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Has the Relationship between Formal Education and the Formal Employment Sector in Nepal changed between 1995 and 2014?

Thomas Bolli[1], Mahesh Nath Parajuli[2] and Ursula Renold[3]

Abstract

This paper analyses the relationship between formal education and the formal employment sector in Nepal. The analysis of several individual-level surveys between 1995 and 2014 shows that completed tertiary education increases the probability to be wage-employed in the non-agricultural sector, while primary and secondary education has little relationship with wage-employment. However, primary, secondary and tertiary education all increase an extended measure of formal sector employment that accounts for company registration and size. This highlights the relevance of choosing the appropriate measure of formal sector employment. The strength of the relationship between completed primary and secondary education and formal sector employment has decreased over time. This decrease provides suggestive evidence that the relative returns to formal education in the informal sector have increased, implying that the informal employment sector provides relatively more opportunities in 2014 than 20 years earlier. The relationship between tertiary education and wage-employment has also decreased but the relationship between tertiary education and the extended measure of formal sector employment has remained stable. This might reflect the large share of tertiary educated working in government related sectors.

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1 Introduction

A large literature discusses various goals of formal education systems. A prominent example is Klieme et al. (2006), who differentiates three goals of formal education systems, namely providing human capital for the production processes, enabling individuals to govern the course of their lives, and contributing to civic society. Even though many authors highlight the relevance of taking a holistic perspective of formal education (see, e.g., Parajuli, 2014), this paper focuses on the human capital function of formal education systems, because increasing human capital plays a critical role to reduce poverty and increase the living standard in Nepal (see, e.g., Krueger et al., 2001, Hanushek and Woessmann, 2008). This is particularly true for rural areas of Nepal (see, e.g., Sharma, 2014), where educational attainment lags behind substantially.

Reaping the benefits of formal education in terms of growth requires an environment that rewards human capital sufficiently. In this context, the informal employment sector is considered an important policy issue (see, e.g., ILO, 2013, Benjamin et al. 2014) that the literature discusses in an ambivalent way though. On the one hand, some authors argue that the informal sector might represent a hindrance because entry barriers of the formal sector prevent workers to reap the full benefit of human capital (see, e.g., La Porta and Shleifer, 2014). On the other hand, this negative view is disputed, as the informal sector might also represent an opportunity for entrepreneurs to escape the grasp of the regulatory requirements (see, e.g., De Soto, 1989, Timalsina, 2007). Furthermore, the informal sector might provide the opportunity to be an owner rather than a worker. The difference between these opposing perspectives shows that the theoretical relationship between formal education and employment in the formal sector remains ambiguous, as it remains unclear from a theoretical perspective whether the returns to formal education are higher in the formal or informal sector.

The question also represents an unresolved issue from an empirical point of view (see Dickson et al., 2008, and Van der Sluis et al., 2008, for an overview). A meta-analytical study that focuses on developing countries suggests that formal education increases formal economic activity measured by wage-employment (Van der Sluis et al., 2005). We complement this existing literature by considering more elaborate measures of formal sector employment and by presenting first evidence for Nepal since the existing literature provides no insights into the relationship between formal education and formal sector employment in Nepal. The most relevant literature provides descriptive statistics of formal employment (Jah, 2002, CBS, 1999, 2009). Hence this paper uses individual-level data from Nepal Living Standard Surveys (NLSS), Nepal Labour Force Surveys (NLFS) and Annual Household Surveys (AHHS) to analyse formal educational attainment in terms of the ISCED categories primary, secondary and tertiary education. Furthermore, we analyse the prevalence of formal economic activities and the relationship between formal education and formal economic activity. Using various data sets across time further allows to assess how the relationship between formal education and formal sector employment has developed over time.

The results show that formal education of the population in Nepal has increased substantially between 1995 and 2014. Furthermore, the share of non-agricultural employment has improved. However, the share of the informal sector in the non-agricultural sector has remained relatively constant. This holds independent of whether the formal sector is measured simply by comparing wage-employment and self-employment or whether the measure accounts for company registration and size.

The differentiation of formal sector measurements becomes relevant for the results regarding relationship between formal education and formal sector employment. Tertiary education has a clearly positive relationship with wage-employment, while the relationship remains negligible for primary and secondary education. This might be due to a lacking link between actors from

the education and employment system (Bolli et al. 2018). However, all three formal education levels increase the probability to work in the formal sector if company registration and size are accounted for.

Finally, the paper shows that the relationship between completed primary and secondary education and formal sector employment has decreased over time. This might suggest that these workers see a relative increase in the opportunities provided in the informal sector. Alternatively, it might arise due to increasing labour migration. This hypothesis suggests that the effect is particularly pronounced for young workers, which is not supported empirically. The increase of opportunities in the informal sector highlights the relevance to strengthen the informal sector, for example by providing services of state and non-state agencies or by including informal workshops in the provision of formal education. Particularly for deprived workers, the informal sector might represent an important possibility to become an owner.

While the relationship between tertiary educated workers and wage-employment has decreased over time as well, the relationship has been stable for tertiary education and the formal sector employment measure that accounts for company registration and size. This might reflect the fact that a large share of workers with tertiary education work in the government related sectors public administration, education and health, which are mostly located in the formal sector.

Section 2 of the paper develops the hypotheses based on the existing literature regarding formal education and formal sector employment. Section 3 describes the data sources and the empirical methodology. Section 4 shows the results and section 5 draws conclusions.

2 Literature review and hypotheses

The argument to develop a hypothesis regarding the relationship between formal education and formal sector employment builds on the literature analysing the returns to formal education. Particularly relevant is the literature that compares the returns to formal education for self-employed and wage-employed workers (see, e.g. Fossen and Büttner, 2013). This literature builds on two main theoretical arguments. First, the human capital theory argues that formal education improves productivity, thereby increasing wages of workers (see, e.g. Becker, 1962). Second, the signalling theory argues that because acquiring formal education is costly, formal education degrees signal high individual productivity (see, e.g., Spence, 1973). Hence, the signalling theory argues that returns to formal education arise because formal education represents a signalling device in labour markets with imperfect information rather than because formal education creates productivity improvements.

Assuming that self-employed are not subject to screening, combining these two theories suggests that returns to formal education are higher for wage-employed than for self-employed (see, e.g., Wolpin, 1977, Brown and Sessions, 1999). The reason is that self-employed workers benefit from the productivity increases, but have no benefit from the signal. Wage-employed workers on the other hand enjoy both productivity increases and signalling benefits. This would suggest that educated persons select into wage-employment, indicating a positive relationship between formal education and wage-employment.

However, other authors argue that customers use formal education as a screening device (see, e.g., Backes-Gellner and Werner, 2007, Parker and Van Praag, 2006). Furthermore, the personal control theory argues that organizational constraints restrict self-employed less in the use of their human capital than wage-employed. Hence, self-employed workers can employ their human capital more effectively (see, e.g., Douhan and Van Praag, 2009, Van Praag et al., 2013). These constraints can either stem from the company or from government

regulations (De Soto, 1989). These two arguments indicate a neutral or negative relationship between formal education and wage-employment.

Since theoretical arguments go both ways, a theoretical framework remains ambiguous regarding the relative return of formal education for self-employed and wage-employed workers, respectively, and hence regarding the relationship between formal education and wage-employment. This theoretical ambiguity is supported by empirical ambiguity of the literature review of Dickson et al. (2008) and Van der Sluis et al. (2008). However, the meta-analytic study of Van der Sluis et al. (2005) suggests a positive relationship between formal education and wage-employment for developing countries. This suggests that returns to formal education are relatively low for self-employed in developing countries. Based on this empirical evidence, we hypothesize that

H1: Higher formal educational attainment increases the probability to be wage-employed rather than self-employed.

Building on this hypothesis raises the question whether hypothesis H1 holds for employment in the formal sector in general. Recall that the control theory argues that self-employed have more control over their resources than the wage-employed because of restrictions created by either the company or the government. Hence, wage-employed individuals working in an informal company might use their human capital less effectively if restrictions stem from the company. However, to the extent that the government regulations represents the source of control loss (De Soto, 1989), wage-employed individuals working in an informal company are more effectively using their human capital than wage-employed individuals working in a formal company. Hence, we hypothesize that Hypothesis H1 also applies to formal sector employment in general.

H2a: Higher formal educational attainment increases the probability to work in the formal sector.

In developing these hypotheses, we have implicitly assumed that the informal sector represents a homogenous labour market. However, a recent literature recognizes the heterogeneity of the informal sector (see, e.g., Amin, 2010, Günther and Launov, 2012, Falco et al., 2011). Some workers are active in the informal sector due to necessity, while others choose the informal sector voluntarily because it provides more opportunities (Fossen and Büttner, 2013). They argue that the personal control theory applies to so-called “opportunity self-employed”, but not to so-called “necessity self-employed”. Correspondingly their empirical analysis supports the resulting hypothesis that the return to formal education is higher for “opportunity self-employed” than for “necessity self-employed”.

Fossen and Büttner (2013) differentiate the two self-employment types based on a survey question, asking respondents whether they are self-employed voluntarily. Since this question is not available in the data used in this paper, it takes an indirect approach. This indirect approach consists of estimating the relationship between formal education and formal sector employment at different points in time. If opportunities in the informal sector increase relative to the formal sector, we expect that better educated workers select into the informal sector. Hence, the relationship between formal education and the formal sector becomes weaker. Conversely, if opportunities become relatively scarcer in the informal sector, better educated

workers opt for the formal sector and the relationship between formal education and the formal sector becomes stronger. Since we are ambiguous regarding the development of opportunities in the informal employment sector of Nepal, we posit two alternative hypotheses:

H3a: The relationship between formal education and formality increases over time, reflecting a relative decrease in opportunities available in the informal sector.

H3b: The relationship between formal education and formality decreases over time, reflecting a relative increase in opportunities available in the informal sector.

3 Data and Methodology

3.1 Data sources

The empirical analysis uses seven surveys of individuals conducted by the Central Bureau of Statistics Nepal. The seven surveys can be separated into three types of surveys. First, the Nepal Living Standard Surveys (NLSS) refer to the years 1995/1996, 2003/2004, 2010/2011, respectively (for more information, see CBS Nepal, 1996, 2004, 2011). Second, the Nepal Labour Force Surveys refer to the years 1998/1999 and 2008, respectively (for more information, see CBS Nepal, 1999, 2009). Third, the Annual Household Surveys refer to the years 2013/2014, 2014/2015, respectively (for more information, see CBS Nepal, 2015, 2016).[4]

The different data sources differ regarding available information and sample size. Restricting the sample to individuals aged between 25 and 65 and dropping observations with missing values in labour market status yields 96'359 observations. Further restricting the sample to individuals working in the non-agricultural sector without missing values regarding formal education, gender, age, living district and formal sector employment yields a total sample of 31'598 or 24'186 observations, depending on the measure of formal sector employment. Table A1 in the appendix shows that the samples are substantially larger for the Nepali Labour Force Surveys in 1998 and 2008. This matters for two reasons. First, in order to ensure sufficient sample size, the descriptive statistics of differences across provinces and industries use cross-sectional weights to calculate averages across years. Hence, these differences are mainly driven by the years 1998 and 2008. Second, we report estimates of the relationship between formal education and informal activity measures that control for the data source, thereby testing a potential bias arising from this variation in sample size across data source.

3.2 Measurement of informal economic activity

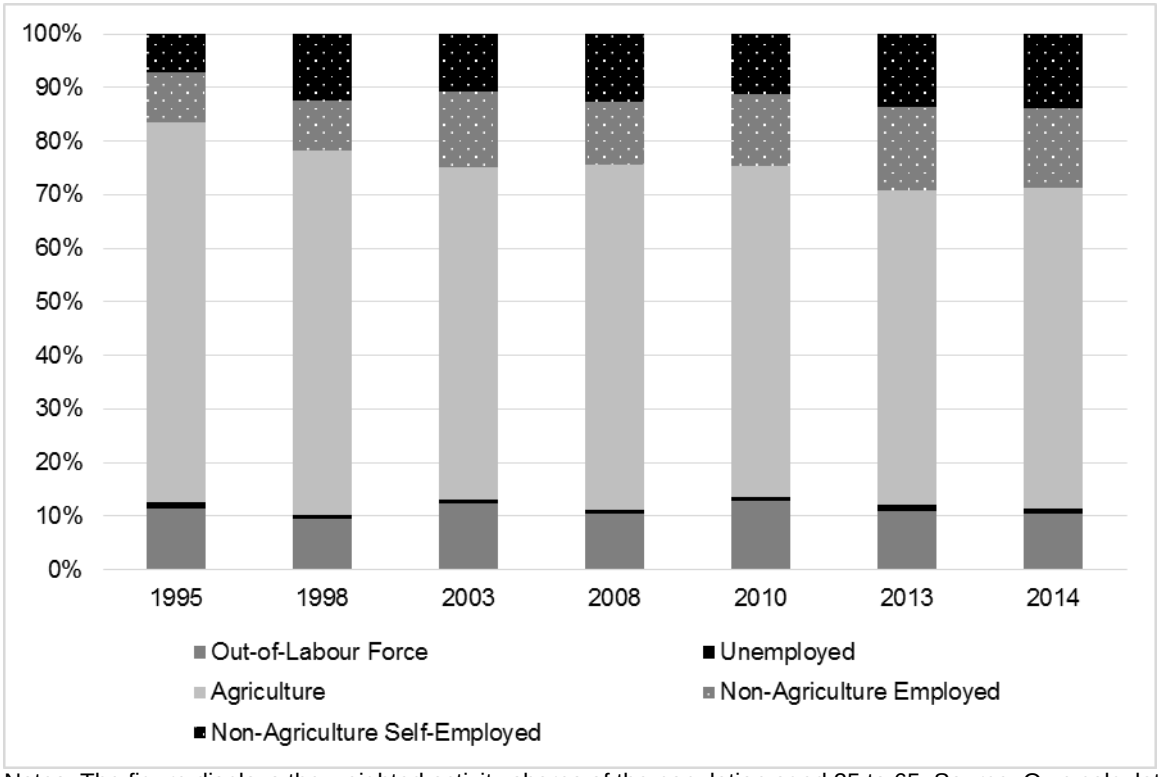
For our analysis, we need to measure informal economic activity. However, though Hart (1973) has sparked a substantial literature on informal economic activity, a uniform definition of the term "informal economic activity" does not exist. ILO (2013) broadly describes informal sector employment as jobs in informal sector companies, which consist of small, private, unincorporated companies engaged in non-agricultural activities meant for sale or barter. Building on this general description, the literature proposes several empirical measures of formal and informal economic activity (see, e.g., Hussmanns, 2004, CBS Nepal, 2009, ILO, 2013).

[4] For simplicity, the following discussions refer to the first year of the surveys only. For example, 1995/1996 is denoted as 1995.

The simplest measure of informal economic activity refers to the distinction between wage-employed and self-employed workers in the non-agricultural sector. Figure 1 exploits the simplicity of this measurement approach to illustrate how the activity patterns of the Nepali population aged 25 to 65 changed between 1995 and 2014. The results suggest that about 11% of the population are not in the labour force and that this value has remained stable across time. Similarly, unemployment is scarce at about 1% in all of the years. In 1995, 71% of the population worked in the agricultural sector. This value dropped continuously, reaching 60% in 2014. This finding reflects a substantial structural change in the Nepali economy.

Hence, the share of the population working in the non-agricultural sector has increased substantially from 17% in 1995 to 25% in 2014. However, the share of self-employed within this sub-population has remained roughly constant at about 49%. It should be noted though, that the two NLFSs in 1998 and 2008 suggest a self-employment share of 57% and 51%, respectively. This is higher than the other data sources suggest.

Figure 1: Development of activity patterns over time

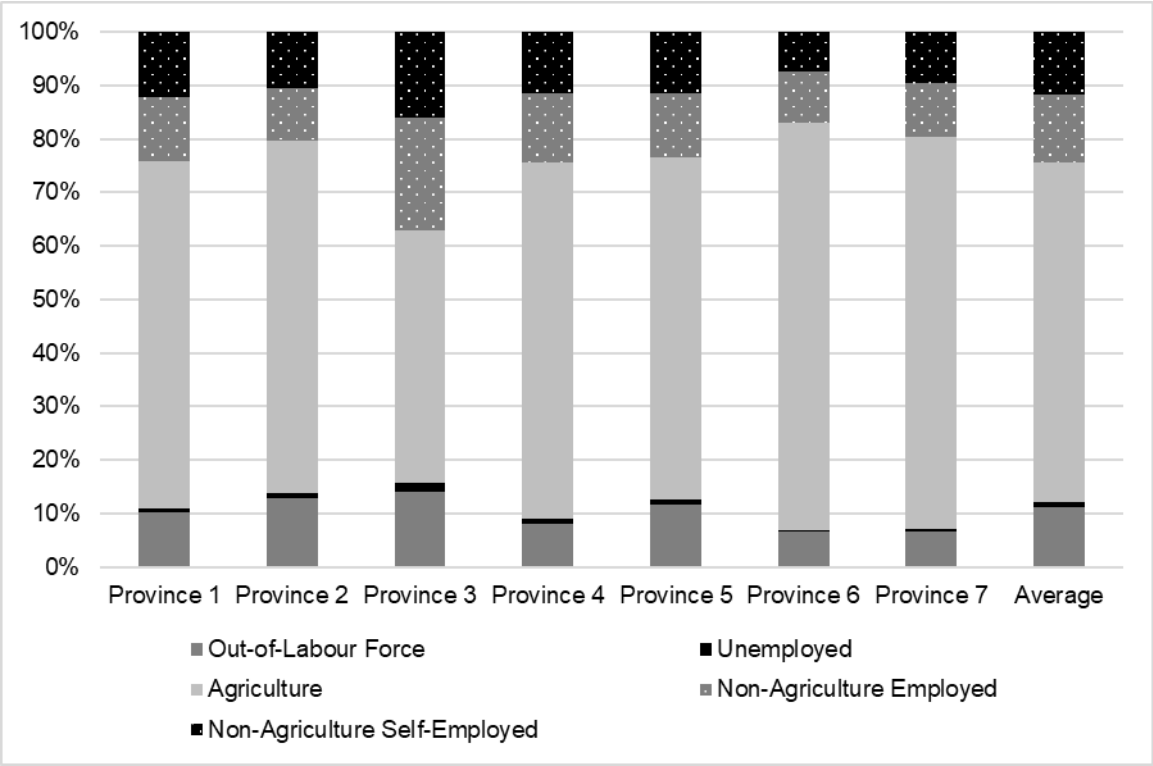


Notes: The figure displays the weighted activity shares of the population aged 25 to 65. Source: Own calculations based on NLSS 1995/1996, 2003/2004, 2010/2011, NLFS 1998/1999, 2008, AHHS 2013/2014, 2014/2015. N=96'359.

Following the acceptance of the new constitution in 2015, Nepal has adopted a federalized governance system, introducing seven provinces (Nepal Law Commission, 2015). In this process, the provinces and especially the local governments should receive more power and responsibility than before. To the extent that the federalization of power and responsibility increases the efficiency of formal education (see, e.g., ETF, 1999, Sharma, 2008, Kafle, 2013), this process has the potential to improve the quality of formal education. Though this process is still under construction (see, e.g., Renold and Caves, 2017, Renold et al. 2018), this represents an important shift in formal education policy.

In this context, Figure 2 displays the activity patterns across the new provinces.[5] The results suggest that the Provinces 1, 4 and 5 are situated similar as the sample average. A somewhat higher share of agricultural employment characterizes Provinces 2, 6 and the 7. However, in Province 3, the seat of the capital Kathmandu, a relatively high share of 14% and 2% of the population are out-of-the-labour force and unemployed, respectively. Furthermore, the share of agricultural employment reaches only 47% and 61% of non-agricultural employment takes place in wage-employment. Hence, while six provinces display a relatively homogenous activity pattern, Province 3, differs substantially. This heterogeneity and the corresponding differences in challenges and resources should be accounted for in the process of federalization.

Figure 2: Heterogeneity of activity patterns across provinces



Notes: The figure displays the activity shares of the population aged 25 to 65. Source: Own calculations of weighted averages across years based on NLSS 1995/1996, 2003/2004, 2010/2011, NLFS 1998/1999, 2008, AHHS 2013/2014, 2014/2015. N=96'359.

The share of self-employed workers among non-agricultural workers represents a relatively crude measure of the informal sector (see, e.g., Henley et al., 2009, Yu, 2012). Hence, the literature suggests to combine this simple indicator with information about the characteristics of the employer. Concretely, Table 2 illustrates that the full measurement of the informal sector is based on three conditions (Hussmanns 2004, CBS Nepal 2009), namely employment status, company registration and company size. Hence, using all three conditions suggests that the informal sector refers to a) paid employees in unregistered companies with less than ten employees and to b) self-employed workers or contributing family members in companies with less than ten employees. All other employees work in the formal sector.

[5] The figure shows averages across the years 1995/1996, 1998/1999, 2008/2009, 2010/2011, 2013/2014 and 2014/2015, weighted by cross-sectional weights.

However, this type of information remains unavailable in the NLSS in the years 1995, 2003 and 2010. Therefore, the paper analyses three different types of measures of informal sector prevalence. The first measure uses only employment status, suggesting that the informal sector refers to all self-employed or contributing family members. The second measure additionally considers whether the company of paid employees is registered. Finally, the third measure uses all three conditions employment status, company registration and company size. Differentiating these three measures allows to assess the empirical relevance of the three conditions.

Table 1: Measurement of informal sector

Employment status	& Company registration	& Company size
Paid employee	Unregistered company	Less than 10
Self-employed or contributing family member		Less than 10

Source: Own depiction based on Hussmanns (2004).

Hence, the literature suggests to define the informal sector based on the economic status of the individual and the company characteristics. However, an accurate measurement of informal employment should further account for whether the job can be categorized as formal or informal (Hussmanns 2004, CBS Nepal 2009). Table 3 shows that informal employment further requires that the worker has paid annual leave and security contribution. Unfortunately, this information is only available in the Nepali Labour Force Survey of 2008. Hence, we can compare the share of employment in the informal sector to the share of informal employment in 2008, but the development over time remains unknown.

Table 2: Measurement of informal employment

Employment status	Formal employment	Informal employment
Paid employee	Paid annual leave and social security contribution	No paid annual leave or social security contribution
Self-employed or contributing family member	Formal sector	Informal sector

Source: Own depiction based on Hussmanns (2004).

Based on these three measures of informal sector and one measure of informal employment, Figure 3 displays the shares of informality in the years 1995, 1998, 2003, 2008, 2010, 2013 and 2014. Table A2 in the appendix displays corresponding regression results to test whether differences across time and data source are statistically significant.

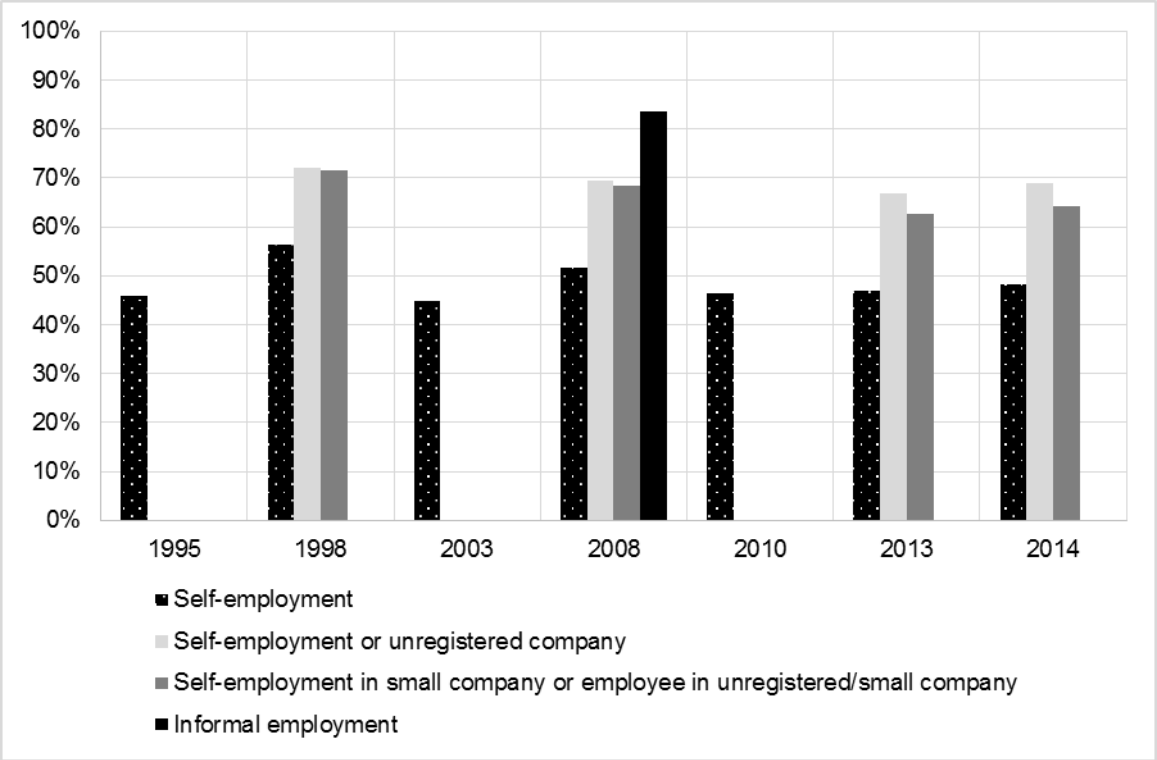
Starting with the comparison of measurement concepts reveals that the share of self-employed is substantially lower (49% on average) than the measure of informal sector that additionally accounts for whether the employer is a registered company (70% on average). Additionally accounting for the size of the employer slightly reduces the share of informal sector employment (67% on average). However, considering paid annual leave and social security contributions yields a substantially higher share of informal employment (84% on average). Hence, the measures of formal sector employment underestimate the share of informal employment substantially.

While this comparison highlights the sensibility of results to the applied measurement concept, data availability prevents this paper from analysing the developments in the share of informal employment over time. This further raises the question of whether measurement differs across

data sources. The most obvious answer is that the share of self-employed is slightly higher in the NLFS. This appears to be due to differences in statistical procedures, since the corresponding measures of the NLSS yield lower values both before and after the NLFS. However, whether the slightly lower share in the NLSS compared to the AHHS represents a trend remains unclear as the two surveys do not overlap in terms of time. This also prevents drawing a definite conclusion from the fact that the two extended measures of informal sector employment are higher in the NLFS than in the AHHS.

The consideration regarding the data sources represent a challenge of assessing the development over time. Hence, Table A2 displays results with and without controlling for the data source. This matters in terms of effect direction and statistical significance. However, the largest effect size amounts to a change of 0.2% per year. Hence, the estimation results support the visual impression that the share of informal sector employment has remained relatively constant between 1995 and 2014. This further suggests that comparisons across time are not particularly susceptible to the questions of measurement concept and statistical procedure.

Figure 3: Development of informality over time



Notes: The figure displays the weighted informality share in the population aged 25 to 65 that is working in the non-agricultural sector. Source: Own calculations based on NLSS 1995/1996, 2003/2004, 2010/2011, NLFS 1998/1999, 2008, AHHS 2013/2014, 2014/2015. N=31'599, 24'544, 24'189, 10'522 for the different indicators, respectively.

3.3 Measurement of formal education

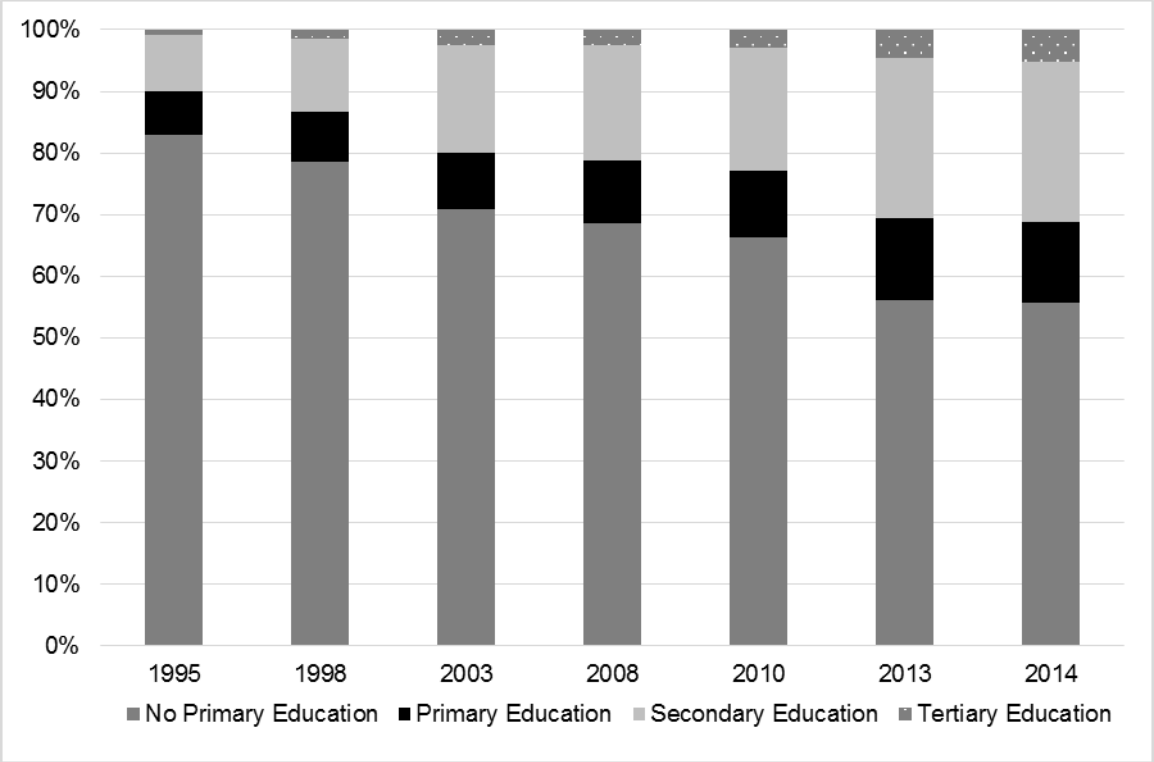
Formal education represents the main explanatory variable of the analysis. Formal education simply refers to four categories, namely individuals without primary education and individuals with completed primary, secondary and tertiary education, respectively. Figure 4 shows the development of formal education shares in the Nepali population aged 25 to 65 between 1995 and 2014.

In 1995, most of the population had not finished primary education (83%) and the shares of completed primary, secondary and tertiary education amounted to only 7%, 9% and 1%, respectively. This pattern has substantially changed in the following 20 years, reflecting substantial progress of Nepal in providing formal education to the population. By 2014, the population share without completed primary education dropped to 68%. 10% have finished a primary education, corresponding to an annual growth of about 0.2% (see Table A3 in the appendix). The strongest growth of annually 0.7% happened in the share with secondary education, which reached 18% in 2014. The share of tertiary education increased by 0.1% per year, ending up at 3% of the population. Hence, even though growth rates have been substantial, the majority of Nepali still has not finished primary education and the share of tertiary educated Nepali remains very low.

Comparing the formal education shares across data sources suggests that the NLSF and AHHS yield similar results with the exception that the share without primary education is lower in the AHHS. However, since the AHHS refers to the years 2013 and 2014, it remains unclear whether this is due to the time trend or statistical differences. Furthermore, The NLSS suggests a larger share of the population without primary education at the cost of the share with primary, secondary and tertiary education.

However, despite these differences, Table A3 shows that the time trends remain almost identical after controlling for the data source. Similar to the results regarding the measurement of formal sector employment, this suggests that estimating the development of the relationship between formal education and formal sector employment is possible.

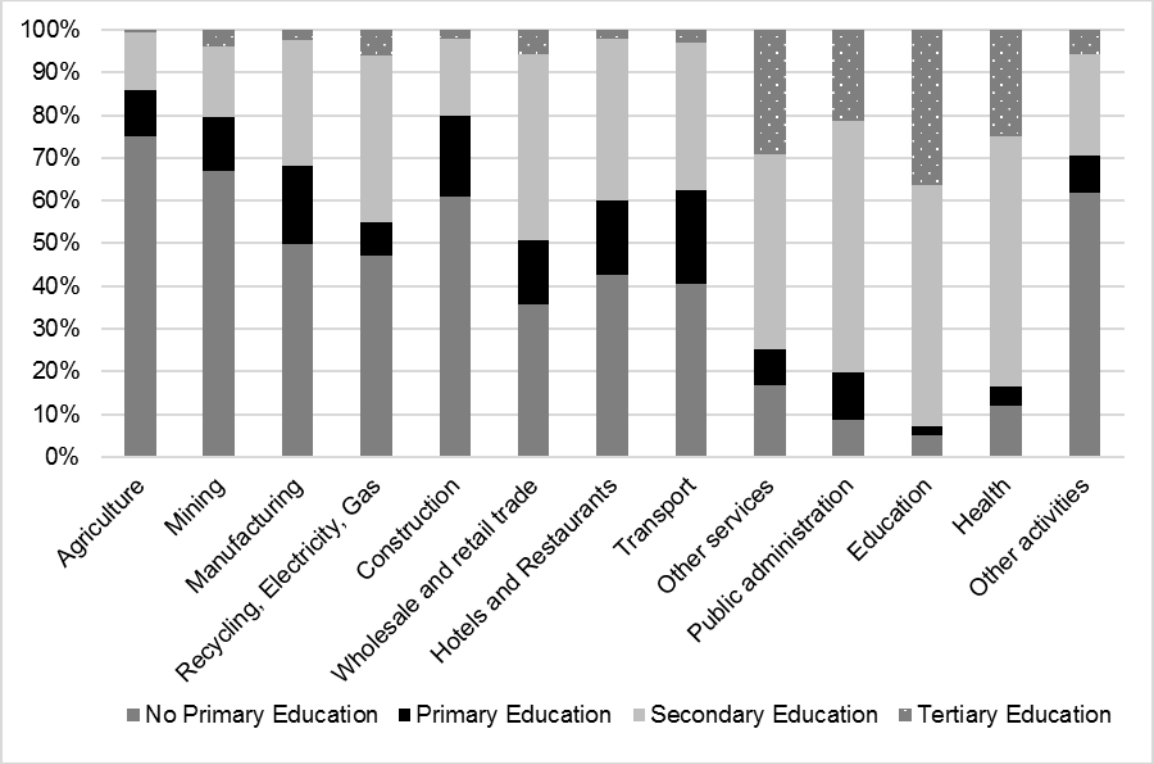
Figure 4: Development of formal education



Notes: The figure displays the weighted formal education shares of the population aged 25 to 65. Source: Own calculations based on NLSS 1995/1996, 2003/2004, 2010/2011, NLFS 1998/1999, 2008, AHHS 2013/2014, 2014/2015. N=95,854.

Figure 5 illustrates the differences in formal educational attainment across economic sectors.[6] The results show that the formal educational attainment allows to broadly separate economic sectors into three groups. First, agriculture has highest share of workers with no primary education. Similarly, the share of workers with no primary education is particularly high in the sectors mining, construction and other activities. Second, the sectors manufacturing, recycling, trade, hotels and transport represent a group of sectors with moderate formal education levels. Third, the share of workers without primary education is very low in other services and the government-related sectors public administration, education and health. Particularly striking is the high share of workers with tertiary education in these sectors, ranging between 21% and 36%. Comparing this to the population average of 3% reveals that these four sectors absorb the majority of tertiary educated workers. Furthermore, recycling and trade also display shares of about 6% of workers with tertiary education.

Figure 5: Heterogeneity of formal education across economic sectors



Notes: The figure displays the formal education shares of the working population aged 25 to 65. Source: Own calculations of weighted averages across years based on NLFS 1998/1999, 2008, AHHS 2013/2014, 2014/2015. N=59'870.

3.4 Empirical methodology

Following the description of the data and the measures for informal sector employment and formal education, the paper estimates the following probit estimation with robust standard errors:

[6] The figure shows averages across the years 1998/1999, 2008/2009, 2013/2014 and 2014/2015, weighted by cross-sectional weights.

$$y_i = \propto + \beta_1 2008 + \beta_2 EDU_i + \beta_3 EDU_i * 2008 + \gamma X_i + \varepsilon_i \ ,$$

where the index i denotes the individual. The dependent variable y takes two variations of formal sector employment in the non-agricultural sector. The first measure simply analyses whether an individual is wage-employed rather than self-employed. This is denoted as wage-employment. The second measure additionally considers employed workers in unregistered or small companies (less than ten workers) and self-employed workers in small companies as informal sector workers. In the following this measure is denoted extended formal sector. Using the intermediate measure based on employment status and company registration are not shown as it provides qualitatively the same results as those for the extended formal sector.

EDU is a vector of three dummy variables indicating whether the highest formal educational attainment of an individual is primary, secondary or tertiary education, respectively (see, e.g., KOF Swiss Economic Institute, 2015, for more information about the Nepali education system). Individuals without completed primary education represent the baseline category. 2008 denotes a dummy variable taking the value 0 before 2008 and 1 afterwards. Hence, the interaction of EDU and 2008 represents the change in the relationship between EDU and y before and after the year 2008. The paper models change over time in the relationship in a simple two-period model because estimating marginal effects of interaction terms of continuous variables in probit estimations is non-trivial (Ai and Norton, 2003). Complementing these estimations, Figures 6 and 7 display marginal effects in each year based on estimations that include a full set of dummy variables for each year instead of the 2008 indicator.

The vector of control variables, X, includes gender, age, age squared and district fixed effects. The results table further shows results including dummies for the data source to account for potential differences in survey methodology and sample size.

A potential problem with the estimation is unobserved heterogeneity that is not captured by the control variables. One reason for this problem is the increase in labour migration from about 200'000 individuals in 2008/2009 to about 500'000 individuals in 2014/2015 (MoLE, 2016). This increase might affect the ability of the domestic workforce and thereby the relationship between formal education and formal employment. About 68% of individuals obtaining a working permit in 2014/2015 have been younger than 35 years. Hence, labour migration is more prevalent among young than among the old. This allows to analyse the relevance of labour migration for the change in the relationship between formal education and formal employment by splitting the sample into individuals aged more or less than 40 years. If the relationship change is driven by older workers, we reject labour migration as the main driver of the change in the relationship.

While this particularly obvious issue can be addressed empirically, the estimations still represent correlations rather than causal effects and should be interpreted accordingly. An example for remaining unobserved heterogeneity refers to the lack of control variables that capture human capital that is acquired outside of the formal education system. This so-called non-formal skill development through courses may have an impact. However, no data about this is available.

4 Empirical results

This section discusses the empirical results regarding the relationship between formal education and formal sector. Figures 6 and 7 display yearly marginal effects of formal education on wage-employment and extended formal sector employment, respectively. Table

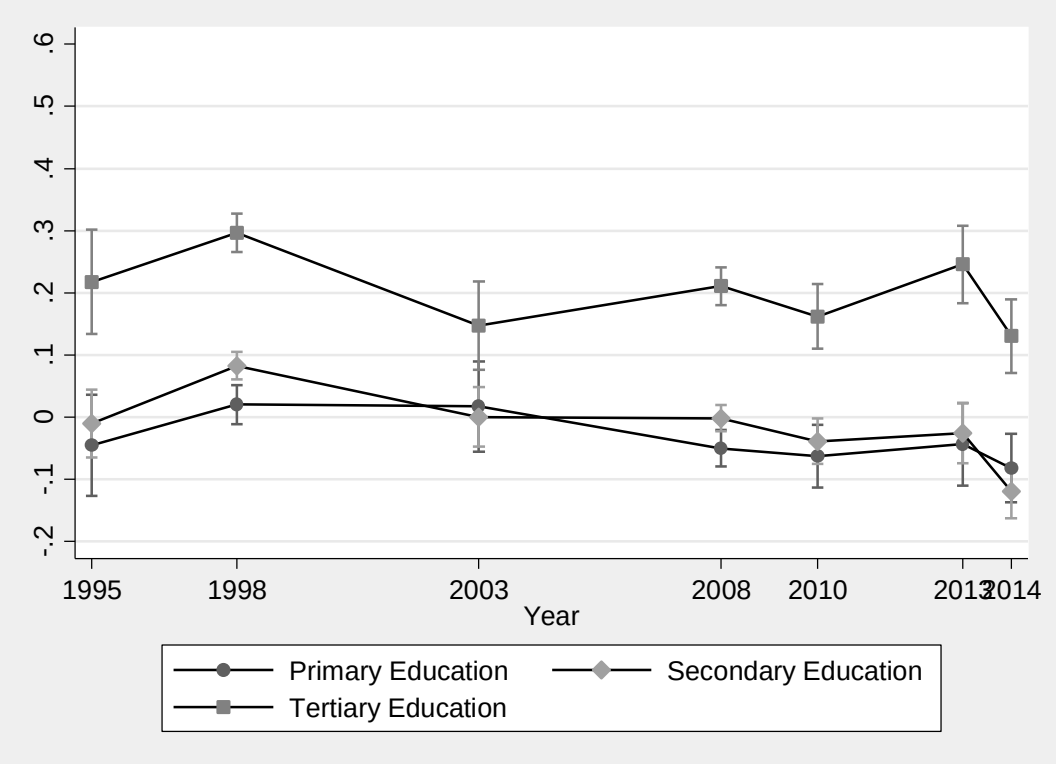
3 tests formally whether the marginal effects changed between the period before 2008 and thereafter.

Figure 6 shows that completed primary and secondary education has no or only a small effect on wage-employment. These results fail to support hypothesis 1. This might be due to a lacking link between actors from the education and employment system (Bolli et al. 2018). These effects of primary and secondary education appear to decrease over time. This finding is supported by the formal test in Table 3. In the period before 2008, completion of primary and secondary education has an insignificant and positive relationship with wage-employment. In the period after 2008, the relationship is negative for both formal education levels, independent of whether the estimation controls for the data source. Hence, the effect for both formal education categories has decreased. This supports hypothesis 3b, suggesting that opportunities in self-employment have improved.

Tertiary education on the other hand has a positive relationship with wage-employment. Having completed tertiary education increases the probability of wage-employment by about 23%[7], thereby supporting hypothesis 1. Figure 6 further suggests that the strength of the relationship has decreased over time. The formal test confirms that the marginal effect of tertiary education is lower after 2008 than before. Hence, these results also suggest that opportunities of self-employment have improved.

The control variables suggest that men are more likely to be wage-employed. Furthermore, the probability to be wage-employed increases with age albeit at a decreasing rate.

Figure 6: Relationship between formal education and wage-employment



Notes: The figure displays marginal effects and 95% confidence intervals based on robust standard errors of probit estimations relating formal education and the probability to be wage-employed rather than self-employed

[7] These numbers are based on pooled estimates regressing formal sector employment on formal education and year fixed effects that are available upon request.

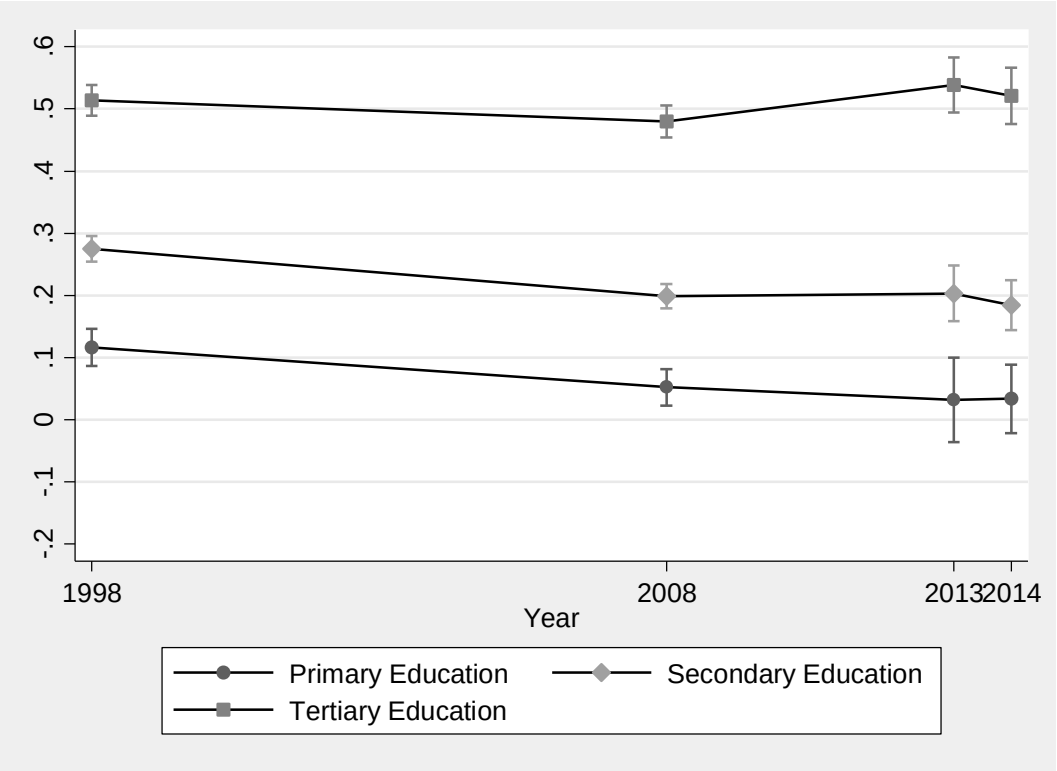
for the population aged 25 to 65 working in the non-agricultural sector. Estimates further control for gender, age, age squared, district and year. Source: Own calculations based on NLSS 1995/1996, 2003/2004, 2010/2011, NLFS 1998/1999, 2008, AHHS 2013/2014, 2014/2015. N=31'598.

Figure 7 displays the yearly marginal effects of formal education on extended formal sector employment that accounts for company registration and size. Since this information is only available in the NLFS and the AHHS, no estimates for the years 1995, 2003 and 2010 exist. The results in terms of the average effect differ substantially from the estimates using wage-employment as dependent variable. Concretely, completed primary education increases formal sector employment, though only by about 8%. Furthermore, secondary education has a strong positive relationship with formal sector employment, increasing it by about 23% on average. Finally, completed tertiary education improves the probability of formal sector employment by about 46% on average. Hence, these results support hypothesis 2, suggesting that formal education increases extended formal sector employment.

The results regarding the development of the effects over time are similar between estimates using wage-employment and extended formal sector employment as dependent variable. Concretely, the effect of both primary and secondary education has been seven to eight percent higher before 2008 than thereafter. This supports hypothesis 3b, suggesting that informal sector employment provides more opportunities in 2014 than in 1998.

However, this result is less clear-cut for tertiary education, for which Figure 7 displays a fairly stable effect. Testing this formally yields an insignificant estimate for the change before and after 2008 independent of whether the estimates include data source fixed effects. Hence, these results suggest that opportunities of informal sector employment have remained the same for workers with tertiary education. This might be related to the finding of Figure 5 that employment of workers with tertiary education is strongly concentrated in the government-related sectors public administration, education and health. Table A4 in the Appendix supports this interpretation, since the relationship between tertiary education and formal sector employment decreases over time for a sample that excludes these three sectors. Furthermore, the level of the relationship becomes weaker in this reduced sample. For primary education, the effect size is reduced only slightly by about three percent. For secondary education, the drop increases to about ten percent and for tertiary education, the strength of the relationship decreases by about 20 percent if the government-related sectors are excluded. This illustrates that working in these sectors matters little for individuals with primary education, but represents an important source of formal sector employment for individuals with secondary or tertiary education.

Figure 7: Relationship between formal education and extended formal sector employment



Notes: The figure displays marginal effects and 95% confidence intervals based on robust standard errors of probit estimations relating formal education and the probability to be in the extended formal sector for the population aged 25 to 65 working in the non-agricultural sector. Estimates further control for gender, age, age squared, district and year. Source: Own calculations based on NLFS 1998/1999, 2008, AHHS 2013/2014, 2014/2015. N=24'186.

Tables A4 and A5 in the appendix show the regression results for two subsamples. Concretely, Table A4 splits the sample into individuals of age below and above 40 years. Table A5 shows the results for men and women separately.

Comparing formal economic activity between young and old shows that young people are slightly more often wage-employed (54%) than the old (48%). The two groups are also quite similar in terms of the share of extended formal sector employment, which is 33% and 28% for young and old workers, respectively.

The results in Table A4 suggests that the results are generally similar for young and old individuals in terms of the average effect across time. An exception is the relationship between secondary education and wage-employment, which is marginally negative for the young but positive for the old. Since this difference disappears for the extended measure of formal sector employment, the difference regarding wage-employment might suggest that secondary education helps the old to find a governmental job but not the young.

The results regarding the change over time suggest that the relationship between primary and secondary education and formal sector employment has decreased for both young and old over time. However, the results also show that the effect is stronger for the old regarding tertiary education. These findings provide suggestive evidence that increasing labour migration is not the source of the development.

Table A5 further analyses the difference between women and men. Formal sector employment measured by wage-employment is more pronounced for men (58%) than for women (35%).

This gender-gap is smaller for the extended formal sector employment measure. According to this measure, 34% of men and 24% of women work in the formal sector. ILO (2019) suggests that the Nepali gender-gap in terms of formal sector employment is relatively high in an international comparison.

The results in Table A5 show that the relationship between primary education and informal sector employment is similar for women and men. Primary education decreases wage-employment but increases the extended measure of informal sector employment. However, secondary education increases wage-employment for women but decreases it for men. This difference disappears though once we use the extended measure of informal sector employment. Similarly, tertiary education increases formal sector employment for both genders, but is more pronounced for women if wage-employment is considered. This might suggest that the signal of formal education is more important for women than for men when it comes to finding wage employment.

Looking at the changes of estimates across time, the results show that the developments are similar across gender regarding primary and secondary education. The relationship between tertiary education and wage-employment has also decreased for both men and women over time. However, the finding that tertiary education has remained stable regarding the extended measure of formal sector employment only holds for men. For women, the effect of tertiary education has decreased. This suggests the opportunities of women with tertiary education in the informal sector have improved over time.

Table 3: Estimations for the relationship between formal education and formality

Dependent Variable	Wage employment		Extended formal sector	
Estimation	Baseline	Datasource	Baseline	Datasource
Primary education				
Before 2008	0.010	0.011	0.119***	0.119***
	(0.014)	(0.014)	(0.015)	(0.015)
After 2008	-0.052***	-0.055***	0.049***	0.045***
	(0.011)	(0.011)	(0.012)	(0.012)
Change	-0.062***	-0.066***	-0.071***	-0.074***
	(0.018)	(0.018)	(0.019)	(0.019)
Secondary education				
Before 2008	0.060***	0.059***	0.275***	0.276***
	(0.010)	(0.010)	(0.010)	(0.011)
After 2008	-0.025***	-0.027***	0.200***	0.196***
	(0.008)	(0.008)	(0.009)	(0.009)
Change	-0.085***	-0.086***	-0.075***	-0.080***
	(0.013)	(0.012)	(0.013)	(0.013)
Tertiary education				
Before 2008	0.265***	0.264***	0.514***	0.510***
	(0.014)	(0.014)	(0.012)	(0.012)
After 2008	0.198***	0.195***	0.500***	0.497***
	(0.012)	(0.012)	(0.010)	(0.011)
Change	-0.067***	-0.069***	-0.014	-0.013
	(0.018)	(0.018)	(0.016)	(0.016)
Control variables				
Male	0.207***	0.207***	0.094***	0.096***
	(0.006)	(0.006)	(0.006)	(0.006)
Age	0.005**	0.004**	0.013***	0.013***
	(0.002)	(0.002)	(0.002)	(0.002)
Age2	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
N	31598	31598	24186	24186
District FE	Yes	Yes	Yes	Yes
After 2008	Yes	Yes	Yes	Yes
Data-source FE	No	Yes	No	Yes

Notes: The table displays marginal effects and robust standard errors of probit estimations. *, ** and *** refer to significance on the 10%, 5% and 1% level, respectively. Each panel of primary, secondary and tertiary education shows the effect of formal education before and after 2008 in addition to the change, which refers to the difference between these two effects. No completed primary education is the baseline category.

4 Summary and Conclusion

This paper uses individual-level data of the NLSS, NLFS and AHHS to describe how formal educational attainment has developed over time and how it differs across provinces. Furthermore, the data allows to compare several measures of the formal employment sector share. . These measures differ substantially in terms of the share of formal economic activity, but suggest that the share has remained relatively stable over time. The results further show that formal economic activity is highest in the sector other services as well as in the government-related sectors public administration, education and health.

Building on these variables allows to estimate the relationship between formal education and formal sector employment. The results show a surprisingly low relationship between primary/secondary education and wage-employment, while the relationship is positive for

tertiary education. However, all formal education levels increase the probability to be in formal sector employment if company registration and size is accounted for. Furthermore, the relationship between formal education and formal sector employment has weakened over time for workers with primary or secondary education. This finding suggests that the informal sector provides relatively higher returns to these levels of formal education. However, the results are less clear for tertiary education. While the relationship has also decreased regarding wage-employment, it has remained stable for the extended measure of formal sector employment that accounts for company registration and size. Hence, opportunities in the informal sector have improved relatively less for workers with tertiary education. This might be due to the fact that workers with tertiary education are heavily concentrated in government-related sectors.

The results suggest that the informal sector provides more opportunities today than 20 years ago. This finding highlights the heterogeneity of the informal sector (Günther and Launov, 2012). While it might be a last resort for some workers, it is an opportunity for other workers. Particularly for poor and deprived workers, the informal sector represents an important possibility to become an owner. Hence, policy should aim to improve and strengthen the opportunities in the informal sector in a way that formal and informal sector can coexist and complement each other. This includes for example providing services offered by state or non-state agencies to the informal sector. Another example can be illustrated based on the informal workshops of Autovillage in Butwal. In order to strengthen this car repairing district and its employment opportunities, a solution would have to be found how to improve formal education at upper secondary level by learning and working in the informal workshops of these repair shops.

The main limitation of the study consists of the indirect approach to measuring the returns to formal education in the informal sector. Future studies should evaluate in more detail whether informal sector employment is voluntary as suggested by Fossen and Büttner (2013). This would also provide more insights into which population groups choose informal sector employment and which population groups are in informal sector employment due to a lack of choice. This is particularly relevant as the results for workers with tertiary education suggest that working for the government might represent an important determinant of formal sector employment. Whether this is indeed the case should be analysed in more detail.

A related limitation consists of the fact that the paper estimates the relationship between formal education and formal sector employment rather than the causal effect to formal education. Hence, it remains ambiguous what causes changes in the relationship. We hypothesize that the decreasing relationship represents an increase of opportunities in the informal sector. However, this change in the relationship might also arise because of other reasons. One reason might be changes in labour migration. Between 2008 and 2013, the number of labour permits increased from about 220’000 to about 560’000 (MoLE, 2016). While these numbers decreased to about 380’000 in 2017, their magnitude illustrates the relevance of labour migration for Nepal. In order to test the relevance of this phenomena for the results in this paper, we analyse whether our results differ between young and old individuals. We find little differences between young and old workers. This suggests that increasing labour migration is an unlikely explanation for our findings. Nevertheless, other sources of unobserved heterogeneity might exist, such as the lack of control variables for short-term skill development activities. This concern is particularly relevant in Nepal, where informal and non-formal forms of human capital development are very relevant. Hence, future research should propose credible identification strategies to estimate these returns. Addressing these limitations in the future matters because this study suggests that the informal sector provides more opportunities in 2014 than in 1995, but fails to identify why and for whom this is the case.

Data availability further limits the conclusions drawn from the empirical analysis. Different data sets can provide a varying picture, thereby highlighting the relevance of continuing the process of collecting the data of the AHHS. Furthermore, continuing to gather future data of the NLFS also helps to create consistent estimates across time. This is particularly important because the NLFS is the only data source that allows to distinguish formal sector employment and formal employment.

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Appendix

Table A1: Number of observations in each year

Year	Data source	Number of Observations
1995	NLSS	5,834
1998	NLFS	23,203
2003	NLSS	5,535
2008	NLFS	24,991
2010	NLSS	9,826
2013	AHHS	4,567
2014	AHHS	7,109

Table A2: Estimations for the development of formality indicators over time

Dependent Variable	Self-employment		Self-employment or unregistered company		Self-employment in small company or employee in unregistered/small company	
Estimation	Baseline	Datasource	Baseline	Datasource	Baseline	Datasource
Year	-0.002***	-0.001	0.000	0.001**	-0.001***	0.001
	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
NLFS		0.038***		0.024**		0.059***
		(0.010)		(0.010)		(0.011)
NLSS		-0.032***				
		(0.011)				
N	31601	31601	24544	24544	24189	24189
Datasource	No	Yes	No	Yes	No	Yes

Notes: The table displays marginal effects and robust standard errors of probit estimations. *, ** and *** refer to significance on the 10%, 5% and 1% level, respectively. The AHHS represents the baseline data source.

Table A3: Estimations for the development of formal education over time

Dependent Variable	No Primary Education		Primary Education		Secondary Education		Tertiary Edcation	
Estimation	Baseline	Datasource	Baseline	Datasource	Baseline	Datasource	Baseline	Datasource
Year	-0.011***	-0.010***	0.002***	0.002***	0.007***	0.007***	0.002***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
NLFS		0.018***		-0.005		-0.002		-0.002
		(0.006)		(0.004)		(0.005)		(0.003)
NLSS		0.080***		-0.014***		-0.042***		-0.017***
		(0.006)		(0.004)		(0.005)		(0.003)
N	95866	95866	95866	95866	95866	95866	95866	95866
Datasource	No	Yes	No	Yes	No	Yes	No	Yes

Notes: The table displays marginal effects and robust standard errors of probit estimations. *, ** and *** refer to significance on the 10%, 5% and 1% level, respectively. The AHHS represents the baseline data source.

Table A4: Estimations young and old for the relationship between formal education and formality

Sample	**Young (<40 years)**				**Old (>=40 years)**				**Excluding government**			
Dependent variable	Wage employment		Extended formal sector		Wage employment		Extended formal sector		Wage employment		Extended formal sector	
Estimation	Baseline	Datasource	Baseline	Datasource	Baseline	Datasource	Baseline	Datasource	Baseline	Datasource	Baseline	Datasource
Primary education												
Before 2008	0.007	0.009	0.097***	0.097***	0.002	0.003	0.138***	0.138***	-0.024*	-0.024*	0.065***	0.065***
	(0.018)	(0.018)	(0.020)	(0.020)	(0.022)	(0.022)	(0.024)	(0.024)	(0.014)	(0.014)	(0.016)	(0.016)
After 2008	-0.057***	-0.060***	0.020	0.016	-0.054***	-0.057***	0.075***	0.072***	-0.076***	-0.081***	0.013	0.008
	(0.015)	(0.015)	(0.016)	(0.016)	(0.017)	(0.017)	(0.018)	(0.018)	(0.011)	(0.011)	(0.011)	(0.011)
Change	-0.064***	-0.069***	-0.077***	-0.081***	-0.057**	-0.059**	-0.062**	-0.066**	-0.052***	-0.058***	-0.052***	-0.048**-
	(0.023)	(0.023)	(0.026)	(0.026)	(0.028)	(0.028)	(0.030)	(0.030)	(0.018)	(0.018)	(0.019)	(0.019)
Secondary education												
Before 2008	0.032**	0.030**	0.237***	0.237***	0.108***	0.108***	0.336***	0.338***	-0.044***	-0.055***	0.119***	0.120***
	(0.013)	(0.013)	(0.013)	(0.014)	(0.016)	(0.016)	(0.017)	(0.018)	(0.010)	(0.010)	(0.011)	(0.012)
After 2008	-0.053***	-0.055***	0.165***	0.161***	0.011	0.010	0.247***	0.243***	-0.128***	-0.136***	0.059***	0.054***
	(0.011)	(0.011)	(0.012)	(0.012)	(0.013)	(0.013)	(0.013)	(0.013)	(0.009)	(0.008)	(0.009)	(0.009)
Change	-0.085***	-0.086***	-0.072***	-0.076***	-0.096***	-0.098***	-0.089***	-0.094***	-0.085***	-0.081***	-0.061***	-0.067***
	(0.017)	(0.017)	(0.017)	(0.017)	(0.020)	(0.020)	(0.021)	(0.021)	(0.013)	(0.013)	(0.014)	(0.014)
Tertiary education												
Before 2008	0.218***	0.219***	0.481***	0.476***	0.329***	0.330***	0.559***	0.556***	0.117***	0.101***	0.341***	0.341***
	(0.019)	(0.018)	(0.017)	(0.016)	(0.021)	(0.021)	(0.019)	(0.019)	(0.018)	(0.018)	(0.022)	(0.022)
After 2008	0.192***	0.188***	0.495***	0.491***	0.197***	0.197***	0.495***	0.493***	0.029*	0.008	0.287***	0.278***
	(0.015)	(0.015)	(0.014)	(0.014)	(0.018)	(0.018)	(0.017)	(0.017)	(0.015)	(0.014)	(0.018)	(0.017)
Change	-0.025	-0.031	0.014	0.014	-0.132***	-0.133***	-0.064**	-0.063**	-0.088***	-0.092***	-0.054**	-0.063**
	(0.024)	(0.024)	(0.021)	(0.021)	(0.027)	(0.027)	(0.025)	(0.025)	(0.023)	(0.023)	(0.027)	(0.027)
N	18327	18327	14229	14229	13259	13259	9934	9934	27594	27594	20480	20480
Male, Age, Age2, District FE, After 2008	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Data-source FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Notes: The table displays marginal effects and robust standard errors of probit estimations. *, ** and *** refer to significance on the 10%, 5% and 1% level, respectively. Each panel of primary, secondary and tertiary education shows the effect of formal education before and after 2008 in addition to the change, which refers to the difference between these two effects. No completed primary education is the baseline category.

Table A5: Estimations men and women for the relationship between formal education and formality

Sample	**Women**				**Men**			
Dependent variable	Wage employment		Extended formal sector		Wage employment		Extended formal sector	
Estimation	Baseline	Data-source	Baseline	Data-source	Baseline	Data-source	Baseline	Data-source
Primary education								
Before 2008	0.004	0.006	0.085***	0.085***	-0.016	-0.015	0.110***	0.110***
	(0.029)	(0.029)	(0.032)	(0.032)	(0.016)	(0.016)	(0.018)	(0.018)
After 2008	-0.095***	-0.094***	0.003	0.002	-0.054***	-0.057***	0.065***	0.066***
	(0.019)	(0.019)	(0.021)	(0.020)	(0.014)	(0.014)	(0.015)	(0.015)
Change	-0.099***	-0.100***	-0.081**	-0.083**	-0.038*	-0.042**	-0.045*	-0.044*
	(0.035)	(0.035)	(0.038)	(0.038)	(0.021)	(0.021)	(0.024)	(0.024)
Secondary								
Before 2008	0.199***	0.198***	0.302***	0.304***	0.003	0.002	0.252***	0.251***
	(0.020)	(0.020)	(0.021)	(0.021)	(0.012)	(0.012)	(0.013)	(0.013)
After 2008	0.081***	0.079***	0.217***	0.214***	-0.080***	-0.082***	0.197***	0.198***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.011)	(0.011)	(0.010)	(0.011)
Change	-0.118***	-0.119***	-0.085***	-0.090***	-0.083***	-0.085***	-0.055***	-0.053***
	(0.023)	(0.023)	(0.024)	(0.025)	(0.016)	(0.016)	(0.016)	(0.016)
Tertiary education								
Before 2008	0.533***	0.536***	0.661***	0.659***	0.191***	0.192***	0.464***	0.465***
	(0.028)	(0.027)	(0.026)	(0.026)	(0.016)	(0.016)	(0.015)	(0.015)
After 2008	0.419***	0.411***	0.583***	0.579***	0.123***	0.121***	0.470***	0.471***
	(0.022)	(0.023)	(0.022)	(0.022)	(0.014)	(0.014)	(0.012)	(0.012)
Change	-0.114***	-0.126***	-0.078**	-0.080**	-0.069***	-0.071***	0.006	0.006
	(0.035)	(0.035)	(0.033)	(0.033)	(0.020)	(0.020)	(0.019)	(0.019)
N	9349	9349	7415	7415	22230	22230	17110	17110
Age, Age2, District FE, After 2008	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Data-source FE	No	Yes	No	Yes	No	Yes	No	Yes

Notes: The table displays marginal effects and robust standard errors of probit estimations. *, ** and *** refer to significance on the 10%, 5% and 1% level, respectively. Each panel of primary, secondary and tertiary education shows the effect of formal education before and after 2008 in addition to the change, which refers to the difference between these two effects. No completed primary education is the baseline category.