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ONLY IN CAPITAL-INTENSIVE COMMODITIES!**

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Te Kunenga  
ki Pūrehuroa



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# **The GATT/WTO Has Promoted Trade, But Only in Capital-Intensive Commodities!**

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## **ABSTRACT**

This paper contributes to the recent empirical debate about the effectiveness of the GATT and the WTO in promoting trade. We use gravity models to explore the impact of the GATT/WTO on bilateral trade in a sample of 46 countries over the period 1965-1997. Our data enable us to disaggregate trade by broad commodity aggregates. The results for total trade are similar to those reported by Rose (2004). However, the disaggregated estimates reveal that the GATT/WTO has had a positive and statistically significant impact on trade in capital-intensive commodities, but that it has had no statistically significant impact on trade in other commodities. The paper demonstrates that simple modifications of Rose's approach lead to results that are much more 'common sense' than his.

Running Title: "The GATT/WTO Has Promoted Trade"

JEL Classification Numbers: F10, F15.

Key words: GATT/WTO, gravity model, bilateral trade, commodity aggregates, capital-intensive commodities.

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## 1. INTRODUCTION

This paper contributes to the recent empirical debate about the effects of the World Trade Organization (WTO) and its predecessor, the General Agreement on Tariffs and Trade (GATT), on international trade. The controversial paper by Rose (2004)<sup>1</sup> concludes, seemingly against much common sense and against the widely held beliefs of most economists, that there is little empirical evidence that GATT/WTO membership has had a substantial positive impact on the level of bilateral trade. Subramanian and Wei (2003) challenged Rose's (2004) findings, but derive their results using an alternative gravity model with different variable specifications.

Rose (2004) mentions that decomposing trade by industry is a potentially fruitful area of further research on the impact of the GATT/WTO on trade, but that it is greatly restricted by data availability. In this paper we exploit the NAPES database to shed light on this issue. While restricted mostly to OECD and Asia-Pacific economies, this database enables disaggregation of trade by aggregate commodity group ('commodity aggregates'). Apart from the database, we only deviate from Rose's basic model specification by including, alternatively, country fixed effects and a correction for serial correlation.

Our findings confirm Rose's hunch that the multi-lateral trade system has been less successful at liberalizing trade in such areas as agriculture- and labour-intensive commodities. However, the GATT/WTO has been highly effective in increasing trade in capital-intensive commodities. This seemingly confirms the view of many critics as well as supporters of the GATT/WTO, i.e. that the organization had positive trade impacts only in commodities important to developed economies, while trade in commodities in which most poor countries have a comparative advantage has been restricted.<sup>2</sup> However, the importance of trade in capital-intensive commodities for economic growth has been highlighted by the literature on embodied international R&D spillovers (see, for example, Bayoumi *et al.*, 1999).

Our findings are important because they highlight the fact that when making simple modifications to Rose's (2004) method, the GATT/WTO *can* be shown to have had positive impacts on trade. This strengthens the expectation that further liberalisation of agricultural trade and trade in labour-intensive commodities might result in positive trade impacts in future.

The rest of the paper is organised as follows. Section 2 introduces the method. Section 3 discusses the data. Results for our different model specifications are presented in Section 4. Section 5 concludes.

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<sup>1</sup> It was earlier circulated as a working paper (Rose, 2002). See also Economist (2002).

<sup>2</sup> See, for example, Stiglitz (2002) and Wolf (2004).

## 2. METHOD

We employ Rose's (2004) model, but disaggregate it by factor-intensity based commodity aggregates (see section 3). Therefore, our basic model (model 1) takes the form:

$$\begin{aligned}
 (1) \quad \ln X_{ijtA} = & \beta_0 + \beta_1 \ln D_{ij} + \beta_2 \ln(Y_i Y_j)_t + \beta_3 \ln(Y_i Y_j / \text{Pop}_i \text{Pop}_j)_t + \beta_4 \text{Lang}_{ij} + \beta_5 \text{Cont}_{ij} \\
 & + \beta_6 \text{Landl}_{ij} + \beta_7 \text{Island}_{ij} + \beta_8 \ln(\text{Area}_i \text{Area}_j) + \beta_9 \text{ComCol}_{ij} + \beta_{10} \text{CurCol}_{ijt} \\
 & + \beta_{11} \text{Colony}_{ij} + \beta_{12} \text{ComNat}_{ij} + \beta_{13} \text{CU}_{ijt} + \beta_{14} \text{FTA}_{ijt} + \sum_t \phi_t T_t \\
 & + \gamma_1 \text{Bothin}_{ijt} + \gamma_2 \text{Onein}_{ijt} + \gamma_3 \text{GSP}_{ijt} + \varepsilon_{ijt}
 \end{aligned}$$

where

- $X_{ijtA}$  denotes the average value of real bilateral trade of commodity aggregate A between countries  $i$  and  $j$  at time  $t$ .
- $D_{ij}$  is the distance between  $i$  and  $j$ .
- $Y$  is real GDP.
- $\text{Pop}$  is population.
- $\text{Lang}_{ij}$  is a dummy variable which is one if  $i$  and  $j$  have a common language, and zero otherwise.
- $\text{Cont}_{ij}$  is a dummy variable which is one if  $i$  and  $j$  share a land border, and zero otherwise.
- $\text{Landl}$  is the number of landlocked countries in the country-pair (0, 1, or 2).
- $\text{Island}_{ij}$  is the number of island nations in the pair (0, 1, or 2).
- $\text{Area}$  is the area of the country in  $\text{km}^2$ .
- $\text{ComCol}_{ij}$  is a dummy variable which is one if  $i$  and  $j$  were ever colonies after 1945 with the same colonizer, and zero otherwise.
- $\text{CurCol}_{ijt}$  is a dummy variable which is one if  $i$  and  $j$  are colonies at time  $t$ , and zero otherwise.
- $\text{Colony}_{ij}$  is a dummy variable which is one if  $i$  ever colonized  $j$  or *vice versa*, and zero otherwise.
- $\text{ComNat}_{ij}$  is a dummy variable which is one if  $i$  and  $j$  remained part of the same nation during the sample (e.g., France and Guadeloupe), and zero otherwise.
- $\text{CU}_{ijt}$  is a dummy variable which is one if  $i$  and  $j$  use the same currency at time  $t$ , and zero otherwise.
- $\text{FTA}_{ijt}$  is a dummy variable which is one if  $i$  and  $j$  both belong to a common regional free trade area, and zero otherwise.
- $T_t$  is a set of year fixed effects.
- $\text{Bothin}_{ijt}$  is a dummy which is one if both  $i$  and  $j$  are GATT/WTO members at time  $t$ , and zero otherwise.
- $\text{Onein}_{ijt}$  is a dummy which is one if either  $i$  or  $j$  is a GATT/WTO member at time  $t$ , and zero otherwise.

- $GSP_{ijt}$  is a dummy which is one if  $i$  extends Generalized System of Preferences privileges to  $j$  or *vice versa* at  $t$ , and zero otherwise.<sup>3</sup>
- $\varepsilon_{ijt}$  is the error term, assumed to be well behaved.

The only difference from Rose's basic model is the inclusion of the subscript A, which indexes our commodity aggregates.<sup>4</sup>

The second specification (model 2) adds country fixed effects to model (1). This is advocated by Anderson and van Wincoop (2003) who argue that a gravity equation grounded in theory always needs to include such dummy variables to account for the "multilateral resistance" of a country, essentially its average propensity to trade. We define the country dummy variables as time invariant, and fixed irrespective of trading partner.

Egger (2002) and Krishnakumar (2002) discuss the fact that trade data residuals usually exhibit serial correlation, i.e. a below or above average observation in one period tends to be associated with a similar departure from the mean in the next period. Our third model specification (model 3), therefore, includes an ARMA(1,1) correction in model (1).<sup>5</sup> Durban-Watson tests indicate that the probability of the residuals from our regressions exhibiting at least first-order serial correlation is in excess of 99 percent. It is unsurprising that serial correlation exists in trade data sets, as there are numerous, persistent, long-term phenomena, which could affect the level of trade between countries. For example, business cycles, changing comparative advantage, terms of trade shifts and changing international relations can all have a persistent bearing on trade, and can all last for years on end.

It should also be noted that, like in Rose (2004) and Subramanian and Wei (2003), all our reported standard errors are robust to clustering by country-pair.<sup>6</sup> The problem with using regular standard errors is that for a  $n \times t$  panel there are not  $n \times t$  independent observations. Instead, there are  $n$  clusters sampled  $t$  times (we consider each country-pair to be an independent cluster). Observations from different clusters are assumed to be independent of each other, but observations from the same cluster are likely to be correlated. It is therefore necessary to correct the standard error estimates to account for this loss of independence.

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<sup>3</sup> The GSP is a system under which a developed country can grant non-reciprocal duty concessions to imports from developing countries. The system is not a homogenous one, instead allowing the importing country to determine the extent of coverage, the volume of goods, and the conditions that must be met.

<sup>4</sup> Although, in general, gravity models are very successful in explaining bilateral trade, their theoretical foundations are controversial, as they can be derived from very different trade theories. For a survey of the theoretical debate, and an empirical test of various trade theories that might explain gravity models, see Evenett and Keller (2002).

<sup>5</sup> We also attempt inclusion of both country fixed effects and ARMA(1,1) correction, as well as estimation of a non-linear version of the model. However, we encounter convergence problems that prevent us from obtaining any useful estimates.

<sup>6</sup> We adopt the standard way of correcting for clustering, i.e. we use generalized estimating equations (GEEs), a technique developed by Liang and Zeger (1986).

### 3. DATA

Trade data disaggregated by ‘factor intensity’ commodity aggregates are obtained from the Australian National University’s NAPES database.<sup>7</sup> This subscription-based database covers bilateral trade exceeding \$1,000 denominated in current US dollars, between 46 countries (see Table A 1), with a focus on the Asia-Pacific Region, for the period 1965-1997.<sup>8</sup> Total trade data, as well as data for four non-overlapping commodity aggregates (i.e. agriculture-intensive, labour-intensive, minerals-intensive, and capital-intensive commodities), are used (see Appendix Table A2).<sup>9</sup> It should be noted that our commodity aggregates provide a different, but in some respects complementary, perspective to that of the sectoral disaggregation used by Subramanian and Wei (2003). The latter focus explicitly on the distinction between sectors in industrial countries that have a high level of trade protection versus those that have little or no protection. They use disaggregated data for only four years and discard observations with trade values (in their case import values) of less than US\$ 500,000. Although including many more economies, they use far fewer observations than we do in this study.

Most other data are taken from Glick and Rose (2001). The reason for using this data set rather than the Rose (2002) set is that Rose (2002) excludes any observations for which he is unable to obtain trade data. By contrast, Glick and Rose (2001) include observations for which other variables are available, even if trade data are not, meaning that a greater number of observations from the NAPES data set can be included in this study. The WTO dummies are easily recreated using data provided on the WTO website regarding joining dates of the GATT<sup>10</sup> and the WTO<sup>11</sup>.

The GSP dummies are taken from Rose (2002). This creates a problem, as the data set is not a full panel, which means that GSP variables are not available for all country-pairs and years. To correct for this, GSP status is interpolated from those years for which data are available.<sup>12</sup> Another reason for treating coefficient estimates for the GSP dummy with caution is that the GSP applies only to specific goods. However, Rose (2002, 2004) sets the dummy to one if a GSP relationship of any type or extent exists between two countries. This raises the unavoidable possibility that some of our regressions contain observations where the GSP dummy equals one but GSP privileges are not extended to that category of commodities. In addition, the GSP applies mainly to industrialised and developing country-pairs, so in sectors where no agreement exists but the dummy still equals one, it may proxy for an industrial-developing country dummy.

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<sup>7</sup> Australian National University, “National Asia Pacific Economic and Scientific Database (NAPES)”, Canberra. <http://iedb.anu.edu.au/napes/index.php>

<sup>8</sup> Exceptions are the following countries for which data start after 1965 (starting dates are given in brackets): Bangladesh (1969), Vietnam (1975), Czech Republic (1993).

<sup>9</sup> The four commodity aggregates cover almost all commodities according to SITC-Revision 1. Not included are the groups 411, 421, 422, 431, 662, 670, 911, 931, 941, 961.

<sup>10</sup> [http://www.wto.org/english/thewto\\_e/gattmem\\_e.htm](http://www.wto.org/english/thewto_e/gattmem_e.htm)

<sup>11</sup> [http://www.wto.org/english/thewto\\_e/whatis\\_e/tif\\_e/org6\\_e.htm](http://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm)

<sup>12</sup> If one country in a pair extends GSP privileges to the other at the start and end of a period, with observations missing in between, it is assumed that the privileges are extended throughout the period. Similarly, if privileges are not extended at the start or end of a period, with missing observations, then it is assumed that they are not extended at any time in-between either. If privileges are extended at the start of a gap, but not at the end, then it is assumed that those privileges cease at the beginning of the gap, while if they are extended at the end, but not the start, they are assumed to begin at the end of the gap.



A further problem arises because NAPES treats Belgium and Luxembourg as a single country when recording trade data, while the Glick and Rose data set treats them as separate countries. The latter, however, also contains data for most variables needed for combining the two countries, with only trade, GDP and GDP per capita missing. The situation is complicated by the fact that the Rose and Glick data set does not contain the GDP or GDP per capita data separately for each country, but rather the product of the two values. In order to include the maximum number of observations in our analysis, we estimate the values for the combined pair from the separate observations.<sup>13</sup>

The possibility of multicollinearity is a significant concern with the NAPES data set, for two reasons. Firstly, by 1965 a significant number of countries had already joined the GATT/WTO, including most of the industrialised ones. Of the 46 countries included, 26 were members by 1965 and 34 were members by 1973. Secondly, some of those outside the GATT/WTO have substantial gaps in their trade data, for example Laos, or began reporting later than 1965 (Bangladesh, Vietnam, the Czech Republic). As a result, over 96% of the observations in the data set involve country pairs where either one or both countries are GATT/WTO members, increasing the likelihood that multicollinearity could cause problems.

## 4. RESULTS

To save space, we concentrate on estimates for the main variables of interest, i.e. the GATT/WTO dummy variables ‘one in’ and ‘both in’ as well as the GSP dummy (see Table 1). Some more detailed estimates for regressions of particular interest are shown in Table A3, and variables accounting for the traditional gravity effects ( $\ln D$ ,  $\ln(YY)$ ,  $\ln(YY/PopPop)$ ) are also briefly discussed. The complete estimates are available from the authors upon request. All regressions were run using SAS Version 8.

### 4.1 The Disaggregated Rose Model

To start with, the estimates for the total trade case in model 1 are qualitatively very similar to those obtained by Rose (2004): Neither of the GATT/WTO dummy variables is statistically significant, while the GSP dummy is positive and statistically significant (see Table 1). Taken at face value, it seems that using the NAPES database and Rose’s original model

<sup>13</sup> The GDP and GDP per capita of Belgium and Luxembourg are obtained from the Penn World Tables Version 6.1. Country names in the PWT are converted to country codes using the International Financial Statistics nomenclature (see <http://www.bsu.edu/web/cob/econ/database/ifs/ifscty.html>). The GDP and GDP per capita values for trade are calculated using the following formulae:

$$(I) \quad (gdp_{bel,i} + gdp_{lux,i}) \times \left( \frac{gdp_{bel,i}}{gdp_{bel}} + \frac{gdp_{lux,i}}{gdp_{lux}} \right) \div 2$$

$$(II) \quad \left( \frac{pop_{bel} \times gdppc_{bel,i} + pop_{lux} \times gdppc_{lux,i}}{pop_{bel} + pop_{lux}} \right) \times \left( \frac{gdp_{bel,i}}{gdp_{bel}} + \frac{gdp_{lux,i}}{gdp_{lux}} \right) \div 2$$

The GDP of the partner country in question is calculated as the average of the two values obtained from the separate GDP observations. These values are not always the same, as the Rose and Glick data set was created using an earlier version of the Penn World Tables.

specification, the results for the effect of the GATT/WTO on trade are similarly disappointing as those obtained by Rose.<sup>14</sup> Reassuringly, the traditional gravity effects also apply in our data sample: Countries that are more distant from each other trade less; economically larger and richer countries trade more. Moreover, landlocked countries trade less, countries using the same language trade more, as do those with a shared colonial history (see the baseline regression estimates in Table A3).

**Table 1: The Rose Model with Commodity Aggregates**

	<b>Agriculture Intensive</b>	<b>Labour Intensive</b>	<b>Minerals Intensive</b>	<b>Capital Intensive</b>	<b>Total Trade</b>
	<b>Model 1 (basic model)</b>				
One In	-0.17 (0.30)	-0.28 (0.43)	-0.27 (0.40)	-0.03 (0.31)	-0.02 (0.31)
Both In	0.04 (0.31)	-0.35 (0.44)	-0.41 (0.42)	-0.11 (0.32)	0.02 (0.32)
GSP	<b>0.28</b> <b>(0.08)</b>	<b>0.49</b> <b>(0.08)</b>	0.10 (0.12)	<b>0.62</b> <b>(0.08)</b>	<b>0.37</b> <b>(0.07)</b>
No. of obs.	25,401	25,355	25,180	23,952	26,976
R-Squared	0.73	0.83	0.78	0.66	0.84
	<b>Model 2 (with country-fixed effects)</b>				
One In	-0.09 (0.26)	-0.29 (0.27)	0.21 (0.28)	0.28 (0.24)	0.22* ( . )
Both In	0.07 (0.25)	-0.22 (0.27)	0.21 (0.28)	<b>0.49</b> <b>(0.23)</b>	0.30* ( . )
GSP	<b>0.25</b> <b>(0.06)</b>	<b>0.47</b> <b>(0.06)</b>	0.09 (0.09)	<b>0.50</b> <b>(0.06)</b>	0.30* ( . )
No. of obs.	25,401	25,180	23,952	25,355	26,976
R-Squared	0.80	0.84	0.78	0.88	0.89
	<b>Model 3 (with ARMA (1,1) correction)</b>				
One In	0.03 (0.23)	0.14 (0.23)	0.15 (0.21)	<b>0.43</b> <b>(0.21)</b>	0.40 (0.21)
Both In	0.18 (0.23)	0.19 (0.24)	0.14 (0.22)	<b>0.59</b> <b>(0.21)</b>	<b>0.47</b> <b>(0.20)</b>
GSP	-0.06 (0.06)	<b>0.44</b> <b>(0.07)</b>	<b>-0.23</b> <b>(0.08)</b>	-0.02 (0.06)	-0.07 (0.05)
No. of obs.	25,401	25,180	23,952	25,355	26,976
R-Squared	0.70	0.76	0.64	0.79	0.80

Notes: The definitions of the commodity aggregates are given in Table A2. \*The robust standard error can not be calculated as the Hessian matrix used in its calculation is not positive definite. ( . ) denotes the missing standard deviations.

<sup>14</sup> However, the GSP dummy estimate is much lower in value than that estimated by Rose (i.e. 0.37 compared to 0.86). One reason for this could be that the developing countries in the data set tend to be both large (e.g. China, India, Indonesia, Malaysia and the Philippines) and/or relatively well developed (e.g. Korea, Chile, Thailand). The GSP agreements in this sample may therefore have been less generous due to fears that markets could become flooded.

Disaggregating trade by commodity aggregates produces interesting, though still disappointing, results: The estimates for ‘both in’ and ‘one in’ remain statistically insignificant, but those for the GSP dummy are, except for ‘minerals-intensive’, all positive and statistically significant (Table 1). Also, the GSP coefficient estimate for trade in agriculture-intensive commodities is smaller than that for labour-intensive and, especially, capital-intensive commodities. The GSP has mostly been offered by industrialised countries to developing ones. However, most industrialised countries have had significant protection in place in the agricultural sector, for example, the EU’s Common Agricultural Policy or the US’s farm subsidy program, and to a lesser extent in labour-intensive sectors. This seems to be reflected in the size of the coefficient estimates.

The GSP is not associated with any statistically significant impact on trade in minerals-intensive commodities. Given that fuel is vital for almost all economies, and that so many economies import so much of it, this is not necessarily surprising. It is unlikely that many countries had significant protectionist measures in place against fuels. This means there are few additional benefits that can be offered through the GSP system, so the result is a sensible one.<sup>15</sup>

The variables capturing the traditional gravity effects in the four commodity aggregates regressions of model 1 are all statistically significant and have the expected signs. Estimates for other variables are mostly similar across regressions (see, for example, regression 3, Table A3).

## 4.2 The Disaggregated Rose Model with Country-Fixed Effects

Including country fixed effects in the model results in some large changes in the estimates for some of the variables (see Table 1, model 2 estimates). The coefficient estimates for both economies being GATT/WTO members (*both in*) in the minerals-intensive and capital-intensive categories increase greatly. The change in the capital-intensive coefficient is large enough to cause the estimate to become positive and statistically significant. The estimate is quite large as well, with a value of 0.49 corresponding to an increase in trade of 63%.<sup>16</sup> It is unfortunate that the standard errors could not be calculated for total trade.<sup>17</sup> There are also quite large changes for the coefficient estimates for one country being a WTO member in the mineral- and capital-intensive categories. They are now both positive, but still statistically insignificant. The GSP dummies, however, are essentially unchanged by the introduction of country fixed effects alongside time fixed effects.<sup>18</sup>

<sup>15</sup> In fact, the Australian GSP handbook explicitly states that petroleum products are excluded from their scheme, as Australian output is subject to the same excise duties that imports are (UNCTAD, 2000a, p. 5). The United States offers GSP privileges on petroleum products (excluding crude oil) to only least-developed countries, none of which are included in the NAPES database, and none of which are major petroleum producers (UNCTAD, 2000b, pp. 37-40 & p. 180).

<sup>16</sup> The percentage impact can be calculated as  $\exp(\text{coefficient}) - 1$ , i.e.  $\exp(0.49) - 1 = 63\%$ .

<sup>17</sup> The Hessian matrix is not positive definite, i.e. SAS is unable to calculate standard errors. This is of concern, as it indicates that there may be problems with multicollinearity in the model.

<sup>18</sup> On the whole, estimates for the variables of most interest seem reasonable in size. However, estimates for *Landl*, *Island*, and  $\ln(\text{AreaArea})$  seem large (see regression 4, Table A3) compared to those obtained from models 1 and 3.

### 4.3 The Disaggregated Rose Model with ARMA Correction

Including an ARMA(1,1) correction in (1) produces results that are in important ways different from those for models 1 and 2, as well as those of Rose (2004). The impact of GATT/WTO membership on total trade is positive and statistically significant when both countries are GATT/WTO members, and very close to being so when only one country is (see Table 1). On the other hand, the GSP dummy becomes statistically insignificant and negative.

Looking at model 3 estimates for commodity aggregates (Table 1), it can be seen that the coefficient estimates for trade in capital-intensive commodities when either one or both countries are GATT/WTO members are larger than those obtained in models 1 and 2, as well as both being statistically significant. By contrast, the GSP dummy estimates are much less positive than before, remaining positive and statistically significant only for labour-intensive commodities. The traditional gravity effects are again confirmed in all regressions (see, for example, regression 5, Table A3).

The statistically insignificant GSP coefficient estimates seem to imply that, once recent historical trends in trading patterns between country-pairs have been accounted for, entering into a GSP relationship does not noticeably affect trade levels. This may be for a number of reasons. For example, it might indicate that GSP agreements have tended to formalise prior informal arrangements between countries in certain sectors rather than representing any serious change in the way in which they treat each other. Alternatively, it could have been that the GSP was introduced in response to an increase in trade between industrialised and developing countries, in which case the ARMA(1, 1) effect would capture this better than the GSP dummy.

Another possibility is that there are inaccuracies in the starting dates of GSP relationships, as Rose took the starting dates from only three booklets printed at five-year intervals. If there is a difference between the actual and recorded times the privileges are extended, then the error term may capture the effect of GSP agreements more effectively than the dummy variables. In a similar vein, if the scope of the GSP arrangement changed over time, this could again have made the error term more effective than the GSP dummy. In particular, if many countries initially allowed in labour-intensive goods under the scheme, and later extended the agreement to cover other goods, then that may explain why a positive estimate was returned for labour-intensive goods as opposed to any others.<sup>19</sup>

Finally, a negative and statistically significant GSP estimate cannot realistically be interpreted as the GSP having caused a decrease in trade. Our estimates do not necessarily infer causality, merely correlation. The GSP dummies may simply be rough proxies for trade between industrialised and developing countries. It could have been, for example, that the value of exports of countries receiving GSP privileges was less than other countries' due to the latter selling higher value-added goods.

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<sup>19</sup> The lists of commodities of Australian and US GSP schemes have been updated multiple times (see UNCTAD 2000a,b).

## 5. CONCLUDING COMMENTS

Our results confirm significant differences by commodity type in the effectiveness of the GATT/WTO in creating trade. For our sample of countries, GATT/WTO membership, far from being ineffective, has been associated with increases in trade in the important category of capital-intensive commodities. Of course, compared to Rose's (2004) data set, ours is weighted towards countries, both industrialised and developing, that are strong exporters of manufactures.<sup>20</sup> We have to await the availability of more comprehensive data to test whether our findings would apply to the same degree in a sample that includes all the GATT/WTO members.

The failure of the GATT/WTO to liberalise (and thereby create) trade in agriculture- and labour-intensive commodities to the same degree as trade in capital-intensive commodities is of significant concern to developing countries. In fact, it is recognised even by proponents of the GATT/WTO as a scandal.<sup>21</sup> It stifles the ability of many developing countries to profit from what tend to be some of their major exports and industries where they have the largest comparative advantages.

The fact that trade in capital-intensive commodities has been liberalised, however, should be seen as a major achievement of the GATT/WTO. There is a substantial literature which shows that research and development in industrialised economies has had a significant impact on productivity and growth not only in other developed countries but also in developing countries.<sup>22</sup> The argument is that imported capital-intensive commodities embody a significant amount of knowledge that would be extremely costly for developing countries to reproduce. Coe *et al.* (1997, p. 148) estimate that the total spillover effects from R&D performed in industrial countries might have increased output in developing countries by US\$ 22 billion in 1990 alone. To the extent that the GATT/WTO has encouraged trade in capital-intensive commodities, it appears that developing countries have derived substantial benefits from their membership. The hope remains that in future developing countries will be able to derive similar benefits from trade in other types of commodities.

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<sup>20</sup> For example, more than half, i.e. 27, of the 46 economies included in our data set are listed by Martin (2003) as having a share of manufactures in total merchandise exports above the world average (11 of them are Asian economies).

<sup>21</sup> Wolf (2004), p. 212-6.

<sup>22</sup> See, for example, the survey by Mohnen (2001).

## APPENDIX TABLES:

**Table A1: Countries in the NAPES Database and the first year of coverage**

Country	Year	WTO	Country	Year	WTO	Country	Year	WTO
Australia	1965	1948	Hungary	1965	1973	Papua New Guinea	1965	1994
Austria	1965	1951	Iceland	1965	1968	Philippines	1965	1979
Bangladesh	1969	1972	India	1965	1948	Poland	1965	1967
Belgium-Luxembourg	1965	1948	Indonesia	1965	1950	Portugal	1965	1962
Brunei	1965	1993	Ireland	1965	1967	Singapore	1965	1973
Cambodia	1965		Italy	1965	1950	Spain	1965	1963
Canada	1965	1948	Japan	1965	1955	Sri Lanka	1965	1948
Chile	1965	1949	Korea	1965	1967	Sweden	1965	1950
China	1965	2001	Laos	1965		Switzerland	1965	1966
Czech Republic	1993	1993	Malaysia	1965	1957	Thailand	1965	1982
Denmark	1965	1950	Mexico	1965	1986	Taiwan	1965	
Finland	1965	1950	New Zealand	1965	1948	Turkey	1965	1951
France	1965	1948	Netherlands	1965	1948	UK	1965	1948
Germany	1965	1951	Norway	1965	1948	USA	1965	1948
Greece	1965	1950	Pakistan	1965	1948	Vietnam	1975	
Hong Kong	1965	1986						

Source: <http://napes.anu.edu.au>

**Table A2: Definitions of NAPES factor intensity commodity aggregates**

**Agriculture Intensive**

0 Food and Live Animals	24 Wood Lumber and Cork
1 Beverages and Tobacco	25 Pulp and Waste Paper
4 Animal, Vegetable Oil, Fat	26 Textile Fibres
21 Hides, Skins, Furs Undressed	29 Crude Animal, Veg Materials NES
22 Oil Seeds, Nuts, Kernels	61 Leather, Dressed Fur, etc
23 Rubber Crude, Synthetic	63 Wood, Cork Manufactures NES

**Labour Intensive**

65 Textile, Yarn, Fabric, etc	84 Clothing
664 Glass	85 Footwear
665 Glassware	893 Articles of Plastic NES
666 Pottery	894 Toys, Sporting Goods, etc
735 Ships and Boats	895 Office Supplies NES
81 Plumbing, Heating, Lighting Equip	899 Other Manufactured Goods
82 Furniture	951 War Firearms, Ammunition
83 Travel Goods, Handbags	

**Minerals Intensive**

27 Crude Fertilizer, Minerals NES	663 Other Non-Metal Mineral Manufactures
28 Metalliferous Ores, Scrap	667 Pearl, (Semi-)Precious Stone
3 Mineral Fuels	671 Pig Iron etc
661 Cement etc Building Products	68 Non-Ferrous Metals

**Capital Intensive**

5 Chemicals	723 Elec. Distributing Machine
62 Rubber Manufactures NES	724 Telecommunications Equipment
64 Paper, Paperboard & Manufactures	725 Domestic Electric Equipment
672 Iron & Steel Primary Forms	726 Electro Medical, X-ray Equipment
673 Iron & Steel Shapes	729 Electrical Machinery NES
674 Iron & Steel Universals, Plate, Sheet	731 Railway Vehicles
675 Iron & Steel Hoop, Strip	732 Road Motor Vehicles
676 Iron & Steel Railway Rails etc	733 Road Vehicles Non-Motor
677 Iron & Steel Wire excl Wire Rod	734 Aircraft
678 Iron & Steel Tubes, Pipes, etc	86 Instruments, Watches, Clocks
679 Iron & Steel Castings Unworked	891 Sound Recorders, Producers
69 Metal Manufactures NES	892 Printed Matter
71 Machinery, Non-Electric	896 Works of Art etc
722 Elec. Power Machine, Switchgear	897 Gold, Silver Ware, Jewellery

Source: <http://napes.anu.edu.au>

**Table A3: Comparison of Rose's and our baseline regression and main regression estimates for trade in capital-intensive commodity aggregates.**

Regression:	All trade		Trade in capital-intensive commodities		
	(1) Rose's baseline regression	(2) Our baseline regression	(3) Model 1	(4) Model 2	(5) Model 3
One in GATT/WTO	-0.06 (0.05)	-0.02 (0.31)	-0.03 (0.31)	0.28 (0.24)	<b>0.43</b> <b>(0.21)</b>
Both in GATT/WTO	-0.04 (0.05)	0.02 (0.32)	-0.11 (0.32)	<b>0.49</b> <b>(0.23)</b>	<b>0.59</b> <b>(0.21)</b>
GSP	<b>0.86</b> <b>(0.03)</b>	<b>0.37</b> <b>(0.07)</b>	<b>0.62</b> <b>(0.08)</b>	<b>0.50</b> <b>(0.06)</b>	-0.02 (0.06)
ln D	-1.12 (0.02)	-0.93 (0.04)	-1.07 (0.05)	-1.19 (0.05)	-1.14 (0.06)
ln (YY)	0.92 (0.01)	0.92 (0.02)	1.08 (0.03)	1.23 (0.18)	1.10 (0.05)
ln (YY/PopPop)	0.32 (0.01)	0.76 (0.03)	0.98 (0.04)	0.09 (0.21)	0.41 (0.07)
Lang	0.31 (0.04)	0.52 (0.08)	0.55 (0.10)	0.16 (0.12)	0.81 (0.13)
Cont	0.53 (0.11)	0.10 (0.23)	-0.09 (0.26)	-0.41 (0.23)	-0.16 (0.26)
Landl	-0.27 (0.03)	-0.54 (0.08)	-0.12 (0.09)	-4.92 (1.55)	-0.15 (0.12)
Island	0.04 (0.04)	0.37 (0.07)	0.29 (0.08)	-25.82 (7.20)	0.38 (0.11)
ln (AreaArea)	-0.10 (0.01)	-0.16 (0.02)	-0.20 (0.02)	-4.85 (1.16)	-0.25 (0.03)
ComCol	0.58 (0.07)	1.15 (0.32)	0.90 (0.35)	0.31 (0.26)	-0.32 (0.47)
CurCol	1.08 (0.23)	0.70 (0.75)	0.51 (1.02)	0.45 (0.69)	0.47 (0.08)
Colony	1.16 (0.12)	0.68 (0.22)	0.79 (0.27)	1.20 (0.24)	0.90 (0.31)
ComNat	-0.02 (1.08)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
CU	1.12 (0.12)	0.92 (0.70)	0.88 (0.75)	0.72 (0.56)	0.78 (0.23)
FTA	1.20 (0.11)	-0.07 (0.10)	-0.15 (0.13)	-0.11 (0.12)	0.15 (0.06)
Observations	234,597	26,976	23,952	25,355	25,355
R <sup>2</sup>	0.65	0.84	0.66	0.88	0.80

Notes: The regressand is log real trade. Intercepts are not reported. Robust standard errors (clustering by country-pairs) are in parentheses.

Rose's 'baseline' regression is taken from Rose (2004, Table 1, 'default' regression', p. 104). Our baseline regression was estimated using OLS. 32 year fixed-effects dummies are also included (but not reported). Model 1: OLS with 32 year fixed-effects dummies (not reported). Model 2: OLS with 32 time fixed-effects dummies and 45 country fixed-effects dummies (not reported). Model 3: ARMA (1,1) model with 32 year fixed-effects dummies (not reported).



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