



APHA 135TH ANNUAL MEETING AND EXPO
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American Public Health Association

Healthcare Expenditure in Spain: As Related to Factors of Economic Growth, Immigration, and Delinquency, (1997-2002)

Authors:

José Aureliano Martín Segura
Jose Luis Navarro Espigares
Elisa Hernández Torres
Pedro González de la Flor



ugr | *Universidad de Granada*



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Three main factors influence population health and healthcare expenditure

- Delinquency
- Economic growth
- Immigration



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Delinquency

- Delinquency is a problem for public health:
 - Due to the impact on the victims' health.
 - And because of the burden imposed on health institutions.



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Economic growth

- There is a relationship between the increment of healthcare expenditure and GDP growth.
- Newhouse in 1977 explained that more than 90% of healthcare resources vary in relation to GDP per capita changes.



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Immigration

- Immigration can influence the social systems, via a special circular relationship:
 - $\uparrow \text{GDP} \rightarrow \text{Healthcare expenditure}$
 - $\uparrow \text{Healthcare expenditure} \rightarrow \uparrow \text{Population Health}$
 - $\uparrow \text{Population Health} \rightarrow \uparrow \text{GDP}$.
- Immigrants do not generate much healthcare expenditure initially.
- So their health status converges with that of other citizens in the long-run.



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A circular relationship among three main factors

- An increment in immigration implies an increment in healthcare expenditure,
- Which has repercussions on GDP increase,
- Which entails a new increase in healthcare expenditure as well as in the cost of security.



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Mathematical expression of this circular relationship:

$$dY = f(K, L) \Rightarrow f[(K_{material}, K_{human}), L]$$

$Y = GDP; K = capital; L = labor$

- ***K human*** includes skilled immigrant workers.
- ***L*** includes unskilled immigrant workers.



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Delinquency as a negative external factor in the previous formula

- The delinquency factor derives from economic growth.
- Sometimes economic growth increases healthcare cost more than expected.
- Economic growth causes a greater inequality in GDP distribution and consequently a possible increment in the general crime rate.
- This could result in unnecessary healthcare expenditure.



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The econometric model

$$GDP_t = \alpha + \alpha_1 immigrantcensus_t + \alpha_2 healthcareex_{t-1} + u_{1t}$$

$$Healthcareex_t = \beta + \beta_1 GDP_t + \beta_2 immigrantcensus_t + \beta_3 delinquencyrate + u_{2t}$$

- This is a two equation system.
- Data are arranged by regions and years.
- So the resulting data panel is multi-equation.



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Model specification

- **Variables**
 - ***Delinquencyrate***: Total crime rate
 - ***GDP***: Gross domestic product
 - ***Immigrantcensus***: Total number of immigrants registered
 - ***Healthcareex***: Public healthcare expenditure by regions
- **Time period**: 1997 to 2002.
- ***Cross sectional data***: 19 Spanish regions.



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Econometric Model Estimation

- **First equation could be calculated by the Two-Stage Least Squares Method (2SLS)**
- **Second equation could also be estimated by the Two-Stage Least Squares Method (2SLS)**
- **We eliminated the unobserved effects of the equation by applying the First Differences transformation and by using the independent variables as instruments.**



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Results

- The results of the first equation are shown in [Table 1](#)
- The results of the second equation are shown in [Table 2](#)



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Dependent Variable: DGDP

Method: Panel Two-Stage Least Squares

Date: 03/14/07 Time: 20:53

Sample (adjusted): 2000 2003

Cross-sections included: 19

Total panel (unbalanced) observations: 72

Instrument list: C DIMMIGRANTCENSUS DHEALTHCAREEX1(-1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-426001.5	270972.0	-1.572124	0.1207
DIMMIGRANTCENSUS	15.68528	6.928626	2.263837	0.0269
DHEALTHCAREEX1(-1)	20.93854	3.006872	6.963563	0.0000

Effects Specification

Period fixed (dummy variables)

R-squared	0.778129	Mean dependent var	2483680.
Adjusted R-squared	0.761321	S.D. dependent var	2486669.
S.E. of regression	1214857.	Sum squared resid	9.74E+13
F-statistic	79.68194	Durbin-Watson stat	1.573849
Prob (F-statistic)	0.000000	Second-stage SSR	6.24E+13
Instrument rank	6.000000		

DATEID01	Effect
2000-01-01	786789.9
2001-01-01	213248.3
2002-01-01	-207269.9
2003-01-01	-687501.1

Table 1

Healthcare Expenditure in Spain

22/11/2007

13



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First Equation Estimation Analysis

- The coefficient that relates the variation of total number of immigrants registered to the GDP variation is positive and statistically significant.
- The coefficient that relates the variation of the Annual Public Healthcare Expenditure in the previous year to GDP variation is also positive and statistically significant.
- During the years 2000 and 2001 the largest Fixed Effects are present. These years coincide with a jump in the number of illegal immigrant [Figure 1](#).



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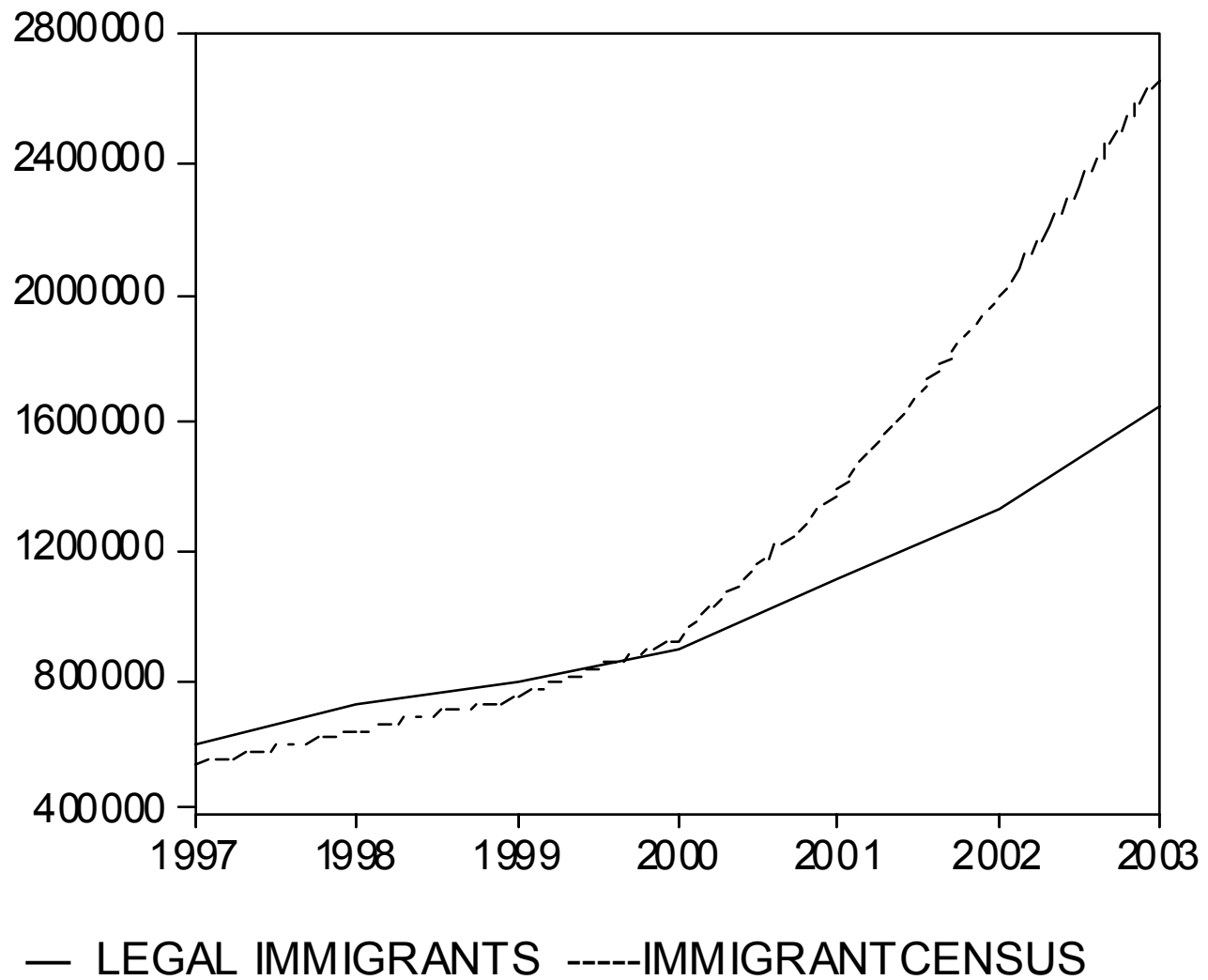


Figure 1



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Redundant Variables: DDELINQUENCYRATE

F-statistic 0.001677 Prob. F(1,63) 0.967462

Test Equation:

Dependent Variable: DHEALTHCAREEX

Method: Panel Two-Stage Least Squares

Date: 03/15/07 Time: 09:20

Sample: 1999 2002

Cross-sections included: 19

Total panel (unbalanced) observations: 70

Instrument list: C DIMMIGRANTCENSUS DHEALTHCAREEX1 DDELINQUENCYRATE

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	21561.57	10777.61	2.000590	0.0497
DGDP	0.048316	0.005946	8.125864	0.0000
DIMMIGRANTCENSUS	-0.865766	0.452639	-1.912706	0.0603

Effects Specification

Period fixed (dummy variables)

R-squared	0.732096	Mean dependent var	122375.9
Adjusted R-squared	0.711166	S.D. dependent var	104371.3
S.E. of regression	56092.49	Sum squared resid	2.01E+11
F-statistic	26.54810	Durbin-Watson stat	1.520821
Prob (F-statistic)	0.000000	Second-stage SSR	2.45E+11
Instrument rank	7.000000		

Table 2

Healthcare Expenditure in Spain

22/11/2007

16



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Second Equation Estimation Analysis

- The coefficient that relates GDP to Annual Public Healthcare Expenditure is positive and statistically significant.
- The relation between Total number of immigrants registered and Public Healthcare Expenditure is negative.
- Total Delinquency Rate is a redundant variable and does not influence Public Healthcare Expenditure.



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FIRST CONCLUSION

Total number of immigrants registered and Healthcare Expenditure of previous year exert a positive impact on GDP.

SECOND CONCLUSION

**GDP and Total number of
immigrants registered had an
effect on total amount of Public
Healthcare Expenditure.**



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THIRD CONCLUSION

In Spain, total crime rate is currently an external factor without relevant importance in Public Healthcare Expenditure.



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**Health is a “state of complete physical,
mental and social well-being”**

WHO 1958

*La salud es “un estado de
completo bienestar físico, mental
y social”*

OMS 1958



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Thanks for your attention!



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