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Internal Migration and the Renovation-era Fertility Decline in Vietnam

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Abstract

The Renovation era in Vietnam (since 1986) has been a period of dramatic social change accompanied by large volume of internal migration. This study aims to identify a link between migration and the rapid decline of fertility levels among Vietnamese women in the last stage of the fertility transition in Vietnam. Data from the Vietnam Demographic and Health Survey 2002 was used to examine three theories of socialization, adaptation and migration on women's fertility. These theories are examined by fitting both OLS and Poisson regression models for the number of children ever born. The results most strongly support the adaptation theory after controlling for education, age, age at marriage and wanted fertility. Women adapt to the fertility norms at their place of current residence to a greater extent than their place of birth. More specifically, among women born in rural areas, those who currently live in urban areas have 17 percent fewer children ever born than those who live in rural areas. This seems to be primarily due to adaptation to the new environment rather than to the act of migration itself, suggesting that migrating was not associated with lower or higher fertility during the Renovation era in Vietnam.

Keywords

Fertility decline, internal migration, socialization, adaptation, Renovation era, Vietnam

Introduction

Vietnam has experienced a rapid decrease in total fertility rates from 6.7 in the 1970s to 2.1 in 2000. Total fertility remains around 2 today (World Population Prospects, United Nations; World Development Indicators). During the period 1980 to 2002, age-specific birth rates in the most fertile age group (25-29) have declined almost three times, from close to 300 births per one thousand women to around 120 births per one thousand women. This decline is observed in all regions across Vietnam, despite wide differences in the socio-economic conditions. From 1979 to 1993, the fertility rate declined at an exceptionally rapid rate of 0.17 per year, equivalent to the declines in Taiwan, Singapore, Hong Kong, Malaysia and Thailand during the most rapid years of their demographic transitions (Haughton 1997).

Classic demographic transition theories argue that development initiates changes in lifestyles and improvements in living standards, thus reducing mortality. This, in turn, increases the number of surviving children in families; parents no longer need to have high fertility to make up for the deceased children. At the same time, modern living standards make the cost of having children increase significantly. Gary Becker (1960) suggested that when it is more expensive to raise children, parents are discouraged from having many of them. Kingsley Davis (1997 [1937]: 623) noted that "the family is not infinitely adaptable to modern society, and this explains the declining birth rates." However, the Vietnamese fertility decline happened even before the socio-economic development that was supposed to accompany it took place. Haughton (1997) notes that among all of the countries with rapid rates of annual fertility decline, no country was as poor as Vietnam. Similarly, Bryant (2007) finds that Vietnamese fertility dropped significantly despite low development scores (measured by urbanization, GDP per capita, and nonagricultural employment). In Vietnam in the 1960s, for example, only 10 percent of the population lived in urban areas, GDP per capita was as low as US$100, and life expectancy at birth was about 50. Despite such poor socio-economic conditions, fertility dropped by 20 percent in the 60s and continued to fall from around 7 to around 2 today. The case of Vietnamese fertility decline cannot be explained by socio-economic development theories.

Although the role of migration is not generally considered a central part of classical demographic transition theory, a large body of research finds that migration accelerates fertility transitions (Goldstein 1973; Singley and Landale 1998; Gyimah 2006; Lindstrom and Saucedo 2002). Previous studies show that rural to urban migration typically increases during the process of socio-economic development, and greater exposure to urban life is one the major reasons for lower fertility. The interpretation of the impact of migration on fertility is closely linked to spatial patterns of fertility and the differences between rural and urban areas. People who live in rural areas are accustomed to the norms of high fertility, as family members are the major source of labor and old age security. While early socialization from rural origins might incline later migrants to high fertility, rural to urban migrants are exposed to lower fertility norms at their destinations. In urban areas, families are smaller because of higher costs of rearing and educating children. In addition to the impacts of origins and destinations, the fertility of migrants may also be affected by their personal characteristics such as education, ambition, and innovation.

Three major theories that explain influences on migrants' fertility levels are socialization, adaptation, and migration. The first theory, socialization, posits that the impact of the place of origin on fertility reflects the intergenerational socialization of values and norms in the community of birth or childhood place of residence. The second theory, adaptation, states that the place of current residence influences fertility as

well, through adaptation as migrants adapt to new fertility values in the destination community during their childbearing ages. In addition to these two factors, if the research design includes non-migrants from the places of origin and destination (as in this study) it is possible to distinguish between the influences of socialization and adaptation and the direct effect of migration itself. After controlling for the effects of socialization and adaptation, if migration has net direct effects it may be because migrants have certain personal characteristics that cause them to be different from non-migrants at the origins and destinations, or it may be that the act of migrating itself has a direct impact on women's fertility.

The theory of socialization relies on the notion that fertility preferences are formed in childhood and are deeply rooted in one's upbringing. Even migrants who move to a different geographical setting may be less likely to change those preferences since they have been exposed to such conditions since they were born and throughout their early development. Duncan (1965) provides a clear model to study the impact of social background and social mobility on fertility and finds that women with less exposure to a farm background show lower fertility levels. Ritchey and Stokes (1972) take residence background into consideration and find that more rural exposure (i.e. longer time spent in rural areas) is associated with higher fertility among U.S rural-urban migrant women, even after controlling for age.

The adaptation theory refers to the adjustment in fertility behaviors to the prevailing norms at migrants' destinations. Proponents argue that as migrants spend more time in an area, they are likely to conform to the prevailing norms and values on reproduction, which may bring ideational changes regarding fertility preferences. The adaptation theory thus posits a process of ideational and behavioral change fostered through social interaction as well as economic constraints and opportunities at the current place of living. Gyimah (2006) finds evidence to support this theory using data from the Ghana Demographic and Health Survey. He finds that the fertility of migrants tends to be similar to those at destination areas; continuous urban residence is associated with lower fertility while continuous rural residence is associated with higher fertility. Also, in the long run, long term migrants tend to adapt to the fertility level prevalent at the destinations regardless of their origins. In a study of Puerto Rican immigrant women in the United States, Singley and Landale (1998) point out that both single women and women in unions (marriage or cohabitation) exhibited an assimilation pattern of fertility to the destination. In particular, the regression results show that female Puerto Rican migrants in the United States have lower fertility than non-migrants in Puerto Rico, but higher fertility than American women. Longer time living in United States is associated with lower fertility among Puerto Rican migrants. These findings strongly support the adaptation theory.

If there is a direct impact of migration on fertility after identifying the influences of origin and destination, there are two possible hypotheses about why migration affects fertility. First, migrants may be selective, relative to non-migrants, in terms of age, education, and other characteristics that affect fertility behavior. The selectivity hypothesis refers to the tendency of migrants being selective for individual characteristics that associate with lower or higher than non-migrants' fertility. Selectivity may occur on the basis of observable characteristics, such as age, education, and occupation or unobservable characteristics, such as mobility aspirations or openness to innovation. A study by Chattopadhyay et al. (2006) on migrants in Ghana finds evidence for the selection hypothesis in the way that fertility of migrants mimics the fertility of women in destination areas even before migration. In addition, migrants may be selected for higher education, which is closely related to lower fertility. A number of previous

studies suggest that women's education is a strong indicator for fertility changes (Blau and Duncan 1967; Jensen and Alhburg 2004; Lindstrom and Saucedo 2002; Singley and Landale 1998).

Alternatively, migration experience may have a direct impact on fertility. The experience of migration creates lifestyle changes that require time for the movers to adjust to. This results in disruption or delay in the timing of marriage and child bearing (Singley and Landale 1998; Rindfuss 1976). Nevertheless, the disruption effect of migration is only visible in short term migrants and diminishes in lifetime migrants, as shown in evidence from Thailand (Goldstein 1973). Chattopadhyay et al. (2006) also finds support for the disruption effect in delaying higher-order births of migrants; however, it has little effect on the total number of children. In the Philippines, Jensen and Alhburg (2004) find that migration has an effect on fertility only if migration followed by paid employment; otherwise, the effect of migration on fertility decline is very minimal.

The decline in Vietnamese fertility from the 1960s to the early 2000s is especially remarkable despite the socio-economic hardships during and after the war. This decline cannot be explained by classical development theories, which suggest higher levels of development result in lower level of fertility. This study examines an alternative explanation, the possible role of internal migration in the decline in Vietnamese fertility. In this paper, I use data from the 2002 Vietnam Demographic and Health Survey to apply the three theories of socialization, adaptation and migration to the fertility transition in Vietnam during the Renovation era in the period before Vietnam's fertility rate stabilized at around 2 in the early 2000s.

Migration in Vietnam

The literature on migration in Vietnam has highlighted two types of migration before and after the Renovation era: organized migration and voluntary migration. After the 1975 reunification of North and South Vietnam, massive migration was organized by the government with the purpose of constructing new economic zones in less densely populated areas, mostly in the Central Highlands and rural or mountainous areas. The ambition of the government was to move about ten million people to new economic zones. No other form of migration was permitted at the time except for the government's organized migration. People moving between regions were strictly monitored through the household registration system. The purpose of this household registration system, which was adopted from a similar system in China, was to control population flows and give priority to urban-based heavy industry (Hardy 2003). As a consequence, negative to slow urban population growth was registered, especially in the mid-late 1970s (Zhang et al. 2006).

Despite the government's effort to control population flows and redistribute population, poor planning and lack of infrastructure forced many migrants to move back to their areas of origin. Desbarats (1987) estimated that the effectiveness of the combined rustication and resettlement schemes was only 30–50 percent of the official targets during the 1970s. If the number of return migrants, estimated at a rate of 50 percent, were counted, the actual effectiveness of the policy would be further reduced to about 15–25 percent (Zhang et al. 2006).

A turning point in Vietnamese history occurred in 1986 with the Renovation policy, called the *Doi Moi* in Vietnamese, which transformed the country from a centrally planned system to a market-driven economy.

The transformation promoted the private sector and accepted private ownership, which created more incentives for economic activities but also removed the subsidy system for lower income families.

Before the Renovation, most migration took the form of government's programs of re-distributing population, and most of the moves were from one rural area to another to work in agriculture or forestry. After the Renovation, more economic pressure and opportunities between areas encouraged more voluntary internal migration. Attracted by the development of urban areas, many people left their home villages for the cities searching for better opportunities. According to the 1999 Vietnam Census, about 4.5 million people changed their residence between 1994 and 1999 (CCSC 1999).

Migration at this time was the result of voluntary decisions by households or individuals, not by the government. Data from the 2004 Vietnam Migration Survey reveal approximately 80 percent of migration decisions were made by migrants themselves or together with family members (GSO 2005). Of the total migrants, 55 percent migrated within their original provinces and 45 percent moved between provinces (Dang 2003). The process started since the beginning of decollectivization in rural areas, which provided considerable incentives for rural labor, leading to improved agricultural productivity. The resultant increase in productivity has made the problem of rural underemployment and unemployment more visible. The growing surplus of rural labor began to interact with the emerging non-state market and responded to market opportunities away from their home villages. Moreover, the household registration system was weakened, which made people leave their residence more freely to search for better opportunities. Furthermore, the private sector changed from being restricted to being encouraged, which created more jobs for migrants. Overall, the Renovation period has been marked by increased migration in both rural–urban and rural–rural directions (Zhang et al. 2006).

According to White et al. (2001), three major factors that contributed to the Vietnamese fertility decline are the family planning policy, the migration policy, and the change from subsidized economy to market-driven economy after the Renovation. They find that the family planning program and the economic reform are the major factors contributing to the decline, while the impact of migration, in the form of population redistribution, is less pronounced. It is important to note here that their definition of migration only includes forced migration to New Economic Zones by the government. The VNDHS 2002 sample (used in this paper) measures migration in the Renovation era, when such programs had ended and all migrations were entirely voluntary.

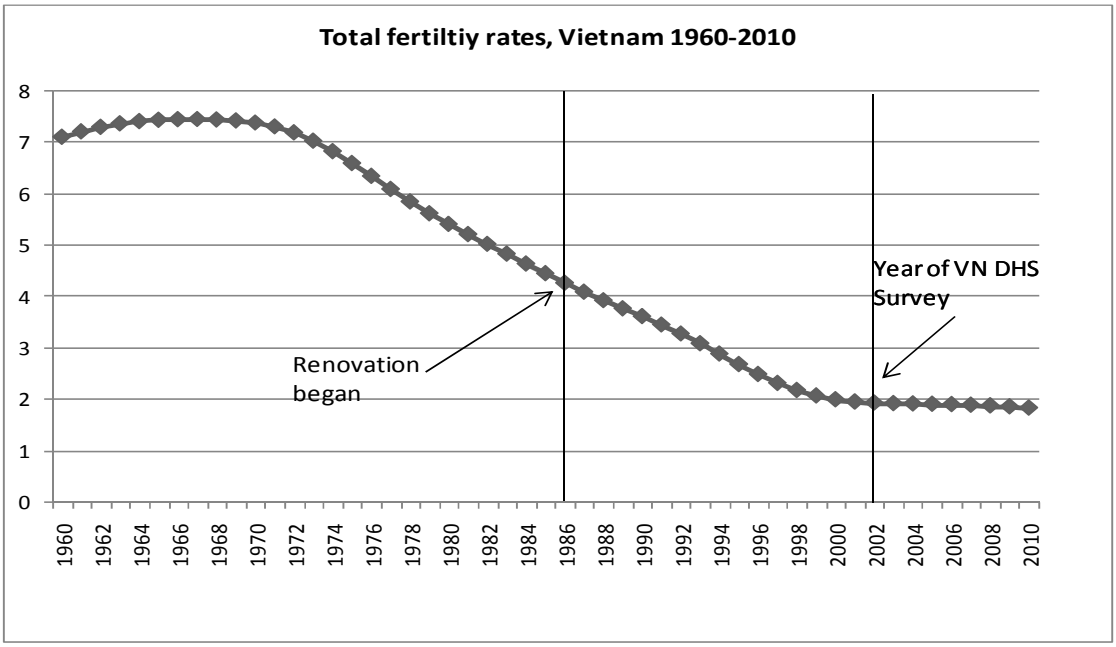
The General Statistics Office of Vietnam estimates that nearly 70 percent of migrants move because of economic reasons (GSO 2005). Therefore, the majority of migrants participate in the labor markets of receiving areas. For women, having to work means more sacrifices in time and labor costs to have children. Therefore, migrants may have fewer children than non-migrants in their origins. On the other hand, the migration experience requires time for the movers to adapt to new life, thus they may delay the timing of child bearing. Both factors would tend to reduce fertility levels for migrants.

Vietnamese fertility before and after the Renovation

The literature on Vietnamese fertility finds that it has been dropping rapidly since the 1960s despite the socio-economic conditions that the country has experienced. Figure 1 shows a dramatic decrease in the total fertility rate in Vietnam from above 7 in 1960 to below 2 in 2010. Before the Renovation in 1986,

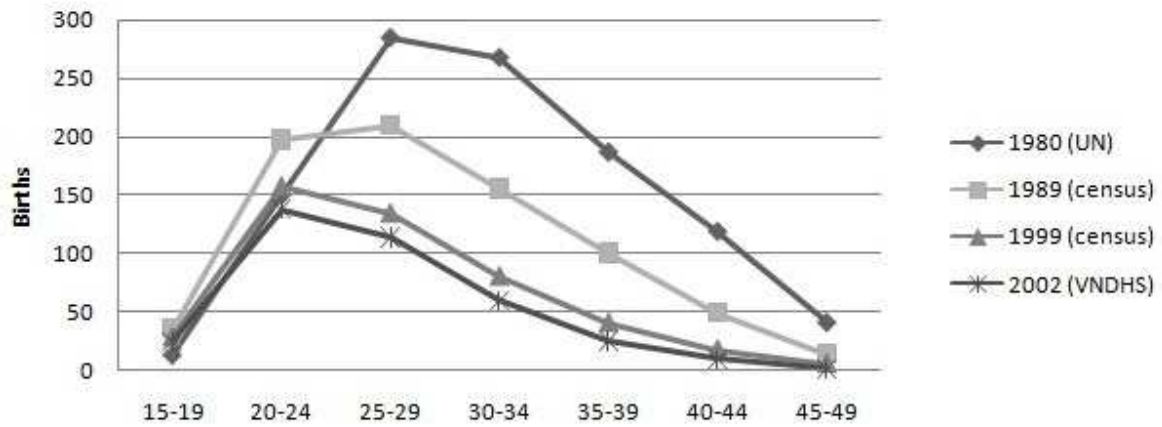
fertility levels decreased from more than 7 to more than 4 children per woman. After the Renovation, Vietnamese fertility continued to drop significantly. By 2002 it was only just above 2, much lower than the predicted total fertility rate of 4 based on development indicators such as literacy and gross domestic product per capita estimated by Bryant (2007).

Figure 1: The fertility trend in Vietnam



Source: World Development Indicators, 2012

Figure 2: Trends of age-specific birth rates



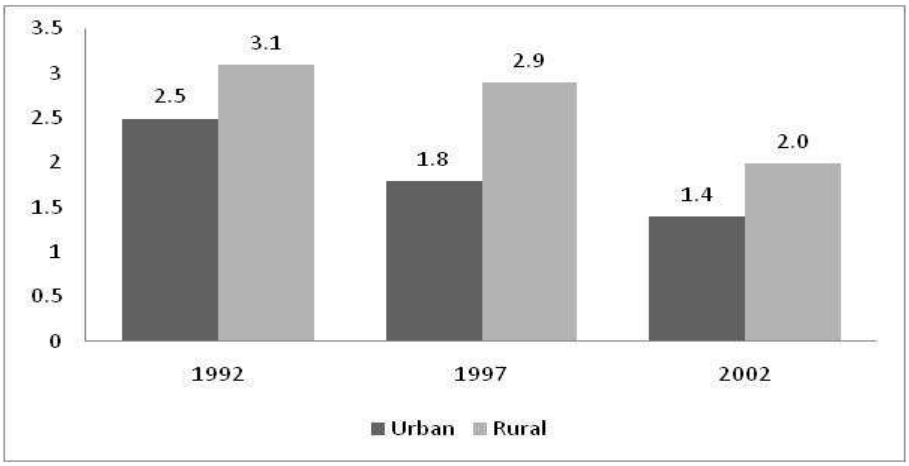
Sources: Compiled from World Fertility Patterns 2007 – United Nations Population Division, Vietnam Census 1989, 1999; VNDHS 2002

Together with the decline in total fertility rate, significant declines in age-specific fertility are observed. Figure 2 shows that fertility declined in all age groups between 1980 and 2002. Data were compiled from the World Fertility Patterns 2007 by United Nations Population Division, the Vietnamese Census 1989, the Vietnamese Census 1999, and the Vietnam Demographic and Health Survey 2002 to show the decline in age-specific fertility from 1980 to 2002.

Most births occur among women aged 19-34; accordingly, the highest fertility rates are observed in the age groups 20-24 and 25-29. These are also the ages at which most Vietnamese women marry. The rates decline significantly in older age groups. While there is not much difference in the youngest age group (15-19) across the years, the difference in older age groups is dramatic, especially for women aged 20-24 and 25-29. In about two decades, the age-specific fertility among women aged 25-29 declines by almost two thirds, from nearly 300 births to 120 births per 1000 women.

Figure 3 shows the urban-rural difference in total fertility rate. The majority of the Vietnamese population lives in rural areas; about eighty percent in 1980 and seventy-four percent in 2003 (Aassve et al. 2006). From 1992 to 2002, total fertility rate declined in both rural and urban areas by about 1.1 children per woman. However, the total fertility rate in urban areas has always been lower than that of rural areas. In 2002, when the VNDHS data were collected, there was still a 0.6 child difference between rural and urban fertility rates.

Figure 3: Trends of urban and rural Total fertility rates 1992-2002



Sources: Vietnam Living Standard Survey 1992-1993, VNDHS 1997, VNDHS 2002

The Vietnamese General Statistics Office (1999) reports that age-specific fertility is also different in urban and rural areas in the period from 1988 to 1998. During that decade, the age specific fertility of rural areas was always higher than that of urban areas. Nevertheless, patterns of fertility are similar; with most births concentrated in the age group from 19 to 34. Over the period of ten years, there was a reduction in age specific fertility in both urban and rural areas, and the gap in age specific fertility of urban and rural areas lessened. However, the difference still remains, especially in younger age groups.

Data and design of the study

This paper uses data from the Vietnamese Demographic and Health Survey (VNDHS) 2002 to investigate the determinants of fertility (and, implicitly, or fertility decline) in the Renovation era in Vietnam. The survey was designed and the data collected by United States Agency for International Development and the Vietnamese General Statistics Office. The survey includes information on households and eligible women living in these households. There are 5,665 eligible women, defined as ever-married and aged 15-49. The sample was carefully selected to be both geographically and demographically representative. The observed average numbers of children ever born (CEB) by age group for the sample are reported in Table 1.

Table 1: Observed CEB by ever-married women, classified by age groups and current residence (eligible women, VNDHS 2002)

	Urban	**Rural**	**All**	**N**
15-19	0.37	0.37	0.37	67
20-24	0.86	1.06	1.03	550
25-29	1.19	1.80	1.67	983
30-34	1.69	2.36	2.21	1063
35-39	2.05	2.97	2.74	1125
40-44	2.56	3.58	3.32	1056
45-49	2.92	4.26	3.87	821
N	1300	4365	5665	5665

Data were collected in 2002, coinciding with the leveling off in Vietnam's fertility decline (as seen in the Figure 1). This study focuses on the 3,002 women between in the VNDHS 2002 who were between the ages of 35 to 49 at the time of survey. There are substantial reasons for focusing on this age group. First, since the women were at between the ages of 35-49 at the time of the survey, it is likely that their childbearing was mostly finished, which means that their number of children is most likely the completed number. Hence, analyses based on their number of children are more meaningful than the equivalent figure for younger women who may not have completed their childbearing. Second, women aged 35-49 at the time of survey were between 19-33 years old in 1986 (the beginning of the Renovation era), their most fertile ages. Their most fertile years overlapped with the increase in the volume of internal migration after the Renovation policy. Thus, the cohort of women who were age 35-49 at the time of the VNDHS in 2002 is the most appropriate cohort for studying the relationship between fertility decline and internal migration after the Renovation.

In this study, fertility is measured by the number of children ever-born (CEB). Both OLS and Poisson regression models are fitted to this number. Controls variables include age at the time of survey (in years), age at first marriage (in years), wanted number of children, and highest year of education. Blau and Duncan (1967) find women with higher education have lower fertility. Similarly, Jensen and Alhburg (2004) observe that Filipino migrant women with secondary and tertiary education have longer

conception intervals than women with low education. Bongaarts (2003) also notes the significantly lower than average in the total fertility of women with secondary education or higher.

In addition to education, wanted fertility is an important control variable. In the Vietnam Demographic and Health 2002 survey, wanted fertility is determined by the question "if you could go back to the time you did not have any children and could choose exactly the number of children to have in your whole life, how many would that be?" Bongaarts (2003) finds that wanted fertility and actual fertility are relatively parallel with each other when plotting these two variables for developing countries, with actual fertility always higher than wanted fertility. Moreover, data from Brazil, Thailand, and Vietnam show that these two variables are inversely related to educational level, meaning that women with higher educational levels want fewer children and in fact, they have fewer children than those with lower education (Bongaarts 2003). Therefore, in this study, wanted fertility is included as a control variable with the expectation that women with higher ideal numbers of children are more likely to have higher numbers of children, and vice versa. Studies in the Philippines (Hiday 1978; Jensen and Ahlburg 2004) suggest age at marriage is negatively associated with fertility so this variable is also included in the examined models.

Three key independent variables in this study are place of birth, place of current residence, and migration status. Type of place of origin is self-determined by the respondents (city/town/countryside) bases on a question about their childhood place of residence ("For most of the time until you were 12 years old, did you live in a city, in a town or in the countryside?"). Although no information about the birth places of the respondents is recorded, the question specifically asked about the place that the respondents spent the majority of their childhood, so this study assumes that childhood place of residence is equivalent to birth place. This variable is later operationalized to "urban/rural" by combining the two categories of "city" and "town" into "urban." Since this information is solely based on the respondents' memories about their childhood residences, it is possible that some misclassifications might happen. However, urban and rural areas are quite distinctive, so such misclassifications are likely to be rare.

In the VNDHS, place of current residence is recorded in both exact locations and in type of residence (urban/rural). There are 7 major administration regions and 64 provinces in Vietnam. The two largest deltas, the Red River Delta and the Mekong River Delta, are the most populated and developed. The two largest cities, Hanoi and Ho Chi Minh City, are located in these two regions. Although each province has its own capital, which is more urbanized than the rest, their sizes and levels of development are not comparable to the two largest cities. The mixture of urban/rural population in the same region makes it difficult to compare the fertility across regions. Instead, this paper compares the fertility differential between rural and urban areas from all regions. Most studies about migration and fertility use urban/rural mobility instead of regions. Using the simple urban/rural comparison makes it convenient to test theories and compare the results with those of other studies.

Migration status is determined by how long the respondents have lived in their current places of residence. Based on their answers, a variable on migration status is computed. Women who had always lived at their current places of residence or moved to their current places of residence before the age of 18 are categorized as non-migrants. The age 18 years old is chosen as a cut-off point for migration status with the assumption that migration before age 18 is usually not the result of the respondents' decisions, but is more likely the result of their parents' or other older family members' decisions. Migrants in this study are defined as women who changed their residence at the age of 18 or older.

Results

Table 2: Descriptive characteristics of the studied sample, by types of migration

	Observed CEB (mean)	Age (mean)	Age at marriage (mean)	Years of Education (mean)	Wanted fertility (mean)	Percent of sample
Urban non-migrants	2.51	41.42	22.19	8.72	2.88	11.8
Rural non-migrants	3.58	41.36	20.50	6.98	2.72	45.3
Urban-urban migrants	2.27	41.37	22.61	9.08	2.20	5.6
Rural-rural migrants	3.45	41.56	21.64	7.50	3.25	24.6
Urban-rural migrants	3.21	42.17	21.51	8.85	2.83	2.7
Rural-urban migrants	2.58	42.09	22.61	9.95	2.72	7.9
All	3.25	41.49	21.31	7.80	2.85	100.0

Women aged 35-49, total N =3,002

Table 2 shows the characteristics of selected sample (women aged 35-49) by their types of migration. Four types of migrants (urban-urban, rural-rural, urban-rural, and rural-urban); and two types of non-migrants (urban non-migrants, rural non-migrants) are identified. Rural non-migrants account for the largest proportion of the sample. The observed CEB of this group is the highest, 3.58 children per woman. An additional one quarter of the sample moved from one rural area to another. Only 7.9 percent moved from rural to urban areas, quite a small percentage despite the conventional thinking that this flow of migration contributes to the majority of internal migration. Very few people moved from urban areas to rural areas. People moving between urban areas have the lowest number of children, only 2.27 compared to the average 3.25 of the sample.

Five models have been estimated to examine three theories of fertility: [1] socialization (fertility is determined by places of origin), [2] adaptation (fertility is determined by places of current residence), and [3] migration (fertility is determined by the characteristics of migrants or the act of migrating). The dependent variable is the number of children ever-born (CEB) of women aged 35-49. Results are reported for both OLS (Table 3) and Poisson (Table 4) regressions.

The first model, which is the base model, includes four control variables: age (in years), education (in years), age at first marriage (in years), and the ideal number of children (wanted fertility).

The second model takes into account place of birth to test for the socialization theory with the idea that women who were born and raised in rural areas have values favoring higher fertility, while women who were born and raised in urban areas are socialized to urban values which favor lower fertility. If the socialization theory is true, ideas about the appropriate level of fertility are shaped when the women were young and are not affected by where they currently live.

Model 3 tests for the adaptation theory by taking into account the place of current residence. Fertility is believed to be adapted from the values of the places where the women are currently living, regardless of the types of places they came from. If this theory is true, the fertility of women who came from rural areas

but currently live in urban areas will be close or similar to women who were born and currently live in urban areas.

Model 4 tests for the migration theory by adding the migration status variable while controlling for age, age at marriage, education and wanted fertility. A negative coefficient means that migrants have lower fertility than non-migrants.

Lastly, Model 5 directly tests all three hypotheses at the same time by adding place of origin, place of current residence, and migration to the base model with four control variables. Model 5 is the full model with all independent variables included.

Table 3: OLS regression for CEB

Variables	**Model 1 Base**	**Model 2 Socialization**	**Model 3 Adaptation**	**Model 4 Migration**	**Model 5 Full**
Intercept	2.874	2.813	2.613	2.868	2.628
Age	0.105*	0.105*	0.108*	0.105*	0.107*
Years of education	-0.11*	-0.112*	-0.100*	-0.118*	-0.100*
Age at first marriage	-0.152*	-0.149*	-.0145*	-0.152*	-0.145*
Wanted fertility	0.031*	0.032*	0.033*	0.031*	0.033*
Place of birth (urban=1)		-0.395*			-0.098
Place of residence (urban=1)			-0.510*		-0.451*
Migration (migrant=1)				-0.027	-0.000
R-squared	0.368	0.378	0.387	0.368	0.388

** significant at p-value <0.05*

Table 3 reports the OLS regression results for the five models estimated. The R-squared for the base model with all control variables included is 0.368, meaning these four variables explain about 36 percent of the variation in the number of children ever born. In the base model, all four control variables show significant effects on the number of children ever born. *Age* and *wanted fertility* are positively associated to fertility. Meanwhile, *age at first marriage* and *education* are negatively associated with fertility.

Model 2 tests for the effect of socialization by adding *place of birth*, using rural place of birth as the reference category. Results from this model show that women who were born in urban areas have on average 0.395 children fewer than those born in rural areas, after controlling for all of the control variables.

Model 3 tests for the effect of adaptation, using the *place of residence* variable. Place of residence shows a significantly negative coefficient to the number of children ever born. Women who live in urban areas

have 0.51 children fewer than women who live in rural areas. Four control variables stay relatively similar to the base model.

In Model 4, the migration model, the variable migration status is added to the base model. Migrants have on average 0.027 children fewer than non-migrants; however the coefficient is not significant. The control variables are similar to the base model.

Model 5 is the full model with all independent variables included. Women with urban background and urban current residence have fewer children than rural women. In particular, women who were born in urban areas have 0.098 children fewer than women who born in rural areas; and those who live in urban areas have 0.451 children fewer than those who live in rural areas. Migrant women have slightly children fewer than non-migrants women, however, the coefficients of *place of birth* and *migration* are not statistically significant, indicating that the socialization and migration theories are weaker explanations of fertility than the adaptation theory.

Models 3 and Model 5 have similar R-squared; however, Model 5 sacrifices two extra degrees of freedom. An F test comparing the R-squareds of Models 3 and 5 indicates that the improvement in R-squared in Model 5 is not significant. Thus, adding *place of birth* and *migration* does not improve the fit of the model.

Table 4: Poisson regression for CEB

Variables	**Model 1 Base**	**Model 2 Socialization**	**Model 3 Adaptation**	**Model 4 Migration**	**Model 5 Full**
Intercept	1.168	1.149	1.080	1.167	1.088
Age	0.032*	0.033*	0.033*	0.032*	0.033*
Years of education	-0.037*	-0.034*	-0.031*	-0.036*	-0.031*
Age at first marriage	-0.054*	-0.053*	-0.051*	-0.054*	-0.052*
Wanted fertility	0.006*	0.006*	0.006*	0.006*	0.006*
Place of birth (urban=1)		-0.150*			-0.042
Place of residence (urban=1)			-0.189*		-0.165*
Migration (migrant=1)				-0.005	0.005
-2LL	9528.252	9498.656	9476.810	9528.183	9475.285

** significant at p-value <0.05*

Although fitting the data with OLS regression models tends to support the adaption theory, for countable outcomes Poisson regression is a better statistical technique to use since the dependent variable represents counts of the number of children ever-born. Negative binomial models allowing for overdispersion in the

dependent variable were attempted but did not converge. In the Poisson models, the coefficients represent the logarithms of the proportionate change in the average number of children ever born when the value of the variable increases by one unit, holding everything else constant. Poisson regression models are estimated using iterative maximum likelihood. As a result, the relative fit of nested models can be compared using a likelihood ratio test.

Model 1 is the base model which includes all control variables, *age*, *age at first marriage*, *education* and *wanted fertility*. Results from the Poisson regression mirror those achieved using OLS regression. *Age* and *wanted fertility* have positive effects on the average number of children. For women in child bearing age, the longer the exposure, i.e. being married, the higher the chance of getting pregnant. Wanted fertility is also positively related to the actual number of children ever born. Women who prefer higher number of children will eventually have more children than those who prefer fewer children. This model also shows that *education* and *age at first marriage* are negatively associated with CEB. Women with lower education have more children than women with higher education, specifically, each year of education increase the chances of the woman having more children by an average of 4 percent. Consistently with the literature, in this sample education shows a very strong effect on fertility.

Model 2 tests the theory of socialization by adding *place of birth* to model 1. The coefficients of all four control variables are relatively similar to those in the base model and *place of birth* shows a negative coefficient. *Place of birth* is a dummy variable with "urban" equals 1 and "rural" equals 0. The exponentiation of -0.15 gives a 14 percent change when comparing rural and urban birth place, holding other variables constant. Therefore, women who were born in rural areas are expected to have 14 percent more children than those who were born in urban areas.

Model 3 tests the theory of adaptation by adding *place of current residence* to Model 1. In Model 3, *place of residence* is a dummy variable which takes urban residence at value 1 and rural residence as reference category. Urban residence shows a strong effect on the number of children. Women who live in urban areas have on average 17 percent fewer children than their counterparts living in rural areas. Four control variables barely change compared to the base model.

Model 4 test the theory of migration by adding *migration status* to Model 1. In Model 4 the average number of children of migrants is about 0.05 percent lower than that of non-migrants, holding other variables unchanged. However, the coefficient is not statistically significant. In this sample, migrants have lower number of children than non-migrants; yet, the relationship between migration status and fertility is not significant. Again, all four control variables stay relatively similar to the base model.

Model 5, takes all three variables *place of birth*, *place of residence* and *migration* into consideration. The coefficients of the four control variables, *age*, *age at marriage*, *education* and *wanted fertility*, remain relatively unchanged compared to the base model. Interestingly, *place of birth* loses its significance in this model. It is significant when using it as the only variable in Model 2, but when adding the variable of *place of residence* the significance diminished. Similar to Model 3, in Model 5 women who reside in urban areas have 15 percent fewer children compared to women who live in rural areas. The migration variable, non-significant in Model 4, is still non-significant in Model 5.

Model 3 is a nested model of Model 5. The likelihood ratio test gives a result of 1.525 (9476.810 - 9475.285= 1.525) with 2 degrees of freedom. The p-value of a chi-squared test of 1.525 with 2 degrees of freedom is p = 0.466, indicating that Model 5 does not significantly improve on the explanatory power of Model 3.

The results from both OLS and Poisson regression modeling support the adaptation theory and cast doubt on the socialization and migration theories. For women in this sample, place of residence is the most important determinant of their number of children, despite their birthplaces and migration statuses. This confirmation of the adaptation hypothesis is consistent with a number of previous studies (Lindstrom and Saucedo 2002; Rindfuss 1976; Giymah 2006; Singley and Landale 1998). Migration as such certainly cannot account for the fertility decline observed in Vietnam in the Renovation period. Adaptation to new surroundings, however, might hold the key.

Conclusion

Fertility in Vietnam has declined significantly in the last few decades from above 6 to about 2 children ever born to a woman. This analysis of the Vietnam Demographic and Health Survey 2002 tries to link the decrease in fertility levels from the Renovation era to until early 2000s with the concurrent increase in internal migration in Vietnam at the same period. The literature suggests three different theories — socialization, adaptation, and migration — to explain the relationship. This study examines these three theories by fitting both OLS and Poisson regression models for the number of children ever born and finds by far the strongest support for the theory of adaptation.

For this sample of women aged 35-49 in 2002, place of current residence significantly affects the number of children ever born. Women who live in urban areas show a significant 17 percent lower number of children compared to women who live in rural areas after controlling for age, age at migration, wanted fertility and education. Consistent with the literature, education appears to be a strong control variable in fertility, more specifically, each year of education deceases 3 percent in the number of children ever born.

Place of birth shows significant coefficient in the model testing the socialization theory in isolation, however this result seems to have been caused by a correlation between *place of birth* and *place of residence*. The correlation between these two variables is 0.67. The high correlation implies that, for migrants, a woman who was born in a rural area has a tendency to move to other rural areas, while a woman who was born in urban area is more likely to move to areas with similar level of urbanization. Likewise, for non-migrant women, their birth places are by definition also their current residences. Multiple regression results show that place of birth does not have a net effect on the number of children ever born by a woman; thus this study does not provide support for the socialization theory.

In this sample, being a migrant does not significantly decrease the number of children ever born compared to a non-migrant, net of other factors. The possible explanation is that most of the moves are between rural areas, probably for the purpose of getting married and moving into the husbands' families. The similarity in fertility levels in rural areas might be the reason why migrant women do not have significantly lower fertility than non-migrant women. A previous study of migration and fertility in the Philippines suggests that if migration is not followed by work for pay then the fertility decline is minimal (Jensen and Alhburg 2004). In Thailand, Goldstein (1973) finds that migrants who moved within 5 years

have considerably lower fertility than non-migrants at the destination, probably because of the spousal separation thus reduce their fertility. However, she also observes no difference in the fertility levels of lifetime migrants and non-migrants at the destination. Similarly, Chattopadhyay et al. (2006) come to the conclusion in the case of Ghana that migration only has effect on the timing of higher-order births but not on the total number of births. In Vietnam, this analysis finds little evidence for the theory of migration.

Many studies have shown a link between current residence and fertility (Giymah 2006; Singley and Landale 1998). The evidence presented in this paper supports that conclusion: women adapt to the fertility norms at the places that they currently live; higher fertility levels are prevalent in rural areas while lower fertility levels are predominant in urban areas. Despite the concurrence of large volume of migration and the fertility decline up until early 2000s, results from this study suggest migration was not a major cause of the last stage of the fertility transition in Vietnam. Prior research linking migration and fertility decline seems to have been premised on a false assumption that most migration was rural — urban, when in fact most migration was rural — rural, resulting in little effect on fertility. The post-Renovation fertility decline in Vietnam was more likely caused by changes in norms *in situ* than by the large scale migrations during that period.

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