Analysis of vocational and residential preferences of rural population: application of an experimental technique to rural Slovenia

Alberto M. Zanni [1], Sophia Davidova [2], Alastair Bailey [2]

[1] Imperial College London, Centre for Environmental Policy, United Kingdom

[2] Kent Business School, University of Kent, and Imperial College London, United Kingdom

Corresponding author: Sophia Davidova, Kent Business School, University of Kent, Wye Campus, Wye, Ashford TN25 5AH, United Kingdom. Email s.davidova@imperial.ac.uk

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Abstract

This study represents the first application of Choice Experiments to the analysis of the monetary and non-pecuniary determinants of vocational choice and spatial labor supply. It identifies the determinants of individual's choice of jobs and place of residence, and provides a better understanding of the process of rural labor adjustments in a country in transition, Slovenia. The results indicate that the effect of wages, as the main factor influencing employment choice, is counterbalanced by other determinants affecting working conditions and residence. A considerable degree of immobility in terms of migration and commuting has been revealed. As a result, a rapid urbanisation process is unlikely to happen in the near future, according to individuals' preferences.

Keywords: Choice experiments, labor supply, migration, rural, Slovenia

JEL classification: J0, P0, C0

1. Introduction

This study represents the first application of Choice Experiments (CE) to the analysis of spatial labor supply. It considers a range of attributes, both monetary and non-monetary, as determinants of individuals' labor supply choices. The attributes refer to both the job itself

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and the residence from which workers commute to their workplaces. From a methodological point of view, the study aims to assess the usefulness of CE to the analysis of labor. From a policy point of view, the paper aims to identify and quantify some of the determinants of the choice of jobs and residence in a territorial context, and to provide a better understanding of the process underlying rural labor adjustments in a country in transition.

In the Central and Eastern European countries (CEECs), the combination of the initial economic conditions and speed of transition has resulted in an inefficient allocation of labor between different sectors and territories (Swinnen et al., 2001). A more efficient allocation of labor would require a transfer of agricultural labor to the other sectors of the economy. This is because, while agriculture is the main employer in rural areas in CEECs, hidden unemployment is typical for agriculture in most of these countries. These intersectoral and interspatial adjustments might encourage rural inhabitants in CEECs to commute or migrate to reach new places of work in areas where wages are higher, or where living and working conditions are better. However, these incentives might be countered by other possibly non-pecuniary factors. These adjustments represent important policy issues. Policy makers need to be informed about the possible direction of change and identify those factors on which they may have an influence and which could be instrumental in achieving their policy goals.

The structure of the paper is as follows. The next section describes the methodology. The third section provides the characteristics of the surveyed area and section four details the sample. The econometric estimations are discussed in section four. The estimated results are detailed in section five and section six concludes.

2. Methodology

CE is a survey-based methodology which models preferences for goods that are described by their attributes and the levels that these attributes may take (Hanley et al., 2001). CE is part of

a family of methods known as 'Choice Modelling', 'Conjoint Analysis' or 'Attributes Based Stated Choice Methods'. These methods analyse choice behaviour by the "decomposition into part-worth utilities or values of a set of individual evaluations of, or discrete choice from, a designed set of multi-attribute alternatives" (Louviere, 1988:93).

2.1 Theoretical model

CE is based on the Random Utility Theory and considers discrete choices in a utility maximising framework. The alternative chosen is the one that yields the maximum utility among the choice bundle available at the moment of choice. The utility of the respondent is composed of a deterministic, or observable, component and a random error component:

$$U_i = v_i + \varepsilon_i \tag{1}$$

where U_i represents the utility derived from alternative *i*, v_i is the observable component and ε_i is the random error term with standard statistical properties (Boxall et al., 1996). If a respondent selects alternative *i* (viewed as a package of attributes) over another, this implies that the utility of alternative *i* is greater than that of all other alternatives.

The probability of selecting alternative *i* is:

$$P(i) = P\{v_i + \varepsilon_i \geq v_j + \varepsilon_j ; \forall j \in C \ \} \tag{2}$$

where *C* is the choice set and *j* another alternative or the respondent's *status quo*. If it is assumed that the error terms is Gumbel-distributed with scale parameter μ (McFadden, 1974), the equation (2) can be rewritten as:

$$P(i) = \frac{\exp(\mu v_i)}{\sum_{j \in C} \exp(\mu v_j)} \tag{3}$$

Equation (3) is then estimated with a multinomial regression. The scale parameter μ is inversely proportional to the standard deviation of the error distribution. This parameter is not

easily identifiable and it is typically assumed to equal to unity, implying a constant error variance. Selections from the choice set *C* must obey the independence from irrelevant alternatives (IIA) property.

In order to derive from the multinomial model a willingness to pay (WTP) or accept (WTA) compensating variation welfare measure, the following equation can be used:

$$WTP = \frac{1}{b_y}\left[\ln\left(\sum_i \exp(v_0)\right) - \ln\left(\sum_i \exp(v_1)\right)\right] \quad (4)$$

where b_y is the marginal utility of income (the coefficient of the monetary variable) and v_0 and v_1 represent the utility of the initial and alternative state respectively. The inclusion of a monetary variable among the attributes permits the derivation of implicit prices, also known as part-worths or part-utilities, for the other attributes (Roe et al., 1996). The equation (4) can be simplified as:

$$WTP = -\frac{b_{attribute}}{b_y} \quad (5)$$

where the WTP compensating variation of welfare is presented as a ratio between the coefficient of any of the attributes and the coefficient of the monetary variable (Hanley et al., 2001).

2.2 The design of the survey

The model described above requires a primary survey in which the respondents are asked to select their preferred option from the set *C* drawn from work and residence scenarios in an artificial labor market. Each option is described by a set of work and residence related attributes, each presented at different levels. In this research, the attributes were, first selected on the basis of research hypotheses and previous studies of labor supply (Atrostic, 1982; Bartel, 1982; Oi, 1976), which allowed for the identification of factors likely to affect

individuals' decisions. Attributes and levels were subsequently reshaped as a result of discussions with local experts and the outcome of two pilot tests conducted in Slovenia. The final list of attributes and levels is presented in Table 1.

Twenty seven different combinations of attribute levels were generated using a 'fractional, main effects, orthogonal design' (Green, 1974). These combinations were randomly split and 9 choice cards were presented to each survey respondent. Three options were offered on each choice card, two hypothetical and one *status quo*. As respondents were asked for information about their current work and residence situation before the completion of the choice cards, the *status quo* was not a simple reference alternative but was defined by real attribute levels.

3. The survey

The survey was conducted in 2003-2004 among the rural labor force in the region of Pomurzka, in the north east of Slovenia. The region borders Austria, Hungary and Croatia, and presents a relatively high degree of rurality and remoteness, and a labor market which has experienced substantial changes in the recent years. For these reasons, it appeared to be a suitable case study of a rural region in a transition country.

The respondents in Pomurska were found on the base of a house-to-house canvass in villages in the rural areas of the region. The potential respondents were required to be part of the labor market, that is either employed or unemployed. Student and pensioners were excluded. Another important exclusion applied to partners. Wherever more members of the same household were interviewed, these persons were not partners. This approach was adopted to ensure that respondents reported their choice independently.

The sample was composed of 290 respondents, of these 258 were employed and 32 were unemployed. These respondents provided choice information in 2610 choice cards. The average age of the respondents was 37 years. Males represented a slight majority, 52 per cent

of the sample. Most of the respondents held a diploma of secondary education (66 per cent) and earned an income slightly below the regional average. In terms of working activity, 12 per cent of the respondents were engaged in agriculture while 32 per cent and 56 per cent were in industry and services respectively. The majority of respondents have not been very mobile in the recent past, both in terms of changes in residence and employment, and in terms of commuting.

The sample was compared with the corresponding regional figures in order to assess its degree of representativeness. The sample did not appear to be skewed towards any particular category of the population.

4. Econometric estimations

A Multinomial-Conditional Model (MNL) has been applied. Choice was the dependent variable, while the attribute levels were the independent variables. The only non-attribute variable considered in this analysis was the alternative specific constants (ASC). The ASC, which takes the value of 1 for options other than the *status quo*, is useful to detect the presence of a *status quo* bias among the respondents.

In order to take into account heterogeneity of respondents, a set of socio-economic variables were inserted in the regression equation as interactions with both the attributes and with the ASC. In this way, it was possible to link the probability of selecting particular scenarios, hypothetical or the *status quo*, to the personal characteristics of the respondents.

The application of the MNL rests upon the assumption of the property of Independence from Irrelevant Alternatives (IIA). As the test of the violation of the property did not provide complete results[2], an alternative Heteroscedastic Extreme Value Model (HEV) was also applied. It relaxes the IIA by considering different scale parameters across the different

[2] The procedure was capable of generating a test statistics only when one of the alternatives was dropped from the sample while the elimination of the remaining two alternatives in the choice cards created problems of convergence.

alternatives (Louviere, et al., 2000). However, the application of the HEV did not considerably alter the results and the overall performance of the model. For these reasons, this paper considers the results of the MNL.

Various alternative sub-samples and data-sets were initially used. Those considered a different number of respondents and/or a different number of choice cards. Respondents who always selected their *status quo* and respondents who selected all the options in which a particular attribute was shown at a certain level were, first, eliminated following common practice in literature (Adamowicz et al., 1998; Bullock et al., 1998; Burton et al., 2001; Scott, 2002). Both category of respondents may be identified as *non-participants* as they do not appear to engage themselves in the selection process (von Haefen and Adamowicz, 2003). Second, choice cards in which one of the option was chosen by more than 75% of respondents were eliminated as they carried a 'dominant option' (Carlsson and Martinsson, 2003). However, the comparison of the results of the basic MNL model including all respondents and all choice cards with the different specifications outlined above did not show particular discrepancies (Table 2). In addition, the characteristics of the *status quo* in this survey are different from those in much of the literature. Therefore, we may expect that respondents did trade-off among attribute levels' even when they selected their current situation as their favourite one. In addition, the attributes are relatively numerous in this application. This is a disincentive for any dominant strategy as respondents may be less likely to select scenarios reporting a given attribute at a given level when these alternatives may carry a considerable loss in terms of the other attributes. In terms of choice cards, the identified dominant options were not selected by the totality of respondents but by the 75% of it. For all these reasons, all respondents and all choice cards are considered for further analysis.

5.1 Choice-related attributes

Table 3 details the estimates with the MNL model. Only choice-related attributes are considered. As the utility depends on the attributes of the option, the sign and significance of the coefficients associated with the attribute levels become the determinants of the probability of choice. A coefficient with a positive sign means that respondents are more likely to choose an option in which the corresponding attribute is presented at that level. A coefficient with a negative sign describes the opposite situation. The table shows that most of the variables affect the choice as expected and signs are in accordance to the a priori expectations.

Table 3 indicates that respondents are more likely to choose job options involving an activity in industry rather than in agriculture, while, on the other hand, services are preferred to industry. In terms of working hours and wage, unsurprisingly, respondents are more likely to select options involving fewer hours of work and higher wages. A certain disutility is associated with jobs located at more than 45 minutes travel from the residence compared with the other two levels, 20-45 minutes and between 0 and 20 minutes. Respondents are less likely to select options involving continuous supervision as they prefer to work independently.

When spatial variables are considered, respondents associate residence in an urban area with disutility and prefer other options. The presence of medical centers is not significant at both levels and the same applies to schools. The attribute Shopping and entertainment is significant only in its level ‘no shops, no entertainment facilities’ and the corresponding coefficient shows a negative sign. The attribute Transport is significant in both its levels. Respondents associate negative utility with options involving a residence without transport facilities in the immediate vicinity. A bus stop is preferred to a railway station. A *status quo bias* was not detected as the ASC coefficient was not significant.

3.2 Respondents' characteristics

When respondents' socio-economic characteristics were considered into the analysis, results indicate that agricultural workers are more likely to select an option involving a work activity in agriculture than respondents belonging to the industrial sector. Surprisingly, agricultural workers also appear to be more likely to select options involving continuous supervision. Options in which the wage is at its lowest level are preferred by both high and low income respondents. Options in which the residence is located in urban areas convey more utility to younger than to older respondents. Respondents who are members of larger households are more likely to select options in which there is a local shop around the residence.

The older respondents are more likely to select their current situation as their most favoured option. This also applies to the employed respondents. The same higher probability of selecting the *status quo* alternative applies to those respondents who are engaged in services and in self-employment activities. On the other hand, respondents with a lower income and respondents currently employed in agriculture are more likely to choose hypothetical options. Interestingly, respondents engaged in an agricultural activity appeared to be more likely to select options other than their *status quo*. As it was previously mentioned, these respondents were more likely to select a job option in the agricultural sector. Agricultural workers did not appear to be satisfied by the current conditions of their job and residence but, nevertheless, they did not express a strong willingness to switch to another sector of the economy. The same category of respondents also expressed a preference for a continuously supervised activity. This could be interpreted as a wish to continue working in farming (a desire they clearly expressed) but, perhaps, as employed in one of the farming companies that are slowly making their way in the Slovenian agricultural sector.

Finally, the number of employed members in the respondents' households also has an influence on the preference for the *status quo*. The higher is this number, the higher is the probability that respondents will select a hypothetical option instead of *status quo*.

3.3 Implicit prices

The inclusion of the wage as monetary attribute has permitted the derivation of implicit prices for the non-monetary attributes. Table 4 presents the willingness to pay/willingness to accept compensation for each of these attribute levels as a percentage of the wage derived from MNL.

The results suggest that the respondents should be compensated for by a 4.7 per cent increase in their monthly wages in order to accept a job in agriculture instead of industry. In order to get a job in services instead of industry the respondents are willing to give up 9.5 per cent of their wage. The marginal value of one hour longer working day is a 6 per cent increase in the monthly wage. In order to work closer to home, rural inhabitants are willing to give up 3.2 per cent of their wage, however, they would require compensation of 14 per cent in order to accept a job more than 45 min away from home. Selecting an option involving a continuously supervised activity should be counterbalanced by an increase of 2.6 per cent of wage, while respondents would be willing to renounce to 7.8 per cent of the wage in order to be able to work independently. Respondents would be prepared to move from a peri-urban to an urban area only if their wage is increased by 6.2 per cent.

6. Conclusions

This study represents the first attempt to provide a better understanding of rural labor adjustments through the identification and quantification of the determinants of vocational and locational choices by employing CE. It analyses labor supply and attempts to assess its

flexibility to incorporate the complex monetary and non-monetary aspects of individuals' labor supply choices.

From a methodological point of view, the techniques of CE do appear to provide a consistent and tractable means of understanding the motivations of individuals. In the majority of the cases, the signs of the coefficients were in line with the theory and *a priori* expectations. This indicates that despite the experimental nature of the methodology and the complexity, respondents appeared to act rationally when facing the different scenarios.

Results obtained by the application of the MNL model show that, when facing an employment choice, individuals consider the type of activity, the duration, the wage, commuting distance, supervision, as well as characteristics linked to the residence like location and service availability.

The results of this analysis indicate that wage differentials may not be the only instrument to control or smooth labor supply adjustments among sectors and geographical areas. Accordingly, the policy makers' who have specific objectives in the region might be able to improve the welfare of the population by improving the provision of services which, results presented here suggest, are likely to be an important stimulus of individuals' decisions.

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Table 1. List of attributes and levels

WORK ATTRIBUTES	LEVELS
(1) Type of work	1. Agriculture 2. Industry 3. Services
(2) Hours of work	1. – 1.30 hour 2. Same as now 3. + 1.30 hour
(3) Wage	1. 90% of current 2. Same as now 3. 120% of current
(4) Distance from home	1. 0-20 min 2. 20- 45 min 3. More than 45 min
(5) Supervision	1. You work alone and, possibly, you supervise others 2. You are subject to occasional supervision 3. You are subject to continuous supervision
(6) Location of the residence	1. Rural 2. Peri-Urban 3. Urban
(7) Schools[1]	1. No schools 2. Kindergarten 3. Kindergarten and primary school
(8) Medical centers[2]	1. No centers 2. Doctor 3. Hospital
(9) Shopping and entertainment facilities[3]	1. No shop, no facilities 2. Local Shop, Bar 3. Shopping center, Restaurant, Cinema
(10) Transport facilities[4]	1. No facilities 2. Bus stop 3. Bus stop and train Station

[1]within 10 km from the residence in rural areas, within 3 km in peri-urban areas and within 1.5 km in urban areas
[2]within 15 km from the residence in rural areas, within 5km in peri-urban areas and within 3 km in urban areas
[3]within 10 km from the residence in rural areas, within 3 km in peri-urban areas and within 1.5 km in urban areas
[4]in the proximity of the residence, reasonable walking distance

Table 2 Comparison of results of the different specifications of the MNL model

Variable	MNL All respondents	MNL All Status quo excluded	MNL Dominant option excluded	MNL Dominant preference excluded
ASC	-0.0787 (-0.79)	0.2119 **(2.05)	-0.0822 (-0.80)	-0.3526 ***(-3.15)
Type of work *'agriculture'*	-0.2136 ***(-2.93)	-0.0981 (-1.30)	-0.1980 ***(-2.67)	-0.2665 ***(-3.22)
Type of work *'services'*	0.4341 ***(7.33)	0.5032 ***(7.83)	0.4219 ***(6.90)	0.4824 ***(7.32)
Hours of work	-0.2750 ***(-10.43)	-0.2966 ***(-10.73)	-0.2623 ***(-9.46)	-0.2962 ***(-9.83)
Wage	4.5578 ***(17.99)	4.8585 ***(18.24)	4.3816 ***(16.03)	4.7136 ***(16.26)
Distance *'0 to 20 minutes'*	0.1443 **(2.29)	0.1278 *(1.91)	0.1457 **(2.25)	0.1178 *(1.69)
Distance *'more than 45 minutes'*	-0.6380 ***(-7.98)	-0.7100 ***(-8.52)	-0.5975 ***(-7.12)	-0.7603 ***(-8.34)
Supervision *'you work alone…'*	0.3571 ***(5.44)	0.2225 ***(3.16)	0.3294 ***(4.69)	0.3312 ***(4.54)
Supervision *'continuous'*	-0.1199 ***(-1.98)	-0.1448 ***(-2.27)	-0.1193 *(-1.92)	-0.1009 (-1.50)
Location *'rural'*	0.0005 (0.00)	-0.0237 (-0.29)	-0.0054 (-0.06)	0.0343 (0.39)
Location *'urban'*	-0.2830 ***(-3.46)	-0.3201 ***(-3.80)	-0.2839 ***(-3.43)	-0.2380 **(-2.54)
Medical centers *'no'*	0.0432 (0.60)	0.1215 *(1.65)	0.0580 (0.81)	0.0782 (0.98)
Medical centers *'hospitals'*	-0.1096 (-1.47)	-0.0184 (-0.24)	-0.1408 *(-1.80)	-0.1166 (-1.36)
Schools *'no'*	-0.0122 (-0.16)	-0.0146 (-0.18)	-0.0113 (-0.14)	0.0061 (0.07)
Schools *'kinder. and primary'*	0.0360 (0.49)	-0.0460 (-0.60)	0.0491 (0.65)	-0.0090 (-0.11)
Shopping entertainment *'no'*	-0.1961 **(-2.54)	-0.1955 **(-2.43)	-0.1901 **(-2.43)	-0.1369 (-1.58)
Shopping entertainment *'shopping center…'*	-0.1201 (-1.57)	-0.0612 (-0.77)	-0.1552 *(-1.94)	-0.1333 (-1.53)
Transport *'no'*	-0.2576 ***(-3.45)	-0.2227 ***(-2.85)	-0.2412 ***(-3.16)	-0.2981 ***(-3.52)
Transport *'bus stop, railway station'*	-0.1020 *(-1.73)	-0.0191 (-0.30)	-0.1177 *(-1.91)	-0.1407 **(-2.15)
LOG-LIKELIHOOD[1]	***-2438.386***	***-2091.125***	***-2308.840***	***-2011.594***
PSEUDO R²[1]	***0.14961***	***0.15403***	***0.12977***	***0.18294***
Number of Observations	***2610***	***2250***	***2415***	***2241***

[1] Figures for Log-Likelihood and Pseudo R^2 are shown for informative purposes only as the different specifications use different data-sets and these figures are not comparable.

Columns report *Beta* coefficients and T-ratio values (in brackets). *significant at 10% level, **significant at 5% level, ***significant at 1% level.

Table 3. MNL estimates, all respondents

Variable	Coefficients	Standard Error	t-ratio	P-value
ASC	-0.0787	0.0995	-0.7910	0.429
Type of Work *'agriculture'*	-0.2136	0.0729	-2.9299	***0.003
Type of Work **'***services'*	0.4341	0.0592	7.3328	***0.000
Hours of work	-0.2750	0.0264	-10.4321	***0.000
Wage	4.5578	0.2534	17.9899	***0.000
Distance *'0 to 20 minutes'*	0.1443	0.0629	2.2948	**0.022
Distance '*more than 45 minutes'*	-0.6380	0.0800	-7.9773	***0.000
Supervision *'you work alone…'*	0.3571	0.0656	5.4447	***0.000
Supervision *'continuous'*	-0.1199	0.0605	-1.9808	**0.048
Location *'rural'*	0.0005	0.0776	0.0070	0.994
Location *'urban'*	-0.2830	0.0818	-3.4613	***0.001
Medical Centers *'no'*	0.0432	0.0713	0.6057	0.545
Medical Centers *'hospitals'*	-0.1096	0.0743	-1.4745	0.140
Schools *'no'*	-0.0122	0.0762	-0.1600	0.873
Schools '*kinder. and primary'*	0.0360	0.0734	0.4907	0.624
Shopping Entert. *'no'*	-0.1961	0.0770	-2.5453	**0.011
Shopping Entert. *'shopping center….'*	-0.1201	0.0766	-1.5677	0.117
Transport *'no'*	-0.2576	0.0747	-3.4477	***0.001
Transport *'bus stop, railway station'*	-0.1020	0.0591	-1.7268	*0.084

*significant at 10% level, **significant at 5% level, ***significant at 1% level. Number of obs.= 2610. Log likelihood= -2438.386 Pseudo R^2= 0.14961

Table 4. WTP/WTA for each of the significant non-monetary attributes levels

VARIABLE	WTP/WTA (% of wage)	Standard Deviation[1]	Confidence Interval (95%)[1]
Type of Work '*agriculture*'	4.7	0.0163	2.0-7.4
Type of Work **'***services'*	-9.5	0.0141	7.3-11.9
Hours of work	6.0	0.0067	5.0-7.2
Distance *'0 to 20 minutes'*	-3.2	0.0140	0.9-5.5
Distance '*more than 45 minutes'*	14.0	0.1931	11.0-17.3
Supervision *'you work alone…'*	-7.8	0.0153	5.4-10.4
Supervision *'continuous'*	2.6	0.1342	0.4-4.9
Location *'urban'*	6.2	0.0184	3.2-9.3
Shopping Entert. *'no'*	4.3	0.0171	1.5-7.2
Transport *'no'*	5.7	0.0168	2.9-8.4
Transport *'bus stop, railway station'*	2.2	0.0131	0.1-4.4

[1]Standard deviations and confidence intervals figures are calculated following Krinski and Rob (1986)