

Senior Project
Department of Economics



“The Relationship between Tariffs,
Corruption, and Growth in Developing
Countries”

Mitchell Upp
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Advisor: *Dr. Francesco Renna*

Abstract

This paper looks at the relationship between tariffs and the growth rate of developing countries. In addition, the interaction between corruption and tariffs is examined to determine whether tariffs become more helpful or harmful if corruption is also present. Using pooled OLS regression, results are inconclusive. However, using a fixed effects model returns much clearer results. Tariffs are found to increase growth, but the increase becomes smaller as corruption falls.

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I. Introduction, Hypothesis, and Motivation

International trade has become an increasingly large part of the economy for most countries. However, there is a deep divide between economists about whether more open trade actually leads to faster growth. Some economists have performed studies that show that more open trade leads to faster growth (Edwards 1992, 1998). Others claim that while trade encourages growth, trade barriers can also encourage growth, and are a valid tool that developing countries should use to promote growth (Yanikkaya 2003) (Kwon 2013). The purpose of this paper is to add to existing knowledge by examining the effects of tariffs on the growth of developing countries, and whether trade barriers have positive effects on growth that outweigh the negative effects of reduced trade. In particular, following the advice of Kwon (2013) to look at other variables that may interact with tariffs, this paper will look at the interaction between corruption and tariffs to determine whether the effects of tariffs on growth increase or decrease when corruption is also present, and vice versa. A possible connection between tariffs and corruption has already been hypothesized by Lee (2008). He found that high tariffs can lead to higher corruption because it creates a way for officials to demand bribes in exchange for dodging tariffs. Additionally, higher corruption can lead to higher tariffs because officials are more likely to implement tariffs to protect industries they have personal interests in. This paper will expand on this idea to include how growth is affected.

II. Literature Review

Sebastian Edwards (1992) examines the effects of trade openness on the growth rate of 30 developing nations. He does this by modeling growth rate as a function of investment and the level of trade openness and trade distortion. Trade openness and distortion were measured using indices that predict the effectiveness of trade barriers in developing countries. Edwards' results

show that higher levels of trade openness result in faster levels of growth in developing countries, and trade barriers reduce growth. In addition, higher levels of trade distortion result in slower growth. This includes scenarios where exports are subsidized, which means that promotion of exporting is also harmful to growth rates, as well as barriers to importing.

Edwards (1998) revisits the effects of trade openness on growth to address a major criticism of literature up to that point, namely indices that measure trade openness tended to be subjective, in that trade openness was measured in very indirect ways, and could over- or underestimate trade openness by very wide margins. To attempt to demonstrate whether the link between trade openness and growth is robust to many different measures of trade openness, Edwards looks at a wide range of different indicators that relate to trade openness and distortion. Nine indicators were used, including: the Sachs and Warner Index, that sets a binary value of 0 for closed economies or 1 for open economies; the World Development Report Outward Orientation Index, which ranks countries from 1 to 4 based on openness; Leamer's Openness Index, which compares expected trade flow to actual trade flow to estimate trade openness; average black market premium, which estimates trade distortion; average import tariff on manufacturing, which measures trade barriers based on import taxes; average coverage of non-tariff barriers, which measures trade barriers based on how much trade was affected by methods other than import taxes; The Heritage Foundation Index of Distortions in International Trade, which ranks countries 1 to 5 based on how much government policy distorts trade; collected trade taxes ratio, which compares the value of traded goods to the taxes on those goods; and Wolfs Index of Import Distortion, which attempts to measure how much imports are distorted. Edwards finds that all nine indicators are effective predictors of growth, supporting the hypotheses that there is a link between trade openness and growth. He completes his study by

combining 5 of the 9 indicators into a composite index. This composite index is also an effective indicator, and explains 32 percent of the variance of the growth of sample countries. However, Edwards points out that endogeneity is a serious issue in the link between trade and growth because while trade generally leads to higher income, higher income also leads to more trade. He finds that the relationship between trade openness, trade distortion, and growth is not as strong as he first concluded, since the effects of trade policies appear to be much smaller after endogeneity is accounted for.

Halit Yanikkaya (2003) further questions this relationship by finding that trade barriers can have a positive effect on growth. He questions how appropriate previous indicators of trade openness are, claiming that previous indicators of trade openness have been very questionable in their actual relevance to trade policy. He uses black market premiums (previously used by Edwards) as an example, stating that it is not a proper indicator of trade openness, but is more accurately an indicator of other trade inhibiting factors such as high inflation, corruption, poor law enforcement, etc. Therefore, it is not possible to use it as an indicator for trade policy because it is too highly correlated with a host of other policies. To address this, Yanikkaya only uses variables that can be directly linked to trade policy. To measure openness he uses the ratio of imports and exports to gross domestic product (GDP) and share of exports to GDP. To measure trade barriers he uses import duties, export duties, and taxes on international trade. Yanikkaya's results are vastly different than those of previous literature. While his results show that higher volumes of trade lead to faster growth, they also show that more restrictive trade barriers also lead to faster growth. Yanikkaya justifies this apparent paradox by stating that the positive relation between growth and trade barriers is likely highly conditional on factors such as

the size of the country, its state of development, and whether the country is protecting industries in which it has a comparative advantage.

These conditions are examined in closer detail by David N. DeJong and Marla Ripoll (2006). They reason that the conflicting results found by previous research are caused because the states of development of the countries were not being properly accounted for. They hypothesize that the relationship between tariffs and growth is not linear, but is instead an inverted-U shape. Because previous papers assumed a linear relationship, their results were biased, explaining why previous papers conflicted on whether tariffs have a positive or negative effect on trade. The least developed countries should be able to promote growth via tariffs, but rich countries will slow growth if they implement tariffs. Their results confirm this hypothesis. When countries are separated by stages of development, poor countries are found to be helped by tariffs, while rich countries are hindered.

Other conditions in which tariffs can increase growth are examined by Roy Kwon (2013). He states that tariffs do not directly increase the growth of a developing country, but instead augment the positive effects that domestic investment, domestic manufacturing, and labor force participation have on growth. Kwon's results are very supportive of these claims. When an interaction variable is added, the positive effects of labor force participation and investment are found to be much higher when they are supplemented with tariffs. However, Kwon states that this study only scratches the surface of how tariffs can affect other determinants of growth. He says that this only shows that sweeping declarations of what helps or harms growth cannot be made. He calls for more research into how tariffs can augment other factors of growth.

One of these factors of growth was already examined by Young Lee and Omar Azfar (2008). They examine the link between corruption and tariff reductions, and find that more corrupt countries tend to have higher tariffs and take longer to reduce them. They find that this relationship is endogenous, and that higher tariffs lead to higher corruption. However, their research has some major limitations. They gathered data from three years covering 1995 through 1998 and have only 30 total observations. This paper will seek to improve on this research by using a larger range of years from a more recent period with more observations.

Economic growth and corruption have been extensively researched already. Mushfiq us Swaleheen and Dean Stansel (2007) study whether corruption increases or decreases growth. They determine that economic freedom is a key determinant of whether corruption has a positive or negative effect. In countries with low economic freedom corruption decreases growth rates because it causes resources to be allocated inefficiently. However, in countries with high economic freedom, corruption increases growth by allowing industry to bypass slow and inefficient bureaucracies. This is important to this study because developing countries typically have lower economic freedom than developed countries. This means that tariffs may begin to lose effectiveness as a country becomes more developed and less corrupt.

III. Theoretical Model

There are two competing models for how tariffs affect growth. One states that tariffs decrease growth by reducing trade, which reduces the market size available to domestic producers, which reduces output and employment. The other model states that tariffs can increase growth by protecting emerging industries from foreign competition and replacing imports with domestically produced goods, which increases output and employment.

There are also two competing theories for how corruption affects growth. One states that corruption reduces growth because it decreases competition. The other states that corruption can lead to higher growth by bypassing inefficient bureaucracy. According to Swaleheen (2007), the economic freedom in the country determines which theory is dominant. In countries with high economic freedom, corruption tends to increase growth. In countries with low economic freedom, corruption tends to decrease growth.

Two final control variables are added. The first is education, which is used as a proxy for human capital. This has a positive effect on growth by increasing the productivity of workers. The second is the GDP per capita already present in the country. This has a negative effect due to the law of diminishing returns. As a country becomes wealthier it becomes more expensive and difficult to grow even more.

These relationships are graphically demonstrated in a flow chart located in the appendix. Tariffs affect growth positively by enhancing emerging industry, but affect growth negatively by decreasing trade. Education increases growth by increasing the productivity of workers. Current GDP per capita decreases growth due to diminishing returns. Corruption has an ambiguous effect on growth. It may enhance growth by allowing inefficient bureaucracy to be bypassed, but may decrease growth by causing resources to be inefficiently allocated.

IV. Data and Methodology

The data used in this study comes from the World Development Indicators collected by the World Bank. Data from the years 2005 through 2011 are used because this is when the World Bank began to use the Country Policy and Institutional Assessment (CPIA) transparency index.

This study uses pooled ordinary least squares regression and a fixed effects model to examine the growth rates of 55 developing countries. A list of these countries is available in the appendix.

The econometric model used is as follows:

$$\begin{aligned}
 GROWTH = & \beta_0 + \beta_1 INDUSTRY + \beta_2 EDUCATION + \beta_3 LNGDPPC + \beta_4 TRANSPARENCY + \beta_5 TRADE \\
 & + \beta_6 TARIFF + \beta_7 TARIFF * TRANSPARENCY + \varepsilon
 \end{aligned}
 \tag{1}$$

INDUSTRY measures the percentage of GDP that comes from industry in each country, which includes processing raw materials and manufacturing goods. Since countries grow faster as they move from an agrarian economy to an industrial one, this is expected to have a positive effect on growth..

EDUCATION measures the percentage of GNI that is spent on education. This is expected to have a positive sign because it increases the productivity of workers.

LNGDPPC measures the natural log of GDP per capita. It is expected to have a negative effect on growth due to the law of diminishing returns.

TRANSPARENCY measures corruption using the CPIA transparency index, which evaluates the accountability of public officials, oversight of government actions, and public access to government actions. Corruption is measured on a scale of 1 to 6, with 1 being very corrupt. This is measured in half-point intervals. This variable has an unknown effect on growth because of the competing theories discussed in the theoretical model.

TRADE measures the ratio of trade to GDP. This is expected to have a positive effect on growth due to technology spillovers and increased market sizes.

TARIFF measures the average tariff rate on all imports. This variable has an unknown effect on growth because of the competing theories discussed in the theoretical model.

*TARIFF*TRANSPARENCY* is an interaction term between *TARIFF* and *TRANSPARENCY*. This variable has an unknown effect. If it is positive, then tariffs have a more positive effect on growth as transparency increases, and vice versa. If it is negative, then tariffs have a more negative effect on growth as transparency increases, and vice versa.

A list of countries used in this study is available in the appendix, as well as descriptive statistics for each variable.

V. Results

	OLS	Fixed Effects
INTERCEPT	3.70822 (0.68)	- -
INDUSTRY	0.08732 (3.34)***	0.10805 (0.91)
EDUCATION	-0.46048 (-2.35)**	0.05560 (0.09)
LNGDPPC	0.12290 (0.26)	-5.13472 (-2.04)**
TRANSPARENCY	-0.38934 (-0.22)	11.10376 (3.81)***
TRADE	0.01771 (1.78)*	0.10253 (3.67)***
TARIFF	-0.23953 (-0.63)	3.29009 (4.62)***
TARIFF*TRANSPARENCY	0.09292 (0.70)	-1.07632 (-4.77)***
Country Dummies	No	Yes
Adj. R ²	0.1026	0.7731
N	232	232
F-Statistic	-	13.75

*T-values in parentheses. *, **, and *** represent significance at 10 percent, 5 percent, and 1 percent confidence intervals, respectively. Country dummy variables are included in the fixed effects model, but are unreported.*

The results of the pooled OLS regression are very inconclusive. Only three variables are statistically significant at any level. While *INDUSTRY* and *TRADE* are positive as expected, they both have extremely small effects. A 1 percent increase in industry increases growth by only 0.08 percent, while a 1 percent increase in trade increases growth by a negligible 0.01 percent. *EDUCATION* is also statistically significant, but is the incorrect sign. All other variables are statistically significant.

The fixed effects model returns much clearer results. An increase of one point on the CPIA transparency index increases growth by 11.10 percent. Since developing countries tend to have lower economic freedom than developed countries, this result agrees with the results found by Swaleheen (2007). A one percent increase in trade increases growth by 0.1 percent. A one percent increase in tariffs increases growth by 3.29 percent. This result agrees with those found by Yanikkaya (2003).

*TARIFF*TRANSPARENCY* has a coefficient of -1.08. This means that at a constant level of tariffs, an increase in transparency decreases growth, and vice versa. When evaluated at the mean level of transparency, tariffs have a total effect of:

$$\frac{\partial Growth}{\partial Tariff} = 3.29 - (1.08 \times 2.87) = 0.19$$

(2)

This means that while tariffs increase growth by protecting emerging industries, they have a much smaller impact in non-corrupt countries due to the increased inefficiency caused by the

extra bureaucracy. At transparency scores above 3.04, tariffs begin to reduce growth instead of increasing growth. Because of this, developing countries must reduce tariffs as they become less corrupt in order to maintain growth. Since the CPIA Index is measured in half-point intervals, countries should work to eliminate tariffs when they move from a 3 to a 3.5.

VI. Conclusion

After correcting for fixed effects both transparency and tariffs are found to increase growth by significant amounts. However, higher transparency reduces the positive effects of higher tariffs, and at high enough levels of transparency tariffs begin to decrease growth. This result is a possible explanation for why previous studies have had conflicting results about whether tariffs have a positive or negative effect on growth. This is also a possible explanation for the inverse-U relationship between tariffs and growth found by DeJong (2006). If more developed countries also tend to have less corruption, this could explain why tariffs are harmful in developed countries but helpful in developing countries. This also agrees with the theory of efficient corruption discussed by Swaleheen (2007).

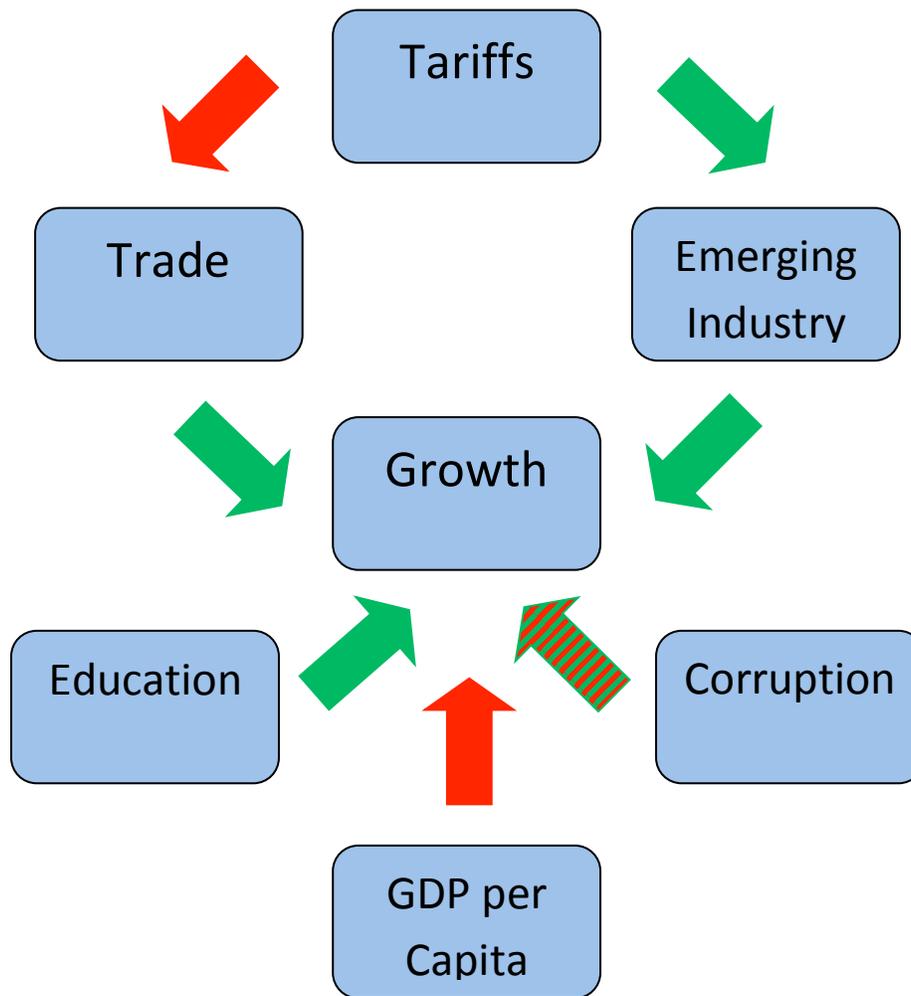
There are some limitations to this study. This study assumes that there is no direct relationship between tariffs and growth, and that tariffs only affect growth through indirect means. It also assumes that growth does not affect tariffs. Possible endogeneity between growth and tariffs may bias results. Future research should focus on whether such a relationship exists.

VII. Appendix

Variable Definitions and Sources		
Variable	Definition	Source
GROWTH	Per capita gross domestic product (GDP) growth, measured using purchasing power parity (PPP).	World Development Indicators (WDI)
INDUSTRY	Percentage of GDP from industry.	WDI
EDUCATION	Expenditure on education as a percentage of GNI.	WDI
GDPPC	GDP per capita, measured using PPP.	WDI
LNGDPPC	Natural log of GDPPC.	Calculated.
TRANSPARENCY	Scale of 1 to 6, with 6 being very transparent.	WDI
TRADE	Ratio of imports and exports to GDP.	WDI
TARIFF	Taxes collected on imports as a percentage of the total value of imports.	WDI

Descriptive Statistics					
Variable	N	Mean	Std. Dev.	Min	Max
GROWTH	232	5.70467	4.40599	-9.52852	26.4
INDUSTRY	232	25.65835	12.76499	5.86082	73.24084
EDUCATION	232	3.82449	1.79392	0.85	9.75393
GDPPC	232	2330	1946	311.36515	10452
TRANSPARENCY	232	2.86638	0.55968	1.5	4.5
TRADE	232	80.47905	35.46086	32.07185	213.92621
TARIFF	232	11.82328	4.20363	2.9	22.15

Theoretical Model



 = Negative Effect

 = Positive Effect

List of Countries Used

Albania	Cameroon	India	Moldova	Sri Lanka
Angola	Central African Republic	Indonesia	Mongolia	St. Lucia
Armenia	Chad	Kenya	Mozambique	St. Vincent and the Grenadines
Azerbaijan	Comoros	Kyrgyz Republic	Nepal	Sudan
Bangladesh	Dem. Rep. of Congo	Lao PDR	Nicaragua	Tajikistan
Benin	Rep. of Congo	Lesotho	Niger	Tanzania
Bhutan	Cote d'Ivoire	Madagascar	Nigeria	Togo
Bolivia	Ethiopia	Malawi	Pakistan	Vanuatu
Burkina Faso	The Gambia	Maldives	Rwanda	Vietnam
Burundi	Guinea	Mali	Senegal	Yemen Rep.
Cambodia	Honduras	Mauritania	Solomon Islands	Zambia

Countries shaded in red had a transparency value of 3.5 or higher in 2011, and have tariffs with a negative effect on growth. Tariffs should be reduced to increase growth.

Countries shaded in yellow had a transparency value of 3 in 2011, and have tariffs with an extremely small positive effect on growth. Tariffs should be reduced before transparency rises any further.

SAS Code

```

DATA wdi2 (rename=(CPIA_transparency_accountabili=TRANSPARENCY
GDP_growth_annual___NY_GDP_MK=GROWTH
GDP_per_capita_PPP_current_in=GDPPC
GNI_per_capita_PPP_current_in=GNIPC
Tariff_rate_applied_simple_me=TARIFF
Telephone_lines_per_100_people_=PHONELINES
Trade___of_GDP___NE_TRD_GNFS_ZS=TRADE
Industry_value_added___of_GDP=INDUSTRY
Adjusted_savings_education_expe=EDUCATION));
    set wdi;
    run;

```

```

DATA wdi3;
    set wdi2;

    /*removes high income countries;
    if GNIPC>=12615 then delete;

    /*creates interaction term for transparency;
    TARIFFTRANSPARENCY=TARIFF*TRANSPARENCY;

    /*creates logged variables;
    LNGDPPC=log(GDPPC);
    LNPHONELINES=log(PHONELINES);

    /*removes observations with missing variables;
    if TRANSPARENCY="" then delete;
    if GDPPC="" then delete;
    if GNIPC="" then delete;
    if GROWTH="" then delete;
    if TRADE="" then delete;
    if PHONELINES="" then delete;
    if TARIFF="" then delete;
    if EDUCATION="" then delete;
    if INDUSTRY="" then delete;
    if country_name="Bosnia and Herzegovina" then delete;
    if country_name="Cabo Verde" then delete;
    if country_name="Georgia" then delete;
    if country_name="Guinea-Bissau" then delete;
    if country_name="Haiti" then delete;

    /* creates dummy variable for each country;
    if country_name="Albania" then alb=1; else alb=0;
    if country_name="Angola" then ang=1; else ang=0;
    if country_name="Armenia" then arm=1; else arm=0;
    if country_name="Azerbaijan" then aze=1; else aze=0;
    if country_name="Bangladesh" then ban=1; else ban=0;
    if country_name="Benin" then ben=1; else ben=0;

```

```
if country_name="Bhutan" then bhu=1; else bhu=0;
if country_name="Bolivia" then bol=1; else bol=0;
if country_name="Burkina Faso" then burk=1; else burk=0;
if country_name="Burundi" then buru=1; else buru=0;
if country_name="Cambodia" then camb=1; else camb=0;
if country_name="Cameroon" then came=1; else came=0;
if country_name="Central African Republic" then cen=1; else cen=0;
if country_name="Chad" then cha=1; else cha=0;
if country_name="Comoros" then com=1; else com=0;
if country_name="Congo, Dem. Rep." then cond=1; else cond=0;
if country_name="Congo, Rep." then conr=1; else conr=0;
if country_name="Cote d'Ivoire" then cot=1; else cot=0;
if country_name="Ethiopia" then eth=1; else eth=0;
if country_name="Gambia, The" then gam=1; else gam=0;
if country_name="Guinea" then guin=1; else guin=0;
if country_name="Honduras" then hon=1; else hon=0;
if country_name="India" then indi=1; else indi=0;
if country_name="Indonesia" then indo=1; else indo=0;
if country_name="Kenya" then ken=1; else ken=0;
if country_name="Kyrgyz Republic" then kyr=1; else kyr=0;
if country_name="Lao PDR" then lao=1; else lao=0;
if country_name="Lesotho" then les=1; else les=0;
if country_name="Madagascar" then mad=1; else mad=0;
if country_name="Malawi" then mala=1; else mala=0;
if country_name="Maldives" then mald=1; else mald=0;
if country_name="Mali" then mali=1; else mali=0;
if country_name="Mauritania" then mau=1; else mau=0;
if country_name="Moldova" then mol=1; else mol=0;
if country_name="Mongolia" then mon=1; else mon=0;
if country_name="Mozambique" then moz=1; else moz=0;
if country_name="Nepal" then nep=1; else nep=0;
if country_name="Nicaragua" then nic=1; else nic=0;
if country_name="Niger" then nig=1; else nig=0;
if country_name="Nigeria" then nigi=1; else nigi=0;
if country_name="Pakistan" then pak=1; else pak=0;
if country_name="Rwanda" then rwa=1; else rwa=0;
if country_name="Senegal" then sen=1; else sen=0;
if country_name="Solomon Islands" then sol=1; else sol=0;
if country_name="Sri Lanka" then sri=1; else sri=0;
if country_name="St. Lucia" then luc=1; else luc=0;
if country_name="St. Vincent and the Gren" then vin=1; else vin=0;
if country_name="Sudan" then sud=1; else sud=0;
if country_name="Tajikistan" then taj=1; else taj=0;
if country_name="Tanzania" then tan=1; else tan=0;
if country_name="Togo" then tog=1; else tog=0;
if country_name="Vanuatu" then van=1; else van=0;
if country_name="Vietnam" then vie=1; else vie=0;
if country_name="Yemen, Rep." then yem=1; else yem=0;
if country_name="Zambia" then zam=1; else zam=0;
```

```
run;

*/displays means and correlation between variables;
PROC CORR data=wdi3;
    var growth industry education gdppc gnipc transparency trade  tariff;
run;

*/OLS model for all countries;
PROC REG;
    OLS:model growth=industry education lngdppc transparency trade tariff
        tarifftransparency;
run;

*/fixed effects model for all incomes;
PROC REG;
    Fixed_Effects:model growth=industry education lngdppc transparency trade tariff
        tarifftransparency alb ang arm aze ban ben bhu bol burk
        buru camb came cen cha com cond conr cot eth gam guin hon indi
        indo ken kyr lao les mad mala mald mali mau mol mon moz nep nic nig nigi pak
        rwa sen sol sri luc vin sud taj tan tog van vie yem zam /noint;
run;
quit;
```

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