Population and Migration in Thimphu Thromde

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Abstract

As a developing country, Bhutan is on the upward trajectory of urbanization. While it has benefits it also exerts pressures. Within Bhutan, Thimphu thromde has the largest urban population, which exhibit many forms of urbanization. Using the data from 2017 Population and Housing Census of Bhutan, the paper projects the population of Thimphu city till 2027 due to lack of its population projection. The cohort-component method is used for projection. The net-migration from 2005 to 2017 is calculated using residual method. Further, employing probit regression, the determinants of migration to Thimphu thromde is examined. Age, marriage, unemployment, land, household composition, household income and education are significant determinants of migration.

Introduction

Urbanization in Bhutan has continued apace. The urban population has increased from 30.9% in 2005 to 37.8% in 2017, and largest share of the overall population reside in Thimphu *thromde* (city) at 15.8%[1] where most of the government offices are based. The other three cities are Phuntsholing, Samdrup Jongkhar and Gelephu thromdes. There are relatively smaller urban areas in each of the 20 districts.

The annual growth rate of Thimphu thromde (3.72%) has

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[1] See the report of the first census conducted in 2005, *Population and Housing Census of Bhutan 2005*, and the second census conducted in 2017, *2017 Population and Housing Census of Bhutan*.

outpaced the national population growth rate (1.3%) as it is evident from the last two censuses. The population increase in Thimphu city is largely contributed by migration. Notwithstanding the economic opportunities brought about by urbanization, the growth in population has exerted pressures on infrastructure, environment and social fabric. Soaring house rent, pollution, gridlocks, accelerating waste generation, water shortage, substance abuse by youth are some of the issues Thimphu city face. On the other hand, there are empty households, fallow lands and uncared elderly in rural areas.

Despite having planning documents, strategies and rules, such as Thimphu Structure Plan 2002, Bhutan National Urbanization Strategy (2008), Bhutan Building Rules 2002, Land Pooling Rules 2009, Land Pooling and Readjustments Regulations 2018, the Rural Construction Rules 2013, and the Thromde Act of Bhutan 2007, the aforementioned challenges could not be addressed. To compound the issues there were cases of non-compliance and deviations from planning rules in Thimphu city planning process (Bajaj, 2014). National Human Settlements Policy 2019 has been approved and Spatial Planning Act is being drafted by the Ministry of Works and Human Settlement with the hope of addressing these challenges.

This paper is motivated by 1) the absence of the population projection of Thimphu thromde and 2) to identify and analyze the determinants of migration to Thimphu thromde. National Statistics Bureau (2019) has projected the population of 20 districts of Bhutan up to 2047 but left out population projection for Thimphu thromde and the other three thromdes. Thromde is a city within a district. The population of Thimphu district is 138,736 as of 2017. Out of this total Thimphu population, Thimphu thromde comprises of 114,551, which is a very large share of 82.5%. Therefore, it merits an understanding of population growth and projection of Thimphu thromde. In studying urbanization, priority has been given to urban concentrations, which refers to the degree of concentration of a country's urban population in one or two major cities (Hofmann

and Wan, 2013; Henderson, 2003).

Literature review on migration

Migration is simply the change of residence away from the usual place of residence. According to United Nations, long-term migrants are individuals who changes his or her place of usual residence for at least one year. This paper will define migrant as a person who has moved away from his/her previous residence for at least one year. The geographical unit in this paper refers to *gewog* (county)/town. This definition will exclude short-term and seasonal migrants, visitors and students but could include return migrants. As the focus of this paper is on internal migration, foreign (non-Bhutanese) migrants are excluded from the analysis.

Perhaps the first formal theory of migration was proposed by Todaro (1969) in his model of labour migration in developing countries. In this model, the decision to migrate from rural to urban areas are influenced by two factors: the urban-rural real income differential and the probability of finding an urban job. Todaro's model was further expanded by Harris and Todaro (1970) in the context of aggregate and inter-sectoral welfare implications. Both Todaro (1969) and Harris and Todaro (1970) highlight higher productivity urban job (which results in higher wage) as the factor inducing migration to urban areas. Recent extension of rural-urban migration has been developed by Kanbur, Christiaensen and Weerdt (2019) to the case of migration from rural areas to secondary towns and big city, and conclude that investing in secondary towns is more poverty reducing than investing in big cities by showing various mechanisms at play.

There are other theories of migration that considers political factors and mainly concerns with international migration which is of little relevance to Bhutan. International (non-Bhutanese) population constitutes of only 6.25% as of 2017 in Bhutan. Stark (1991, cited in Arango, 2000) consider migration to be more of household decision than individual decision, Piore (1979)

places attention mainly on the receiving end of migration in the context of international migration, and others have approached international migration using world system theory.

There are extensive studies on the determinants of migration in literature. Migration push factors include lack of employment opportunities, poverty, hunger, land scarcity, unsustainable livelihood, lack of market access for agricultural products, limited services and infrastructure, discrimination, climate change, disasters and insecure environment. On the other hand, pull factors include higher income and employment opportunities, better educational, health, and other facilities, technological advancement in urban areas and family reunification.

The Ministry of Agriculture of Bhutan has conducted research on internal rural-urban migration first in 2005 and then a larger one in 2013 but have used inconsistent definition of migration. In the former, migrants were defined as those who have lived away from their gewog of birth for five years or more and in the latter, it is defined as those who are resident of a current dzongkhag (place of enumeration) other than the dzongkhag where they have census (civil registration). Definition of migration having civil registration as a criterion is at odds with many other international studies. Chand (2017) conducted a study on migration in Thimphu in 2010 albeit at a small sample size of 251, without performing any multivariate analysis. The Ministry of Agriculture also did not conduct any multivariate analysis on its study conducted in 2005 and 2013.

Thimphu thromde population projection

The purpose of this section is to project the population of Thimphu thromde using cohort-component method. Using 2005 and 2017 census data, the population of Thimphu thromde will be projected 10 years forward using constant fertility and death rates. It can be projected to any number of years but the deviation of the parameters from it true value will be higher when the projection is done over longer horizons. For instance,

the fertility rate of Thimphu city is 1.7 which is unlikely to vary much in the next five years or 10 years but will do so in the next 15 years and above.

For population projection, it is useful to refer to population balancing equation, which states that the population at current period is given by the sum of population at previous period, number of intervening births and net migrants, minus number of intervening deaths.

Information on current population, birth and death is readily available from census data but it is not straight forward to find information on net migration between intercensal periods. The calculation of net migration involves a number of steps using residual method, which is generally used for extrapolation. Another factor to consider is sex ratio at birth. Sex ratio at birth was 1.05 or 105 male births for every 100 female births in 2005.

To find the net migration between 2005 and 2017, first the population of Thimphu thromde should be projected from 2005 to 2017 using 2005 census data to estimate its population in 2017. The estimated population in 2017 should then be subtracted from the actual 2017 population which is available from 2017 census. The difference is the net migration between the two-census periods. The net migration rate per year can then be calculated for male and female by age groups. The net migration rate per year for age group 75 and above can be split into three equal parts for age groups 75-79, 80-84 and 85 and above. This net migration rate per year will be used to project population from 2017 to 2027. The essential elements of net migration rate are given below in Table 1. The detailed calculation of estimated 2017 Thimphu thromde population is given in Appendix Table A1.

Table 1. *Migration in Thimphu thromde between 2005 and 2017*

Age	Actual 2005 population		Estimated 2017 population		Actual 2017 population		Migration residual 2005-2017		Male net migration rate per year	Female net migration rate per year
	Male	Female	Male	Female	Male	Female	Male	Female		
0-4	3971	3808	4525	4304	4758	4477	233	173	0.0043	0.0033
5-9	3723	3692	3931	3723	4699	4554	768	831	0.0163	0.0186
10-14	4115	4489	3618	3447	4400	4349	782	902	0.0180	0.0218
15-19	4452	5033	3635	3586	4615	5161	980	1575	0.0225	0.0366
20-24	7554	5425	3897	4131	7868	7458	3971	3327	0.0849	0.0671
25-29	5249	3957	4259	4773	8635	7983	4376	3210	0.0856	0.0560
30-34	3539	2760	6194	5216	6750	5988	556	772	0.0075	0.0123
35-39	3208	2211	6004	4477	5168	4578	-836	101	-0.0116	0.0019
40-44	2014	1465	4060	3147	3465	2757	-595	-390	-0.0122	-0.0103
45-49	1570	1126	3164	2295	2792	2221	-372	-74	-0.0098	-0.0027
50-54	1116	713	2310	1600	1922	1620	-388	20	-0.0140	0.0011
55-59	599	503	1548	1069	1176	1182	-372	113	-0.0200	0.0088
60-64	461	477	1083	687	909	976	-174	289	-0.0134	0.0351
65-69	354	363	623	421	629	660	6	239	0.0008	0.0472
70-74	265	304	349	337	438	610	89	273	0.0213	0.0676
75+	275	394	322	629	772	981	450	352	0.1162	0.0466
Total	42465	36720	49521	43842	58996	55555	9475	11713		

As shown in Table 1, 21188 people have migrated to Thimphu thromde between 2005 and 2017 with higher proportion of women than men. The largest chunk of the migrants are between 15-29 age bracket for both men and women. The estimated population of Thimphu city in 2017 is 93363 without migrants. Using the estimated 2017 population and 2005 population, the natural growth rate of Thimphu thromde comes to 1.49%. Subtracting 1.49% (the natural growth rate) from 3.72% (the annual growth rate of Thimphu thromde) yields the growth rate of migration at 2.23%. Therefore, the growth of Thimphu thromde population is driven more by migration than its rate of natural increase.

Since the number of migrants between 2005 and 2017 has been estimated, the population projection of Thimphu thromde till 2027 will now be proceeded. The mortality by age and gender is given in Table 2. The live birth rate by sex of child and age of mother for Thimphu thromde is available in 2017 PHCB, Table A4.8, p. 158.

Table 2. *Mortality in Thimphu thromde, 2017*

Gender	Age	No. of death	Popul-ation	Gender	Age	No. of death	Popul-ation
Female	<1	5	1008	Male	<1	7	1079
Female	1-4	5	3469	Male	1-4	7	3679
Female	5-9	4	4554	Male	5-9	4	4699
Female	10-14	3	4349	Male	10-14	1	4400
Female	15-19	3	5161	Male	15-19	6	4615
Female	20-24	4	7458	Male	20-24	8	7868
Female	25-29	6	7983	Male	25-29	11	8635
Female	30-34	10	5988	Male	30-34	23	6750
Female	35-39	10	4578	Male	35-39	22	5168
Female	40-44	11	2757	Male	40-44	23	3465
Female	45-49	11	2221	Male	45-49	18	2792
Female	50-54	16	1620	Male	50-54	24	1922
Female	55-59	21	1182	Male	55-59	19	1176

Gender	Age	No. of death	Popul-ation	Gender	Age	No. of death	Popul-ation
Female	60-64	18	976	Male	60-64	25	909
Female	65-69	17	660	Male	65-69	20	629
Female	70-74	24	610	Male	70-74	32	438
Female	75-79	27	439	Male	75-79	26	350
Female	80-84	29	300	Male	80-84	30	236
Female	85+	36	242	Male	85+	33	186

Projecting the Thimphu thromde population from 2017 to 2022 involves a number of calculations. First, using mortality data from Table 2, survival rates are calculated as shown in Table A2. And similarly, number of births for the next five years, from 2017-2022, is calculated using fertility rates of child bearing women. Adding surviving population and number of births gives the natural population in 2022. The total number of migrants from 2017 to 2022 is calculated using migration rate. Therefore, adding the migrants to the natural population gives the total population in Thimphu thromde in 2022. Repeating the steps for the next five years from 2022 gives the projected population of Thimphu thromde in 2027. Table A2 shows the details of population projection.

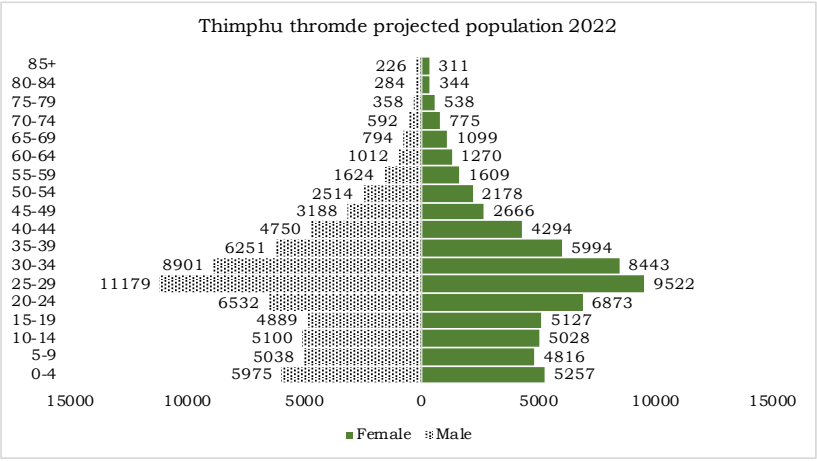

Figure 1. Thimphu thromde projected population pyramid in 2022

The population of Thimphu thromde is projected to increase to 135354 in 2022, with 66146 females and 69208 males. The number of migrants is projected to increase by 12572 in 2022 from 2017.

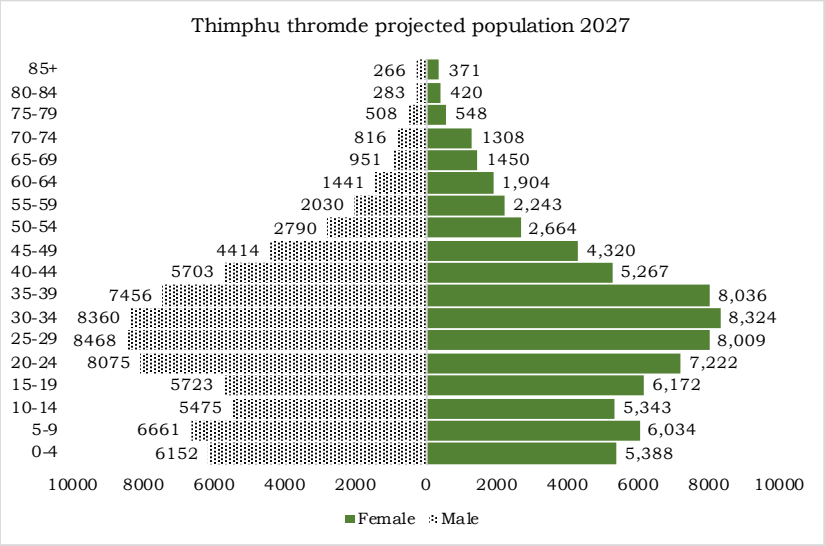

Figure 2. Thimphu thromde projected population pyramid in 2027

In 2027, the population of Thimphu thromde is projected to increase to 150595 (which is 31.5% percentage increase from 2017), with 75021 females and 75574 males. The number of migrants is projected to increase by 19998 in 2027 from 2017. The share of the young population, below 15 years, will slightly fall from 23.8% in 2017 to 23.3% in 2027 during to declining fertility, whereas elderly population, 65 and above, will increase by 1% to 4.6% in 2027 from 2017. The share of youth, 15-24, will fall by 3.8% to 18.1% during this decade.

Migration

Net-migrants in Thimphu thromde

For determining the net-migrants in Thimphu thromde, missing values of previous residence, non-Bhutanese and misreporting of duration of stay in the current gewog/town greater than age are excluded from analysis. The source of data is 2017 PHCB. As mentioned before, migration in this paper refers to change of residence away from his/her previous residence for at least one year. By this definition, there were 59,040 in-migrants (constituting 64.53% of the Thimphu thromde population) while there were 29,158 out-migrants resulting in 29,882 net-migrants in Thimphu thromde. Of those who migrated to Thimphu thromde, 69.5% were from rural areas whereas 30.5% were from urban areas, as shown in Table 3; by sex, 52.06% were females against 47.94% males.

Table 3. *Previous residence of migrants to Thimphu thromde, 2017*

Area of previous residence	Frequency	Percent
Urban	18007	30.5
Rural	41033	69.5
Total	59040	100

The migrants mostly comprise of younger age groups among those who migrated to Thimphu thromde. The maximum is found at age group 25-29 at 16.66%. 62.5% of the migrants are between 15-39 years (see Figure 3).

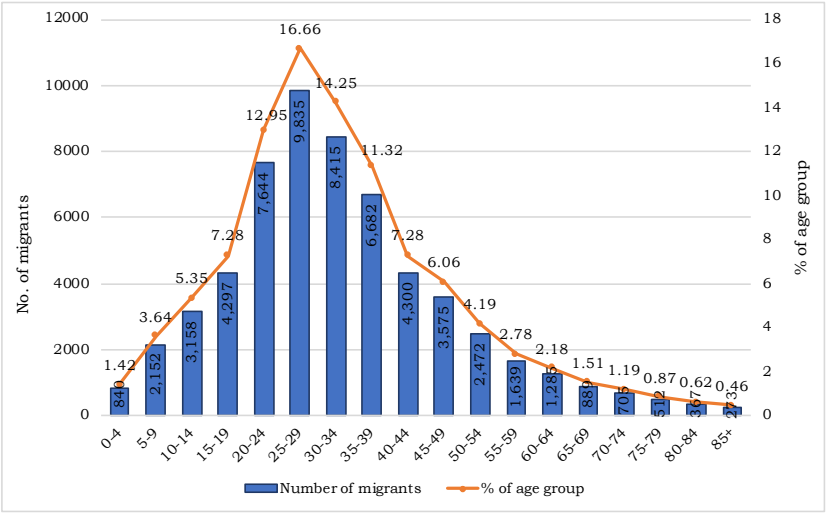

Figure 3. Migrants to Thimphu thromde by age group, 2017

Determinants of migration to Thimphu thromde

For regression analysis, those below 15 years and foreign (non-Bhutanese) migrants in Thimphu thromde are excluded. The foreign migrants constitute a negligible proportion (879 migrants or 1.47% of the total migrants). Missing values of the variables used in the regression are also dropped. This reduces the observation to 50,491. Probit model is used since the dependent variable is a binary variable, taking the value of one for those who are migrants and zero otherwise.

Summary statistics

Table 4 shows the summary statistics of the variables, separating out the migrants and non-migrants characteristics. 73.77% were migrants out of 50,491 people.

Table 4. *Comparison of migrants and non-migrants, 2017 (age 15 years and above)*

Variable	All (N= 50491)	Migrants (N= 37248)	Non-migrants (N=13243)
Male (%)	50.48	51.23	48.37
Age	30.64	31.81	27.37
Married (%)	55.10	61.61	36.80
Household head (%)	31.46	36.76	16.56
Non-formal education (%)	1.59	1.99	0.48
Primary education (%)	13.72	15.93	7.49
Lower secondary education (%)	8.25	8.39	7.87
Middle secondary education (%)	19.35	19.57	18.75
Higher secondary education (%)	26.1	24.85	29.62
Bachelor's degree (%)	20.64	18.43	26.86
Masters and above (%)	5.3	5.1	5.85
Diploma/Certificate (%)	4.59	5.24	2.77
Others (%)	0.46	0.51	0.31
Age 20-34 with higher education (%)	36.60	34.55	42.36
Log of total household income	12.83	12.76	13.02
Land (%)	47.87	43.49	60.21
Unemployed (%)	4.50	4.18	5.41
No. of kids below 7 years	0.57	0.60	0.46
No. of kids between 7 to 15 years	0.68	0.67	0.72
No. of elders 65 years and above	0.19	0.17	0.26

Note: Age 20-34 with higher education means those aged 20 to 34 having completed higher secondary education, bachelor's degree, masters and diploma/certificate.

Compared with non-migrants, migrants are slightly more male (51.23% vs. 48.37%), mostly married (61.61% vs. 36.8%) and household heads (36.76% vs. 16.56%). Although young the average age of migrants is slightly higher than non-migrants. As for education, migrants are mostly from middle secondary education, higher secondary education and bachelor's degree groups. However, when compared with non-migrants, there are comparatively more migrants from primary education (15.93% vs. 7.49%) and less migrants from bachelor's degree educational group (18.43% vs. 26.86%). In general, migrants tend to have higher education than non-migrants. To capture the tendency that migrants are mostly young with higher education, a variable was generated for those aged 20 to 34 years having higher education (i.e. those with higher secondary education/12th grade, bachelor's degree, masters and diploma/certificate). And yet the proportion of migrants aged 20 to 34 years with higher education is lower than its non-migrant counterparts (34.55% vs. 42.36%). Migrants are less likely to have land; the difference is quite large (43.49% vs. 60.21%). There is not much difference between migrants and non-migrants in terms of unemployment, household income, number of children below 7 years, number of children between 7 to 15 years and number of elders 65 years and above.

Regression analysis

The dependent variable being binary probit model is used. It takes the value of one for those who are migrants to Thimphu thromde and zero otherwise. The result of the regression is shown in Table 5. Both the coefficients and marginal effects are reported. The regression has been checked for multicollinearity; VIF are all below 1.85.

Table 5. *Probit model of migration decision*

	Coefficient	Marginal effect
Male	-0.0240	-0.0071
	(0.0132)	
Age	0.0451***	0.0132
	(0.00304)	
Age squared	-0.000401***	-0.0001
	(0.0000382)	
Married	0.259***	0.0781
	(0.0171)	
Non-formal education	0.377***	0.0837
	(0.0686)	
Lower secondary education	-0.187***	-0.0518
	(0.0296)	
Middle secondary education	-0.124***	-0.0336
	(0.0248)	
Higher secondary education	-0.187***	-0.0519
	(0.0259)	
Bachelor's degree	-0.430***	-0.1285
	(0.0276)	
Masters and above	-0.415***	-0.1234
	(0.0341)	
Diploma/Certificate	-0.00865	-0.0023
	(0.0389)	
Others	0.0371	0.0095
	(0.102)	
Age 20-34 with higher education	0.0453**	0.0133
	(0.0189)	
Log of total household income	-0.0783***	-0.0229

	(0.00607)	
Household head	0.279***	0.0802
	(0.0174)	
Land	-0.297***	-0.0886
	(0.0136)	
Unemployed	0.145***	0.0408
	(0.0297)	
No. of kids below 7 years	0.0912***	0.0268
	(0.00915)	
No. of kids between 7 to 15 years	-0.0234***	-0.0069
	(0.00724)	
No. of elders 65 years and above	-0.147***	-0.0431
	(0.0131)	
Intercept	0.840***	
	(0.0907)	
N	50491	
Pseudo R-sq	0.097	

Note: Standard errors in parentheses
** p<0.05, *** p<0.01
The reference group for educational level is primary education.

As shown in Table 5, gender is not a significant factor of migration when all factors are considered together (i.e. holding all other factors fixed). Age is a significant factor: as age increase the probability of migration increases but at a declining rate, consistent with the earlier finding (see Figure 3) that most migrants are between the ages 20-34. Marriage significantly increases the probability of migration by 7.8%. Marriages are mostly held when people are young. Household heads are more likely to migrate; the probability of migration increases by 8% when the migrant is a household head. It is highly likely that when the household head migrates other members follow.

The effect of education on migration is quite unexpected. With reference group as primary education, those with non-formal education are more likely to migrate. However, those with lower secondary, middle secondary and higher secondary education and bachelor's degree and masters are less likely to migrate to Thimphu thromde compared with those with primary education. This implies that migration to Thimphu thromde is driven largely by low level jobs, which does not require high qualifications. Thimphu thromde do face severe shortage of construction labourers, and hence some are employed as daily wage construction workers. Those with low qualifications works as parking fee collectors, security guards, tailors, and *drayang* (entertainment centres) performers, among others, in towns and cities. Moreover, there are some cases of educated lot (grade 12 and bachelor's degree) who have taken up commercial farming in rural areas. As mentioned before, a variable was generated to examine the effect of those who are young (aged 20-34) with higher education (i.e. those with higher secondary education, bachelor's degree, masters and diploma/certificate). The effect of this variable on the probability of migration is positive and significant although the magnitude of the effect is small at 1.33%. Therefore, it supports the general observation that those who are young and educated tend to migrate to cities. It thus suggest that those who are not young, that is 35 years and above, even if they have higher education, are less likely to migrate to Thimphu thromde. This could be because the returns on human capital declines with the increase in age after crossing a certain point.

An increase in household income by 1% reduces the probability of migration by 2.3%. In other words, those from poor households are more likely to migrate. Those who are unemployed are more likely to migrate than those who are employed. Unemployment increase the probability of migration by 4.1%. Unemployed people migrate to Thimphu city with the expectation of finding jobs, especially high paying productive jobs. Those who do not own any land are more likely to migrate; the probability of migration increases by 8.9%. Land is the main source of rural livelihood and income without which people could be forced to

migrate to urban areas. Household income, unemployment and land variables are all significant at 1% level.

With regard to household composition, while all the variables are significant, having more children under 7 years does not deter migration. On the contrary it increases the migration probability by 2.7%. However, an increase in school going children between 7 to 15 years does deter migration albeit by a very small proportion. One more kid in this age range decreases the probability of migration by 0.7%. The presence of elderly in the household deters migration by a relatively higher magnitude (one more elderly in the household decreases the migration probability by 4.3%), indicating that family members feels obliged to take care of their older parents and relatives.

Conclusion

Given the significance of Thimphu thromde as the major city in Bhutan and lack of its projection, its population was projected till 2027 using constant fertility and death rates for planning and other uses. The rural areas of Thimphu district do not feature in this study. In the process of projection, the paper showed that the net-migration of Thimphu thromde between 2005 and 2017 stood at 21188, with higher proportion of women than men and young ones dominating the population. It also showed that population growth of Thimphu thromde was driven more by migration than its natural increase. The population of Thimphu thromde is projected to increase to 135,354 in 2022 and 150,595 in 2027, and the number of migrants is projected to increase by 1998 in 2027. The proportion of population below 15 years will slightly decrease to 23.3% while those above 65 years will increase to 4.6% by 2027.

As expected a majority has migrated from rural areas to Thimphu thromde. Migrants to Thimphu thromde are more likely to be young, married, household head, unemployed, landless and from low income background. Among these factors, being landless has the largest effect followed by being head of household, marriage

and unemployment. An increase in school going children between 7 to 15 years and elderly in the household deters migration; however, an increase in children under 7 years does not deter migration. At higher levels of education, probability of migration decreases compared with primary education whereas those with non-formal education are comparatively more likely to migrate. When an interaction term of age 20-34 and higher education (higher secondary education, bachelor's degree, masters and diploma/certificate) was included in the regression, the effect was positive and small but significant, indicating that young and educated are somewhat more likely to migrate to Thimphu thromde. It has to be noted that there could be policy variables, such as access to credit, that could influence migration but the census data do not allow to test this in the model. The determinants of migration to Thimphu thromde give an idea about controlling the flows of migration.

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Appendix

Table A1. *Estimated 2017 population of Thimphu thromde*

Age	2005 population		Survival rates		2005 fertility rate	Births 2005-2010	2010 population		Births 2010-2015	2015 population		Survival rates		Births 2015-2017	Estimated 2017 population	
	Male	Female	Male	Female			Male	Female		Male	Female	Male	Female		Male	Female
0-4	3971	3808	0.934	0.920			3875	3700		4565	4359	0.973	0.966		4525	4304
5-9	3723	3692	0.981	0.996			3709	3502		3619	3402	0.992	0.998		3931	3723
10-14	4115	4489	0.998	0.996			3654	3677		3639	3487	0.999	0.998		3618	3447
15-19	4452	5033	0.993	0.997	0.0217	545	4105	4469	484	3645	3661	0.997	0.999	159	3635	3586
20-24	7554	5425	0.996	0.995	0.0986	2675	4422	5018	2474	4077	4456	0.998	0.998	879	3897	4131
25-29	5249	3957	0.989	0.997	0.1395	2760	7524	5400	3767	4405	4995	0.995	0.999	1394	4259	4773
30-34	3539	2760	0.987	0.991	0.0717	990	5189	3947	1416	7438	5386	0.995	0.996	773	6194	5216
35-39	3208	2211	0.975	0.982	0.0384	425	3494	2735	526	5124	3911	0.990	0.993	301	6004	4477
40-44	2014	1465	0.983	0.973	0.0191	140	3129	2171	207	3408	2686	0.993	0.989	103	4060	3147
45-49	1570	1126	0.953	0.931	0.0071	40	1979	1425	51	3075	2113	0.981	0.972	30	3164	2295
50-54	1116	713	0.939	0.945			1496	1048		1886	1327	0.975	0.978		2310	1600
55-59	599	503	0.911	0.825			1048	674		1405	991	0.964	0.926		1548	1069
60-64	461	477	0.867	0.899			546	415		955	556	0.944	0.959		1083	687
65-69	354	363	0.817	0.833			400	429		473	373	0.922	0.930		623	421
70-74	265	304	0.747	0.818			289	302		327	358	0.890	0.923		349	337
75+	275	394	0.343	0.664			292	510		316	586	0.652	0.849		322	629
Total	42465	36720				7575			8924	48357	42647			3637	49521	43842

Source: Author's calculation using data from 2017 PHCB

Table A2. *Population projection of Thimphu thromde*

Age	2017 population		Survival rates		2017 fertility rate	Births 2017-2022	2022 population		Migration 2022		2022 pop. with migration		Births 2022-2027	2027 population		Migration 2027		2027 pop. with migration	
	Male	Female	Male	Female			Male	Female	Male	Female	Male	Female		Male	Female	Male	Female	Male	Female
0-4	4758	4477	0.979	0.984			5850	5170	125	87	5975	5257		5899	5213	253	175	6152	5388
5-9	4699	4554	0.996	0.996			4659	4406	379	410	5038	4816		5729	5088	932	946	6661	6034
10-14	4400	4349	0.999	0.997			4679	4534	421	494	5100	5028		4639	4387	835	956	5475	5343
15-19	4615	5161	0.994	0.997	0.0081	210	4395	4334	494	793	4889	5127	176	4674	4518	1050	1653	5723	6172
20-24	7868	7458	0.995	0.997	0.0653	2435	4585	5146	1947	1727	6532	6873	1680	4367	4321	3709	2900	8075	7222
25-29	8635	7983	0.994	0.996	0.1193	4760	7828	7438	3351	2084	11179	9522	4435	4562	5132	3906	2876	8468	8009
30-34	6750	5988	0.983	0.992	0.0850	2545	8580	7953	321	490	8901	8443	3380	7778	7410	582	914	8360	8324
35-39	5168	4578	0.979	0.989	0.0374	855	6636	5938	-385	56	6251	5994	1109	8435	7887	-979	149	7456	8036
40-44	3465	2757	0.967	0.980	0.0120	165	5059	4528	-309	-234	4750	4294	271	6496	5874	-793	-607	5703	5267
45-49	2792	2221	0.968	0.975	0.0045	50	3352	2702	-164	-36	3188	2666	61	4893	4439	-479	-118	4414	4320
50-54	1922	1620	0.939	0.952			2703	2167	-189	11	2514	2178		3245	2636	-454	28	2790	2664
55-59	1176	1182	0.922	0.914			1805	1542	-181	68	1624	1609		2539	2062	-508	181	2030	2243
60-64	909	976	0.870	0.911			1084	1081	-72	190	1012	1270		1664	1409	-222	495	1441	1904
65-69	629	660	0.851	0.878			791	889	3	210	794	1099		943	985	8	465	951	1450
70-74	438	610	0.684	0.818			535	579	57	196	592	775		673	780	143	528	816	1308
75-79	350	439	0.680	0.728			300	499	58	39	358	538		366	474	142	74	508	548
80-84	236	300	0.507	0.602			238	320	46	25	284	344		204	363	79	56	283	420
85+	186	242	0.377	0.447			190	289	37	22	226	311		192	321	74	50	266	371
Total	58996	55555				11020			5940	6632	69208	66146	11113	67296	63300	8277	11721	75574	75021

Source: Author's calculation using data from 2017 PHCB