This is the authors version, published first online 16 November 2015;
<http://onlinelibrary.wiley.com/doi/10.1111/tesg.12172/abstract>

TITLE

The effect of primary school absence and closure on inward and outward flows of families

AUTHORS

Hans Elshof ^{a,b,*}, Tialda Haartsen ^a, Clara H. Mulder ^a

^a Netherlands Interdisciplinary Demographic Institute, Postbus 11650, 2502 AR, Den Haag, The Netherlands

elshof@nidi.nl

^b Faculty of Spatial Sciences, University of Groningen, Groningen, The Netherlands

h.elshof@rug.nl

t.haartsen@rug.nl

c.h.mulder@rug.nl

*Corresponding author. Tel.: +31 (0)70 3565 246.

E-mail address for correspondence: elshof@nidi.nl (H. Elshof)

ABSTRACT

Due to ageing and depopulation, the continued existence of many primary schools in villages in rural North-Netherlands is threatened. It is believed that villages without a primary school will no longer be attractive to families with children, which could strengthen the process of population decline. This research examines to what extent the absence and closure of a primary school in a village influence the inward and outward flows of families with children in rural villages. We used population register data to acquire the flows at village level for the period 1996 to 2011. Data on primary schools were provided by the Dutch Ministry of Education. Linear regression analyses of relative inward and outward flows show that villages without a primary school, and villages that have experienced the closure of a primary school, have similar influx, but larger outward flows of families with children compared with villages with a primary school.

KEY WORDS

Moving behaviour, North-Netherlands, linear regression, primary schools, families with children, rural population decline.

1. INTRODUCTION

The demographic landscape of contemporary Dutch rural areas is characterised by ageing and dejuvenation, resulting in stagnating or declining populations. Dejuvenation, that is, declining numbers of 0-18 years old, is caused by the combined effects of consistently low levels of fertility at the national level and the continuing flow of young people from rural to urban areas. As a result, rural areas in the Netherlands have witnessed a decrease in the numbers of primary school children over the last decade. Moreover, between 2012 and 2020 this decrease is expected to be even sharper because of an echo of the baby bust of the late 1960s and 1970s (Author 2012) and a temporary decline of fertility due to the economic crisis (De Beer 2012). The impact of the decline of children of primary school age is likely to be most decisive in rural areas, because schools in rural areas tend to be smaller than those in urban areas and because the decrease in the number of pupils is stronger in rural areas (Author 2014).

Among local policy makers and inhabitants of rural villages, a persistent image exists that villages without a primary school are not an attractive place of residence for families with children, and that school closures therefore are a 'recipe for depopulation' (Barakat 2014). Primary schools are perceived as symbols of healthy, viable and prosperous communities (Egelund & Laustsen 2006, Author 2012, Woods 2005). Media items on school closures often reflect and stress this idea of diminishing community attractiveness for families with children (Dagblad van het Noorden 2014, Jouster Courant 2013, RTV Noord 2010). However, the relation between the presence or absence of a primary school and moving behaviour of families with children has never been **investigated** empirically.

Moving behaviour is often explained by push and pull factors in origin and destination (Lee, 1966). In this regard, community attractiveness is an important driver of moving behaviour. "People vote with their feet", as Tiebout (1956) stated already. They tend to be pulled towards places where the circumstances fit their needs, and pushed out of places where this is not the case. People's evaluation of community attractiveness is influenced by the presence of public goods, beneficial taxation laws, and environmental quality (Banzhaf and Walsh 2008). As primary schools are an important public good for families with school-aged children, absence of this public service may thus push families with children out of a village, while presence of a primary school may pull them in. However, the theory of push and pull factors also includes intervening obstacles, which obstruct a move because of, for instance, certain obligations at the origin destination. Primary schools could serve as such a 'keep factor' for some families who would like to move, for instance when employment is found elsewhere, but do not do so because they do not want their children to change primary schools. In such a case, primary school closure could unlock a potential of families who move out of a village, while they would have remained if the school had stayed open.

This study aims at finding out to what extent the absence or closure of a primary school indeed influences inward and outward flows of families with school-aged children in small rural villages. Our analysis is limited to rural villages of between 100 and 860 inhabitants in North-Netherlands, which consists of the provinces Friesland, Groningen and Drenthe. This region can be typified as being the most rural region of the Netherlands (Author 2003) and has been experiencing population decline and primary school closure in some areas for several years (Ministry of education, culture and science 2014, Statistics Netherlands 2015). For these small villages inward and outward flows of families with school-aged children were calculated for the period 1996-2011. With these data, separate regression models for relative inward and outward

flows were estimated to determine to what extent villages without a school, or with a recently closed school, showed lower inward or higher outward flows of families with school-aged children than villages with a school.

2. PRIMARY SCHOOLS AND MOVING BEHAVIOUR

Research on the effect of school absence in villages on inward and outward flows of families with children is scarce and the results are mixed. Older studies from the US indicate that primary school closures have a negative effect on demographic change. A study by Johnson (1978) suggested that when a school closes, “a post-closure shift to fewer families with school-age children may in fact be the most significant finding” (p.359). Dreier and Goudy (1994) found that rural communities without a high school lose population faster when compared to all other towns which lose population. In Scotland however, Forsythe (1983) did not find a consistent effect of primary school closure on population change.

Two recent studies focus more specifically on the effects of primary school absence on moving behaviour. In Sweden, Amcoff (2012) could not demonstrate evidence that school closure had an effect on the inward and outward flows of families with children, but pointed out that the well-developed school bus system in rural Sweden could be an explanation for this lack of an effect. A study in Saxony, Germany by Bakarat (2014) also produced little evidence that either primary school closure, or the mere absence of a primary school in a municipality had a noteworthy effect on inward and outward flows. In this case, however, the period of observation was preceded by a period in which small schools were closed in favour of larger schools in key settlements, a situation to which the parents and children already had adapted their daily routines (Fickermann *et al.* 1998).

Although the recent findings dismiss the effect of primary school absence and closure on inward and outward flows of families with children, an effect might still be found in rural areas in North-Netherlands because the situation is different in several ways from Sweden and Germany. Firstly, with 206 inhabitants per km² in 2010 (Statistics Netherlands 2015) rural areas in North-Netherlands are more densely populated than those in Sweden, with 23 inhabitants per km² including urban areas (Statistics Sweden 2015). This allows for a denser network of primary schools. Secondly, the school bus system in the Netherlands is not well developed and could create a different dynamic. Thirdly, when the situation in Saxony is compared to North-Netherlands, it can be observed that in the Netherlands no deliberate choice was made to create a hierarchy in the spatial distribution of primary schools. **The decision to close a school is largely left to the schoolboards, who do have to decide within certain legislation and pressure from local and national governments.** In 1995 there was an operation to increase the scale of primary schools, but the minimum number of pupils in rural areas is still 23, which leaves room for many small schools in rural villages in North-Netherlands.

3. DATA AND METHODS

Primary school data from the Dutch ministry of education and register data on moving behaviour from Statistics Netherlands were used to analyse the relation between primary school absence and moving behaviour in rural villages in North-Netherlands during the period 1996-2011. Our analysis consisted of two parts for which different selections of rural villages were used. For the descriptive analysis of primary schools and flows of families with children below twelve years of age in rural North-Netherlands, all villages with an address density below 1,000 addresses per km², excluding islands and the capital municipalities of the three provinces were used.

For the regression models we selected rural villages with an address density below 500 per km². From this sample, areas with a predominantly agricultural or industrial function were removed, because they are unlikely to hold a primary school. Furthermore, because the number of moves can fluctuate considerably on this low spatial scale, the smallest villages with fewer than 100 inhabitants, of which none contained a primary school, were also removed. In the sample, the largest village without a school in 2011 had 860 inhabitants. To allow for a good comparison between villages with or without a primary school, all villages with more than 860 inhabitants were also taken out. Finally, those villages with a sharp population increase of over 400%, hinting at newly built housing, and those who had contained an asylum seekers centre during 1996-2011, were removed because they possibly were difficult to compare to the other villages. This resulted in a sample of 553 villages: 344 with a primary school, 28 that experienced closure of the last primary school during the research period, and 181 without a primary school (see table 1). Of the 28 villages that experienced closure the last school, 19 were within three years of the beginning or the end of the period of observation and therefore only moving behaviour before or after the closure of these villages was included in the sample. From the other nine villages moving behaviour both before and after the closure of the last school was included in the sample.

With this sample of villages, two linear regression models were estimated for inward and outward flows of families with children below twelve years of age. Because inward flows depend on the availability of housing in a village, an average annual 'rate' was calculated for inward flows by dividing the inward flow by the number of observed household-years of all households (as an equivalent to person-years) in the village. This is not strictly a rate, because the population at risk here is not those households who live in the village, but rather all other households. Nevertheless, we use it as a rate because it provides a measure of the magnitude of the inflow. For outward flows an average annual rate was calculated by dividing the outward flow by the total number household-years of families in the village. To account for possible autocorrelation because of dual observations of the same villages before and after school closure, the models were also estimated by using robust standard errors (Huber 1967), which returned no significantly different results than the estimation of the models without robust standard errors. We are aware that there might be a causality issue in using linear regression, because the migration flows may be influenced by the status of the primary school, but also vice versa. We have tried to deal with this issue by separating migration flows before and after closure. Furthermore, we are aware of more sophisticated ways to analyse migration flows (such as Klotz 2014), but our simple approach resulted in such clear results that it was not deemed worthwhile to pursue any further modelling.

The most important independent variable was school availability in the village. In model A four categories of villages were considered: those without a school, those where the last school was going to close, those where the last school had closed, and those which had at least one school during the period of observation. In model B the categories from model A were regrouped into two categories: 1) villages without a primary school or where the last school had closed 2) villages with at least one school or where the last school was going to close. In both models a set of control variables was included. In the model of inward flows, the outward flow of all household types during the period 1996 to 2011 was included to control for the creation of space for inward movers. In the model of outward flows, the outward flow of all households other than families with children below twelve was included to control for a possible self-reinforcing effect of population decline (Author *et al.* 2014). To serve as proxy for service level, the total number of households in 1996 was included. Villages with more households were supposed to hold higher levels of services and be more attractive to families with children. Because it has been found that people prefer to live among peers (Kearns and Parkes 2003), the percentage of families with children below twelve in 1996 was included in the model, in which higher levels of families with children were expected to increase the inward flow. Finally the distance to the nearest city with an address density above 1,500 addresses per km² was included to account for the notion that villages closer to cities seem to be more attractive than more remote villages (Steenbekkers and Vermeij 2013).

Table 1: Descriptive statistics of four groups of villages in sample

	Total sample	School open	Before school closure	After school closure	School absent
N	562	344	20	17	181
Means					
Rate inward flow	12.59	12.57	12.59	12.96	12.61
Rate outward flow*	53.62	50.85	58.23	74.72	56.39
Total number of households, 1996*	123.44	151.31	105.10	96.18	75.06
% families with children < 12, 1996*	24.08	24.57	26.42	25.56	22.76
Distance to nearest city (km)	27.76	27.56	32.98	24.87	27.83

**Difference between means of groups significant using one-way ANOVA*

4. PRIMARY SCHOOLS AND MOVING BEHAVIOUR IN RURAL NORTH-NETHERLANDS

As can be observed in figure 1, the number of primary schools in rural areas in North-Netherlands has steadily declined from 893 in 1996 to 828 in 2011. In contrast, the total number of children enrolled in rural primary schools actually increased up to 2007. This broadly corresponds with the peak of 4-12 year olds observed for the whole of the Netherlands (Author 2012). After 2007, the number of primary school-aged children plummeted by 6.3% in five years, which was accompanied by an accelerated decrease in the number of primary schools. The decline in the number of pupils is expected to continue up to 2020 (Author 2012), suggesting a further decline in the number of primary schools.

Figure 1: Change in number of pupils and primary schools, rural North-Netherlands, 1996-2011 (Children: 1996=99,516; 2011=96,411 / Schools: 1996=893; 2011=828)

Despite the decline in the number of school-aged children, rural North-Netherlands appears to remain an attractive place for families with young children. This is exemplified by the observation in figure 2 that inward flows of families with young children have been higher than outward flows during the entire period of observation, and conforms with the finding of Van Dam *et al.* (2002) that also in the Netherlands, young and middle-aged families have an above-average preference for rural living. Nevertheless, despite the positive net flows, figure 2 also shows that the total number of young families in rural areas has been declining since 2004, likely because of the echo of the baby bust in the late 1960s and 1970s.

Figure 2: Total number of families with children < 12 years (bars) and their moving behaviour (lines), rural North-Netherlands, 1996-2011

5. INWARD FLOWS OF FAMILIES WITH CHILDREN

Map A: Relative inward flows of families with children < 12 years in rural villages; average 12.59 families / 1,000 households per year; North-Netherlands, 1996-2011

Map A presents the relative inward flows in the sample villages in relation to village size and primary school status. Villages where the last primary school closed during 1996-2011 are predominantly located in the more peripheral regions in the north and east. The majority of these villages seem to have below-average inward flows, especially in the north. Villages without a primary school seem to be somewhat more common in Drenthe and in the north of Friesland and Groningen (Inset A). In some areas, like the north, most such villages appear to have below-average inward flows. However, in other areas, like the south of Drenthe, this image is reversed (Inset B). A similar heterogeneity of inward flows can be found for villages with a primary school, for example in villages to the southeast of the city of Groningen and in the centre of Friesland (Inset C).

Table 2: Linear regression model inward flows| dependent variable: (inward flow families with children < 12 years/total number of households, 1996-2011)*1,000

	Total sample ^a		Sample (flows > 10) ^b	
	A	Sig	A	Sig
A1. No school during 1996-2011 ^c	-0.412		0.200	
A2a. Before school closure during period ^c	-0.997		-1.384	
A2b. After school closure during period ^c	-0.014		0.644	
B. A1 and A2b together ^d		-0.295		0.298
Outmigration rate ^e	0.096 ***	0.096 ***	0.109 ***	0.109 ***
Total number of households	-0.002	-0.001	-0.008 ***	-0.008 ***
% families with children < 12	0.075 ***	0.074 ***	0.060 *	0.057 *
Distance to nearest city (in kilometres)	0.055 ***	0.054 ***	0.042 ***	0.040 ***
Constant	4.236 ***	4.201 ***	5.595 ***	5.633 ***
R ²	0.216	0.214	0.305	0.302

^aAll villages in the sample are included in the model

^bOnly villages where total absolute in- and outflow is above 10 are included

^cReference category: Villages where school was present during 1996-2011

^dReference category: Villages where school was present or still open during 1996-2011

^eOutmigration rate of all households in the village

*P<0.1 ** P<0.05 ***P<0.01

Although villages that recently experienced primary school closure appeared to have lower relative inward flows than other villages, the regression results in table 2 show that these villages are not significantly different from villages with a primary school. Such is also the case for villages where a primary school was absent during the entire period of observation. Apparently the presence of a primary school is not a determining factor for most young families when they choose a village to move to. Determinants of inward flows are found in the control variables. Greater outward flows of all households go with greater inward flows of families with young children who occupy the vacant housing. Given the higher inward flows in villages where the initial share of families with young children is higher, families with children seem to attract their peers. Inward flows are greater in villages that are further away from cities, possibly because of lower house prices in more remote areas (note that, in the Netherlands, even remote rural areas are usually within commuting distance of a city).

6. OUTWARD FLOWS OF FAMILIES WITH CHILDREN

Map B: Relative outward flows of families with children <12 years in rural villages; average 53.62 families / 1,000 families per year; North-Netherlands, 1996-2011

Map B shows that most villages with above-average outward flows are found in the province of Groningen (Inset A) and the south and northwest of Friesland. Especially in Groningen a higher prevalence of above-average outward flows appears to coincide with a larger share of villages without a primary school (Inset B). In contrast, most villages with below-average outward flows are found in the area between the provincial capitals (Inset C). This seems to coincide with a higher prevalence of villages with a primary school.

Table 3: Linear regression model outward flows| dependent variable: (outward flow families with children < 12 years/total number of families children < 12 years, 1996-2011)*1,000

	Total sample ^a		Sample (flows >10) ^b	
	A	sig	A	sig
A1. No school during 1996-2011 ^c	4.336 *		4.792 *	
A2a. Before school closure during period ^c	7.429		10.220 *	
A2b. After school closure during period ^c	25.971 ***		34.719 ***	
B. A1 and A2b together ^d		5.955 ***		6.445 **
Outmigration rate ^e	0.467 ***	0.468 ***	0.627 ***	0.634 ***
Total number of households	0.030 **	0.031 **	-0.001	-0.001
% families with children < 12	-0.705 ***	-0.648 ***	-0.916 ***	-0.893 ***
Distance to nearest city (in kilometres)	0.031	0.030	0.054	0.057
Constant	36.910 ***	35.741 ***	40.265 ***	39.613 ***

R ²	0.275	0.252	0.418	0.391
----------------	-------	-------	-------	-------

^aAll villages in the sample are included in the model

^bOnly villages where total absolute in- and outflow is above 10 are included

^cReference category: Villages where school was present during 1996-2011

^dReference category: Villages where school was present or still open during 1996-2011

^eOutmigration rate of all households in the village

*P<0.1 ** P<0.05 ***P<0.01

The general patterns found on map B are confirmed by the regression results in table 3. The results show that outward flows are higher in villages without a school than in villages with a school. This suggests that the absence of a primary school might function as a push factor for families with children. In villages where the school has closed during the period of observation the outward flows are even higher after the closure, and also before closure, although evidence for the latter finding is not as strong as for the former. This could indicate that school closure, or the prospect thereof, serves as a particularly strong push factor. However, it might also be that the primary school served as a 'keep factor' for those who already planned to leave, for instance because they found employment elsewhere.

The results furthermore show that when other people than families with children move out of a village, families with children are more likely to move out as well, suggesting a self-reinforcing effect of decline. The idea that families with children prefer to live among peers is supported by the finding that relative outward flows are smaller in villages where initial shares of families with children are larger. Finally, according to model A for the total sample, outward flows are larger when the total number of households is larger.

7. CONCLUSION

Our study shows that the persistent image that primary school absence and closure in villages are a 'recipe for depopulation' is only partly true. Contrary to popular belief, closing the last primary school was not found to influence inward flows of families with young children. However, the closure and absence of a primary school were associated with greater outward flows of families with young children. This could either be because the lack of a primary school pushes people out of a village, or because some families with young children were retained in the village as long as their children visit the local primary school. When the school closes, their reason for staying is removed, and they are free to relocate. **Because this research focuses on migration flows of families with children and not on individual migration decisions, we propose that future research will investigate individual push, pull and keep factors of primary school absence, presence, and closure more thoroughly.**

The moving behaviour of families with young children also seems to be influenced by other factors. Larger outward flows of all household types are associated with both greater inward flows, which suggests that inward movers need space, and greater outward flows, hinting at a 'decline-effect'. Village size had various effects on inward and outward flows, depending on which sample was looked at. The initial share of families with children was found to have a positive effect on inward flows and a negative effect on outward flows. This suggests that families with children prefer to move towards places with higher concentrations of their peers and are more likely to stay in these kinds of places. Finally, villages further away from a city boasted higher levels of inward flows, while no significant effect was found for outward flows. This latter finding is interesting, because it is commonly believed that villages closer to cities are more attractive places of residence than villages in peripheral areas.

One of the limitations of this study was the limited number of villages where the last school had closed during the period of observation. **This was one reason why it was difficult to investigate the causal relationship between primary school closure and migration flows.** Unfortunately, data restrictions did not allow increasing the geographical area or the period of observation at this point. Moreover, the villages that lost their last school were not evenly distributed throughout North-Netherlands. Some of the observed results are therefore possibly caused by unobserved regional characteristics. **But regardless of numbers of observations, it would never be possible to be fully certain about the causal relationship between school closure and migration with the type of data at hand: schools may be closed in response to anticipated further population decline and we can never be certain that the decline would not have taken place had the school not closed.** Another limitation of this research can be found in the implicit assumption that the village school is of equal importance to all families. In reality the Netherlands has schools of particular religious backgrounds. Therefore not the closure of the last school in the village could influence inward and outward moves, but rather the closure of the last school of a particular denomination.

This research has presented evidence that primary school absence and closure affect outward moves of families with children. However, these results need to be considered carefully. With the push effect for instance, the question arises why families with children who move out of villages without a school do not reappear in increased inward flows of such families in villages with a school. If the closure of the last school means the disappearance of a 'keep factor', we might wonder what the actual impact on the village is if we consider that these families would have left anyway, but only a few years later.

REFERENCES

- AMCOFF, J. (2012), Do rural districts die when their schools close? Evidence from Sweden around 2000. *Educational Planning* 20:3, pp. 47-60.
- BANZHAF, H.S. & R.P. WALSH (2008), Do people vote with their feet? An empirical test of Tiebout's mechanism. *American economic review* 98:3, pp. 843-863.
- BARAKAT, B. (2014), A 'recipe for depopulation'? School closures and local population decline in Saxony. *Population, Space and Place*, doi: 10.1002/psp.1853.
- BEER, J. DE (2012), Crisis in de economie, crisis in relatie- en gezinsvorming? *Bevolkingstrends*, <<http://www.cbs.nl/nl-NL/menu/themas/bevolking/publicaties/bevolkingstrends/archief/2012/2012-bevolkingstrends-conjunctuur-relatie-gezinsvorming-art.htm>>, accessed on 10-03-2015.
- DAGBLAD VAN HET NOORDEN (2014), Einde scholen Stadskanaal nabij, <<http://www.dvhn.nl/nieuws/groningen/einde-scholen-stadskanaal-nabij-11987693.html>>, accessed on 25-2-2015.
- DREIER, W.H. & W. GOUDY (1994), Is there life in town after the death of the high school? Or high schools and the population of Midwest towns. *Paper presented the annual rural and small schools* Manhattan, KS, 24-10-1994.
- EGELUND, N. & H. LAUSTSEN (2006), School Closure: What are the consequences for the local society? *Scandinavian Journal of Educational Research* 50:4, pp. 429-439.
- FICKERMANN, D., H. WEISHAUP & P. ZEDLER (1998), Kleine grundschulen in Deutschland: rückblick und ausblick, In: D. FICKERMANN & H. WEISHAUP, eds., *Kleine grundschulen in Europa*, pp. 7-34. Weinheim: Deutscher studienverlag.
- FORSYTHE, D. (1984), The social effects of primary school closure. In: T. BRADLEY & P. LOWE, eds., *Locality and rurality: economy and society in rural regions*, pp. 209-224. Norwich: Geobooks.
- HUBER, P. J. (1967), The behaviour of maximum likelihood estimates under nonstandard conditions. In: L.M.L. CAM & J. NEYMAN, eds., *Proceedings of the fifth Berkeley symposium on mathematical statistics and probability*. pp. 221-233. Berkeley, CA: university of California press.
- JOHNSON, H.M. (1978), School closure: How much impact on the community? *The Phi Delta Kappan* 59:5, pp. 357-359.
- JOUSTER COURANT (2013) Christenunie op barricaden voor behoud kleine scholen. <<http://www.joustercourant.nl/gemeentenieuws/13390/christenunie-op-barricaden-%09voor-behoud-kleine-scholen>>, accessed on 25-2-2015.

KEARNS, A. & A. PARKES (2003), Living in and leaving poor neighbourhood conditions in England. *Housing Studies* 18:6, pp. 827-851.

KLOTZ, J. (2014), A statistical model of annual migration counts for rural municipalities (Ph.D. thesis, University of Vienna).

LEE, E.S. (1966), A theory of migration. *Demography* 3, pp. 48.

MINISTRY OF EDUCATION, CULTURE AND SCIENCE (2014), Open onderwijsdata: primair onderwijs. <http://www.ib-groep.nl/organisatie/open_onderwijsdata/databestanden/po/default.asp>, accessed on 10-3-2015.

RTV NOORD (2010), Loppersum bestrijdt krimp op de verkeerde manier. <<https://www.youtube.com/watch?v=Tw2vAdlLawQ>>, accessed on 25-2-2015.

STATISTICS NETHERLANDS (2015), Statline. <<http://statline.cbs.nl>>, accessed on 23-2-2015.

STATISTICS SWEDEN (2015), Statistikdatabasen. <<http://www.statistikdatabasen.scb.se>>, accessed on 23-2-2015.

STEENBEKKERS, A., & L. VERMEIJ (2013) *De dorpenmonitor*. Den Haag: Sociaal en Cultureel Planbureau.

TIEBOUT, C. (1956), A pure theory of local expenditures. *Journal of political economy* 64:5, pp. 416–424.

VAN DAM, F., S. HEINS & B.S. ELBERSEN (2002), Lay discourses of the rural and stated and revealed preferences for rural living. Some evidence of the existence of a rural idyll in the Netherlands. *Journal of rural studies* 18:4, pp. 461-476.

WOODS, M. (2005), *Rural geography: Processes, responses and experiences in rural restructuring*. Ashgate publications.