Cohort Influence and Cumulative Causation: Reconsidering Demographic Factors in Explanations of Migration Momentum

Sara Curran
University of Washington
Seattle, Washington

Michelle Shannon
University of Washington
Seattle, Washington

September 30, 2013

Abstract

Recently migration and demography scholars have considered how demographic transitions are related to migration transitions. We explore these ideas with an analysis of a unique dataset to consider both variable patterns of demographic transitions across villages and variable patterns of migration (whether to migrate, length of migration trip, and likelihood of return). We evaluate how members of cohorts born prior to the fertility boom, in the midst of the fertility boom, and after the boom have experienced migration and been influenced by migration institutions. We observe distinctly different patterns of migration for each cohort, indicating shifting roles and meanings of migration for rural communities. Furthermore, migration momentum effects and migrant selectivity change with successive cohorts. The demographic dividend appears to be directly and indirectly related to growing rates of migration. However migrant members of younger cohorts in the emerging demographic deficit cohorts have increasingly attenuated ties to origin.

DRAFT NOT FOR CIRCULATION. Draft prepared for the 2013 THEMIS Conference: Examining Migration Dynamics. September 23-25, 2013, Oxford University

1 Introduction

Recent theory and evidence demonstrates compelling evidence for the growth of migration and its endogenously derived momentum across many different settings around the globe. Migrant institutions, including migrant networks, emerge to facilitate and ease the costs and enhance the benefits of migration. In some origin community contexts, eventually migration can become a part of the communitys culture or an expected element of a persons life course trajectory. However we should not forget that these emergent and endogenously derived phenomena fueling migration have also coincided with other dramatic demographic changes over the last 40-50 years, including mortality declines followed by fertility declines, often referred to as the demographic transition. Recently both migration and demography scholars have begun to consider how demographic transitions are related to the idea of migration transitions. We explore these ideas with an analysis of a somewhat unique dataset that allows us to consider variable patterns of migration across cohorts born between 1955 and 1978 and living in rural Thailand. We evaluate how cohorts prior to the fertility boom, those born in the midst of the fertility boom, and those born after the boom have experienced migration and been influenced by migration institutions. What we observe is that while the size of cohorts may have served to propel cohort members to leave their home communities and become migrants during the baby boom years, subsequent, smaller-sized cohorts show continued tendencies to migrate. We suggest that these prospective longitudinal life history data indicate a shifting culture of migration from old to young cohorts and more evidence of how a migration transition is occurring, even in the relatively small, geographic context of rural-urban, internal migration in Thailand.

In what follows, we review the emerging literature on demographic transitions and migration transitions. We summarize the primary conceptual and theoretical ideas and then turn to some of the evidence linking these ideas. We also briefly review the methodological approaches that have been used to evaluate these transitions and their relationships, noting how the theories are extraordinarily data demanding. Finally, we discuss the literature on Thailand and its demographic and migration transitions. Following this background review, we provide a description of the unique data available for this project, its relevance and value for understanding variable patterns across communities, and particularly variation in cohort size, and variability in migration patterns across villages. Given this context, a description of our methodological approach follows with careful attention to cohort differences, net of individual and migrant network impacts. Since gender is a critical social category of difference and one that has observably shifted in its meaning and instantiation in Thailand, we also evaluate how gender and cohort interact to reveal distinctively different effects upon migration outcomes.

2 Background

A growing literature in the field of demography and migration has begun to elaborate on the possible connections between demographic transitions and migration transitions (Bloom, Canning & Sevilla 2003; Dyson 2011; Fargues 2011; Reher 2011; Skeldon 2012; Zelinsky 1971). These inquiries have revealed the possibilities that the demographic results of the demographic transition may have as much to do with the emergence of worlds in motion or may even have as much to do with seeming shifts towards modernity and more recent transnationalities as economic or technological factors (Bloom, Canning and Sevilla 2003; Bloom and Williamson 1998; Hatton and Williamson 2006). In other words, recent research calls into question the causal ordering of modernization affecting demographic transitions. These rather sweeping claims, have some grounding in evidence, but more importantly suggest the value of shedding light on the causal mechanisms relating both demographic transitions to migration transitions and, in turn, how both are related to development. The empirical evidence linking demographic transitions to migration transitions remains limited in number and scope, generally evaluating national or cross-national patterns. Furthermore, these have not examined how migration momentum is distinct from, or closely related to, demographic momenta, specifically changing age structures and distinct cohort effects influencing migration.

2.1 Demographic Transitions, Cohorts, & Migration Transitions

The term demographic transition refers to the secular shift in fertility and mortality from high and sharply fluctuating levels to low and relatively stable ones. This historical process ranks as one of the most important changes affecting human society in the past half millennium, on a par with the spread of democratic government, the industrial revolution, the increase in urbanization, and the progressive increases in educational levels of human populations (Lee and Reher 2011). The transition transforms the demography of societies from many children and few elderly to few children and many elderly; from short life to long; from life-long demands on women to raise young children to the concentration of these demands in a small part of adulthood; and, from horizontally rich kin networks to vertically rich ones. From a strictly demographic standpoint, the demographic transition has generated four changes

1. Change in age structure from bottom heavy or young to an increase in relative importance of working-age populations (demographic dividend), and on to a top-heavy age structure and rising old-age and total dependency.
2. Reductions in fertility coupled with increasing life expectancy have a direct effect on kin groups: overall size of the within generational kin network shrinks, but generational depth increases
3. Increasing reproductive efficiency leads to reduced time of women spent in bearing and rearing children
4. Longer life raises the return to investments in human capital and greatly expands years at older ages

Importantly, from a migration perspective, young adults in the youth bulge bear an exceptionally light demographic burden. By comparison with past as well as future generations, they have a low burden in terms of dependent children and dependent elders: due to their own expected fertility (much lower) and due to their parents high fertility (they have many brothers and sisters to share the burden of the elderly). This has been described as an unprecedented demographic gift: by producing differentiated population growth, higher at working ages than at dependent ages (Bloom and Williamson 1998; Bloom, Canning, and Sevilla 2003).

This demographic dividend may have two possible and opposite impacts on migration. In a context of full employment and institutional structures that facilitate job sorting and finding, it can lead to endogenous growth through savings and investments. However, if a labor market has high unemployment and low wages the youth dividend cannot be invested and leads to out migration (Fargues 2006, 2011). In other words,

youth are free to move.

At the international level, until recently, research has not found a connection between population surpluses and international migration (de Haas 2009; Zlotnick 2004 and others). However, some of the most recent empirical research in this area supports the contention that there is a connection, especially taking into account lagged effects (Sanlinari and De Santis [date]). Reher (2011) makes a strong case for how the demographic transition caused increased internal and international migration. Dyson (2011) also argues for a reconsideration of mainstream demographic transition heterodox i.e. economic growth and industrialization drove urbanization and demographic transitions. Instead, Dyson empirically substantiates his claims to show how population surpluses in rural areas drives migration and then urbanization, which in turn yield sustained economic growth (Dyson 2011). In another instance, Hatton and Williamson (2006) test the hypothesis that mass migration has often been a lagged response to high birth rates in sending countries. Their analysis confirms their hypothesis. And, a more recent and somewhat more sophisticated analysis suggests that migration and demographic growth are intrinsically related because of the selectivity of the migration process (Fargues 2006; Beine et al. 2008), how migration experience change the migrant, and how migration networks link origin places with destinations conveying important information back to origins that much influence demographic calculi (health care and fertility plans). Furthermore the pressures to migrate will change as a result of the changes in composition of those that remain behind or have not yet migrated away. A youth bulge may push people out, but remittances back, as well as a shrinking bulge, may keep people in place. Finally, Salinari and De Santis (date) show with a sophisticated empirical assessment that lagged population growth in Africa is a significant factor explaining international migration.

While the preceding studies have examined population age structures and their impact on migration, there are no studies that have examined how cohort membership might be a distinctly influential social category. The idea of cohorts is intrinsically related to demographic and migration transitions and many other ideal typical transitions in social science. Associated with demographic transitions are distinctly different cohorts of baby booms and baby busts. With regards to migration, however, the linkage between cohorts and migration has hardly been evaluated. Salinari and De Santis (date) argument for lagged effects of population age structure changes, makes a convincing case for a cohort analysis, although they, themselves do not explicitly suggest a cohort analysis: A sudden reduction of mortality creates structural imbalances whose effects emerge in full only several years later. In a rural economy, for instance, the demographic transition changes the ratio between population size and available land. But this becomes apparent only later, when heredity, dowry and, more generally, family formation come into play, and may foster out-migration: in this sense, past population growth matters more than current growth. (Salinari and De Santis, p. 1). Building on this idea of lagged effects, a cohort conceptualization would argue that cohorts will have experienced, in unique ways, structural imbalances of population change and that these experiences carry through their life course and influence their behavior regardless of age or period effects. Glenn (2003) provides a succinct definition for the social relevance of distinctions between age, period and cohort:

1. Age effects represent the variation associated with different age groups brought about by physiological changes, accumulation of social experience, and/or role or status changes.
2. Period effects represent variation over time periods that affect all age groups simultaneously often resulting from shifts in social, economic, cultural or physical environments (these might include economic shocks)
3. Cohort effects are associated with changes across groups of individuals who experience an initial event such as birth or marriage in the same year or years; these may reflect the effects of having different formative experiences for successive age groups in successive time periods.

Until recently, it has not been possible to evaluate distinct cohort effects from age and period effects when explaining migration, because most migration data do not afford such temporal depth or detailed information. However, with the growing availability of 5% and 10% census samples for multiple decadal points, along with a growing number of long term, longitudinal survey data from sites around the world it might now be possible

to more fully elaborate the linkages between demographic transitions and migration transitions. Our study falls into the latter category of longstanding, longitudinal survey data that allows us for the evaluation of cohort influence on migration in Thailand.

3 Data, Site Demography, Village Variability

3.1 Prospective, Longitudinal, Multilevel Data Nang Rong

Our migration data come from the Nang Rong Surveys, a longitudinal panel data collection effort conducted by the Carolina Population Center at the University of North Carolina and the Institute for Population and Social Research at Mahidol University in Thailand. We employ the first three waves of data (collected in 1984, 1994, and 2000) for our analyses. The 1984 data collection was a census of all households and individuals residing in 51 villages within Nang Rong. It included information on individual demographic data, household assets and village institutions and agricultural, natural, economic, social, and health resources. Further, village-level data were collected from all of the villages in Nang Rong district. The 1994 survey followed all 1984 respondents still living in the original village, as well as respondents from 22 of the original 51 villages who had moved to one of the four primary destinations outside of the district, plus any new village residents. The 1994 surveys included all questions from the 1984 survey, as well as a 10-year retrospective life history about education, work, and migration, a survey about the age and location of siblings, and a special survey of migrants migration experiences and histories. The 2000 round of surveys built on the previous data collection efforts by following all of the 1994 respondents and adding to the database any new residents and households in the original villages.

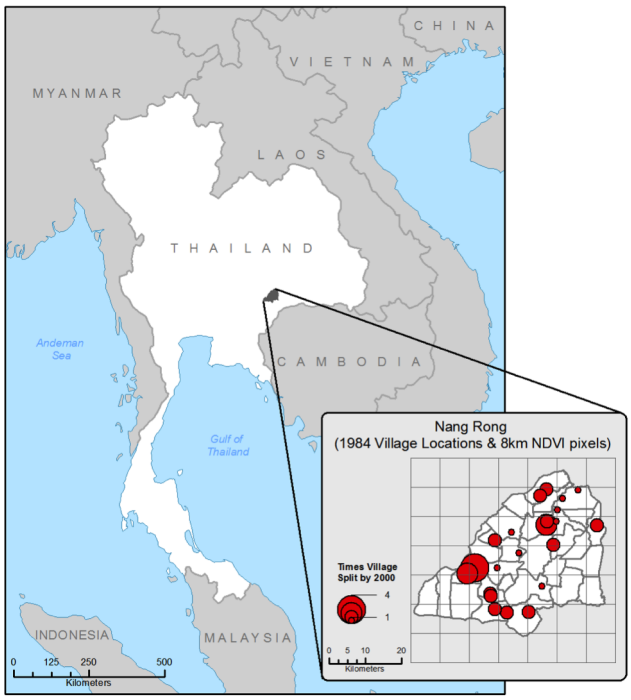


Figure 1: Map of Site

The 1994 and 2000 surveys included a migrant follow-up component. This was conducted among persons who had resided in 22 of the original 1984 villages, and defined a migrant as someone who was a member of a 1984 household and had since left a village for more than two months to one of four destinations: the provincial capital, Buriram; the regional capital, Korat or Nakhon Ratchasima; Bangkok and the Bangkok Metropolitan Area; or Eastern Seaboard provinces. The migrant follow-up in 2000 included migrants identified and interviewed in 1994, and individuals who had lived in the village in either 1984 or 1994 but subsequently migrated to one of the four primary destinations. The retrospective recall items in the survey allow us to measure timing and sequencing of moves (outgoing and returning), migrant destination, occupation in

destination, and duration of stay. The data for these analysis focus only upon villagers from the 22 villages where there was a migrant follow-up component. In these villages, the follow-up rate is fairly high (about 78%) because the survey team relied on a multiple search methods (see Rindfuss et al. 2007). This means that migrant selectivity bias is minimized among this group of villagers and villages.

Our analysis file relies primarily on the data found in the life history modules implemented in both 1994 and 2000. With these data we construct an analysis file that is comprised of person-year-move records. For each individual we have information about their sequence of residences and moves within a year for the preceding 10 years in the case of the 1994 survey and for the preceding six years for the 2000 survey. Retrospective life histories were collected for most individuals who had ever resided in Nang Rong in any 1984, 1994 or 2000 household and who were 13-44 years old at some point during this time period. Our analyses examine individual behavior prospectively from 1984 and 1994 to 2000 and do not include individuals who newly appear in households in 2000.

We measure migration as any move outside of the Nang Rong district for 2 months or more. Figure 2 displays the trends in migration prevalence among those at risk of migrating in any year for each village. This measure is similar to Massey and Zentenos study (1999) and is a measure of having ever migrated. What can be observed from Figure 2 is that while there is a great deal of variation across the 22 villages, there is a general trend of increasing migration between 1990 and 1998, with a drop-off after 1998. In other studies, it has been shown that the cumulative patterns of migration are quite different across villages, with some villages exhibiting quite steep trajectories of accumulated migration experience and others exhibiting much lower rates of increase (Curran et al. 2005; Garip and Curran 2009; Garip 2008). Figure 2 also shows that there is some fluctuation within villages across time.

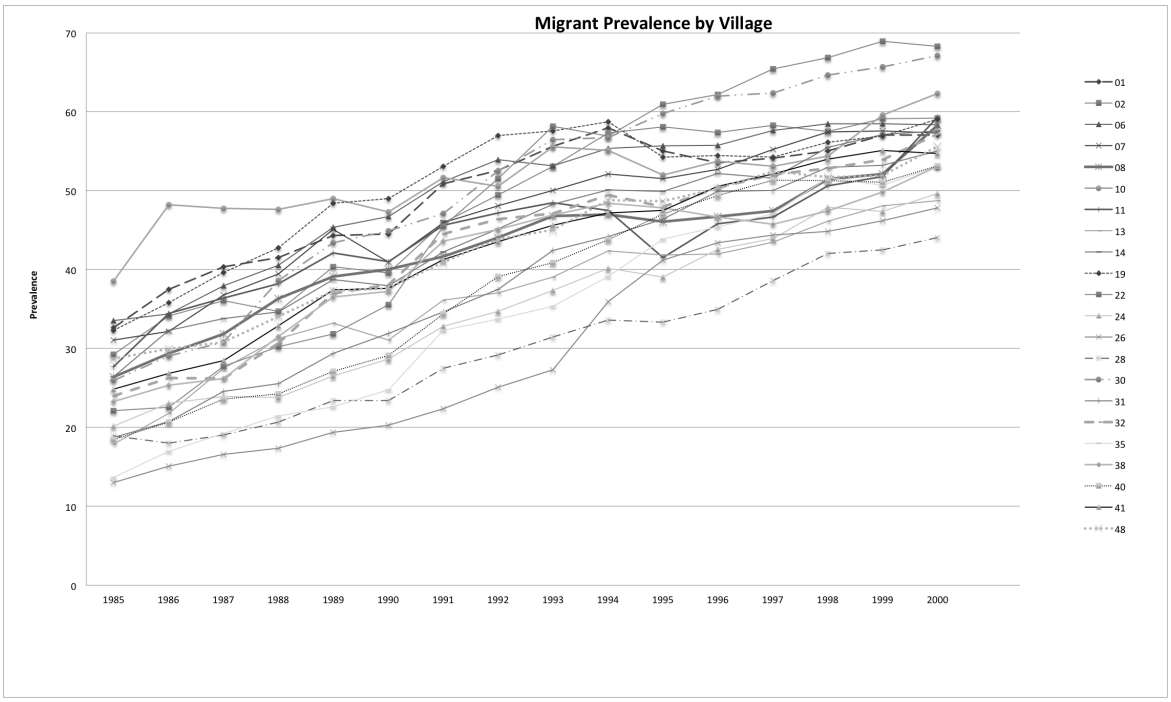


Figure 2: Village Trends in Migration Prevalence

When we shift our attention to cohort distributions and migration, first we observe the distribution of person-years across cohorts in our sample. Table 1 displays the number of person-years represented within each cohort, also indicating particular cohorts representing the fertility boom, peak and decline experiences. Except for the very oldest cohorts, the sample distributions are fairly even across cohorts and follow the

expected trends of growth and decline.

Table 1: Cohort Distributions in Nang Rong

Cohort Birth Year	1984 Age	1994 Age	2000 Age	Total N in Life History Data
1976-1978	6-8	16-18	22-24	10,043
1973-1975	9-11	19-21	25-27	15,831
1970-1972	12-14	22-24	28-30	16,828
1967-1969	15-17	25-27	31-33	16,586
1964-1966	18-20	28-30	34-36	13,979
1961-1963	21-23	31-33	37-39	13,179
1958-1960	25-26	34-36	40-42	7,950
1955-1957	27-29	37-39	43-44	998

Legend	
	Fertility Decline
	Fertility Peak
	Fertility Rise

Our study is not just interested in predicting out migration, but also in showing variable patterns in accumulated experience, whether the number of trips taken, the number of total months lived as a migrant, or the experience of having ever migrated. Table 2 reflects displays the total number of person-years in each cohort and the total trips accumulated with each cohort, the average number of accumulated trips, and the average number of months lived as a migrant by 2000. In all cases, the peak cohort (1970-1972) displays the highest accumulated migration experiences.

Table 2: Cohort Distributions of Average Migration Experience

Cohort	Age in 1994	Total Sample	Total Trips	Mean Accumulated Trips per Person in Cohort by 2000	Mean Total Months of Experience per Person in Cohort by 2000
1976-1978	16-18	10,043	1794	2.12	45.47
1973-1975	19-21	15,831	2459	2.54	60.02
1970-1972	22-24	16,828	2220	2.51	71.15
1967-1969	25-27	16,586	1994	2.34	62.94
1964-1966	28-30	13,979	1566	2.16	54.47]
1961-1963	31-33	13,179	1454	2.01	43.10
1958-1960	34-36	7,950	768	1.73	42.62
1955-1957	37-39	998	78	1.86	120.57

Legend	
	Fertility Decline
	Fertility Peak
	Fertility Rise

What is additionally interesting are the patterns of trends in the growth of accumulated migration experiences. Figures 3 demonstrates these trends. Generally, all cohorts grow in their accumulation of migration experience and, naturally, younger cohorts lag slightly behind older cohorts in their time trends. For the oldest cohort, while they appear to experience the greatest accumulation of months lived away for the entire period and experience the highest level of accumulated trips (at least from mid-1980s through early 1990s), they actually experience the lowest levels of migration prevalence. This finding is not so surprising, given earlier research analyzing these data that show how migration experiences may be concentrated in a few

individuals and simple counts must be complemented with measures of distribution (Garip and Curran 2010).

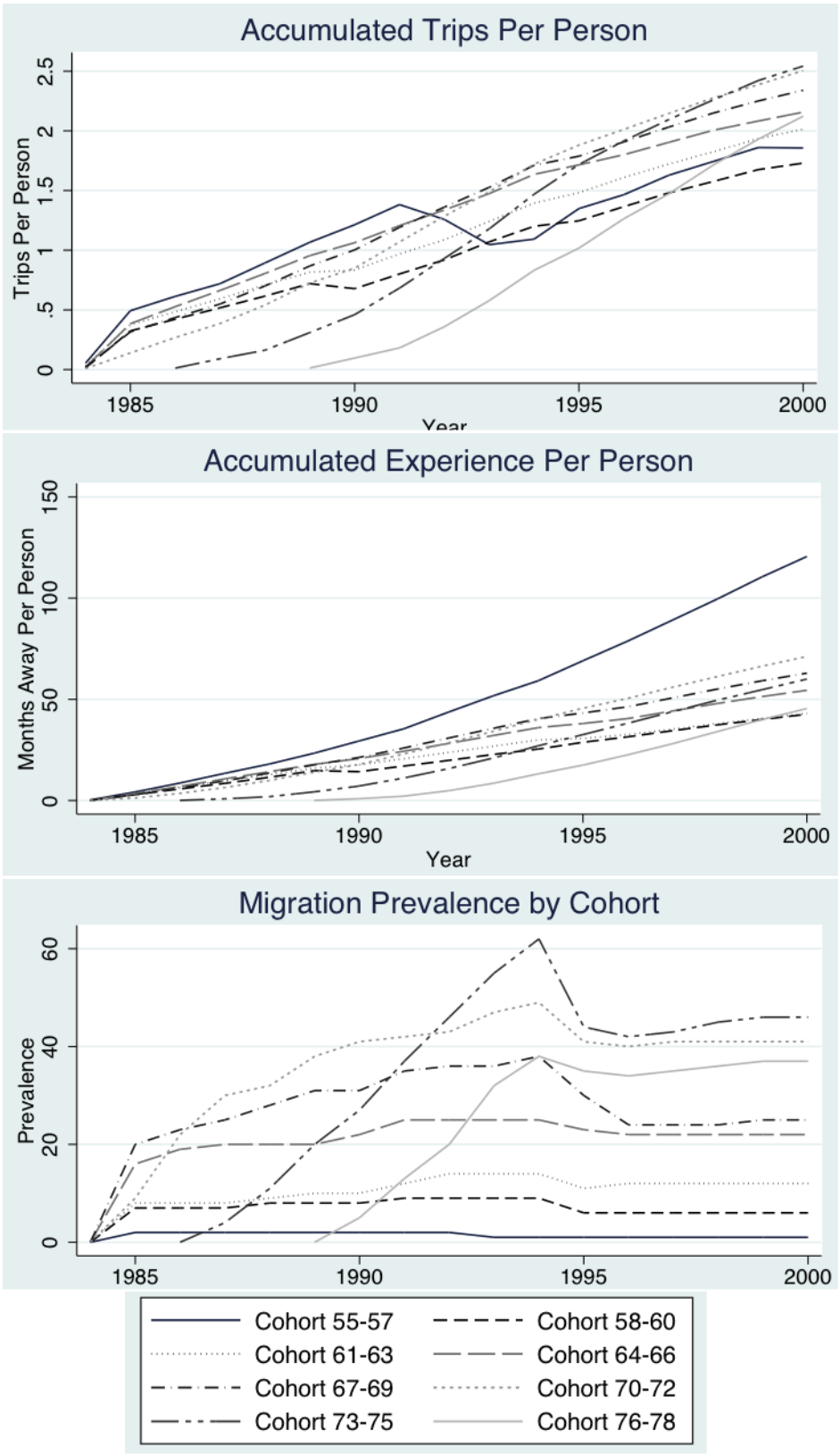


Figure 3: Migration Trips, Months Lived as a Migrant, and Experience of Migration by Cohort and Year (1984-2000)

The cohort that shows the fastest and consistently among the highest numbers of accumulated trips, accumulated months lived as migrants, and migration experience throughout the time period is the peak baby boom cohort (1970-1972). The cohorts just preceding this peak the boom cohorts (1964-1969) - show slightly lower rates, but similar patterns to those of the peak fertility cohorts. Finally, the youngest cohorts (1973-1978), the post peak or declining birth cohorts show a lagged starting point but a cross cutting steep growth in migration prevalence. These descriptive findings suggest to us that there are distinctly different experiences of migration across cohorts, even in this relatively narrowly scoped geographic region. Furthermore, we also find some variation across villages in the contributions of cohort migration experiences to trends in village migration prevalence. For example in high migration villages the contributions of the 1967-1969 cohorts are as important as the 1970-1972 cohort contributions (see Figure 4). For a village that shows steep growth in migration most of the growth in migration can be explained by the post baby boom cohorts (1973-1978), rather than the peak or older cohorts.

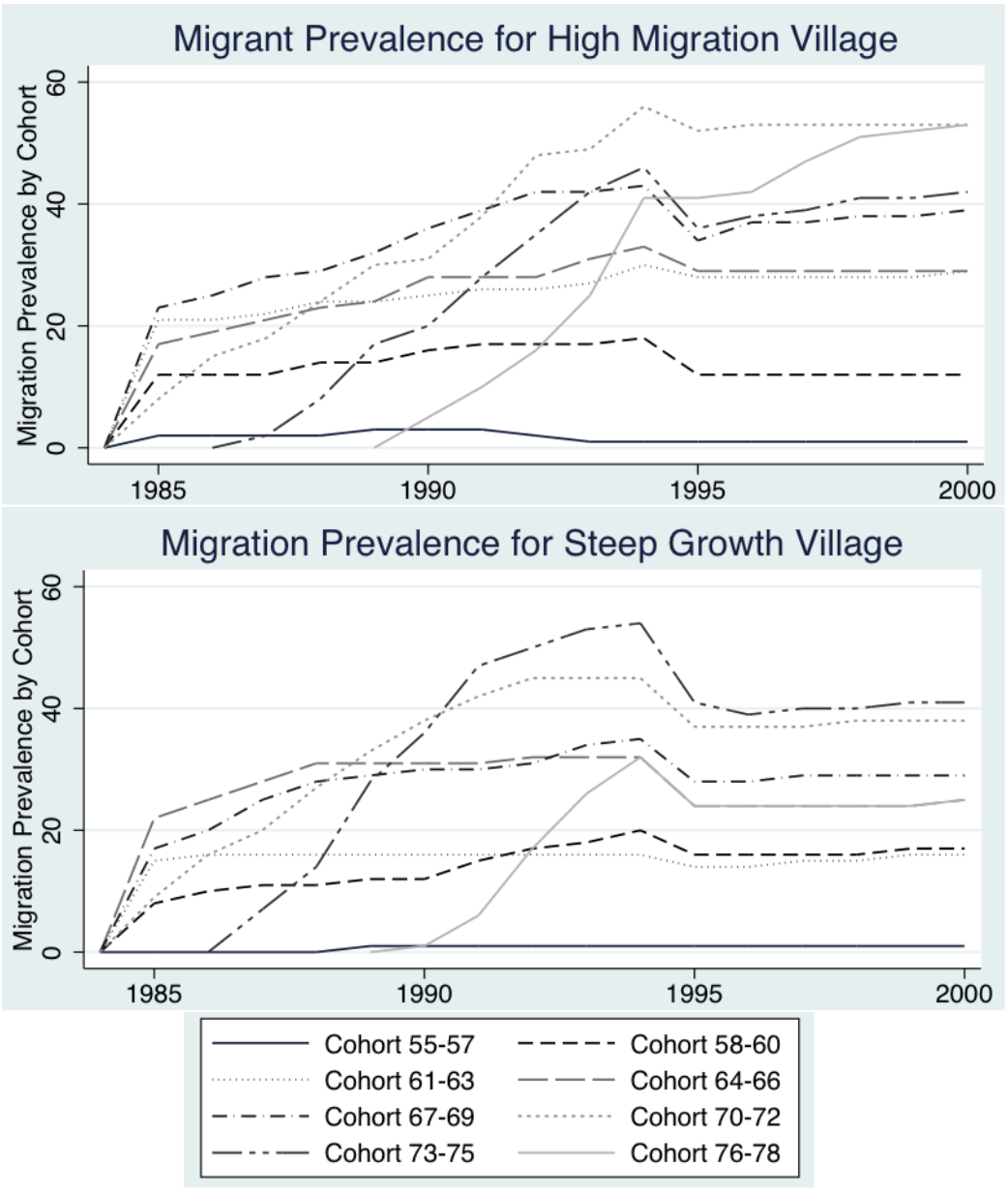


Figure 4: Cohort Patterns of Migration Across Select Villages

Given that patterns of migration appear to vary across villages and cohorts, we now set out to evaluate the distinctiveness of migration behavior across cohorts, especially evaluating how the importance of individual, household, and village characteristics matter more or less for older cohorts rather than younger cohorts.

4 Methodology & Analysis

As mentioned earlier, migration in our data is measured as a trip out of the origin community for 2 or more months. Across all of our person-year records, in fact, this is a relatively rare event. Consequently, we estimate a Poisson regression equation. Poisson regression estimations have emerged recently in analyses of migration as an alternative to log linear or OLS estimators, given the high number of zero outcomes associated with migration behavior and which lead to heteroskedasticity in the estimation (Docquier et al. 2012). In part this is a result of the changing nature of the design of migration studies, which have turned away from sampling on the dependent variable and reconstructing comparative samples of migrants and non-migrants either simply or through propensity score matching. Instead, an increasing number of studies, especially those that measure migration prospectively from origin communities, find that migration is a relatively rare event. As a consequence, non-migration or zero events predominate in the samples. Log-linear estimates or OLS estimates will over disperse the zero values resulting in heteroskedasticity bias. The most appropriate solution to this problem is to use Poisson regression models that rely on pseudo-maximum likelihood estimates. In our case our Poisson models are estimated with robust standard errors to militate against a further econometric complication: this relates to the fact that Poisson maximum likelihood estimation yields consistent point estimates even when the count is not strictly Poisson distributed (i.e., in case of overdispersion). Importantly in such circumstances, the estimated standard errors will be significantly smaller than if the count was strictly Poisson. This occurs when the conditional variance is greater than the conditional mean, that is, when the assumption of equidispersion is violated.

Our model takes the statistical form:

$$\log \mathrm{E}(y|\boldsymbol{x}) = \theta'\boldsymbol{x}$$

Where x is the vector of independent variables. Our primary variables of interest are eight cohort dummies, that represent three year clusters of birth dates, 1958-1960, 1961-1963, 1964-1966 (boom), 1967-1969 (boom), 1970-1972 (peak), 1973-1975 (start of decline), 1976-1978 (decline). In addition, we evaluate how the effect of cohort membership shifts with the inclusion of a set of variables that have previously been observed to influence migration in this setting. In our case, these include time varying (noted with a subscripted t) and non-time varying factors that are observed at the individual, household, or village level: Age_t , Male, $\mathrm{Education}_t$ (Primary Education or less, Some secondary, Secondary or more), Marital Status_t, Household $\mathrm{landholdings}_t$ (No land, near landless, somewhat landed, landed). Finally, we include a set of annual measures of Thailands economic growth patterns, including GDP and unemployment to account for relevant period effects.

In order to take into account and control for underlying currents of migration trends that might be explained by a host of other factors we also control for migration histories and migration experiences at the individual, household and village level. These migration experiences are accumulated up to the just prior time of observation (t-1) for individuals (iTrips_{t-1}, iExp_{t-1}), household (hTripst-1, hExp_{t-1}), and villages (vTrips_{t-1}, vExp_{t-1}). While not perfect proxies for alternative explanations for migration patterns, prior migration prevalence is a well-known measure of cumulative migration and the temporal ordering partially allays endogeneity concerns. Separately, we estimate the number of trips made by a person up through year t-1, the number of months experienced as a migrant by that person up through year t-l, the number of trips made by other community members up through year t-1, the months of experience accumulated by other community members through year t-1. The community migrant trips and months of migrant experience do not include the experience of the observed individual (for details please see Curran et al. 2005).

The Nang Rong surveys used a limited sampling frame to collect life history data in 1994 and 2000. In large part, this was due to a concern with asking life history questions of the very old with faulty memories or poorly informed proxies and with concerns of asking people too young to have experienced much of life

or to find some questions unnerving. Consequently, the life histories represent those from people 13-25 in 1984 growing to a population representing those 13-41 in 2000. Figure 5 displays the age, period and cohort exposures of the observations available for these life histories. We will evaluate our models on four different samples from this sampling frame including:

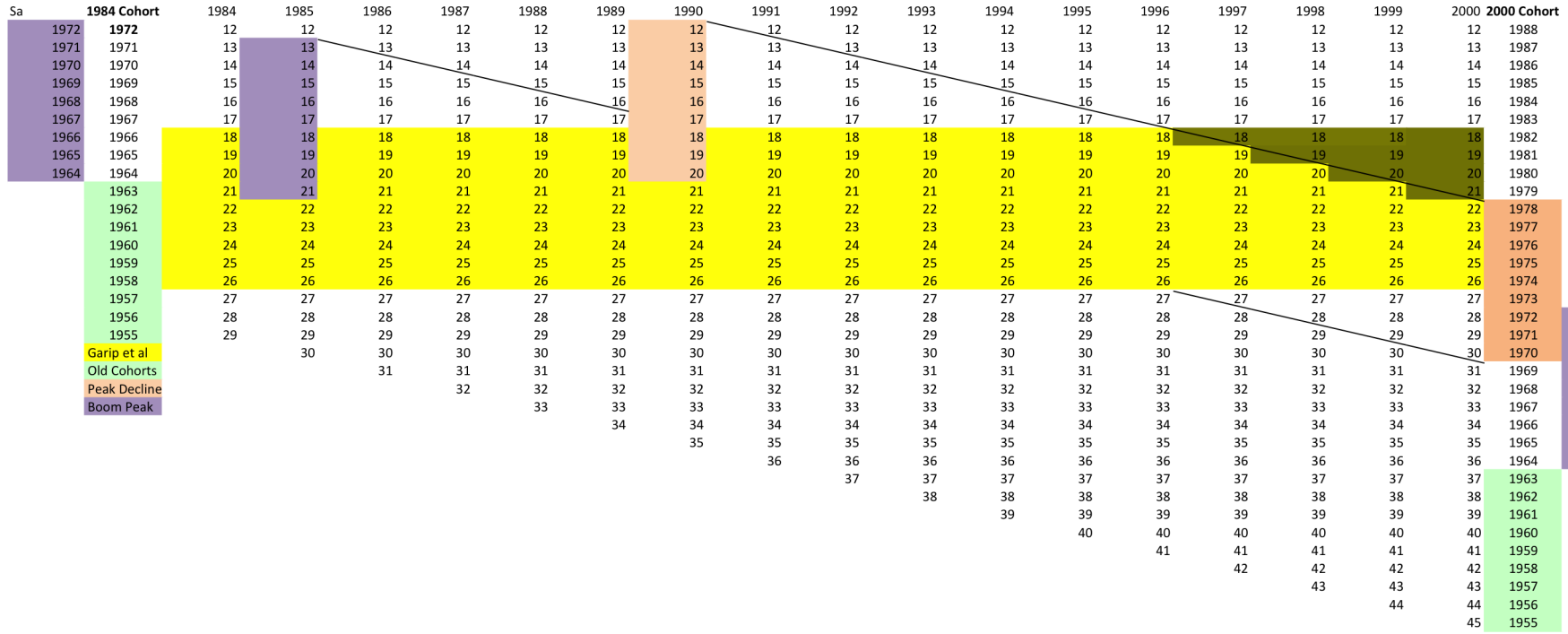
1. a group of people who are 18-25 years old throughout the study (1984-2000)

2. the oldest cohorts, best represented in the earlier period of the study (1955-1963)

3. the boom and peak cohorts (1964-1972)and

4. the peak and decline cohorts (1970-1978).

The first sampling frame replicates one used by Garip and colleagues (Garip and Curran 2010; Garip and Western 2011) and allows us to evaluate the entire study period and all cohorts. The other three sampling frames shift our period foci a bit with each successively younger cohort and allow us to evaluate the changing nature of selectivity with each younger set of cohorts.



Tables.png

Figure 5: Study design and Sampling Frames for Analysis

In sum Figure 5 illustrates:

- "RECTANGLE1825". We compare all cohorts and cohort influence upon migration for just those people who are 18-25 years old at any point between 1984 and 2000, including any person-year who is 18-25. This replicates the full exposure sample used by Garip & Curran (2010) and by Garip Western (2011). This captures a sample of individuals at the modal age for making a migration decision. [We call this sample Garip et al. - yellow]. Note, however, that we drop all cohorts born after 1978.

- Old Cohorts. We can also evaluate our analysis on an older set of cohorts, those who are BIRTH55-BIRTH63. These are all of the individuals who are part of the pre-transition fertility and we can run our descriptives and multivariate analyses on their lives. These are highlighted in light green.

- Boom Peak (1964-1972 Cohorts). We can also evaluate our analysis on the middle set of cohorts who would not be making migration decisions until later in the period. These are highlighted in purple.

- "Peak Decline" (1970-1978). We can also evaluate cohort and cohort patterns on the youngest set of cohorts who would not be making migration decisions until the end of the period of interest. These are highlighted in peach.

For each sampling frame we evaluate three models. A model that includes only cohort dummy variables on the right hand side of the equation, a model that includes cohort dummies plus all variables that have been shown to matter in previous research, and finally a model that interacts cohort dummies with an individuals sex. The final set of models is predicated on the well-known and documented pattern of shifting gender relations in places of origin (Curran et al. 2005) and changing labor demands for womens labor in both origin and destination (Curran et al. 2005). Specifically, we evaluate to what extent with each successively younger cohort women are increasingly likely to be migrants and even dominate migration flows.

5 Findings

We summarize the results for each sample and discuss our findings in the conclusions of this paper.

5.1 Garip et. al. Sampling Frame

Table 3: Garip et. al. Sampling Frame

Explanatory variable	Cohort Model		Migration Model		Gender Model	
Cohort Variables						
Cohort 55-57	0.497	***	2.451	***	2.256	***
Cohort 58-60	−1.059	***	0.687	***	0.581	***
Cohort 61-63	−0.907	***	0.442	***	0.391	**
Cohort 64-66	−0.580	***	0.288	***	0.125	
Cohort 67-69	−0.285	***	0.110		−0.018	
Cohort 70-72	Ref.		Ref.		Ref.	
Cohort 73-75	0.155	***	−0.223	***	−0.169	*
Cohort 76-78	0.192	***	−0.567	***	−0.466	***
Base Variables						
Age			−0.114	***	−0.113	***
Male			0.117	***	0.086	
Primary Educ.			Ref.		Ref.	
Secondary Educ.			0.090	*	0.077	*
Beyond Secondary Educ.			0.456	***	0.452	***
Married			−0.694	***	−0.698	***
No Land			0.004		−0.0002	
Landed			−0.118	**	−0.124	**
Somewhat Landed			−0.020		−0.018	
Nearly Landless			Ref.		Ref.	
GDP in billions			0012	***	0.012	***
Unemployment Rate			0.170	***	0.171	***
Individual Trips			0.120	***	0.120	***
Ind. Experience			0.004	***	0.004	***
Household Trips			0.060	***	0.062	***
Household Experience			0.009	***	0.009	***
Village Trips			−0.176	**	−0.186	***
Village Experience			−0.003		−0.002	
Interaction Variables						
Male x Cohort 55-57					0.322	
Male x Cohort 58-60					0.181	
Male x Cohort 61-63					0.093	
Male x Cohort 64-66					0.298	**
Male x Cohort 67-69					0.246	*
Male x Cohort 70-72					Ref.	
Male x Cohort 73-75					−0.115	
Male x Cohort 76-78					−0.199	*
Dependent Variable: Migrates Out This Year						
Note:	*p<0.1; **p<0.05; ***p<0.01					

There are clear non-linear patterns of the log-odds of migration out of the district, for anyone between the ages of 18-25 years old over the study period. In comparison to members of the peak cohort, members of the oldest cohort and the youngest cohorts have increased log-odds of migrating out, whereas members of the pre-peak cohorts have lower log-odds of migrating out. Interestingly, upon the introduction of the previously tested and influential factors predicting migration, the cohort coefficients reverse their direction. Instead,

members of the peak cohort are less likely to migrate out, relative to anybody else from an older cohort, net of individual, household and village factors. Only members of the cohorts younger than the peak cohort have lower log-odds of out migration, net of individual, household and village factors. All of these individual, household, village and annual economic variables display replicated and robust effects compared to the other papers published analyzing these data (Curran et al. 2005; Garip and Curran 2010; Garip and Western 2011). These results suggest that there is something quite significant occurring within cohort cluster worthy of investigation and possibly implying that it would be wise to estimate a fully interactive model. It should be noted that in our third model testing sex*cohort interactions we find only a few significant effects for the most part men from every cohort are more likely to migrate, although the younger cohorts appear to show significantly lower likelihoods of male migration.

5.2 Older Cohorts Sampling Frame

Table 4: Older Cohorts Sampling Frame

Explanatory variable	Cohort Model		Migration Model		Gender Model	
Cohort Variables						
Cohort 55-57	Ref.		Ref.		Ref.	
Cohort 58-60	−0.981	***	−0.101		0.191	
Cohort 61-63	−0.826	***	−0.157	*	0.191	*
Cohort 64-66	n/a		n/a		n/a	
Cohort 67-69	n/a		n/a		n/a	
Cohort 70-72	n/a		n/a		n/a	
Cohort 73-75	n/a		n/a		n/a	
Cohort 76-78	n/a		n/a		n/a	
Base Variables						
Age			−0.040	***	−0.040	***
Male			0.120	***	0.108	***
Primary Educ.			Ref.		Ref.	
Secondary Educ.			0.049		0.050	
Beyond Secondary Educ.			0.446	***	0.447	***
Married			−0.711	***	−0.713	***
No Land			−0.003		−0.0002	
Landed			−0.122	**	−0.123	**
Somewhat Landed			−0.020		−0.020	
Nearly Landless			Ref.		Ref.	
GDP in billions			0.008	***	0.008	***
Unemployment Rate			0.095	***	0.095	***
Individual Trips			0.118	***	0.119	***
Ind. Experience			0.004	***	0.004	***
Household Trips			0.058	***	0.058	***
Household Experience			0.009	***	0.009	***
Village Trips			−0.204	***	−0.205	***
Village Experience			−0.012	***	−0.013	***
Interaction Variables						
Male x Cohort 55-57					Ref.	
Male x Cohort 58-60					0.161	
Male x Cohort 61-63					0.065	
Male x Cohort 64-66					n/a	
Male x Cohort 67-69					n/a	
Male x Cohort 70-72					n/a	
Male x Cohort 73-75					n/a	
Male x Cohort 76-78					n/a	
Dependent Variable: Migrates Out This Year						
Note:	*p<0.1; **p<0.05; ***p<0.01					

Amongst the oldest set of cohorts, we omit the very oldest group and refer to it as our reference category. In these analyses, members of the oldest cohort are significantly more likely to migrate than the two younger cohorts. This cohort patterned relationship holds even with the introduction of critical predictor variables and there is no significant effect of sex*cohort in the third model estimation.

5.3 Fertility Peak Sampling Frame

Table 5: Fertility Peak Sampling Frame

Explanatory variable	Cohort Model		Migration Model		Gender Model	
Cohort Variables						
Cohort 55-57	n/a		n/a		n/a	
Cohort 58-60	n/a		n/a		n/a	
Cohort 61-63	n/a		n/a		n/a	
Cohort 64-66	−0.420	***	−0.053		−0.246	**
Cohort 67-69	−0.124	**	−0.031		−0.184	**
Cohort 70-72	Ref.		Ref.		Ref.	
Cohort 73-75	n/a		n/a		n/a	
Cohort 76-78	n/a		n/a		n/a	
Base Variables						
Age			−0.045	***	−0.045	***
Male			0.118	***	0.034	
Primary Educ.			Ref.		Ref.	
Secondary Educ.			0.070		0.058	
Beyond Secondary Educ.			0.448	***	0.442	***
Married			−0.706	***	−0.705	***
No Land			0.005		−0.0003	
Landed			−0.118	**	−0.119	**
Somewhat Landed			−0.018		−0.016	
Nearly Landless			Ref.		Ref.	
GDP in billions			008	***	0.008	***
Unemployment Rate			0.97	***	0.098	***
Individual Trips			0.118	***	0.119	***
Ind. Experience			0.004	***	0.004	***
Household Trips			0.058	***	0.059	***
Household Experience			0.009	***	0.009	***
Village Trips			−0.205	***	−0.211	***
Village Experience			−0.012		−0.012	
Interaction Variables						
Male x Cohort 55-57					n/a	
Male x Cohort 58-60					n/a	
Male x Cohort 61-63					n/a	
Male x Cohort 64-66					0.359	***
Male x Cohort 67-69					0.295	***
Male x Cohort 70-72					Ref.	
Male x Cohort 73-75					n/a	
Male x Cohort 76-78					n/a	
Dependent Variable: Migrates Out This Year						
Note:	*p<0.1; **p<0.05; ***p<0.01					

Amongst members of the middle set of cohorts, again members of the peak cohort are significantly more likely to migrate than members of older cohorts. Introducing the individual, household, village and economic factors does not change these effects. It should be noted, however, that a model that did not include measures of accumulated migrant experiences (at the individual, household, and village level) and only included more typical measures of individual, household and economic factors, revealed a shift in the coefficient signs from negative to positive. We aim to explore this puzzling result in subsequent analyses. Furthermore, the third model for this group show significant sex*cohort interactions. Male members of older cohorts are significantly and far more likely to migrate than are the male members of the peak cohort and all females.

5.4 Fertility Decline Sampling Frame

Table 6: Garip et. al. Sampling Frame

Explanatory variable	Cohort Model		Migration Model		Gender Model	
Cohort Variables						
Cohort 55-57	n/a		n/a		n/a	
Cohort 58-60	n/a		n/a		n/a	
Cohort 61-63	n/a		n/a		n/a	
Cohort 64-66	n/a		n/a		n/a	
Cohort 67-69	n/a		n/a		n/a	
Cohort 70-72	Ref.		Ref.		Ref.	
Cohort 73-75	0.582	***	−0.057		0.080	
Cohort 76-78	0.618	***	−0.234	***	−0.047	
Base Variables						
Age			−0.056	***	−0.056	***
Male			0.121	***	0.240	***
Primary Educ.			Ref.		Ref.	
Secondary Educ.			0.067		0.062	
Beyond Secondary Educ.			0.455	***	0.454	***
Married			−0.712	***	−0.714	***
No Land			0.007		−0.005	
Landed			−0.126	**	−0.131	***
Somewhat Landed			−0.021		−0.019	
Nearly Landless			Ref.		Ref.	
GDP in billions			009	***	0.009	***
Unemployment Rate			0.115	***	0.115	***
Individual Trips			0.116	***	0.118	***
Ind. Experience			0.004	***	0.003	***
Household Trips			0.061	***	0.063	***
Household Experience			0.009	***	0.009	***
Village Trips			−0.202	***	−0.209	***
Village Experience			−0.010	***	−0.010	***
Interaction Variables						
Male x Cohort 55-57					n/a	
Male x Cohort 58-60					n/a	
Male x Cohort 61-63					n/a	
Male x Cohort 64-66					n/a	
Male x Cohort 67-69					n/a	
Male x Cohort 70-72					Ref.	
Male x Cohort 73-75					−0.266	***
Male x Cohort 76-78					−0.355	***
Dependent Variable: Migrates Out This Year						
Note:	*p<0.1; **p<0.05; ***p<0.01					

For the youngest cluster of cohorts, the first model shows that members of the peak cohort have lower odds of migrating out than do members of the younger cohorts. Once the model controls for factors influencing the selectivity of migration, this pattern is again reversed, but only significantly reversed for the comparison between the very youngest cohort and the peak cohort. Controlling for all other factors, nets out any differences between members of the 1970-1972 cohort and members of the 1973-1975 cohorts. In the third model, where we test an interaction between sex*cohort, we find that for the very youngest cohort log-odds of migration drop significantly for men and result in a net lower level of migration relative to women from the same cohort.

6 References

Bloom, D. E., D. Canning, and J. Sevilla. 2003. *The Dividend: A New Perspective on the Economic Consequences of Population Change*. Santa Monica, CA: RAND.

Bloom, D. and J.G. Williamson. 1998. Demographic Transitions and Economic Miracles in Emerging Asia. *World Bank Economic Review*. 12:419-455.

Curran, S., F. Garip, C. Chung, and K. Tangchonlatip. 2005. Gendered Migrant Social Capital: Evidence from Thailand. *Social Forces*, 84(1):227-256.
de Haas, H. 2009. International migration and regional development in Morocco: a critical review of the literature. *Journal of Ethnic and Migration Studies*. 35(10) 1571-1593.

Docquier, F., H. Rapoport, and S. Salomone. 2012. Remittances, migrants' education and immigration policy: Theory and evidence from bilateral data. *Regional Science and Urban Economics*, Volume 42 (Issue 5): 817-828

Dyson, T. 2011. [title]. *Population and Development Review*. 37 (Supplement):

Fargues, P. 2006. *Demographic Benefit of International Migration: Hypothesis and Application to Middle Eastern and North African Contexts. World Bank Policy Research Working Paper 4050*. Washington, D.C.: The World Bank.

Fargues, P. 2011. International Migration and the Demographic Transition: A Two-Way Interaction. *International Migration Review*. 45: 588-614

Garip F and Curran S. 2010 Increasing Migration, Diverging Communities: Changing Character of Migrant Streams in Rural Thailand. *Population Research and Policy Review*. 2010; 29:659-685.

Garip F and Western B. Model Comparison and Simulation for Hierarchical Models: Analyzing Rural-Urban Migration in Thailand. In: Jones G, Brooks S, Meng X-L, Gelman *A Handbook of Markov Chain Monte Carlo*. CRC Press; 2011.

Glenn, N. D. 2003. Distinguishing Age, Period, and Cohort Effects. Pp. 465-476 in *Handbook of the Life Course*. Edited by J.T. Mortimer and M.J. Shanahan. New York: Kluwer Academic/Plenum.

Hatton, T.J. and J.G. Williamson. 2006. *Global Migration and the World Economy: Two Centuries of Policy and Pmance*. Cambridge, MA: MIT Press.

Lee, R. D. and D.S. Reher. 2011. Introduction: The Landscape of Demographic Transition and its Aftermath. *Population and Development Review*. 37 (Supplement):1-7.
Massey, D. S. and R. M. Zenteno. 1999. The Dynamics of Mass Migration. *Proceedings of the National Academy of Sciences*. 96:53285335.

Reher, D.S. 2011. *PDR Population and Development Review*. 37 (Supplement):

Rindfuss, Ronald R., Toshiko Kaneda, Arpita Chattopadhyay, and Chanya Sethaput. 2007. Panel Studies and Migration. textitSocial Science Research. 36:374403.

Salinari G. and G. De Santis. [date]. The Role of the Demographic Transition in the Formation of the North African and Trans-Saharan Migration Systems. SOURCE.

Skeldon, R. S. 2012. Migration Transitions Revisited: Their Continued Relevance for the Development of Migration Theory. *Population, Place Space*. 18: 154-166.

Zelinsky, W. 1971. The Hypothesis of the Mobility Transition. Geographical Review. 61:219-249.