IS TRADE OPENNESS IMPACT ON HEALTH LEVEL RISING? EVIDENCE FROM PANEL DATA ACROSS UPPER-MIDDLE INCOME COUNTRIES[+]

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ABSTRACT: The transfer of capital and goods, technology and information to other countries through cross-border trade has led to economic integration among countries. This situation has caused the change in the life structure of the individuals in many areas and thus the welfare as well. This change may also affect the health levels of countries. Particularly, with the new technology and knowledge, the methods and practices related to new treatment and diseases to be transferred to countries via foreign trade have played a role in influencing the health levels of countries. In this respect, the importance of trade openness on impact of the level of health in countries also has begun to be discussed. The new discussion area in foreign trade for healthcare is that the trade openness level whether impact on health outcomes for especially in the less development and developing countries. This study examines the effect of trade openness on the health outcomes of 13 countries in upper-middle income- World Bank classification- Middle East and Asia countries by using a panel data method over 1990-2017. Our finding shows that the trade openness has a statistically significant and positive effect for both health outcomes. In addition, the positive and significant effect of GDP per capita and R&D expenditures share in GDP on health level are also among the other notable results of the study that it has impact on improving the health outcomes through the spillover of new technologies and information with more focus on foreign trade in these countries.

Keywords: Trade openness, Health level, Life expectancy, Infant mortality, Panel data.

DIŞ TİCARETE AÇILMAK SAĞLIK DÜZEYİNİN YÜKSELTİLMESİNDE ETKİLİ MİDİR? ÜST-ORTA GELİRLİ ÜLKELER İÇİN PANEL VERİ ANALİZİ

ÖZ: Sınır ötesi ticaret yoluyla mal ve sermaye, teknoloji ve bilginin diğer ülkelere aktarılması, ülkeler arasında ekonomik bütünleşmeye yol açmıştır. Bu durum birçok alanda bireylerin yaşam standardında ve dolayısıyla refahında değişikliğe neden olmuştur. Bu değişim, ülkelerin sağlık düzeylerini de etkileyebilmektedir. Özellikle dış ticaret yoluyla yeni teknoloji ve bilgilerin ülkelere aktarılacak, yeni tedavi ve hastalıklarla ilgili yöntem ve uygulamalar ülkelerin sağlık düzeylerinin etkilenmesinde rol oynamaktadır. Bu bağlamda, ticaret açıklığının ülkelerdeki sağlık düzeyine olan etkisi literatürde tartışılmaya başlanmıştır. Dış ticaretin sağlık düzeyi üzerindeki etkisi yeni tartışma alanı olarak, özellikle az gelişmiş ve gelişmekte olan ülkeler için dikkat çekmektedir. Bu çalışmada, 1990-2017 yılları arasında panel veri yöntemi kullanılarak, Dünya Bankası sınıflandırmasında üst-orta gelir düzeyinde bulunan 13 Orta Doğu ve Asya ülkelerinin dış ticaret açıklığının sağlık çıktılarına etkisi incelenmektedir. Bulgular, ticaret açıklığının her iki sağlık çıktısı (bebek ölüm ve yaşam beklentisi) için de istatistiksel olarak anlamlı ve olumlu bir etkiye sahip olduğunu göstermektedir. Ayrıca, kişi başına düşen GSYH'nin ve Ar-Ge harcamalarının gelir içindeki payının sağlık düzeyine pozitif ve anlamlı etkisi, bu ülkelerin dış ticarete odaklanarak, yeni teknojilerin ve bilginin yayılmasını artırarak sağlık sonuçlarında iyileştirme etkisi olduğunu da oraya koymaktadır.

Anahtar Kelimeler: Ticaret açıklığı, Sağlık düzeyi, Yaşam beklentisi, Bebek ölümleri, Panel veri

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1.   Introduction

The link between international trade and disease or health level has been recognized for centuries. Black Death, one of the most destructive outbreaks known in history, followed the trade routes in the 14th century (silk road) and introduced that there could be an interaction between infectious diseases and trade. Today, the challenge idea that trade has negative impacts on the global health level has far exceeded those of earlier periods by an order of magnitude (Yach and Bettcher, 1998). This depends on the good and ethical direction of global trade. The impact of trade and investment liberalization on social problems or contributions should not be overlooked. The one of social effects it's on the level of health.

Trade/financial liberalization could offer benefits that improve health status. The globalization of trade has led to the transformation of capital technology and knowledge across the nation. Thus, economic integration between countries has been strengthened. Liberalization of trade is likely to have positive effects on the health status of countries. In particular, the creative destruction process occurring in technology has created positive effects on poor or emerging countries by creating diffusion in the field of health. Undoubtedly, trade liberation is an important part of this transfer mechanism. Information technologies are generally recognized as the driving force of economic and social development, so the process of knowledge creation of developing countries is very critical for their capacity building. The impact of trade and investment liberalization on social problems should not be overlooked. One of these is its effects on the level of health.

Moreover, the globalization of trade can increase the importance of international standards and legal instruments, both to achieve sustainable globalization and to ensure the safety of traded goods such as agricultural and food commodities (Yach and Bettcher, 1998; Bettcher, et al., 2000). This situation reveals its effect on health through commodity trade. The health risks and benefits associated with the liberalization of commodity trade significantly depend on the type of the commodities involved. But even the fact that a country's, in terms of contagion threat, risk controlled of trade openness or liberalization, also implies that it will contribute to the level of health in development by developing impacts on possible economic growth.

From a theoretical view, the country's trade openness can directly affect economic growth through its consumption and investment channel. (Frankel and Romer, 1999; Harrison 1996) in this case, like wealth, inequality and socioeconomic parameters are also affected. affect local institutions through the application of new project rules and norms, as well as existing information and ideas (Sandholtz and Gray, 2003), thereby creating a new environment conductive to enhanced health outcomes (Rodrik, et al., 2004). On the other hand, arguing methodical problem, international trade might increase product quality, stimulate concurrence, reduce prices, and improve public power (Rodriguez and Rodrik, 1998; Rodrik et al., 2004).

It is stated that global trade has positive effects on development and health status of countries as well as negative effects. The negative health repercussions of trade and financial liberalization, such as the extended promotion and marketing of harmful

commodities. The increase in international trade also magnifies the risk of cross-border dissemination of infectious diseases especially commodity. With the progressive opening of all kinds of commodities to the world markets, attention is drawn to the importance of strict international standards and laws in the development of international trade as well. (Bettcher, et al., 2000:522). This situation may also lead to an increased health risk of other trading partners of a trading partner, where the legal regulations in the field of health remain weak.

In other respects, the trade openness can have immortal effects on the health status by creating a negative impact on the environmental conditions -i.e. CO_2 and sulphur dioxide emissions- (Managi, et. al., 2009). On the other hand, excessive industrialization in developing countries might diminish working conditions, increases pollution and uncontrolled urbanization (Grossman and Krueger, 1993), and reduce quality of life standard (Levine and Rothman 2006). Further, countries that are more integrated internationally are exposed to more economic and normative pressures against corruption, in a sense; trade openness can increase corruption, which might negatively affect the efficiency of health systems (Sandholtz and Gray, 2003; Gatti, 2004). Indeed, corruption impedes economic activity by distorting the efficient allocation of resources and increasing costs. Even if the increase in international trade may cause health problems by causing changes in the production structure, working and environment conditions in the race to provide competitive advantage among countries, it is important to maintain the regulatory laws persistently in reducing possible negative effects.

The study examines the direct effect of trade openness and health level. In this way, the lack of a definite analysis for especially emerging economies requires a more rigorous study of the trade openness and health relationship. This study analysis the effect of trade openness on the health outcomes of 13 countries in upper-middle income- World Bank classification- Middle East and Asia countries (Azerbaijan, Georgia, China, Iran, Jordan, Kazakhstan, Malaysia, Russian Federation, Thailand, Turkey, Turkmenistan, Armenia, Lebanon) by using a panel data method over 1990-2017. In the paper, different econometric specifications including different control variables and different proxies for health status and trade openness have been used to better understanding and explain this relationship.

From all, the paper is organized into four sections. Second sections of the article layout broad empirical and theoretical arguments briefly summarize. The third section offers the econometric specifications and variables. The fourth section reports and discusses on the data analysis results fundamentally, in which tested trade openness and health level. Finally, a conclusion draws out key implication.

2. Empirical Literature Review

From an empirical view, the relationship between trade openness and health is not only relatively scarcely examined in the empirical literature. There are studies explaining the effect of trade openness on health status in two ways. In this sense, direct impact and indirect effects between trade openness and health status can be discussed.

The first one is the impact of technology penetrating to the health level. Trade openness operates through knowledge and technology spillovers from developed to

developing countries (Coe and Helpmann, 1995; Owen and Wu 2007; Buntin et. al., 2011). Moreover, the analysis suggests that the relationship between medical technology and spending for raising health level is complex and often conflicting (Sorenson et.al, 2013). On the other side, some studies have revealed that liberalization impact on the health of the population positively through the movement of goods and services, such as pharmacy products and medicinal services. It is stated that through international trade, advanced medical management and health systems practices encourage improvement of health care by providing new solutions for diseases. In a study similar this analysis for the relationship between trade openness and health (child mortality, life expectancy) for developed and developing countries, is found that the positive effect of economic liberalization on wealth, through lower infant mortality and higher life expectancy, but only for developing countries, supporting the existence of knowledge and technology (Owen and Wu, 2007). Increasing trade openness is linked to faster growth in both productivity (Edwards, 1998) and the economy in general (Sachs and Warner, 1995; Dollar,1992). Jawadi et. al. (2018), examines the effect of trade openness on the health outcomes of 12 countries in the MENA (Middle East and North Africa) region. Study findings show two interesting results. First, trade openness has a positive effect on health in the MENA region as it reduces the infant mortality rate and boosts life expectancy for both men and women.

On the other hand, some studies show that trade liberalization negatively affects health through lifestyle changes and the spread contagious diseases. Bussmann (2009) analyses the effect of globalization on women's welfare in both developed and developing countries and concludes that globalization does not improve women's life expectancy significantly. Bergh and Nilsson (2010) find that economic globalization has a robust positive effect on life expectancy as a heath level for 92 countries.

The second approach of the literature has investigated the impact of globalization on health through indirect ways that it's bit contradictory (Grossman and Krueger, 1995; Antweiler et al., 2001; Perdue et al. 2003; Frankel and Rose, 2005; Cavallo and Frankel, 2008; Goldzweig et al., 2009). The studies examining the damage caused by the trade openness to the environment are a dimension of this discussion (Lucas et.al., 1992; Frankel and Romer, 1999). The results of studies analyzing the effects of foreign trade on the environment are controversial, as the environmental conditions are closely related to the public health. On the other side, there are studies showing that trade liberalization has positive effects on appears to be good for the environment hence implicitly positive health level as well (Antweiler et al., 2001 and Managi et al., 2009).

3.   Econometric Models and Data

Examining the relationship between trade openness and health status, panel data fixed effect models have been used. The models that used by Jawadi et al. (2018) have been followed as benchmark.

$$H_{it} = \alpha_{i,0} + \alpha_1 \ln (Tropenness\ i,t-1) + \varepsilon_{i,t} \qquad (1)$$

where $\alpha i,0$, and $\alpha 1$ denote the model parameters and $\ln(.)$ refers to the logarithm function. $\varepsilon_{i,t}$ is assumed to be distributed following an i.i.d $(0, \sigma^2 \varepsilon)$, $\forall t$ = 1990-2017 and $\forall_i$ =

1,…, N, where N = 13 denotes the number of countries in our sample. H and Tropenness denote the health status or level and trade openness measures, respectively.

The effect of trade openness on health, it has been used to measure of health status three kind of indicator; the infant mortality rate (per 1000 live births) and life expectancy at birth for male and for female. Because the life expectancy at birth and infant mortality rate are widely used variables for countries health status (WHO,2000, Joumard et.al., 2008;). Briefly, the health status (H) as dependent variable three kind of measurement has investigated. These are infant mortality rate (per 1000 live births), the life expectancy male and female, respectively by gender.

In addition to the model, control variables that may be effective on health level have been added by model. The variable expression at Table 1.

$$H_{it}= \alpha_0 +\alpha_1 \ln Tropenness_{i,t}+ \alpha_2 \ln GDPC_{i,t\text{-}}+ \alpha_3 \ln GrossEnrol_{i,t} + \alpha_4 \ln Carbon_{i,t} + \alpha5 \ln PopGrow_{i,t} + \alpha_6 \ln R\&Dsh_{i,t} + \varepsilon_{i,t} \qquad (2)$$

Table 1: Data Description for variables

Data*	Description
$H_{i,t}$	Health level three kind of measurement: Infant mortality rate (per 1000 live births), Life expediency male and female (year)
Tropenness	(Total export+ Total import) / GDP
GDPC	GDP per capita (constant 2010 US$)
GrossEnrol	Gross enrolment ratio, secondary, both sexes (%)
Carbon	Adjusted savings: carbon dioxide damage (% of GNI)
PopGrow	Annual population growth (%)
R&Dsh	R&D expenditures in GDP

*__Data source:__ All data is taken from World Bank statistics.

It has employed annual data from 1990 to 2017 for 13 countries in upper-middle income- World Bank classification- Middle East and Asia countries: *Azerbaijan, Georgia, China, Iran, Jordan, Kazakhstan, Malaysia, Russian Federation, Thailand, Turkey, Turkmenistan, Armenia, Lebanon.* The selection of these countries is justified by the fact that most are in a catching-up state through their increasing trade liberalization with developed economies and these countries have similar social and health outcomes.

4. Results

Before the show the model coefficient results, descriptive statistic is given at Table 2. Average trade openness of the countries analyzed in the study is 0.598, infant mortality per 1000 live births is 26.13 and life expectancy at birth in men and women are 67.7 and 74.3, respectively as a health level

In the time series analysis, it is expressed as a statistical problem that the series are not stationary. In econometric analysis with non-stationary series, misleading results can be encountered, and this may lead to spurious regression problem. In the panel data analysis, which is the combination of horizontal section data and time series data, the stationarity of

the series should be tested before performing econometric analysis (Baltagi, 2001). Fist in Table 3, to investigate the statistical properties of the data, started by checking the presence of a unit root. To this end, applied three-unit root tests: Augmented Dickey Fuller (ADF, 1979), Phillips–Perron (PP,1988) and Im et al. (IPS,2003). According to unit roots test results null hypothesis of a unit root can be rejected, all variables have not unit root, other means that series are stationary in level-I(0).

Table 2: Descriptive statistics for variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
Infant Mortality	364	26.138	16.991	6.4	76.5
Life Expectancy (male)	364	67.711	4.653	57.55	77.97
Life Expectancy (female)	364	74.390	3.648	66.261	83.2
Openness	364	0.598	0.375	0.101	1.719
GDPC	364	5219.8	2953.7	730.7	14936.4
GrossEnrol	364	82.086	14.753	28.512	120.631
Carbon	364	3.883	3.435	.834	21.194
PopGrow	364	1.137	1.532	-2.659	7.061
R&Dsh	364	0.00543	0.000875	0.00012	0.0096

Table 3: Panel Unit Roots Tests

Variable	IPS test	ADF	PP
Infant Mortality	−5.871 (0.000)	50.942 (0.000)	380.180 (0.000)
Life Expectancy	−7.97 (0.000)	180.212 (0.000)	234.621 (0.000)
lnOpenness	−1.134 (0.016)	57.302 (0.003)	48.815 (0.028)
lnGDPC	0.231 (0.001)	20.433 (0.005)	18.345 (0.010)
lnGrossEnrol	−1.032 (0.010)	39.698 (0.010)	110.734 (0.000)
lnCarbon	−3.821 (0.001)	36.137 (0.003)	65.197 (0.000)
Ln PopGrow	−10.212 (0.000)	411.002 (0.000)	13.982 (0.000)
R&Dsh	−0.122 (0.002)	25.813 (0.006)	16.621 (0.021)

*p-value ( )

For selection the fitting panel model, applied F test and Hausman Test results are in Table 4 and 5. As the probability value (p-value) is significant in the F test, the null hypothesis is rejected means that no homogeneity between the cross-sections. F test determines whether cross section or time effects are valid in the model. For the F test statistic results, the assumption of pooled model is not suitable, cross sections or time effects are important in the model.

In panel data studies, it is possible to estimate that fixed effects model gives more significant results and therefore models are mostly determined by fixed effects model. However, it is still necessary to choose between the random effects model and the fixed

effects model. The Hausman test selects between fixed effects and random effects models. Hausman test statistics has used to determine whether the difference between fixed-effect model and random-effect model estimators was statistically significant. As a result of the Hausman test under the null hypothesis where the random effects are available, the null hypothesis is rejected according to the probability value (p-value =0.000) in the models. The fixed effects models appropriate to models with any explanatory variables.

According to the results obtained after the pre-tests required for panel data analysis in the study, Table 4 shows that when estimating the first model, trade openness positively and statistically significant affects in health regardless of the health proxy (infant mortality and life expectancy). The effect of trade openness on life expectancy is positive as expected. This confirms that higher trade volume also increases life expectancy. As a health proxy, infant mortality rate negatively affected from trade openness, this situation state that infant mortality points to a negative effect of trade. The effect of trade openness on life expectancy is relatively lower because its coefficient is less. This result might, however, be associated with the misspecification of the model. For that reason, in study the augment model (1) with three control variables (GDP per capita, population growth, carbon emission and the gross enrolment ratio) and enable trade openness to enter nonlinearly.

Table 4: Results of model Basic (1). Fixed Effects

Explanatory Variable	Infant Mortality	Life Exp. (male)	Life Exp. (female)
LnOpenness	-0.598-*** [0.032]	0.049*** [0.003]	0.044*** [0.002]
Const.	2.629*** [0.028	4.248*** [0.002]	4.340*** [0.002]
Adjusted R^2	0.4911	0.4046	0.4671
F (12, 349)	70.68 (0.000)	109.42 (0.000)	75.77 (0.000)
F test Cross-section	165.907 (0.000)	98.099 (0.000)	97.765 (0.000)
Hausman Test (χ^2) Cross-section	39.995 (0.000)	41.239 (0.000)	35.987 (0.000)
Num. Country	13	13	13
Num. Obs.	364	364	364

Significant levels are: ***, **, * for 1, 5 and 10% respectively. Values in ( ) denote p-value and value in [ ] denote the robust standard errors.

As shown in Table 5, trade openness negatively affects infant mortality but raises life expectancy for both sexes. In addition, the impact of trade openness is higher for model (1) than for model (2). The gross enrolment ratio also has a positive and significant effect on health when considering the life expectancy proxies. The effect of GDP per capita appears significant, which can be justified by the fact that GDP growth rates in upper- middle income countries are rather high. The population growth has not significant effect on life expectancy-except life expectancy male- and infant mortality. The carbon emission variable, which is thought to be directly related to the level of health, does not have a significant impact statistically.

On the other side, the positive and significant effect of R&D expenditures share in GDP on health level is also among the other notable results of the study that it has impact on improving the health outcomes. This suggests that investments in technology will have a positive impact on health as an indicator of prosperity and the need to support such research development activities.

Table 5: Results of model (2). Fixed effect model augmented with the control variables

Explanatory Variable	Infant Mortality	Life Exp. (male)	Life Exp. (female)
LnOpenness	-0.306***	0.0237***	0.027***
	[0.035]	[0.003]	[0.002]
LnGDPPC	-0.283***	0.012*	0.010***
	[0.048]	[0.005]	[0.004]
GrossEnrol.	-0.010***	0.001***	0.0008**
	[0.001]	[0.000]	[0.0001]
Carbon.	0.010	-0.003***	-0.0008
	[0.007]	[0.001]	[0.0006]
Popgrow.	-0.025	0.002*	0.001
	[0.016]	[0.001]	[0.001]
R&Dsh	-0.324**	0.209**	0.201**
	[0.002]	[0.017]	[0.017]
Const.	6.065***	4.046***	4.167***
	[0.389]	[0.040]	[0.0325]
Adjusted R^2	0.669	0.568	0.596
$F_{(12, 345)}$	54.08	76.69	48.83
	(0.000)	(0.000)	(0.000)
F test Cross-section	178.098	54.987	64.071
	(0.000)	(0.000)	(0.000)
Hausman Test (χ^2) Cross-section	25.127	33.788	36.963
	(0.000)	(0.000)	(0.000)
Num. Country	13	13	13
Num. Obs.	364	364	364

Significant levels are: ***, **, * for 1, 5 and 10% respectively. Values in ( ) denote prob value and value in [ ] denote the robust standard errors.

5.   Conclusion

Trade openness is characterized as an important factor that affects economic and social welfare and contributes to the development of countries. Countries that have achieved liberalization within the trading context can take advantage of free trade and thus catch social welfare. In this way, it can contribute to the increase of human development level. One of them is to examine the contributions of trade liberalization to health in terms of social welfare. Of course, this effect is observed to cause negative results contrary to expectations.

With globalization, preventing trade constraints or trade openness has caused differences also in health status of countries as in many other areas. Although the increase in goods trade may sometimes increase the risk of disease the main issue is that the new developments that occur outside the country can give the opportunity to be transported by

foreign trade. the research matter that emerged in this context, "what will the implications of increased economic liberalization in health sector and on population health?".

In this framework, this study examined the effect of trade openness on the health outcomes of 13 countries in upper-middle income- World Bank classification- Middle East and Asia countries by using a panel data method over 1990-2017. It was used annual data and different fixed panel data regressions models, including three different proxies for health level. It has found significant relationship between health and trade openness. This supports the positive results made in the literature. The trade openness supports the health level, and its hypothesis is accepted. Although the effect of trade openness on health level proxy variables is limited in terms of coefficient, considering the results obtained in the study, restrictions on commercial activities in order to increase the health level especially in developing middle high-income countries should be abolished and trade liberalization should be encouraged.

At the same time, it has also found that the increase in the income and education levels of the countries contributes positively on the health level. In addition, the positive and significant effect of R&D expenditures share in GDP on health level is also among the other notable results of the study that it has impact on improving the health outcomes through the spillover of new technologies with more focus on foreign trade in these countries. also, with the increasing in free trade and information and technology transfer are easier, its added value on health increases.

In this study, trade liberalization, especially in developing middle-income countries, seems to be a strong component of prosperity. Undoubtedly, the sustainability of trade openness effect in health requires a strong health system. For future studies, more detailed results can be obtained by directly or indirectly analyzing the effect of trade openness or trade liberalization on the level of health considering different model specifications.

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