Econometrics. Faculty of Economics and Business. Santiago de Compostela, Spain. Working Paper Series Economic Development. No. 85 2005

Human Capital, Population Growth and Industrial Development in Mexico and Turkey. A Comparative Analysis with Other OECD Countries, 1964-2004

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Date of creation December 2005

Abstract

Mexico and Turkey have experienced an important growth during the last decades of the 20th century but they have, in spite of that, a low level of real income per inhabitant in comparison with OECD averages. This paper analyses the main economic features of these countries, in comparison with other OECD countries, and suggest some economic policies of interest to foster economic development and employment during the next decades, with special focus on human capital and industrial development.

JEL classification: O1, O11, O14, O15, O57

Key words: Economic Development, Mexico, Turkey, International Comparisons, OECD countries, Human Capital, Industrial Development, Population Growth, Demography.

1. Introduction

Here we analyse the evolution of Mexico and Turkey in comparison with other OECD countries and see that both countries have experienced a high degree of growth during the period 1960-2003 but a low increase in real Gdp per inhabitant. The aim of this analysis is to show which are the main factors that explain this evolution and to insist upon the convenience of increasing the educational level of population, as well as industry and foreign trade. The levels of Mexico and Turkey in these variables are yet low in comparison not only with the most developed countries during the last decades of the 20th century but also with some emerging economies which have experienced a fast growth in real Gdp per inhabitant, during the period 1980-2005 such as Korea and Ireland.

Singer(1995) has emphasized the Turkish paradox, referring to the circumstance of high growth of real Gdp with low growth in real Gdp per inhabitant. The same has happened to Mexico, Brazil and other developing countries.

The main explanation in this regard is given by the high averages rates of population growth, which usually are related with relativeley low average of educational level of population, as it is seen in section 2. In the case of Mexico the natural increase of population has been higher than in Turkey during the period here analysed, but demographic pressure has been softened by the emigration to the US of several million inhabitans. In the case of Turkey demographic pressure has been partly softened by emigration to Germany and other European countries, but increased by the immigration from several Eurasian countries.

Section 3 analyses the role of industry and foreign trade, and the convenience to foster international cooperation. Section 4 analyses the role of institutions and political parties, and section 5 presents the main conclusions.

2. Human capital and Economic Development, 1960-2000.

Graph 1 shows the evolution of one indicator of human capital, the average years of schooling of population over 15 years old, accordingly to the data by Barro and Lee(2000).



Graph 1. Educational level of population in 6 OECD countries (average years of education per inhabitant over 15 years old)

Note: Elaborated from Barro and Lee(2000). Data for United Kingdom, UK, Ireland, Ir, Spain, Es, South Korea, Ko, Mexico, Mx and Turkey, Tr.

The most outstanding countries of graph 1 also show high levels in other international indicators of human capital while Mexico and Turkey show a low level, such as in the level of public and private expenditure on education, analysed in Guisan and Arranz(2001), or in the level of expenditure on RD (research and development) per inhabitant as it is shown OECD statistics and other sources. It is noteworthy the case of Korea, with a level slighly higher than Mexico in 1960 which has surpassed the values of Spain, Ireland and even the United Kingdom during the period 1970-2000.

The educational level of populaltion usually has a highly positive impact on the evolution of real Gdp per inhabitant, although we can find some exceptions to this general rules when some special circumstances happen, as it may be seen in the analysis of Guisan and Aguayo(2004) for Central Europe during the period 1974-90. The international experience shows that education and other variables related with human capital are generally of great important for economic development, with positive direct and indirect effects.

During the second half of the 20th century the main effects of higher levels of education have been: 1) moderation of fertility rates and diminution of the rates of population growth. 2)

increase of investment per inhabitant and productivity per worker. Both effects have been of uppermost importance to explain the positive evolution of real Gdp per inhabitant in developed countries and in many emerging economies. Although Mexico has experienced during the period 1985-2000 a high increase in the average years of schooling, reaching a level close to Spain in 2000, this country has yet lower values than Spain regarding other indicators of human capital development such as average expenditure per inhabitant on education and research. Turkey also showed an increase in human capital during the period 1990-2000, and it is important to insist upon the convenience to increase more the average number of years of education per inhabitant.

Graph 2 shows the evolution of real Gdp per inhabitant. There we can see that the fastest growth of this variable correspond to Ireland, country that has reached the value of the United Kindgom at the end of the period, and Korea that has reached the value of Spain. The values of Mexico and Turkey were very alike at the end of the period although the Mexican level was slightly higher than the Turkish one during the first decades.



Graph 2 Real Gdp per inhabitant in 7 OECD countries.

Note: Data in thousand dollars of 1990 from Maddison(2001).

Table 1 presents the exponential rates of growth of real Gross Domestic Product (Gdp), Population and real Gdp per inhabitant (Gdph) in several OECD countries for 1982-2004. Turkey has had an average rate of growth per year of 4.17%, higher than OECD average of 2.85%, while Mexico has had a rate lower than OECD average with only 2.31%.

The differences of Mexico and Turkey in comparison with Ireland, regarding the rate of increase of Gdph, are 4.27 points lower in Mexico and 2.52 points lower in the case of Turkey. The Turkish difference with Ireland has been due to 1.26 points of lower growth of Gdp and to 1.26 points of higher growth of population, so each of these two rates account for half the difference with Ireland. The Mexican difference with Ireland has been due to 3.12 points of lower growth of Gdp and to 1.15 points of higher growth of population, and thus the first variable accounts for 73% of the difference and the second for the remaining 37%.

The lower growth of population of Mexico in comparison with Turkey has been due to a higher level of emigration, while the lower growth of Gdp in Mexico has been due to the slow evolution of industrial development as we will see in the next section.

Country	Rate of	Rate of	Rate of Gdph
·	Gdp	Population	(per head)
Austria	2.34	0.35	1.99
Greece	2.27	0.48	1.79
Ireland	5.43	0.70	4.73
Italy	1.84	0.13	1.71
Japan	2.31	0.34	1.97
Korea, South	6.72	0.91	5.81
Mexico	2.31	1.85	0.46
Poland	2.22	0.24	1.98
Spain	3.07	0.52	2.55
Turkey	4.17	1.96	2.21
United Kingdom	2.71	0.28	2.43
United States	3.32	1.07	2.25
Total UE-15	2.34	0.33	2.01
Total OECD	2.85	0.82	2.03

Table 1. Rates of growth of real Gdp, Population and Gdph, 1982-2004

Note: Exponential rates per year (%), column (3) =column(1)column(2). Source: Own elaboration from OECD Statistics.

The role of education to moderate average fertility rates is of the great importance in this regard, as seen in the international econometric model estimated by Guisan, Aguayo and Exposito(2001) with a sample of 98 countries, and thus the natural rates of growth of population in Mexico and Turkey have been diminishing in the last years and they are expected to lower down in the next years, favouring the increase in real Gdp per inhabitant.

The following graphs, elaborated from OECD statistics and expressed in dollars at 2000 prices and Purchasing Power Parities, PPPs, show that for the period 1960-2003, Mexico has experienced a growth of real Gdp similar to Spain, while Turkey has experienced a growth of real Gdp very high in comparison with Greece, but real Gdp per inhabitant has evolved slowly both in Mexico and Turkey. Graph 3 shows that the growth of real Gdp in Mexico has been very similar to that of Spain, and the growth of real Gdp in Turkey much higher than that of Greece.



Graph 3. Real Gdp in Mexico, Turkey, Spain and Greece (billion dollars at 2000 prices and PPPs)

Graph 4 shows the high growth of population in Mexico and Turkey during the period 1960-2003, while Spain and Greece have had a moderate growth of population, accordingly to OECD statistics, in billion dollars at 2000 prices and purchasing power parities, PPPs. The moderation in population growth of Spain and Greece, has been due to their higher level of human capital. The average years of education in Greece are higher than in Spain, accordingly to the statistics although other indicators of human capital, such as educational expenditure per inhabitant, have been lower than in Spain, during the analysed period.



Graph 4. Evolution of Population in Mexico, Spain, Turkey and Greec (thousand inhabitants)

Graph 5. Real Gdp per inhabitant in Mexico, Spain, Turkey and Greece (thousand dollars per head at 2000 prices and PPPs)



The demographic pressure in Mexico has been partly alliviated thanks to emigration. Mexico has experienced low levels of immigration, while more than 8 million Mexican inhabitants emigrated to the United States during this period. In the case of Turkey more than 3 million emigrated to European countries, but the net immigration has been almost null due to the high increase of immigrants from other neighbouring countries, during the analysed period, as it is shown in Kirici(2003).

The increase in the educational level of population in Mexico and Turkey during the last years has diminished the demographic pressure and it is indeed positive to favour an increase of real Gdp per inhabitant, if economic policies foster education and have into account also the important role of industry and foreign trade, which is analysed in the next section. Graph 6 shows the moderation in fertility rates during the period 1960-2000, with data of Mexico, Turkey, Korea, Spain and Greece, accordingly to data by Barro and Lee.





Fertility rates of Mexico and Turkey in year 2000 were similar to those of Spain and Greece in 1960, and have enough moderation to guarantee an important increase in real Gdp per inhabitant if other important factors, such as industry and foreign trade experienced a positive evolution in the next years.

2. Industry, Non-Industrial Value-Added and Foreign Trade

Development of non industrial sectors, particularly of Services, is highly and positively correlated with the development of industry and foreign trade. Graph 7 shows the evolution of real Value-Added of Industry per inhabitant in Mexico, Turkey and Spain.



Graph 7. Real Value-Added of Industry per inhabitant (thousand dollars at 1995 prices and PPPs)

Mexico and Turkey are two outstanding OECD countries, among the most populated, with 102.7 million of inhabitants in 2003, in the case of Mexico, and 70.8 million in the case of Turkey. Both countries have experienced important increases both in real Gdp and Population during the last decades of the 20th century, but their real income per inhabitant has suffered some stagnation during several years and needs to be increased towards convergence with OECD averages.

The take off of South Korea during the last decades of the 20th century, both in educational level of population and industrial development is highly remarkable, in comparison with Mexico and Turkey, although the Korean development has presented some problems regarding the financial support to low and medium size enterprises as stated by several authors such as Harvie and Lee(2003) who state that:

"The period 1962-89 witnessed a remarkable transformation of the South Korean economy, from being poverty ridden to the attainment of the status of newly industrialised nation. This transformation was achieved through the adoption of an outward oriented industry led strategy, based, particularly during the period of the 1970s, upon the development of largescale industrial conglomerates and the attainment of economies of scale and technology to achieve international competitiveness. By the early 1980s this strategy had resulted in major structural imbalances, a weakened financial section, heavy concentration in domestic markets, and a repressed development of small and medium enterprises. By the end of the 1980s, despite attempts at economic reform during this decade, the structural and financial problems remained which were to prove the country's undoing during the financial and economic crisis of 1997-98.However, despite this, the achievements of the Korean economy during the period under discussion should not be underestimated".

The increase of Industrial Value Added has per inhabitant is usually very much related with moderation in population growth. Low rates of population growth usually favour an increase on savings and investment per inhabitant, and have other positive effects, as stated in Guisan and Neira(2006) and other studies. On the other hand the increase in industrial development has a highly positive effect on trade and non industrial development.

Graphs 8.1 to 8.4 show the positive relationship between Industrial and non-Industrial real Value-Added in Mexico, Turkey, Spain and the United States, during the period 1990-2003, at prices and exchanges rates of year 2000, from OECD statistics, for the following variables:

QI00 = Real Value-Added of Industrial Sectors

QNI00 = Real Value-Added of Non-Industrial Sectors

The following ending letters indicate the country name: Mx for Mexico, Tr for Turkey, Es for Spain and US for the United States.

Graph 8.1. QNI and QI in Mexico

Graph 8.2. QNI and QI in Turkey







Graph 8.4. QNI and QI in the United States



Besides Industry, Imports have also an important positive role to explain the increase in Non-Industrial activities from the supply side. The following section present some econometric models which show some of these positive effects in the cases of Mexico and Turkey.

3. Econometric Models of Mexico, Turkey: The role of Manufacturing and Trade.

Mexico

The following models show the effects of foreign trade on real Value-Added of Manufacturing (QM90) and Non-Manufacturing sectors (QNM90), expressed in billion dollars at prices and exchange rates of year 1990, in Mexico. Foreign trade has generally a positive total effect, not only due to the positive effect of Exports on the demand side, but mainly to the positive effects of Imports from the supply side, as it has been analysed in several studies cited in the bibliography.

Equation 1. Manufacturing and Trade in Mexico. Dependent Variable: QM90MX Method: Least Squares Sample(adjusted): 1961 1999 Included observations: 39 after adjusting endpoints				
Variable	Coefficien	Std. Error	t-Statistic	Prob
	t			
QM90MX(-1)	1.024238	0.007950	128.8363	0.0000
D(IMP90M)*1000	0.404915	0.052706	7.682589	0.0000
D(EXP90M)*1000	-0.105001	0.094866	-1.106832	0.2757
R-squared	0.995194	Mean depe	endent var	77109.09
Adjusted R-squared	0.994927	S.D. deper	ndent var	34262.16
S.E. of regression	2440.379	Akaike inf	o criterion	18.51150
Sum squared resid	2.14E+08	Schwarz c	riterion	18.63946
Log likelihood	-357.9742	Durbin-W	atson stat	1.651761

Equation 2. Non-Manufacturing related with Manufacturing and Trade in Mexico Dependent Variable: QNM90MX

Method: Least Squares

Sample(adjusted): 1961 1999

Included observations: 39 after adjusting endpoints

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Variable	Coefficien	Std. Error	t-Statistic	Prob.
	t			
QNM90MX(-1)	1.020424	0.005328	191.5249	0.0000
D(IMP90M)*1000	0.222471	0.216007	1.029928	0.3101
D(EXP90M)*1000	-0.950445	0.235242	-4.040291	0.0003
D(QM90MX)	2.253937	0.417935	5.393033	0.0000
R-squared	0.997980	Mean depe	endent var	309263.2
Adjusted R-squared	0.997807	S.D. deper	ident var	130676.2
S.E. of regression	6119.714	Akaike inf	o criterion	20.37333
Sum squared resid	1.31E+09	Schwarz c	riterion	20.54395
Log likelihood	-393.2800	Durbin-Wa	atson stat	0.792282

Equation 3. Non-M	Ianufacturing	related with	Manufacturi	ing in Mexico
Dependent Variable	: QNM90MX	K		
Method: Least Squa	ires			
Sample(adjusted): 1	961 2000			
Included observation	ns: 40 after a	djusting endp	points	
Variable	Coefficien	Std. Error	t-Statistic	Prob.
	t			
QNM90MX(-1)	1.006145	0.004606	218.4555	0.0000
D(QM90MX)	2.622841	0.288814	9.081411	0.0000

Mean dependent var

Akaike info criterion 20.63925

S.D. dependent var

Schwarz criterion

Durbin-Watson stat

315690.5

135243.5

20.72369

0.805027

Causality tests between manufacturing (QM) and non-manufacturing (QNM) and
between the human capital (measured by Total Years of Average Schooling, TYR) and
Industrial real Value-Added per inhabitant (QHI) show significant effects.

0.997269

0.997197

7160.487

1.95E+09

-410.7850

Causality test between Manufacturing and Non-Manufacturing in Mexico Pairwise Granger Causality Tests Sample: 1960 2003

|--|

R-squared

Adjusted R-squared

S.E. of regression

Sum squared resid

Log likelihood

Null Hypothesis:	Obs	F-Statistic	Probability
QM90MX does not Granger Cause	39	5.17611	0.01090
QNM90MX			
QNM90MX does not Granger Cause		7.21545	0.00244
QM90MX			

Causality between Total Years of Education and

Pairwise Granger Causality Tests					
Sample: 1990 2003					
Lags: 2					
Null Hypothesis:	Obs	F-Statistic	Probability		
TYRMX does not Granger Cause	7	28.3221	0.03410		
QHI00MX					
QHI00MX does not Granger Cause TYRMX 8.48632 0.1		0.10541			

Turkey

The following equations show the positive impact of Industry (QI00TR) and Imports onf Non-Industria real Value Added in Turkey (QNI00TR), as well as the positive impact of foreign trade on Industrial development. The causality tests confirm the important relationship of Industry on explaining the evolution of non-industrial real Value-Added, as well as the important positive effect of human capital on the increase of real Value-Added of Industry per inhabitant.

-		•	-	•
Dependent Variable: QI00TU				
Method: Least Squares				
Sample(adjusted): 1993 2003				
Included observation	ns: 11 after a	djusting end	lpoints	
Variable	Coefficient	Std. Error	t-Statistic	Prob.
QI00TU(-1)	0.997247	0.016067	62.06768	0.0000
D(IMP00TU)	0.264543	0.050953 5.191861		0.0008
D(EXP00TU)	0.130218	0.144395	0.901819	0.3935
R-squared	0.948347	Mean dependent var 42		42.85665
Adjusted R-squared	0.935433	S.D. dependent var 5		5.042458
S.E. of regression	1.281286	Akaike info criterion 3.560		
Sum squared resid	13.13356	Schwarz criterion		3.669124
Log likelihood	-16.58334	Durbin-W	atson stat	1.888524

Equation 4. Relation between Industry and Foreign Trade in Turkey

Ecuation 5. Non-Industrial Value-Added related with Industry and Trade

Dependent Variable: Q	NI00TR			
Method: Least Squares	6			
Sample(adjusted): 1993 2003				
Included observations: 11 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
QNI00TU(-1)	0.994181	0.009639	103.1439	0.0000
D(QI00TU)	1.723262	0.703867	2.448277	0.0442
D(IMP00TU)	0.302315	0.212459	1.422932	0.1978
D(EXP00TU)	0.183000	0.298589	0.612885	0.5593
R-squared	0.972436	Mean dependent var		140.5524
Adjusted R-squared	0.960623	S.D. dependent var		12.86937
S.E. of regression	2.553755	Akaike info criterion		4.988294
Sum squared resid	45.65164	Schwarz criterion		5.132983
Log likelihood	-23.43562	Durbin-Watson stat 2.547		2.547896

Causality test between Industry and non-Industrial real Value-Added in Turkey

Pairwise Granger Causality Tests					
Sample: 1990 2003					
Lags: 2					
Null Hypothesis:	Obs	F-Statistic	Probability		
QI00TU does not Granger Cause QNI00TU	10	3.18727	0.12811		
QNI00TU does not Granger Cause QI00TU		1.89796	0.24363		

Causality test between Educational Level and Industrial Value-Added per inhabitant Pairwise Granger Causality Tests Sample: 1990 2003

Sample: 1990 200

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
TYRTR does not Granger Cause QHI00TR	11	4.01368	0.07826
QHI00TU*100/POBTU does not Granger Ca	Jse	0.98267	0.42741
TYRTU			

5. Conclusions and policy recommendations

Mexico and Turkey have some features in common, as both have experienced a high increase of population during the last half of the 20th century and a high growth of Gross Domestic Product but they do not yet achieved an enough increase of the level of real Gdp per inhabitant. Here we have shown that the comparison with other OECD countries regarding human capital, population growth, industry and trade, shows that both countries could have experienced a higher increase in real Gdp per inhabitant if they would have higher levels of average education per inhabitant. It is important to remark that improvements in education will have positive effects to increase industrial and non-industrial real-valued added per inhabitant.

Some authors, as Bildiciri(2004), Cosar(2002) and Pessoa(2004), have expressed their concern about the limitations that political instability and other institutional problems may have to explain a low increase of real Gdp per inhabitant. I agree with those views in the sense that very often those problems cause that there is low political support to education and to other factors which are the main sources of development. It is important to get political stability, social support, and influence of society on governments, in order to foster education, industry and trade to improve economic development in both countries, which are not only important by themselves but they are also an interesting example to be followed by other countries in their areas.

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