W_{icp} + \beta_3 \hat{u}_{icp} + \delta_a + \mu_p)$$

The subscripts identify for individual (or household) i, living in commune c, located in province p. The outcome variable, Y_{icp} is fertility variable, X_{icp} is binary variable for fishing, which equal one if household (wife and/ or husband) engages in fishing, Z_{icp} is instrumental variable. Vector of control variables W_{icp}, including individual characteristics of women (dummies for ethnicity group (Kinh, Tay, Thai, Hoa and other ethnicities), dummies for religious affiliations (Buddhism, Catholic, other religions and no religions), dummy for urban and variables proxy for gender norms (age gap and education gap for the difference between wife and husband). δ_a is age fixed effects, μ_p is province fixed effects. u_{icp} is the first-stage residual and is included in the second stage as another control variable. The significant of residual variable in the second stage suggest that there is endogenous problem and the inclusion of residual to correct for endogeneity is necessary. Standard errors are clustered at the commune level (c) to account for within-commune correlation.

Chapter 4: Empirical analysis

4.1 Descriptive statistics of variables

Table1: Descriptive statistics of variables

	All			Fishing			Non-fishing		
Variable	Obs	Mean	SD	Obs	Mean	SD	Obs	Mean	SD
Fertility1	1,600,967	2.402	1.117	46,924	2.699	1.233	1,554,043	2.393	1.112
Fertility2 (robustness)	1,600,967	2.356	1.066	46,924	2.651	1.181	1,554,043	2.348	1.061
urban	1,600,967	0.259	0.438	46,924	0.179	0.384	1,554,043	0.262	0.439
Age gap	1,600,967	2.789	3.52	46,924	2.472	3.201	1,554,043	2.798	3.518
Edu gap	1,600,967	0.203	1.677	46,924	0.135	0.171	1,554,043	0.205	1.69
Kinh	1,600,967	0.838	0.369	46,924	0.969	0.174	1,554,043	0.834	0.372
Tay	1,600,967	0.041	0.199	46,924	0.003	0.055	1,554,043	0.043	0.202
Thai	1,600,967	0.024	0.154	46,924	0.005	0.071	1,554,043	0.025	0.156
Hoa	1,600,967	0.024	0.155	46,924	0.003	0.052	1,554,043	0.025	0.157
Other ethnicities	1,600,967	0.072	0.259	46,924	0.02	0.141	1,554,043	0.074	0.261
Other_religions	1,600,967	0.027	0.163	46,924	0.019	0.138	1,554,043	0.027	0.163
Buddhism	1,600,967	0.055	0.229	46,924	0.06	0.237	1,554,043	0.055	0.228
Catholic	1,600,967	0.062	0.241	46,924	0.065	0.247	1,554,043	0.062	0.241
No religion	1,600,967	0.856	0.352	46,924	0.856	0.352	1,554,043	0.856	0.352
Age_wife	1,600,967	37.27	6.899	46,924	37.298	6.779	1,554,043	37.269	6.902
Fishing	1,600,967	0.029	0.169	46,924	1	0	1,554,043	0	0
Distance_km	1,600,967	75.541	75.152	46,924	18.773	40.562	1,554,043	77.256	75.289
z_distance1	1,600,967	0	1	46,924	-0.755	0.54	1,554,043	0.023	1.002

Source: calculated from Census 2009

This table show descriptive statistics for all variable in the model. There are total of 1,600,967 observations in the final analysis sample, including 46,924 observation for fishing group and 1,554,043 observations for non-fishing group. The main dependent variable, fertility1, has the mean value of 2.4 births per women, with the minimum value is 1 and maximum value is 15 births per women. Fishing group have higher average fertility than non-fishing group, with 2.7 births for each women, while this number is 2.4 for other occupations. Fertility2 is used for robustness analysis which eliminate the number of children who was born but passed away, so the mean is slightly lower than fertility1, which account for that children, with average value of 2.36 births per women. Other individual characteristics calculated from information of women. Compare to women in

other occupations, the higher proportion of women in fishing family have tend to live in rural area, the majority of them belong to Kinh ethnicity while non-fishing group have higher proportion of other ethnicities, the mean of religious affiliation is quite similar for the two group, the mean difference in age and education with husband is higher for wife in non-fishing group than fishing group. Because fishing family tend to work near the sea, so women in fishing group on average show closer distance to the coastline, around 18 kilometers, whereas women whose family are not engaged in fishing live a average of 77 kilometers from the coastline.

4.2 Regression results

4.2.1 Baseline results

Table 2: Baseline regression results

	(1)	(2)
	First stage	Reduced-form
	Fishing	Fertility
Distance_km (standardized)	-0.059***	-0.038***
	(0.004)	(0.011)
Controls	Yes	Yes
Age fixed effect	Yes	Yes
Province fixed effect	Yes	Yes
Obs	1,600,967	1,600,967
R-squared	0.0763	0.276

	(1)
	IV estimation (Fertility)
Fishing	0.642***
	(0.182)
Controls	Yes
Age fixed effect	Yes
Province fixed effect	Yes

Obs	1,600,967
R-squared	0.2744

*Notes: The sample is restricted to individuals aged 25 - 49 from 1959 - 1984 birth cohorts. All specification include fixed effect for age and province. Controls variables include dummy for urban, age gap between wife and husband, education gap between wife and husband, dummies for ethnicities (Kinh, Tay, Thai, Hoa and others), dummies for religious affiliation (Buddhism, Catholic, others religions and no religion). Robust standard errors clustered at the commune level are in parentheses. Significance level indicated by ***p<0.01, **p<0.05, and *p<0.1.*

In order to check for the validity of instrument variable, this research employ three tests. The under identification test to see whether the external instrument is correlated with the endogenous regressor. The results show that p-value is 0.0000 < 0.01 suggest that the instrument is relevant. The Weak Identification Test using F-statistic to test if the instrument is weak, result show that F-statistic is 205.6, much greater than 16.38 (10% maximal IV size), hence the instrument is not weak. The Endogeneity Test (Durbin-Wu-Hausman test) to see if the regressor variable fishing is endogenous. P-value is 0.0333 smaller than significant level at 0.05. This imply that we can reject the null hypothesis, fishing is endogenous, hence the IV is needed.

The estimation result from the first stage and reduced-form show that, a one standard deviation increase in distance from the coastline reduces the probability of being in a fishing household by 5.9 percentage points and one standard deviation increase in distance to the coast reduces fertility by 0.038 children, on average. The effect of distance on fertility is through the probability to work in fishing occupation, as reflected in the instrument variable (IV) estimation. Specifically, being in a fishing household increases fertility by approximately 0.64 children for each women, on average, this result is significant at one percent level.

The estimation result for control variables of women characteristics show that women live in urban areas have lower average fertility than women in rural areas by 0.4 births. If they belong to Kinh ethnicity, they have lower 0.55 children compare to other ethnicities. If they belong to Tay ethnicity, their birth lower than 0.33 children, If they belong to Thai ethnicity group, their birth lower than 0.39 children and if they belong to Hoa ethnicity group, they have 0.39 fewer children than other ethnicities. This imply that other minority ethnic group will have higher fertility on average than all ethnicities listed above. If women follow a religion, women participating in Buddhism tend to have higher fertility than the rest by 0.68 births, this number is 0.34 births if they are in Catholic group, and 0.2 births if they belong to other religions. This imply that women without religious affiliation tend to have fewer births than women belong to any religious group. All the results are significant at 1 percent level. Variables proxy for gender

norm, including age difference and education difference, are also significant at 1 percent level. An increasing in one age gap lead to higher fertility by 0.01 children, and a rising by one education gap make women bear more 0.02 births. Although the effect is quite small, this result indicate that as the gap increase, the bargaining power of women in their family decrease. Women with smaller age and lower education might have lower voice in making fertility decision, as studies in many fishing communities show that husband consistently want more children than their wife and women with low education significantly have more children (Tietze et al, 2000). In Vietnam a study also found that literacy among reproductive-age women was strongly negatively correlated with fertility (Matsuda, 1996).

4.2.2 Robustness analysis

Using another estimation method (2SRI)

Table 3: Regression results of 2SRI method

	(1)
	First stage
	Fishing
Distance_km (standardized)	-0.059***
	(0.004)
Controls	Yes
Age fixed effect	Yes
Province fixed effect	Yes
Obs	1,600,967
R-squared	0.0763

	(1)
	Second stage
	Fertility
Distance_km (standardized)	0.591***
	(0.175)

Residual	-0.143*
	(0.073)
Controls	Yes
Age fixed effect	Yes
Province fixed effect	Yes
Obs	1,600,967
Pseudo R square	0.046

Notes: The sample is restricted to individuals aged 25 - 49 from 1959 - 1984 birth cohorts. All specification include fixed effect for age and province. Controls variables include dummy for urban, age gap between wife and husband, education gap between wife and husband, dummies for ethnicities (Kinh, Tay, Thai, Hoa and others), dummies for religious affiliation (Buddhism, Catholic, others religions and no religion). Robust standard errors clustered at the commune level are in parentheses. Significance level indicated by ***p<0.01, **p<0.05, and *p<0.1.

In the robustness analysis, 2SRI method is employed to compare with the baseline results. The difference lie in the second stage with the inclusion of residual. The estimation show approximate value compare to the baseline result, the average fertility will increase 0.59 births per women if their household work in fishing sector. The significance at 10 percent level of residual variable also validate for the inclusion of instrument variable because there is endogenous problem in the model and the coefficient of residual partly correct for that.

Using another measure of fertility, (fertility2, excluding children who was born who has died)

Table 4: Regression result of ferttility2

	(1)	(2)
	First stage	Reduced-form
	Fishing	Fishing
Distance_km (standardized)	-0.059***	-0.045***
	(0.004)	(0.01)
Controls	Yes	No
Age fixed effect	Yes	Yes
Province fixed effect	Yes	Yes
Obs	1,600,967	1,600,967

	R-squared	0.0763	0.0733

	(1)
	IV estimation (Fertility)
Fishing	0.767***
	(0.171)
Controls	Yes
Age fixed effect	Yes
Province fixed effect	Yes
Obs	1,600,967
R-squared	0.2744

Notes: The sample is restricted to individuals aged 25 - 49 from 1959 - 1984 birth cohorts. All specification include fixed effect for age and province. Controls variables include dummy for urban, age gap between wife and husband, education gap between wife and husband, dummies for ethnicities (Kinh, Tay, Thai, Hoa and others), dummies for religious affiliation (Buddhism, Catholic, others religions and no religion). Robust standard errors clustered at the commune level are in parentheses. Significance level indicated by ***p<0.01, **p<0.05, and *p<0.1.

Another robustness analysis using different measure of fertility (excluding children was born who has died) for the reason that surviving children may better reflect reproductive decisions. The estimation result from the first stage and reduced-form show that, a one standard deviation increase in distance from the coastline reduces the probability of being in a fishing household by 5.9 percentage points and one standard deviation increase in distance to the coast reduces fertility by 0.045 children, on average. The effect of distance on fertility is through the probability to work in fishing occupation, as reflected in the instrument variable (IV) estimation. Specifically, being in a fishing household increases fertility by approximately 0.767 children for each women, on average, this result is significant at one percent level.

4.2.3 Explaining mechanism of the impact of fishing household on fertility outcomes

Table 5: Preference for large family size

	Reduced-form age_first_birth
Distance_km (standardized)	0.059*
	(0.028)
Controls	Yes
Age fixed effect	Yes
Province fixed effect	Yes
Obs	1,537,636
R-squared	0.2069

	IV estimation age_first_birth
Fishing	-0.877*
	(0.455)
Controls	Yes
Age fixed effect	Yes
Province fixed effect	Yes
Obs	1,537,636
R square	0.2077

Notes: The sample is restricted to individuals aged 25 - 49 from 1959 - 1984 birth cohorts. All specification include fixed effect for age and province. Controls variables include dummy for urban, age gap between wife and husband, education gap between wife and husband, dummies for ethnicities (Kinh, Tay, Thai, Hoa and others), dummies for religious affiliation (Buddhism, Catholic, others religions and no religion). Robust standard errors clustered at the commune level are in parentheses. Significance level indicated by ***p<0.01, **p<0.05, and *p<0.1.

Using age of women at first birth as mediating outcome, reduced-form estimation show that an increase of one standard deviation increase 0.059age at first birth, significant at 10 percent. The IV estimation show that fishing family have

age at first birth lower than 0.887 compare to family working in other occupations. This indicate that women in fishing communities marriage and start to have children at younger age.

Table 6: Preference for son

| | Reduced-form |
	has_son
Distance_km (standardized)	-0.007***
	(0.002)
Controls	Yes
Age fixed effect	Yes
Province fixed effect	Yes
Obs	1,537,636
R-squared	0.0269

| | IV estimation |
	has_son
Fishing	0.114***
	(0.032)
Controls	Yes
Age fixed effect	Yes
Province fixed effect	Yes
Obs	1,537,636
R square	0.0262

Notes: The sample is restricted to individuals aged 25 - 49 from 1959 - 1984 birth cohorts. All specification include fixed effect for age and province. Controls variables include dummy for urban, age gap between wife and husband, education gap between wife and husband, dummies for ethnicities (Kinh, Tay, Thai, Hoa and others), dummies for religious affiliation (Buddhism, Catholic, others religions and no religion). Robust standard errors clustered at the commune level are in parentheses. Significance level indicated by ***p<0.01, **p<0.05, and *p<0.1.

Another mediating outcome is the dummy variable showing the proportion of having at least one son in the family. Reduced-form estimation show that the

probability will of having son will decrease 0.07 percentage point if distance increase by one standard deviation. IV estimation indicate that being a fishing household is associated with an 11.4 percentage point higher probability of having at least one son compared to non-fishing (farming) households, holding other factors constant.

4.2.4 Heterogeneity analysis

4.2.4.1 Subsample between urban and rural area

Because of the substantial socioeconomic differences between urban and rural settings, it is important to treat urban and rural households separately. In rural area, total fertility rate (TFR) is always higher than urban area. The total fertility rate in coastal and rural areas, ranging from 2.2 to 2.8, remains higher than in urban centers, which around 1.4 to 1.6 (UNFPA & GSO, 2021). This imply that the difference in social contexts might help to explain this observed outcome. In comparing women in childbearing age between urban and rural areas, Høyland and Khanh (2011) show that educational attainment is higher for women in urban areas. While urban women had far higher adequacy of care, rural women have worse access to medical facilities, reproductive health care and family planning services. Urban women also had higher income, higher labor participation, and less dependence on their husband. The differential opportunity cost of children for urban households and rural making fertility decisions different between the two regions. Fishery sector reinforce and amplify traditional views which is still prevailing in rural areas because the nature of fishing occupation facilitates the division of labor between men and women.

Table 7: regression results of Urban

	Reduced-form Fertility
Distance_km (standardized)	0.011
	(0.025)
Controls	Yes
Age fixed effect	Yes
Province fixed effect	Yes
Obs	414,922
R-squared	0.218

	IV estimation
	Fertility
Fishing	-0.227
	(0.526)
Controls	Yes
Age fixed effect	Yes
Province fixed effect	Yes
Obs	414,922
R square	0.2125

Notes: The sample is restricted to individuals aged 25 - 49 from 1959 - 1984 birth cohorts. All specification include fixed effect for age and province. Controls variables include dummy for urban, age gap between wife and husband, education gap between wife and husband, dummies for ethnicities (Kinh, Tay, Thai, Hoa and others), dummies for religious affiliation (Buddhism, Catholic, others religions and no religion). Robust standard errors clustered at the commune level are in parentheses. Significance level indicated by ***p<0.01, **p<0.05, and *p<0.1.

Table 8: Regression results of Rural

	Reduced-form
	Fertility
Distance_km (standardized)	-0.045***
	(0.012)
Controls	Yes
Age fixed effect	Yes
Province fixed effect	Yes
Obs	1,186,045
R-squared	0.2762

	IV estimation
	Fertility

Fishing	0.717***
	(0.181)
Controls	Yes
Age fixed effect	Yes
Province fixed effect	Yes
Obs	1,186,045
R square	0.016

Notes: The sample is restricted to individuals aged 25 - 49 from 1959 - 1984 birth cohorts. All specification include fixed effect for age and province. Controls variables include dummy for urban, age gap between wife and husband, education gap between wife and husband, dummies for ethnicities (Kinh, Tay, Thai, Hoa and others), dummies for religious affiliation (Buddhism, Catholic, others religions and no religion). Robust standard errors clustered at the commune level are in parentheses. Significance level indicated by ***p<0.01, **p<0.05, and *p<0.1.

In urban area, both the reduced-form and IV estimation show that fishing and distance to coast has no significant effect on fertility. This result is contrast with the estimation in rural areas. The reduced-form estimation show that a one standard deviation increase in distance reduce fertility by 0.045 children per women, the IV estimation show that fishing increase 0.717 birth on average when individual live in rural areas. The result show that social context matter, because it amplify the effect of being in fishing sector on observed fertility. Studies show that rural and remote areas are more strongly associated with traditional gender norms about son preference and patriarchal gender roles compared to urban areas.

4.2.4.2 Subsample between North and South

The sub-sample between North and South of Vietnam the historically different in political institution lead to different attitudes and perspectives regarding to fertility behavior. During the war time, The North and South were two separate political-economic entities with differing institutions, governance structures, and military conflicts. The North of Vietnam was more strongly influenced by Confucianism, while in the South, the French colonial system intervened in education, undermined the Confucian school system and introduced Western-style schooling and culture (Vu, 2012). Under different political institution, social norms is also different. Manh et al. (2023) through historical mapping of variables proxy for Confucian values found stronger Confucian institutional legacy in the North. The division of North and South follow the study by Miguel et al. (2011), where the separation is in the 17th parallel (near the Ben Hai River in present-day Quảng Trị Province). From the North of the 17th Parallel was the North of Vietnam, which was called Democratic Republic of Vietnam under

Hanoi's administration, from the South of the 17th Parallel was the South of Vietnam, which was called Republic of Vietnam, under Saigon's administration. The study eliminate Quang Tri province because this province have area that was divided, follow the separation of Miguel et al. (2011).

Table 9: Regression results of the North

	Reduced-form Fertility
Distance_km (standard-ized)	-0.08***
	(0.013)
Controls	Yes
Age fixed effect	Yes
Province fixed effect	Yes
Obs	820,718
R-squared	0.2718

	IV estimation Fertility
Fishing	1.862***
	(0.324)
Controls	Yes
Age fixed effect	Yes
Province fixed effect	Yes
Obs	820,718
R square	0.2216

Notes: The sample is restricted to individuals aged 25 - 49 from 1959 - 1984 birth cohorts. All specification include fixed effect for age and province. Controls variables include dummy for urban, age gap between wife and husband, education gap between wife and husband, dummies for ethnicities (Kinh, Tay, Thai, Hoa and others), dummies for religious affiliation (Buddhism, Catholic, others religions and no religion). Robust standard errors clustered at the commune level are in parentheses. Significance level indicated by ***p<0.01, **p<0.05, and *p<0.1.

Table 10: Regression results of the South

	Reduced-form Fertility
Distance_km (standardized)	0.023
	(0.017)
Controls	Yes
Age fixed effect	Yes
Province fixed effect	Yes
Obs	762,975
R-squared	0.2851

	IV estimation Fertility
Fishing	-0.293
	(0.224)
Controls	Yes
Age fixed effect	Yes
Province fixed effect	Yes
Obs	762,975
R square	0.2793

Notes: The sample is restricted to individuals aged 25 - 49 from 1959 - 1984 birth cohorts. All specification include fixed effect for age and province. Controls variables include dummy for urban, age gap between wife and husband, education gap between wife and husband, dummies for ethnicities (Kinh, Tay, Thai, Hoa and others), dummies for religious affiliation (Buddhism, Catholic, others religions and no religion). Robust standard errors clustered at the commune level are in parentheses. Significance level indicated by ***p<0.01, **p<0.05, and *p<0.1.

Result show that in the North, fishing have very strong effect. Reduced-form estimation show that an increase of one standard deviation reduce fertility by 0.08 births. IV estimation show that in the North, fishing household have 1.862 more children than non-fishing household and significant at 1 percent level.

Whereas, impact of fishing occupation is not significant in the South, both in reduced-form and IV estimation.

Chapter 5: Conclusions

5.1 Summary of key finding and mechanism

People engaged in fishing occupations tend to exhibit higher fertility rates compared to those in other professions. The ideal fertility is shaped by two reason, the perceived livelihood profitability and social norms favor for large family size. Children are perceived as valuable economic assets who can provide labor to support the household. This perception helps explain why large families are favored and why high fertility has become a deeply embedded social norm that is difficult to change within these communities. Other fishing communities in developing countries share the same view about large family size. In Philippines, many fisherfolks still believed that larger families would bring greater long-term economic benefits, particularly because children could contribute labor and income. In Senegal, where fisheries were profitable, both poorer and wealthier households desired more children, viewing them as economic assets. In India, Malaysia, and the Philippines, the poorest households who do not have economic assets tended to view children as a form of social and financial security, desiring larger families. In Senegal, Bangladesh and Tanzanian, preference for big family is also a social norm, with the average of six to seven children (Tietze et al. 2000). Moreover, having sons is particularly valued because they are viewed as the main source of labor for the household in the future and as a form of old-age security for parents. Studies in developing countries listed above share the same preference. In Senegal and Tanzanian, son preference is a widespread social norms among fisheries communities and this contribute to high fertility. In Maharashtra (India), larger families persist if early children are not sons. In Bangladesh, this economic pressure and parents' dependence on sons for old-age support reinforce strong son preference and high fertility, with an ideal sex ratio of about 1.7 male per female. In Malaysia, fisherfolk men desired more children—especially sons—to help with fishing, provide old-age security, and continue the family line. This preference reflect the labor demands and economic risks of fishing livelihoods. (Tietze et al. 2000). Thus, economic considerations partly explain the high fertility observed in fishing communities. This rationale is consistent with classical economic theories of fertility proposed by Becker (1960, 1973), Leibenstein (1975), and Easterlin (1968, 1969), which posit that lower income levels are associated with higher fertility and children is considered economically contribute to household income.

However, economic factors alone are insufficient to fully explain this phenomenon. Underlying these economic motivations is a patriarchal ideology manifested in the gendered division of labor and the differential valuation of work and social status by gender. According to Folbre (2020) patriarchal system is a historically dynamic, is has evolved to adapt to many form of the economy,

agrarian, industrial, and post-industrial economies, and collectively sustained structure of male dominance in term of economic and political power, dictate the distribution of resources, responsibilities, and rights between genders, particularly around care work, labor within and outside market, and reproduction. In these systems, men are systematically regarded as holding more important positions, performing more valuable work, and making greater economic contributions to the household. In contrast, women's work, including childcare, domestic management, and nearshore fishing, is often undervalued and considered merely supplementary to household income. Across Asia and the Pacific, women are integral to fisheries production, processing, and marketing, but their contributions are often marginalized by gender norms, caste systems, and lack of institutional support (Charles et al. 1996). In Vietnam, Hao (2018) also show that traditional gender stereotypes and cultural beliefs stress the importance of men in the family, while women are considered as weak or inferior. In the region, women and men have different income earning opportunities. Due to their housework burdens, women are mainly engaged in agriculture and home- based income generating activities such as fish processing and petty fish trade while men are more engaged in fishing and cash earning activities. Generally, men have contributed more cash income compared to women.

Patriarchy functions as a social institution that not only assigns gendered economic roles but also exerts influence through social interactions and cultural norms. This aligns with the social effects on fertility behavior emphasized by Davis et al. (1956), Bongaarts et al. (1996), Casterline (1996), who argue that social influence mechanisms shape reproductive behavior beyond individual preferences. Gender norms thus affect women's fertility decisions by constraining and shaping their desires through everyday interactions within their social networks. These include peers, fellow fishers, older generations, and most crucially, the preferences of their husbands, because of unequal bargaining power within family reflected in age and education gaps. The household, therefore, cannot be viewed simply as a single, rational, and consensual decision-making unit, as assumed by classical economics. Rather, it is a site of both conflict and cooperation, characterized by gendered power dynamics. Decision-making power, including reproductive decisions, is determined by who controls key resources, particularly economic resources. In fishing households, this power typically resides with men. Fishing communities in other countries also reveal the influence of men in fertility decision. In Tanzanian and Maharashtra (India), female-headed households are much less common in fishing communities, men in fishing communities had stronger son preference due to sons' economic contributions. In Bangladesh, and no households were headed by women in either community, men and women reported similar ideal family sizes, possibly because women aligned their responses with their husbands' views due to their subordinate status within the household and community. In Malaysia, fertility was higher among fisherfolk than farmers, and this pattern persisted in men's preferences.

Men consistently desired more children than women, primarily for family continuity and economic support. In Senegal, men consistently reported higher fertility aspirations than women. Because women often have lower household status, men's preferences may lead to women bearing more children than they personally desire. (Tietze et al, 2000). Empirical observations in several countries show that men generally desire larger families and especially prefer sons, while women tend to defer to their husbands' preferences. In fishing communities, son preference is rooted not only in economic rationales but also in patriarchal cultural values that devalue women's contributions and labor. The nature of the fishing occupation itself reinforces and amplifies these gendered ideologies, reproducing gendered norms that persist across generations.

The effect of patriarchal system becomes even more pronounced when the data are analyzed by region. The results indicate that in rural areas, where traditional values and patriarchal norms, including strong son preference, have been longstanding and remain prevalent (Hao, 2018), the effect of fishing on fertility is significantly stronger. In contrast, this effect is statistically insignificant in urban areas. The explanation lies in the socio-institutional context: fishing communities are primarily concentrated in rural regions, where patriarchal institutions continue to exert a powerful influence on gender relations and family structures. By contrast, in urban areas, women's social status, access to education, and employment opportunities have increased substantially, thereby weakening the gender norms associated with son preference. As a result, fishing does not have a significant impact on fertility behavior in urban contexts. A regional disaggregation of the sample analysis between Northern and Southern Vietnam reveals a similar pattern. In the North, where Confucian cultural values and son preference remain more deeply rooted, the effect of fishing on fertility is statistically significant. Conversely, in the South, where Confucian influence is relatively weaker, fishing has little or no measurable impact on fertility behavior.

5.2 Discussions and recommendations

5.2.1 Discussions

Evaluation of fishing household and well-being of women using capability approach

Gendered occupations in fishing communities reinforce traditional roles (women as caregivers, man as providers) align with traditional fertility norms. From the perspective of the capability approach, the patriarchal institutional structure acts as a constraint on women's capabilities by limiting their access to economic resources and reducing their ability to convert those resources into actual capabilities—in this case, the capability to translate reproductive choices into desired actions. Patriarchal institutions restrict women's capability sets by

imposing gendered norms through the gendered division of labor and by shaping personal choices. This division of labor systematically devalues and marginalizes women's work (Hao, 2018; Charles et al. 1996)

Such livelihood structures reinforce traditional gender roles and patriarchal social structure. This gendered division of labor reinforce patriarchal expectations combined with economic insecurity and affects women's autonomy, fertility preferences, and access to reproductive health services (Harper et al., 2013, Marine Policy 38:125–133). Women face double pressure, for being underestimated in their work and confronting societal and family expectations regarding fertility decisions. Firstly, the traditional cultural value man's work as important and making substantial contribution to the income of family. Whereas, the preparation before and after catching fish is considered not fishing, such as gleaning, net weaving and repairing, preparing ice, transporting fish, sorting and selling seafood, which are usually done by women (Fabinyi et al. 2022). Their role in fishing sector is usually overlooked. Many case studies have found that the contributions of women in fishing are considered secondary and undervalued, despite the fact that they frequently work longer hours—balancing both household responsibilities and inland tasks (Kusakabe et al. 2004, Tran 2021, Ta 2021). Secondly, the uncertainty because of fluctuations in catch and market prices, environmental changes and overfishing threaten the livelihood of fishing communities, thus they desire for more children as labor and as economic security, especially son. Women have limited freedom in determining family size, as fertility decisions are tied to both economic needs and social norms regarding reproduction. Additionally, low levels of education and restricted access to healthcare and contraception further weaken women's control over their fertility decisions.

In coastal regions of Vietnam, particularly in the Central provinces, which suffer from frequent natural disasters such as storms and floods, women have very limited alternative livelihood options due to low levels of regional economic development and generally low educational attainment. Most women engage in subsidiary work that supports their husbands' fishing activities. These jobs are typically informal, low-paid, and not recognized as official employment. Moreover, women are primarily responsible for unpaid domestic and caregiving work, which, although essential to maintaining the functioning of the household, does not generate income. As a result, women are economically dependent on their husbands, creating an imbalance of bargaining power within the family (Hao, 2012). Gender division of labor subordinate the position of women and make them dependent on their husband. Despite the family planning program and national trends toward smaller families, cultural pressure to have sons can delay a full demographic transition for regions holding patriarchal culture. The broader socio-economic context of the fishing industry reinforces and amplifies the ef-

fects of patriarchy and son preference. The patriarchal system embedded in fishing communities constrains women's capabilities, limiting their choices, increasing their vulnerability, and ultimately reducing their overall well-being.

5.2.2 Recommendations

The widespread belief that large families and a preference for sons are essential for going to sea is very difficult to change, as it is closely tied to the livelihoods of fishing families and deeply rooted in coastal life. However, policies that act comprehensively and touch multiple dimensions can gradually bring about positive change. The ultimate goal of such policies should be to enhance well-being, expand autonomy and freedom of choice, and enable individuals to live the kinds of lives they have reason to value.

For women in fishing communities, they face numerous barriers in accessing resources and are under pressure from institutions that constrain their decisions, particularly decisions related to childbearing. Removing institutional barriers and improving access to resources would not only enhance the well-being of women, but also that of their children, families, and communities.

First, policies should facilitate the accessibility of resources for fishing communities, especially for women. Improving access to resources ensures that, women actually have the means to exercise their choices. Facilitating the accession of resources can be conducted by promoting alternative livelihoods (for example: aquaculture management, seaweed farming, fish processing, eco-tourism) to reduce dependence on male or family labor at sea. Health care, education and social services also must be improved in the coastal region so that fishery populations have better access to these services.

Second, improving women's well-being in fishing communities, is not merely a matter of expanding access to resources, but rather of enhancing women's capabilities, by dismantling the influence of gendered norms that impede their ability to make genuine and autonomous reproductive decisions for themselves. Removing institutional barriers and introduce the enabling ones means can facilitate the conversion of means into capabilities. In order to do so, we need to enhance the status of women both within the family and in society. For the reason that collective action and social interaction among women group will initiate a transformation, weaken the entrenched gender norms that limit their autonomy. The social status of women can be conducted through reforming the social, legal, and policy structures that restrict women's autonomy, such as discriminatory inheritance laws, male-dominated fisheries governance, or rigid gender norms that limit women's decision-making about fertility and livelihood. Specially, we should design community-based education programs that include both women and men, addressing gender norms and son preference, collaborate with local women's unions and fisheries associations to deliver culturally sensitive messages about gender equality and well-being, review fisheries governance

structures to ensure women's participation in local decision-making bodies, introduce gender-sensitive budgeting in coastal development projects to ensure women's needs, enforce laws protecting women's rights to property, credit, and inheritance. (Hao, 2012) suggested that coastal development policies need to be gender sensitive in order to permit equal access to resources, income generation, a voice in development planning, training courses and decision making processes. Charles et al. (1994) proposed that participatory, community-based projects demonstrate that empowering women through training, organization, and policy inclusion enhances both social welfare and fishery sustainability. Sustainable fisheries development therefore depends on recognizing and strengthening women's economic and leadership roles.

5.3 Conclusions

The impact of fishing occupation of fertility behavior is not only the consequences of economic reasons, but also the influence of social norms. Embedded in economic and social factors is the patriarchal ideology, this institution create gendered norms and gendered division of labor that systematically subordinate the position of women. This constraint the autonomy and well-being of women. The poverty faced by fishing communities in Vietnam is not only because lacking resources, but also by the limited capabilities faced by women. Effective policies addressing with the problem in fishing communities and increase well-being of individual, especially for women, should be the ultimate goal. This can be achieved if we give women more opportunity in accessing resources and challenging the gendered norms that systematically undervalue them and constraint their agency.

Although this study is based on a large and highly representative sample, revealing general pattern of the relationship between employment in fishing industry and fertility behavior, its reliance sorely on cross-sectional data prevents it from capturing the dynamics or changes of this relationship over time. Future research using panel data could overcome this limitation. Future studies that measure this relationship in other developing countries would provide additional empirical evidence on the link between fishing occupation and fertility. Moreover, future studies examining the relationship between other occupational groups and fertility would contribute further empirical evidence to warrant for theories explaining how occupational structure influences fertility.

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