

# The Impact of Interventions on a Pre-Industrial Austrian Alpine Population

Ortrun Veichtlbauer<sup>1</sup>, Achim Zeileis<sup>2</sup> and Friedrich Leisch<sup>3</sup>

<sup>1</sup> Department for the Analysis of Culture and Science, IFF Klagenfurt University, Vienna, Austria

<sup>2</sup> Department of Statistics and Mathematics, Vienna University of Economics and Business Administration, Vienna, Austria

<sup>3</sup> Institute of Statistics and Probability Theory, Vienna University of Technology, Vienna, Austria

## ABSTRACT

*The purpose of the present study is to gain a better understanding of the role of culture in demographic behaviour. The case study uses demographic data to illustrate cultural factors intervening in the social organisation of an Austrian village in the period 1700–1900. Two sets of potential intervening variables that might explain the effects of culture on demographic behaviour were investigated: population policies through normative regulations and institutional changes due to shifts in government. The paper employs statistical techniques in a structural change setting for evaluating the impact of policies and institutional changes on the demographic development. There is clear evidence that normative interventions concerning the fraction of illegitimate births and the marriage pattern were effective.*

**Key words:** demographic anthropology, time series analysis, intervention analysis, structural changes, illegitimacy, marriage pattern, Großarl, Austria

## Introduction

The methodology of this study focuses on three questions: 1) Is it possible to evaluate the impact of institutional change in a demographic time-series approach by using statistical techniques? 2) Is there empirical evidence in the demographic data for the effectiveness of historical policy interventions? Using a mixture of qualitative and quantitative approaches at both the micro- and the macrolevel, the methodological challenge is to develop a linear regression model to analyse the pattern of demographic time-series data that reflects historical policy interventions and institutional changes. Consequently, our third question: 3) Does institutional change really matter?

Our data is from Großarl (a village in the Alpine region of Salzburg) during the eighteenth and nineteenth centuries. The main research questions concerning the demographic pattern deal with the linkage between changing illegitimacy rates and changing seigniorial or national laws concerning sexual activity outside marriage. Another focus is on the development of nuptiality in the context of changing marriage restrictions. Historical arguments are essential prerequisites to provide the interface between the statistical evidence and the inferences made. We employ historical data to define a set of

explanatory variables for the regression model. Section 5 and 6 present and discuss our analysis concerning the problems formulated, along with results from intervention analysis.

Our concern is with *aggregate* demographic behaviour, and *quantitative methods* are necessary. When using historical sources, combining individual sources with aggregate sources is a good way to relate our findings to broader issues of »society« or even »culture«. Although we decided not to distinguish between »culture« and »society«, throughout the paper, the notion of culture is used predominantly in anthropological terms. One definition of culture emphasising normative patterns stresses culture as a set of norms, beliefs and techniques of how societies cope with their environments. In this, culture exists in normative formulations that assume a »law-like authority in behaviour«<sup>1</sup>. In our case study, importance is attached to the process of behavioural change: Changing normative regimes form a social texture for individual and collective strategies within demographic behaviour. According to Fricke<sup>1</sup>, demographic behavioural divergences from normative statements within a locale-specific institutional context cannot be taken as general

»culture change«. Culture can also be seen as a symbolic system with an immaterial internal logic. Defining the logic of a culture as a set of norms or values that influence behaviour also gives meaning to the causal explanations in the models employed, generally in socio-economic analyses of demographic behaviour. Fundamental to this study is the supposition that the flexibility of collective and personal behaviour is a normal feature of the way populations adjust to changing conditions. The hypothesis that »the structure, quantum and tempo of population trends are bound by shifting identities«<sup>2</sup> leads to the assumption that changing demographic patterns may be constituted largely by changes people make in their own or other's collective representation.

By emphasising the normative aspects of institutions, the concept of »social disciplining« offers a useful inventory of theories. In historical research, »social disciplining« became an often-used key term and guiding concept. The theories of Weber<sup>3</sup>, Elias<sup>4</sup> and Oestreich<sup>5,6</sup> have illustrated the development of European culture in the early modern period through similar concepts. They all suppose a more or less linear trend called »modernisation«, and they all stress the importance of the term »discipline«. Behrisch<sup>7</sup> defines social discipline as a »conscious effort at changing a society's norms, behaviours and mental culture from above«, exercised at different levels or by different institutions: the state, the church and the landowners. Vocelka<sup>8</sup> has pointed out that the term »social disciplining« actually refers to a wider range of phenomena than disciplinary practices with the intention of creating obedient subjects. From his point of view, social disciplining emerges as a fundamental concept for analysing social structures and changes in the early modern period. The purpose of this study was to use the concept of social disciplining to describe normative interventions, which in essence can be stated as »population policy«, and to make this fundamental concept operational.

## Anthropology, History and Demography in a Case Study of Großarl

### a) Political history

The knowledge gained from the historical analysis constitutes the basic framework for the statistical analysis, as we derive explanatory variables from this qualitative information. In this section we provide a short overview of the historical development of Salzburg during the period under investigation<sup>9,10</sup>.

Until the late 18th century, the archbishops ruled as absolute royal sovereigns. Regional administration was organised through local units called »Pflegerichte«. After the religious Peace of Augsburg (1555), Archbishop *Wolf Dietrich of Raitenau* (1587–1612) and his successors acted on the agreed policy (*cuius regio, eius religio*). Re-Catholicisation, although a religious issue, became used by the sovereignty for purposes of subjugating the population. The task of influencing the people by sermon and exhortation was carried out mainly by Franciscans

and Capuchins. Protestant expulsions occurred during 1614 and 1615 under Archbishop *Markus Sittikus of Hohenems* (1612–1619). According to an archival source<sup>11</sup>, 96 persons left the parish of Großarl in the year 1615. In 1731, Archbishop *Leopold of Firmian* (1727–1744), issued an edict expelling some 30,000 Lutherans. For the Großarl court district, *Fiala*<sup>12</sup> documented a total of 551 departures. Under the last two sovereign Archbishops, *Sigismund of Schrattenbach* (1753–1771) and *Hieronymus Count Colloredo* (1772–1803), it became more and more difficult to resist the continuous pressure from expansionist neighbour states. Territorial integrity was nevertheless preserved until the end of the 18<sup>th</sup> century. Salzburg was finally secularised with the Treaty of Presburg in 1805, and passed into the possession of Austria, thus becoming a province of a large empire. The first period of Austrian rule ended in 1809 when Napoleon's victory brought Salzburg under direct French administration for one and a half years. From 1809 until the Peace of Vienna, Salzburg was Bavarian, becoming part of Austria again in 1816. The beginning of the 19<sup>th</sup> century was a period of profound change in Central Europe. The coalition wars against France, which entailed the dissolution of the autonomy of the religious principalities, created a fundamental crisis situation, leading to a multi-dimensional structural break in the history of Salzburg, with enormous destruction of public and private resources. The marginalisation and peripherisation of Salzburg, together with the psychological cost of rapidly-changing environments and political instability, meant complex stress for the population, social dilemmas and loyalty conflicts. Finally, in 1850, Salzburg was awarded the right to have its own administration, yet only in 1861, after regional assembly elections, did an independent government take office. A form of national identity in a 19<sup>th</sup> century sense, linking town and mountain regions, was achieved after the end of ecclesiastic principality through the narrative of collective fate of political and economic marginalisation<sup>13</sup>. However, any corrective measures by the authorities always seemed to be less effective in the Alpine region. The latent resistance of the peasant society in the Alpine region in Salzburg (which sometimes even developed into open rebellion) must be considered in cultural-historical studies of this period.

### b) Political interventions – moral regulation

Moral regulation projects are an important form of politics and governance in which seigniorial or state institutions problematise the conduct and behaviour of their population and impose regulation upon them<sup>14</sup>. In Salzburg, since 1612<sup>15</sup> the governmentalisation of issues impinging on the sexuality of the whole population had already resulted in a set of interventions, when several moral laws were enacted. In the year 1736, a few years after Archbishop Firmian's edict expelling as many as c. 30,000 Lutherans from his principality, the seigniorial and political effort to regulate moral conduct culminated in the »Hochfürstlich-Saltzburgische Verordnung zu Wiederherstellung gut-Christlicher Sitten- und Ehrbaren Le-

bens-Wandel»<sup>16</sup>, a fundamental program of social control. This law must be seen in the context of legislative initiatives during the Counter-Reformation and Re-Catholicisation. The close linkage between religiosity and morality and between church and state led to a policy of moral suasion and »social disciplining«, especially concerning undesirable sexual activity. The law was amended in 1753 in an effort to achieve more efficient execution. Although the author of the introduction of this »Erneuerte Poenal-Verordnung«<sup>17</sup> regarded piety as the mainspring of chastity, symptoms of an incipient secularisation and rationalisation can be identified within the subject, according to Ammerer<sup>18</sup>. Nevertheless, local officials were still threatened with a fine if they did not fulfil their control duties properly. The agenda included control of dancing orders<sup>19</sup> and decrees (»Generalien«) against fly-by-nights, »Nachtschwärmer« and »Gasslgeher« (nightly visitors climbing into their girlfriends' chambers). Clerks and court ushers went around at midnight from yard to yard and requested the »fathers of the house« to count all adult sons and service farmhands. To escape punishment, missing persons had to give some plausible reason. Under the aspect of economic logic, a workhouse-prison was established in the city of Salzburg in 1754, a house of correction also designed to force moral delinquents to work and to discipline them<sup>20</sup>.

This moral law was amended in the years 1770, 1772 and 1773<sup>21–24</sup>. At least by the end of the 18<sup>th</sup> Century, this regulation clearly covered purposes influenced by the rise of bio-politics, whereby punishment should uphold security and moral standards for the society. Sexual contacts resulting in illicit pregnancy were punished by the regional courts. In the 1770s, the judgements were designed to achieve broad publicity. Stigmatising punishments (»Schandstrafen«) using the pillory (»Prechl«) were carried out on Sundays or on celebration days. Corporal punishment (»Ruten- oder Karbatschstreiche«) or compulsory labour on fortifications were applied to small offences, such as double »fornication« meaning any unlawful sexual intercourse. Male adulterers were usually sentenced to one hour in the pillory, while women were handed down sentences of two years workhouse-prison, and even had to leave the court district afterwards, because of the possible danger of recidivism<sup>18</sup>. Moral laws of this kind were abolished after secularisation.

### c) Political interventions – marriage restrictions

The seigniorial concepts of Catholic morals and desirable social structures combined with the practical needs of local authorities and the rising precision of economic theoreticians resulted in a range of possible responses to contemporary problems. Apart from a clear juridical dimension and a bio-political purpose, the institution of the »manorial marriage consent« (»Ehekonsens«) indicates an attempt to restore the existing social structures. Municipal laws regarding begging and vagrancy also tried to direct the demographic behaviour especially of the poor to minimise the public burden. Demographically relevant marriage obstacles in Salzburg were given a le-

gal and communal basis in the 17<sup>th</sup> century<sup>25</sup>. From 1667, a »manorial marriage consent« was obligatory<sup>26,27</sup>. Property ownership was necessary for a legally valid marriage, so the marriage consent became a special privilege of the higher social strata. The issuance of marriage consents became one of the most substantial communal functions of the municipalities. The 1667 regulation was amplified by two regulations from August 1681 and from July 1691<sup>28</sup>, in which – analogous to a later general instruction from July 1730<sup>29</sup> – the manorial marriage consent, the right to establish a business, and the poor-relief system were connected<sup>30</sup>. Married poor had to be supported by the district court of marriage, whereas unmarried poor were provided for by their birth place district court<sup>31</sup>. Local clergymen could conduct marriages between local servants, others who »lived-in« with the farmer, or daily labourers, but only if the authorities had not raised any objections against the marriage. The official argument was that marriage restrictions could serve or assist to prevent pauperism and save the public from the burden and expense of supporting many unfortunate and distressed persons. This set of ideas was widely held at the time, supported by contemporary political economists and social thinkers participating in the elaboration of this argument. Under the rule of the last Archbishop *Colloredo* (1772–1803), the laws governing marriage consent were tightened further through the enactment of additional regulations. Soldiers were not allowed to marry (1772). Additionally, the new military conscription law of 1775 included features of »social disciplining« in recruiting disobedient persons who were considered as significant threats to their surroundings regarding their general moral standard. The amended regulation allowing the outlawing nuptials within the poor classes (»verbotene Trauung dürftiger Menschen« 1773), the sanctioning of an evasion of the aforementioned regulations by a previous engagement, which, from this time on, had no more binding force (1787), and the invalidity of marriages conducted outside Salzburg (1780, 1793<sup>32</sup>) were enacted under *Colloredo's* rule.

With secularisation, the Catholic church lost its monopolistic position regarding marriage law. Nevertheless, even after 1803, the legal situation remained unchanged. During the period of the first Austrian government (1806–1809), the laws governing marriage consent persisted, although in 1808 a new marriage law for Salzburg and Berchtesgaden<sup>33</sup> had been enacted which, however, did not deal with the marriage consent specifically.

A new legal situation arose during the Bavarian period. A regulation from July 1808, »die Beförderung der Heurathen auf dem Lande betreffend«<sup>34</sup>, was originally intended to facilitate marriage among rural people. The political marriage consent issued by the local political authorities was abolished<sup>35</sup>. But the permit to marry was still subject to a charge and could be only obtained from the local police authorities<sup>36</sup>. Additionally, there was restrictive control concerning marriages of journeymen, day workers and menial workers. A proclamation concerning unmarried land owners (»unverheurathete Bau-

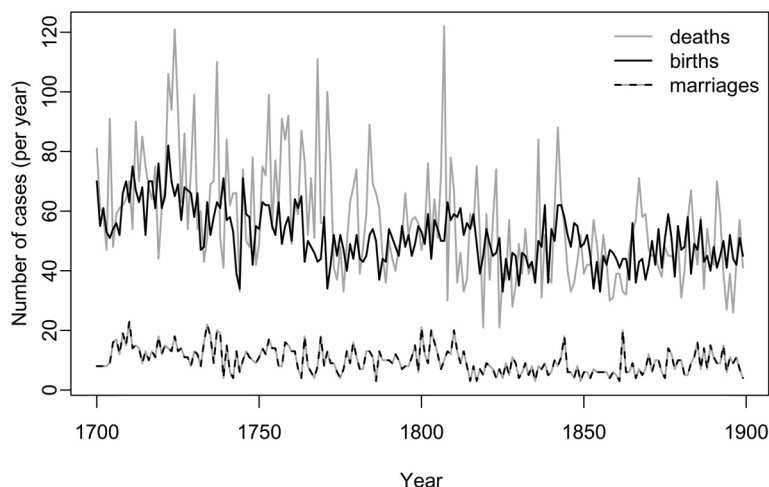


Fig. 1. Annual time series Großarl.

erngutsbesitzer und sog. Kommunhausungen») and confirmed bachelors (»Hagestolzenthum«) was published in December 1815<sup>37</sup>. According to this, directories of the unmarried property owners were to be made and, under penalty of being subject to recruitment for military service, compulsory work or dangerous municipality services, single property owners defined as confirmed bachelors were to be persuaded to marry. Social inequalities concerning marriage remained, because the clause that obliged municipalities to take over the maintenance of families whose members could not feed themselves (»Alimentationspflicht«) ran counter to any liberalisation of the marriage law.

In 1816, Salzburg became a part of Habsburg Austria again, as the fifth district of the Austrian Archduchy above the Enns. From this time, the laws of the Austro-Hungarian monarchy were applicable in Salzburg. Nevertheless, regulations governing political marriage consent remained unchanged. In 1824, an Enquete, organised by the government, dealt with the marriage consent and the legal problems it presented. The municipal authorities of Salzburg (»der Magistrat von Salzburg«), together with almost all Salzburg district courts (»Pflegergerichte«) and the Salzburg district office (»das Salzburgerische Kreisamt«), concluded that the proper and full enforcement of the marriage consent should continue to be ensured, due to matters of local structures and interest<sup>30</sup>.

Especially officials from Großarl supported persistent law enforcement (»Großarl kann sich nur mit einer strengen einschränkenden Auslegung des Hofdekretes vom 9. September 1823 zufrieden stellen.«)<sup>38</sup>. Although the political marriage consent was abolished in almost all crownlands of the Dual Monarchy in 1868, state legislature failed to modify marriage law in Salzburg until the Dual Monarchy's Constitutional Court issued a special ruling in 1883, with reference to §47 of the General Civil Code (ABGB Allgemeines Bürgerliches Gesetzbuch) of 1811. Nevertheless, at first the Salzburg Diet (»Landtag«), the provincial parliament, offered the strongest resistance to this decree<sup>39</sup>.

## Statistical Analysis Framework

### Data

The data sources are local population registers compiled between 1700 and 1900. Parish registers provide a basic demographic sequence of baptisms, burials and marriages. In Großarl, baptism and burial registers are remarkably reliable up to the 20<sup>th</sup> Century, because baptisms and burials appear to have taken place one or two days after birth or death, and parish registers included most of the population. The parish registers were continuously updated and maintained (year-month-day) by the parish priests, recording the de facto population. The parish registers give the date (day, month, year) of an event, together with the names of the people or family involved. Mostly, occupation, residence, and age are listed. In almost every case we have information on gender. On average, 51.67 (SD=9.49) baptisms, 9.96 (SD= 4.39) marriages, and 56.66 (SD=19.14) burials per annum are recorded in the registers for the period studied (1700–1900). The parish registers appear to be complete, with no gap in the registers. Due to generally good record-keeping by the priests and the fact that all records are still extant, while information is missing only for a negligible percentage, the registers contain data of high quality. Between 1700–1900, total population remained roughly constant, except during the Protestant expulsions in 1731/32 (Table 1). The vital series in Großarl appears in Figure 1.

### Statistical methodology

The qualitative information from the historical analysis is combined with demographic data to allow quantitative assessment of relationships among the chosen variables. We derive a set of explanatory variables in a regression model. Thus, we check whether changes in the demographic data coincide with changes due to policy interventions. We assess and visualise structural changes in the regression models using moving sums of regression residuals as diagnostic tests.



**TABLE 1**  
POPULATION GROWTH – MUNICIPALITY GROSSARL

Period	Population	Index (1869=100)
1795–1865 (mean)	1.842	109
1869	1.685	100
1880	1.682	100
1890	1.623	96
1900	1.585	94
1910	1.732	103
1951	2.326	138
1998	3.602	214

Time series of marriages and fraction of illegitimate baptisms per month are modelled using linear regression techniques to find out whether the mean of the time series changes significantly during changing political or »moral« regimes. Tests for structural change are concerned with testing the hypothesis that the coefficients in a linear regression relationship are constant in time. All computations in this paper have been performed using the R system for statistical computing<sup>40</sup>.

#### Linear regression

The mean function is modelled by a method similar to intervention analysis known from econometrics literature<sup>41</sup>. We assume that the mean of the time series depends ultimately on different political regimes in Salzburg during 1700–1900, i.e., that the mean changes, when there is an important known point of change in the political and institutional structure of the underlying system:

$$y_t = \alpha + \beta_{i(t)} \quad (2)$$

where  $\alpha$  is the overall mean,  $\beta_{i(t)}$  is the political influence. The disturbance  $u_t$  forms a weakly dependent sequence with zero mean and variance  $\sigma^2$ . The political influence is piecewise linear over time encompassing four distinct periods of different ruling regimes:

1. Archbishopric (until 1803),
2. Period of multiple changes (1803–1816),
3. Fifth district of the Austrian Archduchy above the Enns (1816–1850),
4. Autonomous crown-land within Habsburg Austria (since 1850).

The mean function is estimated by ordinary least squares (OLS) and is tested as to whether there are breaks that cannot be explained by political influence alone. Where necessary, we try to model such breaks by the inclusion of further explanatory variables, the selection of which depends on the time series modelled. Both series, marriages and fraction of illegitimate births, might also depend on the influence of morals (»moral« regulations) or nuptiality (»marriage« restrictions), which are again assumed piecewise linear. In addition, an additional regressor containing the number of marriages at

time  $t$  and with coefficient could influence the mean function of the illegitimate births series. Thus, the extended model is of the type:

$$y_t = \alpha + \beta_{i(t)} + \gamma_{j(t)} + \delta_{k(t)} + \mathcal{J}_{r(t)} + u_t, \quad (3)$$

where the factor for the »moral influence« is divided into five phases:

1. »Unchastity« regulation 1 (until 1736),
2. Regulation 2 (1736–1753),
3. Regulation 3 (1753–1771),
4. Regulation 4 (1771–1803),
5. Secularised (since 1803).

The effects of marriage restrictions (»nuptiality«) can also be divided into five different regimes:

1. Manorial marriage consent during the Archbishopric (until 1803),
2. After the secularisation, despite changing administrations, the basic condition of conventional statutes of Salzburg remained for the most part unchanged (1803–1810),
3. Change under Bavarian rule (1810–1816),
4. Political marriage consent in the Habsburg monarchy (1816–1883),
5. Abolition of political marriage consent in Salzburg (since 1883).

In the extended model, the significance of each factor is assessed by an analysis of variance (ANOVA) based on F tests and it is tested again for remaining breaks in the trend function.

#### Tests for structural change

Especially in the last decade, tests for structural change or for parameter instability in linear regression models have received much attention in the econometric literature. These tests are concerned with the hypothesis that the parameters of a linear regression model remain constant throughout the sample against the alternative that they vary over time. Testing for structural change is important for two reasons: Firstly, parameter stability is necessary for valid inference in any regression model. If the parameters change, the interpretation of fitted models is generally difficult. Secondly, there are many applications where structural change has an interpretation and the tests can be used to find out if the mean function of a time series changes or if a model is invariant to policy changes. Whereas this approach has become quite popular in econometric modelling<sup>42,43</sup>, it has not been applied among scholars using demographic data sets.

The structural change test used in this paper is the MOSUM test<sup>44</sup> based on the OLS residuals. The idea of the test is fairly simple: if there is a systematic misspecification in the mean function, i.e., a structural break in the trend, then the OLS residuals from the fitted model will also deviate systematically from zero. Thus, if Moving SUMs of the residuals deviate too much from zero the

hypothesis that there is no break in the trend should be rejected. More precisely, a process of sums of residuals in a moving data window, whose size is controlled by the parameter is computed:

$$M_n(z|h) = \frac{1}{\hat{\sigma} \sqrt{n}} \left( \sum_{i=\lfloor N_n z \rfloor + 1}^{\lfloor N_n z \rfloor + \lfloor nh \rfloor} \hat{u}_i \right) \quad (0 \leq z \leq 1-h) \quad (4)$$

where  $\hat{\sigma}$  is the usual variance estimate. If there is a structural break in the mean, the process will have a strong shift at about the same time. This is considered significant if the process crosses some given boundaries (= critical value), which under the hypothesis of no break are only crossed with a fixed probability. In this paper we use  $\alpha = 0.05$ , i.e., the moving sum always contains residuals from 30 years, corresponding to a boundary of 1.206. For the computation and plotting of the MOSUM processes the package *strucchange*<sup>45</sup> has been used.

## Results

### Intervention outcome

In this section we will apply the methods introduced to the demographic time series considered. At first, the *minimal* model from (2) explaining just the effects of the political interventions is fitted which always gives a highly significant improvement over the trivial model (i.e., only one mean for the whole time-series). Then we examine – by applying a MOSUM test – whether there are changes in the mean function that cannot be explained by political influence alone. Subsequently, an *extended* model as in (3) with all available potential influence factors is fitted and a MOSUM test is carried out again to test for remaining breaks. We do not use the MOSUM procedure as a pure significance test, but as a graphical method that helps us to understand the structure in the data.

This is very much in the spirit of Brown, Durbin and Evans<sup>46</sup>, who introduced the first test for structural change (with unknown changepoint) that is closely related to the MOSUM test and who use it »to bring out departures from constancy in a graphic way« and regard the tests »as yardsticks for the interpretation of data rather than leading to hard and fast decisions«. Whereas the minimal model is the same for all dependent variables, the potential and chosen explanatory variables in the extended model can differ for different time series. An overview is given in Table 2.

The table indicates for example that politics, morals, nuptiality and the number of marriages from the same year were considered as covariates for the illegitimate

birth series, and *p* values are significant. For the factor politics no *p* value is given, because it constitutes the minimal model and thus we required it to be in every model. It is important to mention that the finding of a break can only indirectly be attributed to an intervention, since what has been found is a break in the parameters of a regression relationship, but does not prove that this break is caused by a policy intervention. Estimation of a regression model does not explain causality, it may be the constellation of variables that is causally significant. In modelling causality, one would have to consider the characteristics which establish a causal relationship. The literature<sup>47</sup> identifies two main characteristics of causality: temporal ordering of correlated events and the necessity to define the context relevant to the influenced event. A more detailed analysis of every model is given in the following two sections: a) Illegitimate births, b) Marriages.

### a) Illegitimate births

To capture the specific impact of policy changes on the rate of illegitimate births we consider models for the fraction of illegitimate births per year. Figure 2 plots this time series. The allover mean of the time series is roughly at about 17% interrupted by a long decrease during the second half of the 18<sup>th</sup> century followed by a subsequent quick increase to the previous level and a final decrease after the 1880s. The increase is described by both models equally well, whereas the previous decrease seems to be modelled in much more detail by the final model. These descriptive findings correspond to the results of the MOSUM tests. The minimal model still shows a significant shift in the second half of the 18<sup>th</sup> century which vanishes in the extended model. Thus, there are no significant deviances between the true mean function and that fitted by our final model including all available explanatory variables.

At first sight, it seems that policy interventions focusing on moral regulation which always aimed foremost at the hindrance of extramarital sexuality were potent and effective especially during a particular time period. Starting with Archbishop Schrattenbach's accession to power in 1753, the effects of multifaceted moral interventions were in evidence until Salzburg finally became part of Habsburg Austria in 1816 and the moral interventions of previous times ceased. The ultimate abolition of the political marriage consent in 1883, which is included in the final model, most probably was responsible for the decrease of the fraction of the illegitimate births at the end of the century.

TABLE 2  
CONSIDERED AND CHOSEN EXPLANATORY VARIABLES WITH P VALUES

Demographic event	Politics	Morals	Nuptiality	Marriages
Illegitimate births	Yes	Yes (<0.001)	Yes (0.002)	Yes (0.034)
Marriages	Yes	Yes (0.006)	Yes (0.037)	–

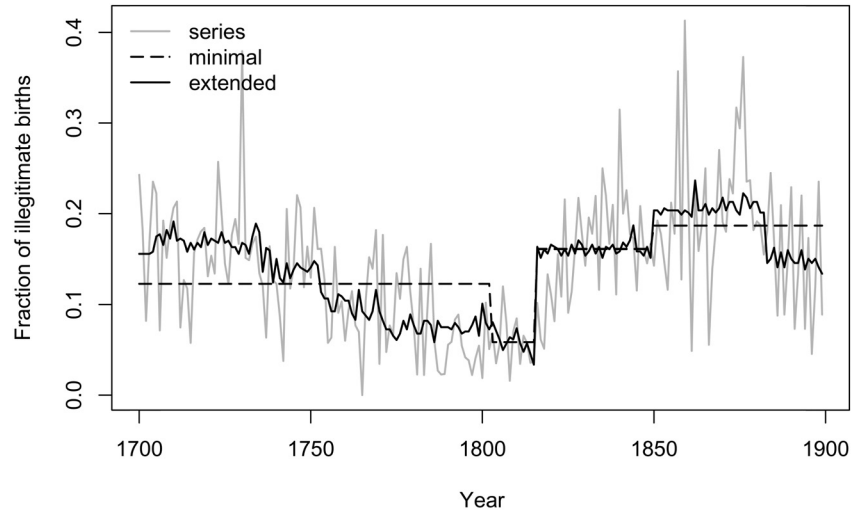


Fig. 2. Fraction of illegitimate births: original time series and fitted mean functions.

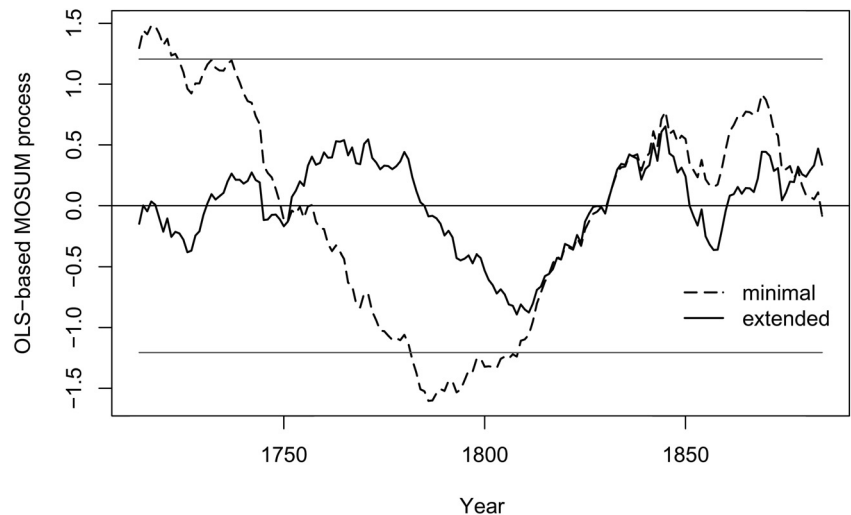


Fig. 3. MOSUM processes for illegitimate births models.

The determinants of an outcome in the illegitimate fraction can be modelled reliably but not perfectly using this procedure. Due to the type of regressors used, the fitted mean function has abrupt shifts and not smooth transitions, which can be seen in the time series, probably caused by policy implementation lags or behavioural lags usually resulting in delayed demographic responses. This could be improved by further refinement of the model, but works well enough in our approach as we focus on detecting the changes caused by policy interventions and assessing their significance.

#### b) Marriages

The number of marriages in Großarl is also an annual time series as depicted in Figure 4. The level of marriages does not seem to vary much until the beginning of the 19<sup>th</sup> century where it decreases abruptly up to a slow

increase at the end of that century. The political change in 1816 which is included in both models describes the sudden change in the mean number of marriages very well. The abrupt breakdown of nuptiality around 1816 was possibly also induced by the supra-regional subsistence crisis at that time, but marriages remained at a low level until the 1880s. Hence there is much evidence of an institutional influence on the nuptiality level. Politically-determined formal rules as well as the causality from polity to demographic process together with stagnant socio-economic structures during this period may be blamed as significant reasons for this development. According to Klein<sup>48</sup> the proportion of the population remaining single was high (sometimes as much as 60%) in the whole region.

The mean function for the final model (adding the variables of moral regulations and marriage restrictions)

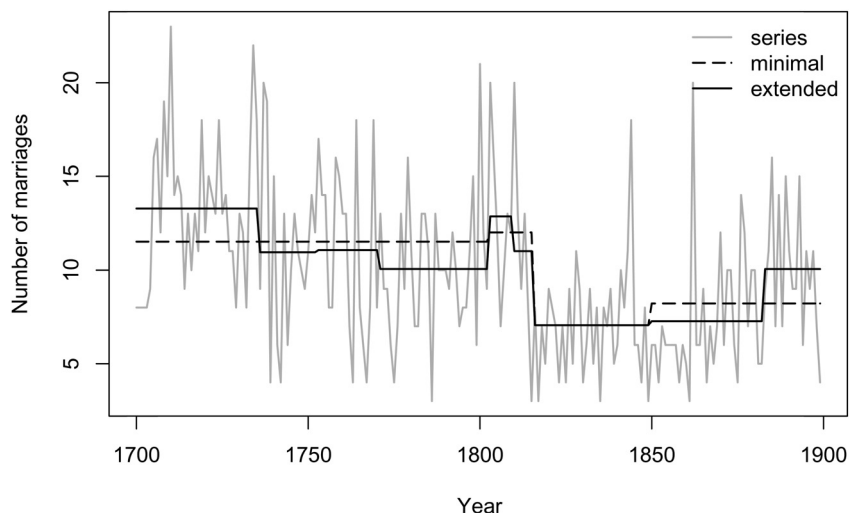


Fig. 4. Number of marriages: annual time series and fitted mean functions.

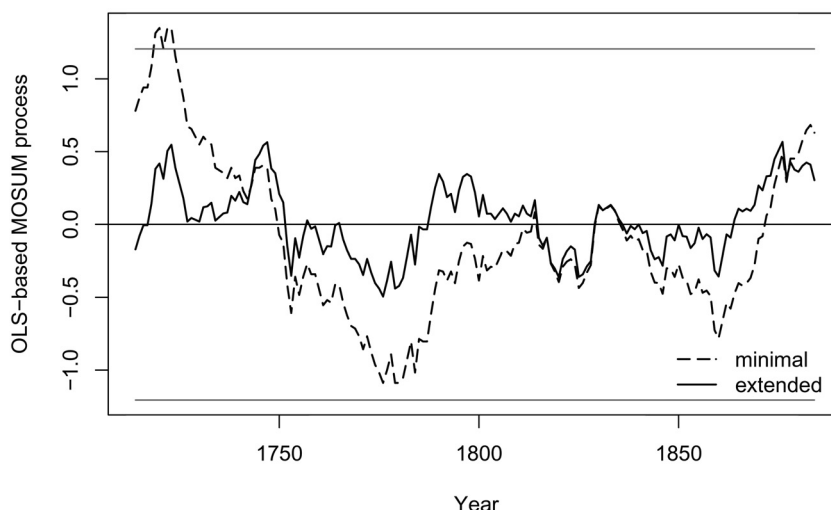


Fig. 5. MOSUM processes for marriage models.

seems to be a bit more accurate for the rest of the sample period. The MOSUM tests for structural change do not exhibit very much fluctuation, although there might be a shift in the first half of the 18<sup>th</sup> century which is not modelled sufficiently well by the minimal model. In any case, this shift disappears in the MOSUM process for the final model.

### Discussion and Conclusion

We offer several types of conclusions: substantive and methodological. A central task of this case study was to specify the linkages between demography, anthropology and history using a mix of qualitative and quantitative, micro-level and macro-level approaches. Regarding the methods used, in this paper we have extended the set of tools available for demographic time series: we applied

tests for structural change in linear regression relationships to visualise demographic changes corresponding to known policy interventions and assess their significance. This procedure leads to a sufficiently good descriptive model of the data that highlights the effects of the variables derived from the historical analysis on the chosen demographical variables. Zeileis and Veichtlbauer<sup>49</sup> compared this approach from the structural change analysis framework with one estimating the breakpoints in a demographic time series without using historical knowledge.

In this investigation, culture is regarded as a body of rules and meanings that are outside of and prior to (demographic) response. Within this framework, the influence of institutions and society-specific socioeconomic characteristics operates on demographic behaviour through various variables such as demand for children or supply of children, whereas costs of »morality« and ferti-



ity regulation can be seen as variables determined by the local production system. In using a rule-based version of institutions, the core results in measuring constraint and compliance lead to an assumption that seigniorial and local institutions did not always act congruently within the normative framework.

Demographic developments can be seen as indicators of social transformations. Our data and source materials expose conflict and cooperation in a complex system of dynamic interrelations. The specific tensions produced by different institutions is thought to underlie demographic behaviour. »Social disciplining« was used as a theoretical structure to summarise normative interventions. The effects of social disciplining aimed at controlling reproductive behaviour can be seen in the results of the statistical modelling section. The necessarily intentional behavioural changes underlying any fertility response require cultural and institutional preparation for their implementation, as Hammel and Galloway<sup>50</sup> have pointed out. However, the policy interventions into reproductive behaviour through social disciplining, primarily focussing upon extra-marital sexuality, were obviously effective. Our results show strong changes over time in the fraction of illegitimate births apparently induced by political changes. During the period with the strongest level of normative order and extensive social control of reproductive behaviour, the second half of the 18<sup>th</sup> century, the fraction of the number of illegitimate births in Großarl was evidently smaller than in any other period. There is no evidence of increased infanticide or missing data for this period.

The question of why seigniorial institutional logics seem to have differed from local social reality is answered by the social practice of production. The farm estate succession laws, in this case defined as impartible inheritance (»Anerbenrecht«), which guaranteed the ability to transfer an undivided farm estate (hereditary farm) to one principal heir of several successors, and the life histories of not-inheriting relatives as unmarried domestic servants or persons who »lived-in«, supported a population system where the number of illegitimate births was very high, as in Großarl. But labelling forms of sexual behaviour as criminal or the classification of such a delict within the patriarchal non-dividing peasant society was more often determined by the so-called »second code«, an informal local based set of rules, than by the »first code«, the criminal law<sup>51</sup>. Why? The labour force needed to run the local mode of production consisted of a high number of several kinds of workers, therefore illegitimate children were seen as »wanted« reservoir pool of prospective domestic servants. And indeed the lack of labour force was an often-documented argument used by the local property holders to defend the moral *status quo*, or economic inefficiencies and delayed modernisation on their farmsteads<sup>52-55</sup>. So we suppose that tensions due to differences between official law and local community norms and values might have decreased, if »moral regulation« had supported an adequate or even better performance within the local production system. Thompson's »moral

economy« concept may also be a reference for this development<sup>56</sup>. In sum, the law had an »open texture« and left interstices where it did not yet fully regulate.

The ideology, ambivalence and dialectics involved in »population politics« during the time under examination can be outlined by analysing the nuptiality development. Constituting a new household was always coupled with obtaining a full peasant holding together with a »social licence for reproduction«<sup>57</sup>. But official perceptions of marriage conditions seem to have been in glaring contrast to local conditions<sup>58,59</sup>. In practice, the Mercantilistic population policy was inconsistent with the Malthusian pauperism politics with its attempt at disciplining social relations. The local authorities required a marriage consent before people could get married. Anyone whose income did not seem to be predictable or secure would not be eligible to obtain the legal consent (marriage license), so marriage in Großarl was a privilege, not a right. The authorities changed over time, but the restrictions remained in effect until around 1883. The results of the statistical modelling section support the presumption that the marriage consent was executed even more rigorously after 1816, after Salzburg's integration into the Habsburg monarchy. This outcome leads to the very interesting debate about the possibility of a change in conflicts between local authorities and the state concerning authority and autonomy during a period of peripheralisation of Salzburg after secularisation: The legal process regarding institutional controls of nuptiality initiated by the central government was aimed at limiting regional competencies, while the municipalities tried to keep their autonomy and independent administration of the marriage ceremonies. Despite liberalisation attempts by the superior legislative authority, in 1880 87.2% of the male persons in the age group 25–29 and 40.2% of the 45–49 aged were unmarried in the court district St. Johann (incl. Großarl)<sup>60</sup>. Hence during the 18<sup>th</sup> and 19<sup>th</sup> centuries, weddings were comparatively few in number and took place at a fairly late age for both bride and groom – many women were well over 30 before they married (the so called »Alpine Pattern«<sup>61,62</sup>). With the chosen regression model in the statistical section, it remains difficult to evaluate an explicit policy effect for the multiple changes around 1800 as none of the considered regressors is able to provide a full explanation for this change. This period can be defined as a transition phase with a high degree of uncertainty.

In conclusion, it is at this local scale level that »the veins of anthropology and demography can be mostly richly mined«<sup>63</sup>. In Großarl, at this specific local scale level, any policy intervention was thus an expression of manorial desirable goals through legislation, institutions, administrative practices in accordance with certain normative objectives, with demonstrable demographic consequences, but also an instrument to maintain a certain local system. Putting together qualitative and quantitative data enables us to build a »thicker« picture of the dialectics of production method and demographic regime in Großarl.

### Computational details

The results of this paper were obtained using the R system for statistical computing, version 2.2.1 and the package *strucchange*, version 1.2–12, that also contains the time series used. Both, R and *strucchange*, are freely available at no cost under the terms of the GNU General Public Licence from <http://CRAN.R-project.org/>. The source code for reproducing the analysis from Section 5 is available via *help* (»Grossarl«) in *strucchange*.

### Acknowledgements

The research presented in this paper was funded by the Austrian Federal Ministry of Education in the research programme *Kulturlandschaftsforschung* (*Cultu-*

*ral Landscape Research*). The study upon which this paper is based is part of the project: *Historische Nachhaltigkeitsforschung: Institutionelle Logik und Dynamik in koevolutionärer Entwicklung*. The research of Achim Zeileis and Friedrich Leisch was supported by the Austrian Science Foundation (FWF) under grant SFB#010: *Adaptive Information Systems and Modeling in Economics and Management Science*.

The authors wish to thank Verena Winiwarter, Hermann Prossinger and Fred Bookstein for their support and very helpful comments. Furthermore, we thank our colleagues Harald Wilfing, Elke Hanser, Fridolin Krausmann and Christoph Sonnlechner for their cooperation and one anonymous reviewer for help and comments. Last but not least: Thank you to the editorial team for their help in writing this article.

### REFERENCES :

1. FRICKE, T., Culture theory and demographic process. In: KERTZER, D. I., T. FRICKE (Eds.): *Anthropological demography. Toward a new synthesis*. (The University of Chicago Press, Chicago, 1997). — 2. KREAGER, P., Population and identity. In: KERTZER, D. I., T. FRICKE (Eds.): *Anthropological demography. Toward a new synthesis*. (The University of Chicago Press, Chicago, 1997). — 3. WEBER, M.: *Wirtschaft und Gesellschaft. Grundriß einer verstehenden Soziologie*. In German. (Mohr, Tübingen, 1956). — 4. ELIAS, N.: *Über den Prozeß der Zivilisation. Soziogenetische und psychogenetische Untersuchungen*. In German. (Suhrkamp, Frankfurt am Main, 1976). — 5. OESTREICH, G.: *Strukturprobleme des europäischen Absolutismus*. In: OESTREICH, G.: *Geist und Gestalt des frühmodernen Staates*. In German. (Duncker und Humblot, Berlin, 1969). — 6. SCHULZE, W., *Zeitschrift für historische Forschung*, 14 (1987) 265. — 7. BEHRISCH, L., *Social discipline in early modern Russia, seventeenth to nineteenth centuries*. In: SCHILLING, H. (Ed.): *Institutionen, Instrumente und Akteure sozialer Kontrolle und Disziplinierung im frühneuzeitlichen Europa*. (Klostermann, Frankfurt am Main, 1999). — 8. VOCELKA, K., *Public opinion and the Phenomenon of Sozialdisziplinierung in the Habsburg Monarchy*. In: INGRAO, C. W. (Ed.): *State and Society in Early Modern Austria*. (West Lafayette, Indiana, 1994). — 9. DOPSCH, H., H. SPATZENEGGER (Eds.): *Geschichte Salzburgs. Stadt und Land, Vol. II/1 and Vol. II/2, Neuzeit und Zeitgeschichte*. In German. (Pustet, Salzburg, 1995). — 10. FLOIMAIR, R. (Ed.): *Daten und Fakten. Bundesland Salzburg*. In German. (Schriftenreihe des Landespressebüros, Salzburg, 1999). — 11. *Handschrift 399: Beschreibung aller und jeder Manß und jeder Weibspersohnen in den fünf Gerichten und Pfarren des Pongwegs, als Werfen, Bischofshoven, St. Johannß, St. Veith und Großarl, welchen in für übergangner gantz notwendigen und haylsamen Reformation, von Iren Irthumben, Secten und Khetzerayen abgestanten, und sich zu der allain wahren und zelligmachenden katholischen Religion bekehrdt, darauf processionem fidei gelaist, auch Beicht und communiert haben*. In German. (Salzburger Landesarchiv, Salzburg, 1615). — 12. FIALA, K.: *Mundartkundliches und Sachliches in der Bauernarbeit im Großarlal*. PhD Thesis. In German. (Universität Wien, Wien, 1967). — 13. HOFFMANN, R., *Salzburg in Salzburg, Landeshauptstadt und Gebirgsgeue in historischer Perspektive*. In: BUSSET, T., L. LORENZETTI, J. MATHIEU (Eds.): *Geschichte der Alpen: Stadt und Gebirge*. In German. (Chronos, Zürich, 2000). — 14. HUNT, A.: *Governing Morals. A Social History of Moral Regulation*. (Cambridge University Press, Cambridge, 1999). — 15. *Geheimes Archiv Generale 35 1/2*. In German. (Salzburger Landesarchiv, Salzburg). — 16. *Geheimes Archiv Generalia 16: Verordnung vom 28. Jänner 1736*. In German. (Salzburger Landesarchiv, Salzburg, 1736). — 17. *Salzburger Landesarchiv: Geheimes Archiv Generalia 16: Erneuerte Poenal-Verordnung Die Fleischliche Verbrechen / Und deren Unterschleipfgebung betreffend 1753*. In: ZAUNER, J. T. (Ed): *Auszug der wichtigsten hochfürstl. Salzburgischen Landesgesetze, Band 3*. In German. (Mayr, Salzburg, 1790). — 18. AMMERER, G., *Zur pönalisierten Sexualität in der zweiten Hälfte des 18. Jahrhunderts anhand Salzburger Kriminalrechtsquellen*. In: ERLACH, D., M. REISENLEITNER, K. VOCELKA (Eds.): *Privatisierung der Triebe. Sexualität in der Frühen Neuzeit*. In German. (Lang, Frankfurt/Main, 1994). — 19. *Hofrat Akten 29 1/2:*

*Verfängliche Abstellung Der Bey Tänzten, und dergleichen Begebenheiten Verübten Ungebühren vom 20. März 1756*. In German. (Salzburger Landesarchiv, Salzburg, 1756) — 20. *Verordnung vom 2. Dezember 1754*. In: ZAUNER, J. T. (Ed): *Auszug der wichtigsten hochfürstl. Salzburgischen Landesgesetze, Band 3*. In German. (Mayr, Salzburg, 1790). — 21. *Geheimes Archiv Generalia 35 1/2: Hofratsverordnung vom 9. Dezember 1770*. In German. (Salzburger Landesarchiv, Salzburg, 1770). — 22. *Salzburger Landesarchiv: Erneuerte Poenalverordnung, Die Strafe deren fleischlichen Verbrechen, deren Unterschleif, und was denenselben Anhängig betreffend vom 19. Dezember 1772: Hofkammer Generale 1772/C/3/A*. In: ZAUNER, J. T. (Ed): *Auszug der wichtigsten hochfürstl. Salzburgischen Landesgesetze, Band 1*. In German. (Mayr, Salzburg, 1790). — 23. *Hofkammer Kriegsrat 1773, Lit. C*. In German. (Salzburger Landesarchiv, Salzburg, 1773). — 24. *Geheimes Archiv Generalia 42, Nr. post 17*. In German. (Salzburger Landesarchiv, Salzburg, 1773). — 25. SIEGEL, H., K. TOMASCHEK: *Die Salzburger Taidinge. Österreichische Weistümer, Band 1*. In German. (Braumüller, Wien, 1870). — 26. *Circularbefehl vom 2. März 1667*. In: PILLWEIN, B. (Ed): *Sammlung der Kur-Salzburgischen Landes-Gesetze unter Ferdinand dem Ersten, Heft II*. In German. (Oberer, Salzburg, 1806). — 27. *Geheimes Archiv Generalien 15: Heiratsverbot für vermögenslose Leute*. In German. (Salzburger Landesarchiv, Salzburg, 1691). — 28. ZAUNER, J. T.: *Auszug der wichtigsten hochfürstl. Salzburgischen Landesgesetze zum gemeinnützigem Gebrauch nach alphabetischer Ordnung, Band 1*. In German. (Mayr, Salzburg, 1785). — 29. *Generalbefehl vom 1. Juli 1730*. In: PILLWEIN, B. (Ed.): *Sammlung der Kur-Salzburgischen Landes-Gesetze unter Ferdinand dem Ersten, Heft II*. In German. (Oberer, Salzburg, 1806). — 30. RINNERTHALER, A., Mitt. d. Dr.-Hans-Lechner-Forschungsgesellschaft, 2 (1992) 262. — 31. *Almosenordnung für das Land Salzburg vom 28. Januar 1754*. In: ZAUNER, J. T. (Ed.): *Auszug der wichtigsten hochfürstl. Salzburgischen Landesgesetze zum gemeinnützigem Gebrauch nach alphabetischer Ordnung, Band 1*. In German. (Mayr, Salzburg, 1785). — 32. *Consistorial-Generale, die heimlichen Verehelichungen ausser Landes betreffend vom 3. Juni 1793*. In: ZAUNER, J. T.: *Sammlung der wichtigsten Salzburgischen Landesgesetze seit dem Jahre 1790 bis zum Schluß der hochfürstlichen Regierung*. In German. (Mayr, Salzburg, 1805). — 33. *Sr.K.K. Majestät Franz des Ersten politische Gesetze und Verordnungen für die Österreichischen, Böhmischen und Galizischen Erbländer, Band 30*. In German. (k.k. Hof- und Staatsdruckerey, Wien, 1810). — 34. RIEDEL, E.: *Das bayrische Gesetz über Heimat, Verehelichung und Aufenthalt vom 16. April 1868 nebst einer Darstellung der älteren bayrischen Gesetze über Heimat, Ansässigmachung, Verehelichung und Armenpflege und den Vollzugsvorschriften*. In German. (München, 1892). — 35. DÖLLINGER, G.: *Sammlung der im Gebiete der inneren Staats-Verwaltung des Königreichs Bayern bestehenden Verordnungen aus amtlichen Quellen, Band 12*. In German. (München, 1835). — 36. DORMITZER, S.: *Die administrativen Verehelichungsbeschränkungen in Bayern*. In German. (Monninger, Nürnberg, 1893). — 37. *Königlich bairisches Salzach-Kreisblatt/Amts- und Intelligenzblatt von Salzburg*. (Salzburg, 1816). — 38. *Stenographische Berichte des Landtages, 2. Sitzung der 5. Session der 5. Periode am 29. Mai 1883*. In: RINNERTHALER, A., Mitt. D. Dr.-Hans-Lechner-Forschungs-

- gesellschaft, 2 (1992) 262. — 39. EHMER, J.: Heiratsverhalten, Sozialstruktur, ökonomischer Wandel. In German. (Vandenhoeck und Ruprecht, Göttingen, 1991). — 40. R DEVELOPMENT CORE TEAM: A Language and Environment for Statistical Computing. (R Foundation for Statistical Computing, Vienna, 2005). — 41. BOX, G. E. P., G. C. TIAO, Journal of the American Statistical Association, 70 (1975) 70. — 42. HANSEN, B. E., Journal of Policy Modeling, 14 (1992) 517. — 43. HANSEN, B. E., Journal of Economic Perspectives, 15 (2001) 117. — 44. CHU, C. S., K. HORNIK, C. M. KUAN, Biometrika, 82 (1995) 603. — 45. ZEILEIS, A., F. LEISCH, K. HORNIK, C. KLEIBER, Journal of Statistical Software, 7 (2002) 1. — 46. BROWN, R. L., J. DURBIN, J. M. EVANS, Journal of the Royal Statistical Society, 37 (1975) 149. — 47. PEARL, J., Structural and probabilistic causality. In: SHANKS, D. R., K. J. HOLYOAK, D. L. MEDIN (Eds.): The Psychology of Learning and Motivation. (Academic Press, San Diego, 1996). — 48. KLEIN, K.: Bevölkerung und Siedlung. In: DOPSCH, H., H. SPATZENEGGER (Eds.): Geschichte Salzburgs. Stadt und Land, Vol. II/2. In German. (Pustet, Salzburg, 1988). — 49. ZEILEIS, A., O. VEICHTLBAUER, Policy Interventions Affecting Illegitimacy in Preindustrial Austria: A Structural Change Analysis. In: DUTTER, R. (Ed.): Festschrift 50 Jahre Österreichische Statistische Gesellschaft. In German. (Österreichische Statistische Gesellschaft, Wien, 2002) — 50. HAMMEL, E. A., P. R. GALLOWAY, European Journal of Population, 16 (2000) 67. — 51. AMMERER, G.: Aufgeklärtes Recht, Rechtspraxis und Rechtsbrecher. In: AMMERER, G., H. HAAS (Eds.): Ambivalenzen der Aufklärung: Festschrift für Ernst Wangermann. In German. (Verlag für Geschichte und Politik, Wien, 1997). — 52. FC Catastral-schätzungs-Elaborat der Gemeinde Dorfgrossarl Nr. 10. In German. (Salzburger Landesarchiv, Salzburg). — 53. Landesausschuss des Herzogtumes Salzburg: Fünfzig Jahre Landtag. In German. (Zaunrith, Salzburg, 1911). — 54. ZILLNER, F. V.: Skizzenbuch aus Salzburg. In German. (Mayr, Salzburg, 1865). — 55. SEETHALER A.: Handschrift 31, Versuch einer Beschreibung des hochf. salzb. Pfleg-, Stadt- und Landgerichtes Laufen am Ende des 18. Jahrhunderts, Absatz 40. In German. (Salzburger Landesarchiv, Salzburg). — 56. THOMPSON, E. P., Past and Present, 50 (1971) 76. — 57. FREITAG, G., Continuity and Change, 13 (1998) 412. — 58. FELNER, J., MGSL, 67 (1927) 75. — 59. VIERTHALER, J. M.: Meine Wanderungen durch Salzburg, Berchtesgaden und Österreich Teil 1. In German. (Gerold, Wien, 1816). — 60. Österreichische Statistik. In German. (k. k. Hof- und Staatsdruckerei, Wien, 1880). — 61. ZURFLUH, A., Geschichte und Region, 1 (1992) 17. — 62. RUESCH, H., Schweizerische Zeitschrift für Geschichte, 29 (1979) 159. — 63. KAUFMANN, G., Kinship structures and reproductive behaviour. In: BASU, A. M., P. AABY (Eds.): The Methods and Uses of Anthropological Demography. (Clarendon Press, Oxford, 1998).

*O. Veichtlbauer*

*IFF Klagenfurt University, Department for the Analysis of Culture and Science, 1070 Vienna, Austria  
e-mail: ortrun.veichtlbauer@uni-klu.ac.at*

## UTJECAJ INTERVENCIJA NA PREDINDUSTRIJSKU POPULACIJU AUSTRIJSKIH ALPI

### SAŽETAK

Svrha ovog rada je razumjeti ulogu kulture u demografskom ponašanju. Ova studija slučaja koristi demografske podatke kako bi prikazala kulturne čimbenike koji utječu na društvenu organizaciju austrijskog sela u periodu od 1700.–1900. godine. Istraživane su dvije skupine varijabli koje bi mogle objasniti utjecaj kulture na demografsko ponašanje: populacijske politike kroz normativne regulative te institucionalne promjene zbog promjena u vlasti. U radu se koriste statističke tehnike za analizu uočenih strukturalnih promjena kako bi se procijenio učinak provedenih mjera kroz normativne regulative i institucionalne promjene na demografski razvoj. Postoje jasni dokazi kako su normativne intervencije bile djelotvorno vezane uz broj vanbračnih poroda te obrazaca vjenčanja.