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Are Free Trade Agreements bad for health?

Quantifying the impact of FTAs on health outcomes

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Summary

The last 15 years have seen the conclusion of a number of bilateral Free Trade Agreements (FTAs) containing intellectual property provisions that go beyond the minimum standards set out in the TRIPS Agreement. These "TRIPS-Plus" provisions have been criticized on the grounds they raise medicine prices and undermine access to medicines, particularly in developing countries.

There is, however, a paucity of analysis based on empirical data to see if these fears are justified: a serious lacuna given that the first such FTAs were negotiated well over ten years ago. This paper attempts to fill this gap in the literature by using panel data fixed effect estimation and panel cointegration methods to determine if FTAs containing TRIPS-Plus provisions have had a positive or negative impact on human health in the countries that have concluded them.

Our analysis shows that contrary to the theoretical literature, FTAs have in fact had modest positive impacts on health outcomes in the countries that concluded them (measured in terms of infant mortality, life expectancy and deaths from non-communicable diseases). We also find a very clear association between trade openness (ratio of trade to GDP) and improved health outcomes. Furthermore, we find that FTAs have not resulted in increases in out of pocket spending.

Our findings suggest that FTAs should be viewed in terms of their wider socio-economic impacts, rather than through the narrow lens of chapter-specific critiques.

Introduction

The establishment in 1994 of the TRIPS Agreement, administered by the World Trade Organization (WTO), introduced intellectual property law into the international trading system for the first time, and set out minimum standards of IP protection that all WTO member states have to afford to creators from other WTO member states. In 2014 the TRIPS agreement marked its twentieth anniversary. Over this period, technology has progressed, patterns of trade have changed and many developing countries have become far wealthier. Given that TRIPS requires a minimum standard of IP protection, certain developed countries, notably the US and member states of the European Union and European Free Trade Association (EFTA), are increasingly using bilateral and regional Free Trade Agreements (FTAs) to secure higher standards of intellectual property protection and enforcement amongst their trading partners.

Almost all of these FTAs require partner countries to accede to a range of World Intellectual Property (WIPO) conventions and treaties, for example the Patent Coopera-

tion Treaty, the Patent Law Treaty and the Trademark Law Treaty. These treaties affect a broad range of industrial sectors. In addition, many FTAs contain intellectual property (IP) provisions around patents, regulatory test data protection and enforcement that are particularly relevant to the biopharmaceutical sector and go beyond the standards required by TRIPS (commonly referred to as TRIPS-Plus). As these IP provisions impact trade in, and marketing of, biopharmaceutical products, FTAs have the potential to impact on health.

The United States and the European Union (plus EFTA) are two of the world's largest trading entities. The growing trend for them to pursue their trade objectives via FTAs has led to a great deal of academic criticism, with particular opprobrium reserved for the intellectual property components of such deals. A commonly expressed argument is that the inclusion of TRIPS-Plus IP provisions will raise medicine prices and thereby ration access to medicines. This criticism extends to regional FTAs that were under negotiation at the time of writing, particularly the Trans Pacific Partnership (TPP) and Regional Comprehensive Economic Partnership (RCEP).

"Most studies on FTAs do not capture their wider impacts on human welfare"

While there is a wealth of theoretical literature critiquing the potential of FTAs to limit access to medicines by raising prices, there is a paucity of analysis based on empirical data to see if these fears have actually translated into actual worsened health outcomes. Given that there is now over a decade of available data since the first TRIPS-Plus FTAs were concluded, this represents a serious lacuna in understanding of the impacts of FTAs that needs to be closed in order for public debate around FTAs to remain meaningful. This paper attempts to fill this gap in the literature by determining if FTAs containing TRIPS-Plus provisions have had a positive or negative impact on human health in the countries that have concluded them. An important sub-question that the study will attempt to address is whether FTAs have increased spending on healthcare.

The findings of this study will be of particular interest to policymakers in countries contemplating entering into an FTA with the US or EU, such as those considering joining an enlarged TPP, or India, which is in the process of negotiating an FTA with the EU. The findings will also be relevant to parties currently negotiating the RCEP in Asia, which is also likely to contain TRIPS-Plus provisions.

Literature review

The literature on FTAs and health falls into two main categories. The most prolific are theoretical studies which make the a priori assumption that FTAs containing TRIPS-Plus IP provisions will certainly worsen health outcomes, as a result of their potential to raise medicine prices. The second category, of which there are only a small handful of examples, attempts to quantify the impact of FTAs on the pharmaceutical sectors of partner countries, in particular the impact on drug prices.

With regards to the theoretical literature, regional and bilateral FTAs are almost uniformly condemned as threatening access to medicines by delaying generic entry and raising drug prices (Smith et al, 2009; Lindstrom, 2010). The Trans Pacific Partnership comes in for especial criticism, in particular its potential to undermine existing flexibilities enshrined within the TRIPS agreement, delaying the introduction of generic drugs and imposing restrictions on the operation of domestic pharmaceutical programmes that would undermine the regulation of drug prices (Gleeson & Friel, 2013; Baker, 2013; Logfren, 2011; Flynn et al, 2012; Trachtman, 2011). All the authors in these studies recommend negotiating countries should maintain their IPR safeguards or reject the TPP's IPR chapter in order to protect access to medicines.

In the more empirical category of studies, a number of authors have attempted to model the impact of FTAs' IPR provisions on the pharmaceutical sector. Kessomboon et al (2010) attempt to model potential impacts of the then proposed US-Thailand FTA on access to medicines, concluding that drug prices would increase in the country as a result of TRIPS-Plus elements of the agreement. A similar conclusion is reached in scenario modeling around the US-Thai FTA undertaken by Akaleephan & Wibulpolprasert (2010), with the additional caveat that the FTA would also result in delays to generic entry and financial losses for the domestic pharmaceutical industry. This study used a very early draft of the negotiating text, and the negotiations were abandoned in 2006 so the current relevance of these two studies is questionable.

Although not peer-reviewed, the International Centre for Trade and Sustainable Development released two studies in 2009 modeling potential impacts of the CAFTA-DR on Costa Rica and Dominican Republic. Both studies concluded that the price of imported active ingredients would increase as a result of the agreement (Hernandez-Gonzalez, 2009; Rathe et al, 2009). Civil society group Oxfam released an un-reviewed briefing paper in 2007 claiming that medicine prices in Jordan had increased at a rate considerably higher than in neighbouring Egypt following the conclusion of an FTA with the US (Oxfam, 2007). However, this study did not factor in a significant devaluation of the Egyptian currency that was occurring at the time, which makes such comparisons of limited use (Ryan, 2007).

The above empirical studies look at the IPR chapters of FTA in isolation and consider input measures such as the price of medicines and their constituent active ingredients. They do not capture the wider impact of FTAs on human welfare, including on indicators such as life expectancy and infant mortality, assuming instead that rises in prices automatically undermine population health. While not looking specifically at FTAs, a handful of studies have attempted to quantify the impact of trade openness on health indicators, with Owen & Wu (2007), Stevens et al (2013) and Herzer (2014) finding that open trade is associated with better population health particularly in lower-income countries. In order to better understand the impact of FTAs on public health, there is a need to build on these three studies by focusing more specifically on those countries that have entered into FTAs with either the US or EU/EFTA. This will provide an alternative and more meaningful framework through which to judge the desirability of entering into such agreements, particularly in light of the fact that FTAs affect many sectors other than pharmaceuticals, and will therefore have an impact on major determinants of health such as economic growth and individual incomes.

Data

We define health outcomes as rates of infant mortality, life expectancy and deaths from non communicable disease. Data on the first two is drawn from the World Development Indicator 2015 online database and data on non-communicable diseases comes from 2014 WHO country profiles. While the data on infant mortality and life expectancy extends from 1990-2012, data on deaths due to non-communicable diseases is only available for the period 2000-2012. We decided to exclude communicable diseases from the analysis given the very low rates in the majority of countries entering into FTAs.

Data on the other variables (health expenditure per capita, public health expenditure, out of pocket health expenditure and proportion of population above 64 years) is also from the World Development Indicator 2015 online database. Health expenditure per capita is expressed in current values. Public health expenditure is expressed as percentage of total health expenditure, while out-of-pocket health expenditure is expressed as percentage of total private expenditure on health.

Since the objective of the paper is to study the relationship between trade and health, we define trade openness as the ratio of trade to GDP at current prices, which is a more nominal measure of trade openness. GDP per capita is expressed in current values.

The data covers the period 1990-2012 and includes countries that have a free trade agreement either with US or EU/EFTA. The countries included in the analysis are: Australia, Bahrain, Chile, Canada, Morocco, Jordan, Oman, Singapore, Mexico, Egypt, Lebanon, Tunisia, and Albania. These countries were selected based on the availability of adequate data points post FTA in order to be able to model the impact of FTA on the dependent variables accurately. The US FTAs with Colombia, Panama and Republic of Korea were left out of the analysis as the agreements entered into force too recently for any useful data to have emerged. The FTAs included in the study are listed in Appendix A.

Methodology

"FTAs are associated with a decrease in infant mortality"

In this paper, we investigate two key questions. Firstly, we examine the impact of FTAs on health outcomes. We define health outcomes to encompass infant mortality (less than 1 per 1000 births), infant mortality (less than 5 per 1000 live births), life expectancy of males and females and the total number of deaths due to non-communicable diseases (NCDs). NCDs include deaths due to cardiovascular diseases, chronic respiratory diseases, cancer and diabetes. Both the theoretical literature and the economic impact analyses on the pharmaceutical sectors outlined in the literature review suggest that FTAs have a negative impact on health outcomes. An important purpose of this study is to test this hypothesis. Another sub-question that the study will attempt to address is whether FTAs have increased spending on healthcare, as suggested by much of the theoretical literature.

We model the impact of trade openness, FTA dummy and GDP per capita on these health outcomes using both panel data fixed effect estimation and panel cointegration methods. Panel cointegration method is essentially used to validate the robustness of the model used in our analysis. Additional control variables such as population growth rate and secondary school enrolment were considered but a combination of factors such as paucity of data and problems of multicollinearity precluded us from including these control variables in the model. The model, specified in log-log form, is as follows:

$$Y_{it} = \beta_o + \beta_1(\text{GDP Per capita}) + \beta_2(\text{Trade Openness}) + \beta_3(\text{FTA Dummy}) + u_i + e_{it} \quad \text{-----(1)}$$

The dependent variable, Y_{it}, reflects the five health outcomes, where i indicates a specific country and t the period. To remain consistent with Owen and Wu (2007), it would have been ideal to model the impact of five year lags of trade openness and GDP per capita on the health outcomes. However, biased, inaccurate and unreliable estimates due to the limited scope of the dataset ruled out such an approach. Hence the independent variables are regressed against the dependent variable with a one year lag instead of a five year lag so that the lagged effect of trade openness and FTA could still be captured without losing the efficiency and un-biasedness of the estimates.

We examine the legitimacy of claims that FTAs undermine access to healthcare by driving up health costs by regressing an FTA dummy on per capita health expenditure using both panel data fixed effect estimation and panel cointegration methods. Additional control variables in the model are public health expenditure (as % of GDP), out-of-pocket health expenditure (as % of private health expenditure), proportion of the

population below 15 years and above 64 years, trade openness and per capita GDP. The model is specified in log-log form as follows:

$$Y_{it} = \beta_o + \beta_1 (\text{GDP Per capita}) + \beta_2 (\text{Trade Openness}) + \beta_3 (\text{FTA Dummy}) + \beta_4 (\text{Public health expenditure}) + \beta_5 (\text{Out of Pocket health expenditure}) + \beta_6 (\text{Prop. of population above 64 years}) + u_i + e_{it} \text{ -----(2)}$$

Analysis

Fixed Effect Estimation Method

Table 1-2 presents the results of the regression of the model described in (1) using fixed effect estimation method.

From table 1, we can see that the relationship between the existence of an FTA and infant mortality is found to be statistically significant, i.e., the presence of an FTA has resulted in a decrease in infant mortality. In other words, the presence of an FTA leads to a 0.14% decrease in infant mortality (less than one per 1000 live births). It needs to be noted that as our model estimates the impact on health outcomes with just a one year lag instead of a five year period, the magnitude of impact (coefficient of FTA dummy) is likely to be smaller. While a positive sign the coefficient seems to indicate that FTA leads to an increase in mortality due to non-communicable diseases,t The impact, however, is found to be statistically insignificant. Further, the impact of FTA on life expectancy is also found to be statistically insignificant. On the other hand, the impact of trade openness on the various health outcomes, including mortality due to non-communicable diseases is found to be positive and statistically significant. As expected, increase in GDP per capita is found to have a beneficial effect on infant mortality and life expectancy.

Table 1: Impact of FTA on Health Outcomes using Fixed Effect Estimation Method

	Infant mortality rate <1 (Per 1000 births)	Infant mortality rate <5 (Per 1000 births)	Life expectancy of males	Life expectancy of females	Total number of deaths due to non-communicable diseases
Real GDP Per Capita, t-1	-0.425 (-5.29)*	-0.465 (-4.895)*	0.043 (5.789)*	0.039 (4.936)*	0.110 (1.823)***
Trade openness, t-1	-0.168 (-1.611)***	-0.177 (-1.725)***	0.021 (2.694)**	0.018 (1.854)**	-0.385 (-2.061)**
Free Trade Agreement	(-0.157) (-2.261)**	(-0.152 (-.2.049)**	0.009 (1.390)	0.007 (1.457)	0.102 (1.157)
Number of observations, N	308	308	308	308	120
Adjusted R-sq.	0.810	0.821	0.949	0.941	0.979

Note: All specifications include dummy variable for fixed effects and are estimated using robust errors. Standard errors are in parenthesis. * denotes significance at 1% level, ** denotes significance at 5% level, *** denotes significance at 10% level.

Table 2: Impact of FTA on Health Expenditure using Fixed Effect Estimation Method

	Health expenditure per capita
Real GDP per capita, t-1	0.799 [15.331]*
Trade openness, t-1	0.060 [0.414]
Free Trade Agreement	0.109 [2.92]
Public health expenditure	-0.208 [2.289]**
Out of pocket health expenditure	0.044 [0.6868]
Prop of population above 64 years	0.781 [3.684]*
Number of observations, N	170
Adjusted R-square	0.98

Note: All specifications include dummy variable for fixed effects and are estimated using robust errors. Standard errors are in parenthesis. * denotes significance at 1% level, ** denotes significance at 5% level, *** denotes significance at 10% level.

"FTAs have not increased out of pocket expenditures on healthcare"

As mentioned earlier, one of the major criticisms against FTAs is that their IP provisions have the potential to make healthcare more expensive and inaccessible. Table 2 provides some answers to this criticism. In order to accurately model the impact of FTA and trade openness on health expenditure, we include other control variables that are major determinants of health expenditure such as the country's income, the fiscal capacity of government, health system characteristics and demographic structure of the population.

When analysing the impact of government's fiscal capacity, we are more interested in examining whether the government spends more on health when more resources are available. We capture this by including public health expenditure (as % of GDP). Demographic characteristics of a population are another factor that significantly impact overall health expenditure. Typically, health expenditure is likely to be higher when there are greater proportions of the population under 15 years and over 64 years. In this case, we take into account only the proportion of population above 64 years, as including both the sets of demographic population would lead to problems of multi-collinearity given they are highly correlated. Lastly, as the make-up of health systems is also an important determinant of health expenditure, we capture this by including out of pocket expenditure (as percentage of total private expenditure) as an additional control variable. Out of pocket expenditure essentially captures the design of health financing functions, which is a key health system characteristic.

From table 2, we can see that while the coefficient of trade openness is positive, indicating a positive relationship with health expenditure, it is found to be statistically insignificant. In other words, trade openness does not have a significant effect on the cost of the health care. The impact of FTA on the health expenditure, however, is found to be positive and statistically significant. However, this is much smaller (0.109) in relation to the other statistically significant variables such as per capita GDP, public health expenditure and proportion of population above 64 years, which account for much of the increase. Further, we cannot rule out the possibility that much or all of the increase in the cost of

health expenditure may also be due to inflation. This implies that FTAs have not typically resulted in a higher financial burden on individuals for accessing healthcare. Out of pocket payment, on the other hand, is also found to be statistically insignificant.

Pane unit root tests and cointegration method

Unit root has profound implications for econometric estimation and testing. A simple definition of unit root is: if a variable is found to have a unit root, it essentially implies that the coefficient of that variable is unity. If variables with unit roots are regressed against each other, the regression results are likely to be spurious – resulting in very high t –values and R- square values. In recent years, a number of unit root tests have been developed, although the most commonly used are the first generation unit root tests. The issue with the first generation unit root tests is that they can exhibit severe size distortions in the presence of cross sectional dependence due to spillovers among countries at the same time. Therefore, we use the test developed by Pesaran et al (2007), known as the second generation unit root test, to account for the potential cross-sectional dependence. The test essentially filters out the cross sectional dependence by augmenting the individual country ADF regressions with the cross sectional average of the lagged levels and first differences of the individual series as proxies for the unobserved common factors.

Table 3: Pesaran (2007) panel unit root tests

	Level s(c,t)	First Differences (c)
Infant mortality (<1 per 1000 births)	-1.59***	-2.00*
Infant mortality (<5 per 1000 births)	-0.90	-1.827**
Life expectancy (male)	0.610	-4.61*
Life expectancy (female)	-0.641	-4.22*
Health expenditure per capita	-0.62	-4.37*
Out of pocket health expenditure	-0.949	-6.82*
GDP per capita	-0.22	-8.78*
Public health expenditure	-0.1.42***	-9.37*
Trade openness	-1.31***	-11.84*
NCD mortality	-0.41	-6.57*
Prop. of population above 64 years	0.24	-6.07*

Note: * denotes significance at 1% level, ** denotes significance at 5% level.. ***denotes significance only at 10% level. Lags of varying lengths have been used to correct for auto correlation. (c,t) indicates that we have allowed for different intercepts and trends for each country.

Table 3 presents the results of the unit root test. The null hypothesis is that the variables have a unit root. Based on the results, we can conclude that the null hypothesis holds for the variables in level terms, but does not hold in first differences. This implies that the variables are non-stationary; i.e., the statistical properties of the variables (mean, variance, autocorrelation) are not constant over time. However, these variables can be rendered stationary through use of mathematical transformation. For our analysis, first differencing these variables makes them stationary, and hence, we say that they are integrated of order I, i.e., I(1). It needs to be noted that as some of the variables are only weakly stationary in level terms (i.e. significant only at 10% level), we take their first differences to establish stronger stationarity. It needs reemphasis that non-stationary variables are likely to yield spurious results as many of the statistical methods are built on the assumption that the statistical properties of the variables are constant over time (that is, they will behave in the same way in the future as they have been in the past).

Next, we determine whether the relationship between the dependent variables (i.e., the various health outcomes) and the control variables is not spurious. In order to do this, we use the Johanssen cointegration test both within dimensions and between dimensions. We test for the cointegration, i.e., existence of long run relationship between the dependent and independent variables using both within and between dimensions tests. We use both between and within dimension tests primarily for purposes of validation of our analysis. The results are shown in table 4 &5.

Table 4: Panel (within dimension) cointegration test

	LE-Female	LE-Male	Infant mortality (less than 1 per 1000 births)	Infant mortality (less than 5 per 1000 births)	NCD mortality	Per capita health expenditure
Panel v- statistic	-1.33	-0.61	-0.79	-0.96	-3.04	-0.42
Panel rho statistic	2.11	0.23	1.41	1.76	-0.98	2.58
Panel PP statistic	0.88	-0.81	-0.454	0.257	-37.75	-5.65
Panel ADF statistic	0.96	-0.88	1.03	1.474	-12.99	-3.35

Table 5: Group (between dimension) cointegration Test

	LE-Female	LE-Male	Infant mortality (less than 1 per 1000 births)	Infant mortality (less than 5 per 1000 births)	NCD mortality	Per capita health expenditure
Group rho statistic	2.51	1.86	1.82	2.03	1.64	3.74
Group PP statistic	0.28	-0.14	-1.13	-0.75	-9.53	-10.49
Group ADF statistic	0.39	-0.88	1.19	1.40	-5.03	-4.11

From tables 4 and 5 we can see that all the test statistics (both panel and group tests) barring Panel and Group PP and ADF statistic for NCD mortality and Per Capita Health Expenditure are statistically insignificant, thereby indicating the existence of a cointegrating relationship. In the case of NCD mortality and Per capita health expenditure, the results are mixed as Panel v& rho statistic and Group rho statistic are found to be statistically insignificant, indicating a cointegrating relationship. We therefore conclude that there does exist a cointegrating relationship in the case of both these variables as well. This essentially implies that the models we specified in equation (1) and equation (2) are meaningful, as the t statistic results prove that there is a long run relationship between the independent variables and the dependent variables specified in the model.

We now use the fully modified OLS method (FMOLS) and the dynamic OLS (DOLS) method to test the impact of FTAs on health outcomes and health expenditure. Fully modified OLS (FMOLS) was designed by Philip and Hansen (1990) to provide optimal estimates of cointegrating regression. This method modifies least squares to account for serial correlation effects and for the endogenity in the regressors that exist from the cointegrating relationship. The Dynamic OLS (DOLS) yields estimates which are super consistent, asymptotically unbiased and normally distributed even in the presence of regressors. This method accounts for serial correlation and endogenity of the regressors by augmenting the cointegrating regression with lead, lag and current values of the I(1) regressors. Table 6-9 present the results of the impact of FTAs on health outcomes and health expenditure using fully modified OLS (FMOLS) and Dynamic OLS (DOLS) methods respectively.

Table 6: Impact of FTA on Health Outcomes – Panel Integration (Fully Modified OLS)

	Infant mortality rate<1 (Per 1000 births)	Infant mortality rate<5 (Per 1000 births)	Life expectancy of males	Life expectancy of females	Total number of deaths due to non-communicable diseases
Real GDP per capita, t-1	-0.411 [-15.130]*	-0.449 [-15.63]*	0.043 [19.942]*	0.039 [3.18.558]*	0.085 [0.951]
Trade openness, t-1	-0.159 [-2.611]*	-0.160 [-2.433]*	0.022 [4.460]*	0.039 [3.790-]*	-0.466 [-3.302]*
Free Trade Agreement	[-0.156] [-5.317]*	-0.155 [-4.937]*	0.009 [3.848]*	0.007 [3.243]**	0.120 [1.250]
Number of observations, N	286	286	286	308	120
Adjusted R-sq.	0.817	0.824	0.949	0.946	0.979

Note: Standard errors are in parenthesis. * denotes significance at 1% level, ** denotes significance at 5% level, *** denotes significance at 10% level.

From Table 6, we can see that both trade openness and FTA are statistically significant for all health outcomes barring NCD mortality. This implies that trade openness and FTAs

both have a positive impact on health outcomes. In particular, the presence of FTA leads to a decline in infant mortality (for both males and females) by roughly 15.5%. It leads to an increase in the life expectancy of males and females by nearly 1%. While these numbers might seem insignificant, it needs to be kept in mind that these numbers reflect only the one-year lagged impact of FTA. It would be natural to assume that, longer the lag, more would be the impact of FTA since the impact on parameters such as life expectancy is more likely to be felt over a longer period of time. In the case of NCD Mortality, the coefficient of FTA is positive indicating a positive relationship, albeit statistically insignificant. Table 7 results on the other hand tell us, that while trade openness is a statistically insignificant determinant of health expenditure, FTA seems to have a positive impact on health expenditure and is found to be statistically significant. However, as with the results obtained using Fixed effect estimation, it needs to be noted that while an FTA may have led to an increase in health expenditure, other variables such as per capita GDP, out of pocket expenditure and proportion of population above 64 years are found to far more account for the increase in health expenditure Secondly, this is no automatic conclusive evidence that FTA, amongst others, is the culpable factor. It is indeed likely that the rise in the health expenditure could be attributed to inflation, for instance, or the increase in the proportion of the population over 65.

Table 7: Impact of FTA on health expenditure – panel integration (fully modified OLS)

	Health expenditure per capita
Real GDP per capita, t-1	0.850 (15.968)*
Trade openness, t-1	-0.056 (0.557)
Free Trade Agreement	0.085 (2.570)**
Public health expenditure	-0.334 (0.001)
Out of pocket health expenditure	0.474 (2.408)**
Prop of population above 64 years	0.637 (3.981)*
Number of observations, N	170
Adjusted R-square	0.91

Note: Standard errors are in parenthesis. * denotes significance at 1% level, ** denotes significance at 5% level, *** denotes significance at 10% level.

Table 8 and 9 present the results of Dynamic OLS methods. As we can see, the results are rather similar. A noteworthy difference is that the DOLS estimator shows trade openness and FTA to be statistically insignificant in terms of its impact on infant mortality and health expenditure respectively. This lends further credence to our hypothesis in the case of results presented by fixed effect estimation and FMOLS that increases in health expenditure are most likely due to other macroeconomic factors including inflation rather than presence of FTA per se. Further, as seen in the case of results obtained by FMOLS, FTAs seem to have a positive relationship with mortality due to NCD but is too statistically insignificant to be of relevance.

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Table 8: Impact of FTA on Health Outcomes – Panel integration (Dynamic OLS)

	Infant mortality rate<1 (Per 1000 births)	Infant mortality rate<5 (Per 1000 births)	Life expectancy of males	Life expectancy of females	Total number of deaths due to non-communicable diseases
Real GDP per capita, t-1	-0.486 [-6.69]*	-0.582 [-7.99]*	0.054 [10.880]	0.053 [10.08]*	0.066 [0.663]
Trade openness, t-1	-0.126 [-0.984]	-0.104 [-0.730]	0.020 [1.939]*	0.028 [2.622]**	-0.326 [-1.846]**
Free Trade Agreement	-0.155 [-2.220]**	-0.125 [-1.63]***	0.001 [0.069]**	0.001 [0.221]	0.140 [1.330]
Number of observations, N	247	249	251	247	120
Adjusted R-sq.	0.810	0.804	0.949	0.946	0.979

Note: Standard errors are in parenthesis. * denotes significance at 1% level, ** denotes significance at 5% level, *** denotes significance at 10% level. Comparison of results

Table 9: Impact of health outcome on health expenditure-panel integration (Dynamic OLS)

	Health expenditure per capita
Real GDP per capita, t-1	0.869 [18.328]*
Trade openness, t-1	-0.242 [-3.414]*
Free Trade Agreement	0.041 [1.416]
Public health expenditure	-0.232 [-3.078]*
Out of pocket health expenditure	0.314 [1.562]
Prop of population above 64 years	0.737 [5.191]*
Number of observations, N	153
Adjusted R-square	0.91

Note: Standard errors are in parenthesis. * denotes significance at 1% level, ** denotes significance at 5% level, *** denotes significance at 10% level.

Comparison of results

The results obtained by the three methods in this paper seem to be largely consistent. While there are minor variations in the results, these differences do not impact the findings significantly. A comparison of the regression results of panel fixed effect estimation, fully modified OLS and dynamic OLS leads us to the following common findings:

- Trade openness and the existence of an FTA both have a positive impact on various health outcomes. FTAs seem to have a positive relationship with mortality due to non-communicable diseases, although the relationship is statistically insignificant. While FTA seems to be a more important determinant of reduced infant mortality, trade openness seems to be the more dominant factor in improving life expectancy.

- Trade openness is not a significant determinant of health expenditure and while one could argue (based on Fixed Effect estimation and FMOLS method) that FTA leads to an increase in health expenditure, the role of FTA is estimated to be much smaller in relation to other macroeconomic factors such as per capita GDP, public health expenditure and proportion of population above 64 years. In fact, as suggested by DOLS results, it is more than likely that those macroeconomic factors including annual inflation costs are responsible for increases in health expenditure.

"Our findings suggest that the IP components of FTAs have not historically undermined public health, a finding of particular relevance to policymakers in countries considering entering into a bilateral or regional FTA containing IP provisions."

Conclusion

The findings of our analysis put into perspective some of the more alarmist claims about the impact of FTAs on health. The literature hypothesizes that the IP components of FTAs will translate into worsened population health as a result of the increased cost of medicines. Our analysis demonstrates that this has not occurred. On the contrary, our analysis shows that FTAs have in fact had modest positive impacts on health outcomes in the countries that have entered into them. These findings suggest that the IP components of FTAs have not historically undermined public health, a finding of particular relevance to policymakers in countries considering entering into a bilateral or regional FTA containing IP provisions.

While the impact of FTAs on health is positive but modest, our analysis finds that trade openness (ratio of trade to GDP) is more clearly associated with improved health outcomes. As the aim of FTAs is to increase overall levels of trade between signatory countries, they can be said to contribute to trade openness. The contribution FTAs make to overall trade openness could be seen as an important mechanism for improving human welfare, in particular health. FTAs should therefore be viewed in terms of their wider socio-economic impacts, rather than through the narrow lens of chapter-specific critiques.

Our study indicates that FTAs are associated with increases in overall health expenditures, albeit weakly. Given this weak relationship, it may be possible that the increase is unrelated to the FTA, but rather be attributable to factors such as inflation, demographic changes or changes in political spending priorities. This would be a good topic for subsequent research. However, we find no link between the existence of an FTA and increased out-of-pocket expenditures on health. This is a particularly important finding for developing countries considering entering into an FTA, as large proportions of the population in such countries continue to pay out of pocket for healthcare.

The trade landscape is evolving, with new FTAs constantly on the horizon. The TPP, for instance, stands to be one of the largest FTAs in existence, linking 12 countries that collec-

tively constitute 40% of global GDP. Although the precise nature of the IP provisions in the TPP were unavailable at the time of writing, our analysis suggests that if it resembles other FTAs with TRIPS-Plus provisions it is unlikely to have negative impacts on public health, and could in fact improve health by contributing to greater trade openness amongst its members.

One shortcoming of our analysis is the scope of countries covered. Limitations in data led us to exclude countries within CAFTA-DR, and also the US FTAs with Panama, Republic of Korea, Colombia and Peru. As data emerges in coming years, our findings and their implications could be refined further.

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APPENDIX

Free Trade Agreements containing IP provisions included in the analysis

Country	Date of FTA
Albania-EFTA	2010
Australia-United States	January 2005
Bahrain-United States	January 2006
Canada (included as NAFTA)	1994
Chile-United States	January 2004
Jordan-United States	October 2000
Lebanon-EFTA	2007
Mexico (included as NAFTA)	1994
Morocco-United States	January 2006
Oman-United States	January 2009
Panama-United States	October 2012
Singapore-United States	January 2004
Tunisia-EFTA	2005

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