**Supplementary Material**

**Demographic data**

In order to construct the database, the population registers data of the Spanish National Statistics Institute have been used. The data used have been drawn from the *Catálogo de pueblos y municipios de Aragón. Estadística de población y nomenclaturas toponímicas entre 1900 y 2004*, Zaragoza: Aragonese Institute of Statistics. It includes all of the inhabited places in Aragón throughout the twentieth century. Specifically, it refers to the census data of 1900, 1910, 1920, 1930, 1940, 1950, 1960, 1970, 1981, 1991, 2001 and 2004.

After obtaining the data we coded the nuclei and entities included in the catalogue based on four different settlement categories:

* **Principal entities.** We have established this category for all of the principal nuclei of each municipality. Therefore, the capital of the municipality is considered as the principal nuclei. We have taken into account that the nucleus maintained its capital status of the municipality at least during half of the period studied.
* **Secondary entities.** All of the smaller or secondary nuclei and population entities that may exist within the municipalities have been considered as a different category. We have also taken into account the existence of a truly cohesive population nucleus, excluding, for example, grouped disseminated houses or urbanisations.
* **Scattered population.** In this category we have included the scattered population existing in the municipalities, and those nuclei that have no historical continuity to the present day or which appear and disappear throughout the time series. We have also included those that do not exactly correspond to a population nucleus per se, but to urbanisations or grouped scattered homes.
* **Provincial capitals.** The provincial capitals of Huesca, Teruel and Zaragoza have been considered as a different group.

In the official censuses we can distinguish between the population entities, which are defined as “any inhabitable area in the municipality, inhabited or exceptionally uninhabited, clearly differentiated within it, and which is known by a specific name which identifies it with no possibility for confusion”. This type would correspond, in general, to our population categories called *principal nuclei* and *secondary nuclei.*

Also distinguished are the *historical population entities*, “unique population entity that has been included as such at some moment in the period 1900-2004, but which, in the year 2004 does not appear in the Register”. In other words, entities that appear in certain censuses of the series but do not have a historical continuity and which are not currently recorded even as uninhabited places. Furthermore, the *population nuclei* are also distinguished: “a group of at least ten buildings which form streets, squares and other urban thoroughfares”. These are problematic categories due to their complexity, which have required an in-depth examination in order to attempt to determine the reality and history of each entity and its subsequent classification as dispersed or secondary entity. In the case where this could not be resolved through researching the history and trajectory of the nucleus, we have attempted to respect the official classification of the Aragonese Institute of Statistics (IAEST).

**Other data of the settlements**

In order to calculate the altitude of each nucleus, the ‘Núcleos de población en formato sqlite’ and ‘WCS 25 metros denominado “CARTO\_RASTER-MDE\_25m’ of the Aragonese Geographic Institute were used (<http://idearagon.aragon.es/descargas>).

For the distance to Zaragoza data of the National Geographic Institute have been used ([centrodedescargas.cnig.es/CentroDescargas/index.jsp#](http://centrodedescargas.cnig.es/CentroDescargas/index.jsp)).

The heads of the judicial district have been obtained from Ubieto (1983).

The distances from the railway stations have been facilitated by Esteban (2021). These distances reflect the hours required to reach the nearest railway station on foot. In this case, as there is no information available for each settlement, we have used that existing from the centre of each municipality. With respect to this variable, we have divided the settlements into two groups, the first with a distance of less than one hour and the second of over one hour.

The distances from the roads in 1912 and 1940 have been facilitated by Mateu Morillas-Torné and Jordi Martí-Henneberg. In this case, as there is no information available for each settlement, we have used that existing from the centre of each municipality.

**Table 1: classification of the provinces in agrarian regions**

**Agrarian Regions: North**: A Coruña, Asturias, Cantabria, Guipúzcoa, Lugo, Ourense, Pontevedra and Vizcaya; **Interior**: Álava, Albacete, Ávila, Badajoz, Burgos, Cáceres, Ciudad Real, Cuenca, Guadalajara, Huesca, León, Lleida, Madrid, Navarra, Palencia, La Rioja, Salamanca, Segovia, Soria, Teruel, Toledo, Valladolid, Zamora and Zaragoza; **Mediterranean**: Alicante, Balearic Islands, Barcelona, Castellón, Girona, Murcia, Tarragona and Valencia; **Andalusia**: Almería, Cádiz, Córdoba, Granada, Huelva, Jaén, Málaga and Seville.

**Evolution of the population of Aragón according to different classification criteria of the settlements (absolute values)**

**Table A1. Variation in the population in accordance with the types of settlement**

|  |  |  |  |
| --- | --- | --- | --- |
| **Type** | **N** | **P1900** | **P2001** |
| **Principal entities** | 916 | 704,003 | 478,090 |
| **Secondary entities** | 577 | 59,799 | 33,412 |
| **Scattered population** | 568 | 50,592 | 4,072 |
| **Provincial capitals**  | 3 | 113,570 | 669,225 |
| **Total** | 2,064 | 927,964 | 1,184,799 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Type** | **N** | **P1900** | **P1950** |
| **Principal entities** | 935 | 706,964 | 743,564 |
| **Secondary entities** | 558 | 56,838 | 63,406 |
| **Scattered population** | 568 | 50,592 | 13,465 |
| **Provincial capitals**  | 3 | 113,570 | 261,418 |
| **Total** | 2,064 | 927,964 | 1,081,853 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Type** | **N** | **P1950** | **P2001** |
| **Principal entities** | 733 | 700,043 | 468,537 |
| **Secondary entities** | 760 | 106,927 | 42,965 |
| **Scattered population** | 568 | 13,465 | 4,072 |
| **Provincial capitals**  | 3 | 261,418 | 669,225 |
| **Total** | 2,064 | 1,081,853 | 1,184,799 |

**Table A2. Number of entities and population according to the size of the settlements in 1900**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Size in 1900** | **N** | **P1900** | **P1950** | **P2001** |
| **1-100** | 865 | 37,480 | 28,718 | 10,238 |
| **101-500** | 722 | 191,900 | 169,849 | 63,149 |
| **501-1000** | 275 | 196,961 | 189,268 | 92,563 |
| **1001-5000** | 192 | 339,213 | 366,278 | 270,096 |
| **5001-10000** | 8 | 57,185 | 82,739 | 109,136 |
| **10001-50000** | 1 | 10,903 | 19,884 | 45,838 |
| **>50001** | 1 | 94,322 | 225,117 | 593,779 |
| **Total**  | 2,064 | 927,964 | 1,081,853 | 1,184,799 |

**Table A3. Number of entities and population according to the size of the settlements in 1950**

|  |  |  |  |
| --- | --- | --- | --- |
| **Size in 1950** | **N** | **P1950** | **P2001** |
| **1-100** | 476 | 28,718 | 8,900 |
| **101-500** | 660 | 169,849 | 62,642 |
| **501-1000** | 265 | 189,268 | 92,520 |
| **1001-5000** | 191 | 366,278 | 270,096 |
| **5001-10000** | 8 | 82,739 | 109,136 |
| **10001-50000** | 1 | 19,884 | 45,838 |
| **>50001** | 1 | 225,117 | 593,779 |
| **Total**  | 1,602 | 1,081,853 | 1,182,911 |

**Table A4. Variation of the population according to the altitude of the settlements**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Altitude (m)** | **N** | **P1900** | **P1950** | **P2001** |
| **0-500** | 500 | 415,263 | 597,627 | 946,176 |
| **501-1000** | 1,066 | 382,413 | 373,224 | 201,340 |
| **>1000** | 498 | 130,288 | 111,002 | 37,283 |
| **Total** | 2,064 | 927,964 | 1,081,853 | 1,184,799 |

**Table A5. Variation in the population in accordance with the distance to Zaragoza (without the city of Zaragoza)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Dist, Zaragoza (Km)** | **N** | **P1900** | **P1950** | **P2001** |
| **1-50** | 197 | 113,788 | 146,885 | 130,623 |
| **51-100** | 844 | 417,051 | 435,857 | 302,491 |
| **101-150** | 836 | 252,557 | 235,490 | 144,857 |
| **151-200** | 186 | 50,246 | 38,504 | 13,049 |
| **Total**  | 2,063 | 833,642 | 856,736 | 591,020 |

**Table A6. Variation in the population according to the distance from the nearest railway station in 1900**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **N** | **P1900** | **P1950** | **P2001** |
| **> 1 hour** | 1,662 | 609,920 | 573,510 | 297,597 |
| **< 1 hour** | 402 | 318,044 | 508,343 | 887,202 |
| **Total** | 2,064 | 927,964 | 1,081,853 | 1,184,799 |

**Table A7. Variation in the population according to the distance from the nearest railway station in 1930**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **N** | **P1950** | **P2001** |
| **> 1 hour** | 1.518 | 461,789 | 211,505 |
| **< 1 hour** | 546 | 620,064 | 973,294 |
| **Total** | 2,064 | 1,081,853 | 1,184,799 |

**Table A8: Panel data estimations of the determinants of the variation in the population of the settlements in Aragon 1900-2001**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   | **1900-1950** | **1900-1950** | **1950-2001** | **1950-2001** |
| **VARIABLES** | **POOL** | **RE-rob** | **POOL** | **RE-rob** |
|   |   |   |   |   |
| **Initial Population** | 0.000 | 0.000 | 0.000 | -0.000 |
|  | (0.000) | (0.000) | (0.000) | (0.000) |
| **Altitude** | -0.004\*\*\* | -0.004\*\*\* | -0.012\*\*\* | -0.013\*\*\* |
|   | (0.001) | (0.001) | (0.001) | (0.002) |
| **Dist. Zaragoza (Km)** | -0.018\* | -0.018\* | 0.003 | -0.011 |
|   | (0.010) | (0.010) | (0.014) | (0.016) |
| **Type of settlement:** |   |   |   |   |
|  **Provincial capitals** | Ref. | Ref. | Ref. | Ref. |
|  **Principal entities** | -7.181\*\* | -7.213\*\* | -17.755\*\*\* | -25.027\*\*\* |
|  | (3.638) | (3.629) | (3.531) | (5.379) |
|  **Secondary entities** | -8.907\*\* | -8.940\*\* | -27.586\*\*\* | -34.322\*\*\* |
|  | (3.673) | (3.664) | (3.595) | (5.425) |
|  **Scattered population** | -31.486\*\*\* | -31.544\*\*\* | -56.951\*\*\* | -65.518\*\*\* |
|  | (3.726) | (3.716) | (4.094) | (5.759) |
| **Location of judicial headq** | 5.093\*\*\* | 5.108\*\*\* | 12.052\*\*\* | 10.008\*\*\* |
|   | (1.059) | (1.060) | (1.862) | (2.139) |
| **Acces. to railway station** | 1.798\*\* | 1.773\*\* | 2.941\*\*\* | 2.983\*\*\* |
|   | (0.773) | (0.776) | (0.869) | (0.952) |
| **Acces. to road (Km)** | 0.559\*\*\* | 0.562\*\*\* | -0.219 | 0.389\* |
|   | (0.052) | (0.052) | (0.194) | (0.224) |
|   |   |   |   |   |
| **Constant** | 8.657\*\* | 8.700\*\* | 8.014\*\* | 15.142\*\*\* |
|   | (3.842) | (3.834) | (3.848) | (5.652) |
|   |   |   |   |   |
| **Observations** | 9,717 | 9,717 | 7,171 | 7,171 |
| **R-squared** | 0.115 |   | 0.120 |   |
| **Number of settlements** |   | 2,064 |   | 1,616 |

Clustered-robust standard errors between brackets.\*\*\* p-value <0.01, \*\* p-value <0.05, \* p-value <0.1.

For the estimations of the panel data models using the information in all the census, those observations where the growth rate was over 100% have been eliminated (1.7% of the observations), as they were nuclei with a very low population where even a very small increase of the population in the following census gave rise to a very large growth rate. These observations respond to abnormal non-definitive variations in the population and have been considered as outliers.

In both periods analysed, the Hausman test leads us to reject the random-effect model (RE) against the fixed-effect model (FE). The problem of FE estimation is the inability to estimate the coefficients of time-invariant regressors, and in our model most of the regressors are time-invariant or almost time-invariant. So, in Table A8 we only present the ordinary least square, OLS (POOL) and randon-effects (RE-rob) estimations.

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