The impact of immigration on public and out-of-pocket health expenditure in OECD countries

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For Citation:

Rana, Rezwanul Hasan and Alam, Khorshed and Gow, Jeff (2019) *Health outcome and expenditure in low-income countries: does increasing diffusion of information and communication technology matter?* Information Technology for Development, 26. pp. 1-19. ISSN 0268-1102. DOI: https://doi.org/10.1007/s12134-019-00667-y

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Abstract

This paper examined the impact of the inflow of new immigrants on public and out-of-pocket health expenditure in 33 Organisation for Economic Cooperation and Developments (OECD) countries over the period of 2000-2015. Dynamic panel data analysis is carried out using the one-step system 'Generalised Method of Moments' and the instrumental variable (IV) estimation approach while controlling for potential endogeneity. The inflow of new immigrants is modelled as a determinant of health expenditure. The results are robust to both static and dynamic models. The results show that an increasing inflow of immigrants is significantly related to out-of-pocket, but, surprisingly, not with public health expenditure. Moreover, the findings are similar for countries that primarily have publicly funded healthcare systems or those more dominated by private financing of healthcare. It can be concluded that new immigrants do not seek publicly funded healthcare at least at the initial years of their relocation and that their arrival does not trigger a significant rise in public healthcare expenditure in the OECD countries.

Key Words: Immigrants; healthcare expenditure; system GMM; instrumental variable; OECD countries

JEL Classification: C3, C33, C36, I10, I18, H40, H51

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1. Introduction

There is no doubt that rising healthcare expenditure and rising inflows of foreign immigrants are two of the most contentious policy issues in many Organization for Economic Cooperation and Development (OECD) countries in recent times. As healthcare expenditure is predominantly funded by governments in these countries [1], any increase in healthcare demand imposes an additional burden on public budgets which applies new challenges to the healthcare system [2] and increases the burden on public social welfare spending [3-5]. In 2015, 7.13 million new documented immigrants entered these countries compared to 3.8 million in the year 2000, a rise of almost 85% [6].

Many empirical studies have argued that increased immigration increases public spending [7]. Some researchers indicated that the magnitude of the impact of rising immigration on public spending is moderate [4, 7], whilst others found the link burdensome [3]. Many studies argue that immigrants dramatically increase public spending, especially in countries where social welfare is generous [8, 9]. In most OECD countries, healthcare is either generously financed or subsidised by governments therefore, it is important to examine the influence of new immigrants on public healthcare expenditure.

Healthcare is a basic human right, hence, OECD countries are expected to ensure equal access to healthcare for all. However, the budgets of many countries are already under extreme pressure as total expenditure on health reached on average approximately 9% of gross domestic product (GDP) in 2016 [6, 10]. One-third of all OECD countries spend more than 10% of their national income on healthcare. This has become a critical policy concern for governments [10] and a key fiscal challenge [11] which has prompted investigation of the key elements of rising healthcare expenditure [12]. Past empirical studies have identified growth in national income, improvements in technology, aging populations, lifestyle choices and a rising incidents of chronic diseases as the primary drivers of increasing healthcare expenditure [11, 13-16].

Some country-specific studies have investigated healthcare usage and expenditure patterns of recent immigrant populations and have concluded that immigrants generally consume less healthcare

due to inequalities in accessing publicly funded healthcare [17-20]. Some of the significant factors contributing to new immigrants' lower use of healthcare services are: i) cultural differences and linguistic barriers [21]; ii) lack of income to afford insurance coverage [2]; iii) lack of understanding of the host countries healthcare system [22], and iv) unfavourable healthcare policies [17, 22]. Supporting these findings, some empirical studies have concluded that total healthcare consumption and expenditure of immigrants are either significantly lower than the host country population [20, 23, 24] or approximately similar [18, 25].

Despite these findings, many researchers indicated that there is a common sentiment among the host country population that immigrants are a burden on the public welfare system and should finance their own healthcare expenses [26, 27]. Foreseeing this trend several OECD countries have conducted key welfare reforms in the past decades. For instance, in 1996, the U.S. Government implemented a five-year prohibition on non-refugee immigrant's eligibility to access the publicly funded Medicare program [20] and other OECD countries are also in the process of formulating policy changes (both favourable and unfavourable to immigrants) in their welfare systems, especially in the healthcare sector [22, 28]**.** Such reforms substantially influence the level of healthcare consumption by new immigrants and act as a barrier to equality of access to healthcare.

Noticeably, all previous research investigating healthcare access, use and expenditure of new immigrant populations were country-specific, or focused mainly on individual states of either the USA or Canada. Although, many of these studies advocated for equity and generous public healthcare funding for immigrants [17, 29, 30], it is still unclear whether the inflow of new immigrants is responsible for rising healthcare expenditure in OECD countries. Thus, no studies have yet examined the link between the increasing inflow of immigrants and healthcare expenditure for OECD countries. Therefore, the following research questions arise: i) does an increasing number of immigrants contribute to rising healthcare expenditure?; ii) is healthcare expenditure by immigrants significantly related to public or out-of-pocket healthcare expenditure?; and iii) does the link between increasing number of immigrants and health expenditure vary due to different healthcare policy and funding frameworks?

Using cross-country OECD data for the period of 2000 to 2015, the main objective of this paper is to examine whether the increasing inflow of immigrants is a key determinant of rising health expenditure, particularly in predominantly publicly funded systems. This study contributes to the existing literature by investigating the growing sentiment that increasing inflows of immigrants imposes additional pressure on publicly funded healthcare. Although many scholars found the evidence of a 'healthy immigrant effect' (immigrants' are generally healthy and demand less healthcare [29, 31]), they have also observed a rapid deterioration of immigrants' health in the long-term [31, 32] because they take riskier occupations, work longer hours and in unhealthier working conditions compared to the host country populations [33, 34]. This study also looked into whether new immigrants' influence the rate of out-of-pocket healthcare expenditure. Rather than focusing on one country or state, this study used cross-country panel data while using an efficient estimation technique to account for unobserved heterogeneity and potential endogeneity bias in the model. Lastly, using dummy variables the study examined how the relationship differs due to variations in healthcare policy and language of the host countries.

The paper is organised as follows. The next section describes the data, regression model and methods used. Section 3 comprises the estimation results and section 4 provides a detail discussion of the findings. Lastly, section 5 contains a brief conclusion and discusses the policy implications that arise.

2. Data and Methods

2.1 Variable definitions and model specifications

This study used a heterogeneous panel data method to examine the relationship between new inflows of immigrants and healthcare expenditure in OECD countries covering the period of 2000 to 2015. Data has been collected for 33 countries[2] from the OECD statistical database [6]. The main exogenous variable in the model is the total inflow of foreign immigrants (*INFR*) in each country per

[2] Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea Republic, Latvia, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom and United States.
Countries excluded due to lack of availability of data are Chile and Turkey.

year and two outcome variables are the log of public healthcare expenditure per capita (*PUBHE*) and the log of out-of-pocket health expenditure per capita (*OOPHE*) both expressed at current (USD) PPP prices. Table 1 shows the descriptive statistics of the variables over several periods. The mean values of the key variables indicate that public and out-of-pocket healthcare expenditure per capita has more than doubled in the past sixteen years and so has the average inflow of immigrants in OECD countries. The obese male and older age population have increased whilst the young population has decreased. Less number of deaths have occurred during the period.

Table 1. Mean values of model variables

	Overall	**2000**	**2005**	**2010**	**2015**
PUBHE^{+}	2177.13	1340.09	1863.33	2491.28	2935.31
OOPHE^{+}	790.74	524.18	711.29	865.72	1056.40
*INFR**	165667	127687	159471	158291	217661
GDPPC^{+}	33675	24477	30260	36234	42731
OBSM	19.20	15.77	18.20	20.69	22.58
TREDU	35.51	26.53	32.85	38.24	42.63
PHMCN^{+}	466.36	308.87	422.59	532.88	556.74
POP65	15.27	13.95	14.67	15.56	17.20
POP14	17.69	19.06	17.93	17.17	16.90
CANDT	217	233	220	209	201

Notes: $^{+}$ indicates variables are expressed in USD, per capita current PPP
* indicates average inflow of foreign immigrants in OECD countries per year

In addition to the primary exogenous variable, some key control variables were included in the model replicating past empirical studies. The estimated regression model controlled for the percentage of the population (18+ and male) who are obese (*OBSM*) based on body mass index. This variable has been identified as a critical element of rising healthcare expenditure [16, 35]. The percentage of the population over 65 years old (*POP65*) and between 0 to 14 years old (*POP14*) are included, as they represent population age structure [36] and have a higher tendency to consume healthcare [37]. Holding other things constant, the longevity of the population is expected to increase with quality improvements of healthcare services. Per capita pharmaceutical consumption *(PHMCN*) was included as growth in drug prices is considered a key driver of rising healthcare expenditure [38, 39]. The percentage of the population (between 24-65 years old) with tertiary education *(TREDU)* was included as the level of education influences both health status and healthcare expenditure [40] and the probability of

catastrophic healthcare expenditure [41]. The number of deaths due to cancer *(CAND)* captures changes in medical technology with the assumption that improvements will significantly reduce mortality related to diseases such as cancer. Past studies have also used infant mortality and life expectancy [42], the number of medical equipment [43] and R&D spending for healthcare [15] as a proxy for technological progress. Finally, GDP per capita is used to proxy national income as many empirical studies have concluded that rising national income is the primary determinant of rising healthcare expenditure [11, 14, 15].

The empirical models are specified as follows:

$$PUBHE_{it} = \alpha\, PUBHE_{i,t-1} + \beta_1 INFR_{it} + \beta_2\, GDPPC_{it} + \beta_3 POP65_{it} + \beta_4\, PHMCN_{it} + \beta_5\, POP14_{it} + \beta_6\, TREDU_{it} + \beta_7\, OBSM_{it} + \beta_8\, CANDT_{it} + e_i + u_i \quad (1)$$

$$OOPHE_{it} = \alpha OOPHE_{i,t-1} + \beta_1 INFR_{it} + \beta_2\, GDPPC_{it} + \beta_3 POP65_{it} + \beta_4\, PHMCN_{it} + \beta_5\, POP14_{it} + \beta_6\, TREDU_{it} + \beta_7\, OBSM_{it} + \beta_8\, CANDT_{it} + e_i + u_i \quad (2)$$

Three dummy variables were added to increase validity of results and the estimated models are:

$$PUBHE_{it} = \alpha\, PUBHE_{i,t-1} + \beta_1 INFR_{it} + \beta_2\, GDPPC_{it} + \beta_3 POP65_{it} + \beta_4\, PHMCN_{it} + \beta_5\, POP14_{it} + \beta_6\, TREDU_{it} + \beta_7\, OBSM_{it} + \beta_8\, CANDT_{it} + \beta_9\, DUMMY_{it} + e_i + u_i \quad (3)$$

$$OOPHE_{it} = \alpha OOPHE_{i,t-1} + \beta_1 INFR_{it} + \beta_2\, GDPPC_{it} + \beta_3 POP65_{it} + \beta_4\, PHMCN_{it} + \beta_5\, POP14_{it} + \beta_6\, TREDU_{it} + \beta_7\, OBSM_{it} + \beta_8\, CANDT_{it} + \beta_9\, DUMMY_{it} + e_i + u_i \quad (4)$$

Dummy variable *HEFDUM* was used to examine whether the relationship differs between countries where healthcare is primarily funded by government or otherwise. The mean value of government expenditure as a percentage of total health expenditure is 71% [6]. The variable is coded 1 for countries where more than 71% of healthcare is financed by government and 0 otherwise. The dummy variable *LANGDUM* was used to examine whether new immigrants consume and spend more on healthcare in English speaking countries and the variable is coded 1 for English speaking countries and 0 for non-English speaking countries. By 2003 only four OECD countries (England, Italy, the Netherlands and Sweden) had established dedicated healthcare policies for immigrants [18]. The dummy variable *IMHPDUM* is coded 1 for these four countries and 0 for all other countries to analyse

whether new immigrants' healthcare expenditure differed between countries. The basic hypothesis is that having a dedicated healthcare policy for immigrants will encourage them to consume more healthcare services.

2.2 Estimation methodology

This study used the 'Generalized Method of Moments' (GMM) estimation approach which uses the lagged values of the dependent and independent variables in levels and first difference as instrumental variables to control for the endogeneity problem in the model. The system GMM estimator incorporates the moment conditions at the first difference and in levels for the dynamic panel regression model [44]. Many empirical studies have justified the use of the system GMM model because of its efficiency in case of small samples and root mean squared error [45, 46]. It is more precise if the models suffer from endogeneity, serial correlation, persistence and unobserved heterogeneity [47-49] or if the variables have unit root problems [50]. Therefore, the system GMM estimator results are more efficient and consistent [51], as well as displaying lower biases [46]. The econometric methodology of system GMM is well documented [45, 49, 52] and has been applied in a number of recent studies related to healthcare [53, 54]. Therefore, only a brief summary of the approach is presented in this study. The following autoregressive model has been considered:

$$y_{i,t} = \alpha y_{i,t-1} + \beta X_{it} + \varepsilon_{it} \qquad (5)$$

where $y_{i,t}$ is the dependent variable (healthcare expenditure), $y_{i,t-1}$ is the lagged dependent variable and X_{it} represents the vector of all the control variables for country *i* at time *t.* ε_{it} denotes the disturbance term consisting of the fixed effects, e_i , and idiosyncratic errors, u_i. Therefore,

$$\varepsilon_{it} = e_i + u_i \qquad \text{and}$$

$$E[e_i] = 0,\ E[u_i] = 0,\ E[e_i, u_i] = 0 \text{ for i = 1,…., N and t = 2,…..,T}$$

Now, by deducting $y_{i,t-1}$ from both side of equation (1) we get,

$$dy_{i,t} = (\alpha - 1) y_{i,t-1} + \beta X_{it} + \varepsilon_{it} \qquad (6)$$

The difference GMM estimator takes the first-difference of the data to control unobserved country-specific fixed-effects [55] and the system GMM estimator combines the two equations simultaneously in first difference and at levels [49]. Therefore, the lagged first-difference of the dependent variables and the response variables were used as instruments for the level equations [45]. Although, system GMM is an efficient estimator, the accuracy and reliability of the results depends upon the appropriate choice of specification tests [56]. To provide evidence of the soundness of the estimated outcomes, this study also reports the diagnostic test results including the number of instruments in the models, Hansen-J test results, the difference-in-Hansen test results and the test results of the second-order serial correlation in the first difference residuals [49, 51].

The problem of weak instrument bias or over identification of instruments in the GMM approach are common issues. This study used some known measures to account for these matters. For all the estimated models with system GMM approach (See Tables 2 and 3) the study reported the Hansen *J* test results. Many studies including those are published recently in the quality journal have used the test to validate the instruments used in the GMM method and declared correct GMM model specifications (for example Heid, Langer, & Larch, 2012; Hou & Chen, 2013; Nguyen, 2012). Secondly, many previous studies have concluded that the Hansen *J* is a credible 'post hoc' test and should be checked to ensure the validity of the instruments and moment conditions (Arellano & Bond, 1988; Kukenova & Monteiro, 2008; Roodman, 2006; Soto, 2007). Thirdly, Bowsher (2002) and Roodman (2006) also concluded that too many instruments can overfit the estimated model and this will weaken the Hansen J test with an implausibly good *p*-value of 1.000. The range of the Hansen *J* test results in this study is 0.17 to 0.39. In addition, in all the system GMM tests the number of instruments were smaller than *N* which is suggested by Roodman (2009). Results reported in paragraph 3 of page 9 in section 3. Fourthly, to ensure the robustness of the estimated results this study conducted ordinary least square, fixed effect and panel corrected standard error tests. The resemblance of the findings proves the reliability of the GMM approach.

3. Results

Table 2 shows the results of models 1 and 3 which examines the relationship between public healthcare expenditure and the inflow of immigrants. Column A in Table 2 indicates the findings of the static panel estimators which are ordinary least square (OLS), fixed-effect (FE) and panel corrected standard error (PCSE). Column B shows the system GMM estimator results with lag values for inflow of immigrants and column C displays the findings of system GMM estimation results for the models with three dummy variables (used separately).

The estimated results show that inflows of immigrants have no association with growth in public healthcare expenditure and the coefficient has the expected sign. Similar to previous studies, national income, obesity and improvements in medical technology display a significant relationship with rising healthcare expenditure. Interestingly, the under-age population is responsible for growing public healthcare expenditure. For every $1000 increase in per capita nominal GDP, the growth rate of public healthcare expenditure increases by 0.3-0.4%.

As expected, in countries where healthcare expenditure is predominantly publicly funded a rise in income increases public healthcare expenditure by a greater than proportional amount. A 1% increase in the older age population and a 1% increase in the population below 14 increases the growth rate of public healthcare expenditure by 1 to 1.7% and 0.9 to 1%, respectively. The coefficients of the variables, pharmaceutical consumption and percentage of the population with tertiary education, are negatively related to healthcare expenditure although the coefficient values are very small and insignificant. None of the dummy variables are significant which means the relationship does not vary significantly between countries: i) where healthcare is mostly publicly funded or not; ii) English speaking and non-English speaking OECD countries and iii) those who introduced healthcare policy for immigrants or otherwise.

Table 2. Determinants of public healthcare expenditure

TESTS	(A)			(B)			(C)		
	OLS	FE	PCSE	System GMM			GMM Dummy Variables		
				No lag	*Lag 1*	*Lag 2*	*D1*	*D2*	*D3*
$LNPUBHE_{t-1}$				0.92***	0.93***	0.91***	0.91***	0.93***	0.92***
				(0.042)	(0.042)	(0.043)	(0.041)	(0.04)	(0.045)
$INFR_{it}$	0.0001*	0.0002	0.0003	0.0006	0.0001	0.0001*	0.0001	0.0003	0.0001
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$GDPPC_{it}$	0.003***	0.001***	0.002***	0.004**	0.003*	0.004**	0.004**	0.003*	0.003**
	(0.001)	(0.001)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
$OBSM_{it}$	-0.004	0.031***	-0.004	-0.002	-0.003	-0.002*	-0.002	-0.003	-0.003
	(0.003)	(0.006)	(0.004)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
$POP65_{it}$	0.076***	0.034***	0.059***	0.016**	0.017**	0.01*	0.016**	0.019**	0.017**
	(0.006)	(0.000)	(0.008)	(0.007)	(0.007)	(0.004)	(0.007)	(0.008)	(0.008)
$PHMCN_{it}$	0.001***	0.001***	0.001***	-0.000	-0.000	0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$TREDU_{it}$	0.005***	0.003**	0.008***	-0.001	-0.001	0.000	-0.000	-0.001	-0.001
	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.000)	(0.001)	0.002)	(0.001)
$POP14_{it}$	0.044***	-0.045**	0.002***	0.01**	0.009**	0.01**	0.009**	0.009**	0.009**
	(0.005)	(0.008)	(0.001)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
$CANDT_{it}$	0.005***	0.001**	0.002***	0.001*	0.001	0.001**	0.001**	0.001	0.001
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
OBS	387	387	387	364	355	343	364	364	364
Instruments				30	30	30	30	30	30
Hansen-J				0.17	0.16	0.13	0.144	0.175	0.14
Diff-in-Hansen				0.655	0.67	0.80	0.58	0.74	0.59
AR(2)				0.49	0.56	0.48	0.50	0.47	0.49
R-Sq	0.89	0.90	0.93						
No. of Groups	31	31	31	31	31	31	31	31	31
Adj R-Sq	0.89								
HEFDUM							0.007		
							(0.045)		
LANGDUM								0.060	
								(0.075)	
IMHPDUM									-0.041
									(0.053)

Notes: Significant at 10, 5, and 1% level is defined by *, **, and ***, respectively. Results based on one step system GMM method with robust standard error. Standard error appear in the parentheses. Hansen J-test and the Diff-in-Hansen tests are used to test the null hypothesis of validity of the instruments and the validity of the moment restriction in the system GMM approach. AR (2) indicates the Arellano-Bond teat for second-order autocorrelation and the null hypothesis is no second-order autocorrelation. The first-order autocorrelation test (not reported) always rejected the null hypothesis. The fixed effect estimation also shows the robust standard errors. For PCSE estimation approach 'hetonly' and 'Corr(ar1)' options were used. All the estimations were conducted with statistical software 'STATA'.

The static estimation results in column A are consistent with the system GMM results for all the models. Only exceptions are pharmaceutical consumptions and tertiary education. According to all the static estimator results, both pharmaceutical consumptions and tertiary educated population significantly impact on public healthcare expenditure.

Table 3 illustrates the findings of models 2 and 4 which investigated the link between out-of-pocket healthcare expenditure and the inflow of immigrants. Both static and dynamic test results

indicate that increasing immigrant populations increases out-of-pocket healthcare expenditure. The other two variables that significantly influence out-of-pocket healthcare expenditure are rising per capita income and advancements in technology. For every 10,000 additional immigrants the growth rate in out-of-pocket healthcare expenditure increases by 0.1 to 0.2%. Interestingly for English speaking countries, the impact of the inflow of immigrants are higher (0.3%) on out-of-pocket healthcare expenditure compared to other countries. Again, in countries where healthcare expenditure is predominantly publicly funded the impact is less (0.13%). Surprisingly, countries who implemented dedicated healthcare policies for migrants have an identical coefficient (0.2) to the other countries. Similar to the results of model 1, none of the dummy variables are significant although the signs of the coefficients are as expected. The static estimation results indicate that tertiary education and pharmaceutical consumption significantly increases out-of-pocket healthcare expenditure. The results indicate that increase in drug consumption contributes to the out-of-pocket healthcare expenditure by 0.1%, and a 1% increase in the tertiary educated population increases expenditure by 0.9 to 1%. However, the variables are not significant in the GMM estimation results.

Tables 2 and 3 also report some diagnostic test results. For all of the system GMM estimations the number of instruments were between 29 to 30, and the number of groups *(N)* were 31. The Hansen-J and difference-in-Hansen test results illustrate the validity of the models and instruments used and the AR (2) results specify that the model does not suffer from second-order autocorrelation.

Table 3. Determinants of out-of-pocket healthcare expenditure

TESTS	(A)			(B)			(C)		
	OLS	FE	PCSE	System GMM			GMM Dummy Variables		
				No lag	*Lag 1*	*Lag 2*	*D1*	*D2*	*D3*
$LNOOPHE_{t-1}$				0.89***	0.88***	0.92***	0.90***	0.88***	0.84***
				(0.10)	(0.097)	(0.111)	(011)	(0.11)	(0.14)
$INFR_{it}$	0.005***	0.004***	0.0014*	0.0013**	0.002*	0.001*	0.0013**	0.003**	0.002*
	(0.000)	(0.001)	(0.000)	(0.006)	(0.000)	(0.000)	(0.0006)	(0.001)	(0.001)
$GDPPC_{it}$	0.009***	0.0003	0.001***	0.003**	0.003**	0.003*	0.004***	0.003	0.005
	(0.002)	(0.0003)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.004)
$OBSM_{it}$	0.025***	0.018	0.024***	0.004	0.003	0.003	0.003	0.005	0.007
	(0.005)	(0.011)	(0.005)	(0.003)	(0.003)	(0.002)	(0.002)	(0.004)	(0.005)
$POP65_{it}$	0.007	0.014	0.002	-0.002	-0.001	-0.002	-0.002	-0.013	0.003
	(0.010)	(0.013)	(0.014)	(0.010)	(0.010)	(0.010)	(0.002)	(0.014)	(0.15)
$PHMCN_{it}$	0.001***	0.001***	0.001***	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$TREDU_{it}$	0.009***	0.011***	0.010***	0.003*	0.002	0.002	0.003*	0.005*	0.003
	(0.002)	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.003)	(0.002)
$POP14_{it}$	0.015*	-0.073**	0.003	0.008	0.011	0.008	0.006	0.011	0.011
	(0.008)	(0.015)	(0.011)	(0.015)	(0.016)	(0.017)	(0.014)	(0.017)	(0.017)
$CANDT_{it}$	0.002***	0.007***	0.002***	0.002**	0.001**	0.001	0.002**	0.002**	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
OBS	387	387	387	364	355	343	364	364	364
Instruments				30	30	29	30	30	30
Hansen-J				0.36	0.35	0.39	0.30	0.34	0.37
Diff-in-Hansen				0.54	0.66	0.77	0.44	0.25	0.60
AR(2) 1st Diff				0.85	0.91	0.49	0.83	0.96	0.37
R-Sq	0.70	0.71	0.92						
No. of Groups	31	31	31	31	31	31	31	31	31
Adj R-Sq	0.69								
HEFDUM							-0.045		
							(0.052)		
LANGDUM								-0.237	
								(0.145)	
IMHPDUM									-0.196
									(0.204)

Notes: Same as Table 2.

4. Discussion

The primary findings of the study are that the inflow of new immigrants has no significant association with increases in public healthcare expenditure. The results endorses the country specific empirical research which concluded that immigrants' access to healthcare services are limited compared to host country populations due to the 'healthy immigrant effect' [33, 57] and the usually rigorous health screening process for documented immigrants [58] in OECD countries. Therefore, it is logical to find that new immigrants' impact is insignificant on the consumption of and expenditure on public

healthcare. Another key finding is that the rising number of new immigrants has a significant relationship with increases in out-of-pocket healthcare expenditure. Both the static and dynamic model results illustrated similar results. Hence, this suggests that due to lack of access to the public healthcare services, immigrants themselves are paying for their essential healthcare consumption. This reliance on out-of-pocket paying for healthcare services may be an important barrier to their use of essential healthcare.

Similar to previous research, it was found that rising national income and developments in medical technologies are the two main drivers of increasing healthcare expenditure. In addition, the aging of the population impacts public, but not out-of-pocket, healthcare expenditure significantly. Implying that countries generally offer noteworthy public healthcare support for the old age population.

Lastly, there is no evidence that new immigrants use publicly funded healthcare services more in countries where government healthcare funding is more generous. Moreover, even in countries which had dedicated immigrant healthcare policies there was not a significant variation in the results. Hence, the general belief that increased immigrant inflows increases overall public healthcare expenditure and imposes a burden on the welfare system is not supported. Therefore, this study postulates that having a dedicated immigrant healthcare policy will not burden the public budget of the countries. Moreover, both financial and nonfinancial barriers to immigrant access to healthcare is need to establish equality in healthcare access for all.

5. Conclusions

The aim of this study was to investigate the impact of the inflow of immigrant populations on healthcare expenditure in the OECD countries. The key findings of the study indicate that increasing inflows of immigrants has no significant relationship with increasing public healthcare expenditure. However, it has a significant association with rising out-of-pocket expenditure. As the number of new immigrants increases the level of out-of-pocket healthcare expenditure per person increases, although only marginally. The findings also show that growth in national income, medical technological

progress, the percentage of the old and young populations are important determinants of rising healthcare expenditure.

The estimated results of this study support the view that immigrants have unequal access to public healthcare and their expenditure on healthcare is less than host country populations. Therefore, the findings contradict the prevailing sentiment that immigrants are a burden to the public welfare systems as it was found that new immigrants mostly incur out-of-pocket expenditure when consuming healthcare services. This clearly explains the lack of consumption of healthcare services by immigrants compared to the host country population. The estimated results also promote the idea that only by reforming healthcare policy can increases in immigrant use and expenditure on healthcare occur.

There are some key policy implications of the findings of this study. First, policymakers should realise that providing more generous healthcare policies for new immigrants will not increase public expenditure significantly. As past studies have indicated the 'healthy immigrants' effect' and the success of the health screening process ensures that new immigrants will not increase their consumption of healthcare above that of the host country population. But by offering more generous policies the OECD countries could improve healthcare access for immigrants. Second, more research is required to identify the nonfinancial barriers to healthcare so that new immigrants can access healthcare. Third, greater public awareness should be created regarding the negligible impact of immigrants on publicly funded healthcare expenditure in the host countries.

In conclusion, although the inflow of immigrants increases the diversity of the population and creates new challenges for the healthcare system, this does not trigger a significant rise in public expenditure in the OECD countries.

References

1. Lis, M.: **Age or time-to-death–what drives health care expenditures? Panel data evidence from the OECD countries**. In: IBS Working Paper 04/2016. Warszawa: Instytut Badan Strukturalnych (2016).
2. Dias, S.F., Severo, M., Barros, H.: **Determinants of health care utilization by immigrants in Portugal**. BMC Health Services Research. **8**(1), 207(2008).
3. Nannestad, P.: **Immigration and welfare states: A survey of 15 years of research**. European Journal of Political Economy.**23**(2), 512-532 (2007).
4. Gaston N, Rajaguru G: **International migration and the welfare state revisited**. *European Journal of Political Economy* 2013, **29**:90-101.
5. Soroka SN, Johnston R, Kevins A, Banting K, Kymlicka W: **Migration and welfare state spending**. *European Political Science Review* 2016, **8**(2):173-194.
6. OECD: **OECD. Stat**. In. Edited by Development OfEC-oa; 2016.
7. Brücker H, Epstein GS, McCormick B, Saint-Paul G, Venturini A, Zimmermann KF: **Managing migration in the European welfare state**. In: *Immigration policy and the welfare system. Volume 74*, edn. Edited by Boeri T, Hanson G, McCormick B. Oxford: Oxford University Press; 2002: 1–168.
8. Chand SK, Paldam M: **The economics of immigration into a Nordic welfare state-and a comparison to an immigration state and a guest worker state**. In. Berlin: Paper presented at the European Public Choice Society Annual Meeting; 2004.
9. Razin A, Sadka E, Swagel P: **Tax burden and migration: a political economy theory and evidence**. *Journal of Public Economics* 2002, **85**(2):167-190.
10. Çelik Y, Khan M, Hikmet N: **Achieving value for money in health: a comparative analysis of OECD countries and regional countries**. *The International journal of health planning and management* 2016.
11. Hartwig J: **What drives health care expenditure? Baumol's model of 'Unbalanced growth' revisited**. *Journal of health economics* 2008, **27**:603-623.
12. Vandersteegen T, Marneffe W, Cleemput I, Vereeck L: **The impact of no-fault compensation on health care expenditures: An empirical study of OECD countries**. *Health Policy* 2015, **119**(3):367-374.
13. Bech M, Christiansen T, Khoman E, Lauridsen J, Weale M: **Ageing and health care expenditure in EU-15**. *The European Journal of Health Economics* 2011, **12**(5):469-478.
14. Baltagi BH, Lagravinese R, Moscone F, Tosetti E: **Health care expenditure and income: A global perspective**. *Health economics* 2017, **26**(7):863-874.
15. Okunade AA, Murthy NRV: **Technology as a 'major driver' of health care costs: a cointegration analysis of the Newhouse conjecture**. *Journal of Health Economics* 2002, **21**:147-159.
16. Scarborough P, Bhatnagar P, Wickramasinghe KK, Allender S, Foster C, Rayner M: **The economic burden of ill health due to diet, physical inactivity, smoking, alcohol and obesity in the UK: an update to 2006–07 NHS costs**. *Journal of public health* 2011, **33**(4):527-535.
17. Mladovsky P: **A framework for analysing migrant health policies in Europe**. *Health Policy* 2009, **93**(1):55-63.
18. Pourat N, Wallace SP, Hadler MW, Ponce N: **Assessing health care services used by California's undocumented immigrant population in 2010**. *Health Affairs* 2014, **33**(5):840-847.
19. Marshall KJ, Urrutia-Rojas X, Mas FS, Coggin C: **Health status and access to health care of documented and undocumented immigrant Latino women**. *Health Care for Women International* 2005, **26**(10):916-936.
20. Mohanty SA, Woolhandler S, Himmelstein DU, Pati S, Carrasquillo O, Bor DH: **Health care expenditures of immigrants in the United States: a nationally representative analysis**. *American Journal of Public Health* 2005, **95**(8):1431-1438.
21. Antón J-I, De Bustillo RM: **Health care utilisation and immigration in Spain**. *The European Journal of Health Economics* 2010, **11**(5):487-498.

22. Vázquez M-L, Terraza-Núñez R, Vargas I, Rodríguez D, Lizana T: **Health policies for migrant populations in three European countries: England; Italy and Spain**. *Health Policy* 2011, **101**(1):70-78.
23. Okie S: **Immigrants and health care- At the intersection of two broken systems**. *New England Journal of Medicine* 2007, **357**(6):525-529.
24. Oza-Frank R, Stephenson R, Narayan KV: **Diabetes prevalence by length of residence among US immigrants**. *Journal of Immigrant and Minority Health* 2011, **13**(1):1-8.
25. Laroche M: **Health status and health services utilization of Canada's immigrant and non-immigrant populations**. *Canadian Public Policy/Analyse de Politiques* 2000:51-75.
26. Rechel B, Mladovsky P, Ingleby D, Mackenbach JP, McKee M: **Migration and health in an increasingly diverse Europe**. *The Lancet* 2013, **381**(9873):1235-1245.
27. Stimpson JP, Wilson FA, Eschbach K: **Trends in health care spending for immigrants in the United States**. *Health Affairs* 2010:10.1377/hlthaff. 2009.0400.
28. Fernandes A, Backstrom B, Padilla B, Malheiros J, Perelman J, Dias S: **Conceptual framework. Challenges for health in the age of migration**. In. Lisbon; 2007.
29. Beiser M: **The health of immigrants and refugees in Canada**. *Canadian Journal of Public Health/Revue Canadienne de Sante'e Publique* 2005:S30-S44.
30. Pitkin Derose K, Bahney BW, Lurie N, Escarce JJ: **Immigrants and health care access, quality, and cost**. *Medical Care Research and Review* 2009, **66**(4):355-408.
31. Giuntella O, Mazzonna F: **Do immigrants improve the health of natives?** *Journal of Health Economics* 2015, **43**:140-153.
32. Newbold KB, Danforth J: **Health status and Canada's immigrant population**. *Social Science & Medicine* 2003, **57**(10):1981-1995.
33. Giuntella O: **Do immigrants squeeze natives out of bad schedules? Evidence from Italy**. *IZA Journal of Migration* 2012, **1**(1):7.
34. Orrenius PM, Zavodny M: **Do immigrants work in riskier jobs?** *Demography* 2009, **46**(3):535-551.
35. Begg S, Vos T, Barker B, Stevenson C, Stanley L, Lopez AD: **The burden of disease and injury in Australia 2003**. *Australian Institute of Health and Welfare, Canberra* 2007.
36. Ke X, Saksena P, Holly A: **The determinants of health expenditure: A country-level panel data analysis**. In: *Working paper The Results for Development Institute (R4D)*. Geneva: World Health Orgnization; 2011.
37. Ang JB: **Financial development, liberalization and technological deepening**. *European Economic Review* 2011, **55**(5):688-701.
38. Okunade AA, Suraratdecha C: **The pervasiveness of pharmaceutical expenditure inertia in the OECD countries**. *Social science & medicine* 2006, **63**(1):225-238.
39. Hauck K, Zhang X: **Heterogeneity in the effect of common shocks on healthcare expenditure growth**. *Health economics* 2016, **25**(9):1090-1103.
40. Jaba E, Balan CB, Robu I-B: **The relationship between life expectancy at birth and health expenditures estimated by a cross-country and time-series analysis**. *Procedia Economics and Finance* 2014, **15**:108-114.
41. Pal R: **Measuring incidence of catastrophic out-of-pocket health expenditure: with application to India**. *International journal of health care finance and economics* 2012, **12**(1):63-85.
42. Dreger C, Remires H-E: **Health Care Expenditures in OECD Countries: A Panel Unit Root and Cointegration Analysis**. 2005.
43. Baker LC, Wheeler SK: **Managed care and technology diffusion: The case of MRI**. *Health Affairs* 1998, **17**(5):195-207.
44. Bun MJ, Windmeijer F: **The weak instrument problem of the system GMM estimator in dynamic panel data models**. *Econometrics Journal* 2009, **12**:1-32.
45. Blundell R, Bond S: **Initial conditions and moment restrictions in dynamic panel data models**. *Journal of Econometrics* 1998, **87**(1):115-143.
46. Soto M: **1SYSTEM GMM ESTIMATION WITH A SMALL NUMBER OF INDIVIDUALS**. In. Barcelona: Institute for Economic Analysis; 2007.

47. Baltagi B: **Econometric Analysis of Panel Data**, 4th edn. Chichester: John Wiley & Sons; 2008.
48. Wooldridge JM: **Econometric Analysis Of Cross Section and Panel Data**, First edn. London, England: MIT press; 2010.
49. Roodman D: **A note on the theme of too many instruments**. *Oxford Bulletin of Economics and statistics* 2009, **71**(1):135-158.
50. Bond SR: **Dynamic panel data models: a guide to micro data methods and practice**. *Portuguese Economic journal* 2002, **1**(2):141-162.
51. Hou N, Chen B: **Military expenditure and economic growth in developing countries: Evidence from system GMM estimates**. *Defence and peace economics* 2013, **24**(3):183-193.
52. Blundell R, Bond S, Windmeijer F: **Estimation in dynamic panel data models: improving on the performance of the standard GMM estimator**. In: *Nonstationary panels, panel cointegration, and dynamic panels*. edn.: Emerald Group Publishing Limited; 2001: 53-91.
53. Breyer F, Lorenz N, Niebel T: **Health care expenditures and longevity: is there a Eubie Blake effect?** *The European journal of health economics* 2015, **16**(1):95-112.
54. Ssozi J, Amlani S: **The effectiveness of health expenditure on the proximate and ultimate goals of healthcare in Sub-Saharan Africa**. *World Development* 2015, **76**:165-179.
55. Arellano M, Bond S: **Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations**. *The review of economic studies* 1991, **58**(2):277-297.
56. Kukenova M, Monteiro J-A: **Spatial dynamic panel model and system GMM: A Monte Carlo investigation**. In: *MPRA Paper No 13405*. Munich; 2008.
57. Biddle N, Kennedy S, McDonald JT: **Health assimilation patterns amongst Australian immigrants**. *Economic Record* 2007, **83**(260):16-30.
58. Chiswick BR, Lee YL, Miller PW: **Immigrant selection systems and immigrant health**. *Contemporary Economic Policy* 2008, **26**(4):555-578.