4

Empirical Results

Aid for Trade and the costs of trading

Principal results

Table 4.1 presents the estimation results of the equation for costs of trading (exporting first) in 2008. We focus on this variable because it has an obvious relation to trade, but it is straightforward from a statistical point of view to examine some other indicators as well. The costs of trading variables are not particularly suitable for constructing time series due to data availability, so we focus on one year. We estimate equation (1) for a cross-section of around 120 developing countries.

There are a number of important findings. Aid to productive capacities (*Atpr*) has a mildly negative effect on the costs of exporting, but is not significant when it is used in a parsimonious specification with only the total size of the economy as a control (column 1). The results are not in line with expectations, but they are not surprising given the way the cost index is constructed. The index includes the official costs for transport from the factory to the point of departure. These are likely to be much larger for a factory situated in a landlocked country. The small effect of *Atpr* on that specification is probably because of omitted variable bias, as its coefficient becomes larger and highly significant (at the 1 per cent level) when other important variables relating to costs of exporting are added (column 2). These include a good governance indicator, which reduces costs of exporting, income per capita, which reduces costs of X, although it is not significant, and a dummy for being landlocked, which significantly increases the cost of exporting.

The coefficient of the size of the economy remains negative, but becomes insignificant in column 2. This suggests that the cost-reducing effect recorded in column 1 was probably due to that variable capturing a negative effect of income per capita (which is an indicator of better governance indicators). The cost reduction associated with an increase of 1 per cent in *Atpr* is considerable at around 0.136 per cent of the costs of exporting. Put differently, an increase of US$15,000 in *Atpr* (from the mean of US$1.48 million) is associated with a reduction of US$1.80 (from the mean of US$1324) in the costs of packing goods and loading them into a 20-foot container, transporting them to the port of departure and loading them on the vessel or truck.

The results for column 2 may be biased due to reverse causality if, for example, more efficient procedures for handling exports lead to countries receiving more *Atpr*.[9] To deal with this issue, we include in the regression the costs of exporting index lagged one year (for 2007) (see column 3). The coefficient of *Atpr* remains highly significant to this addition and it is the only variable which does not experience a reduction in its level of significance. These results are also robust to the restriction of the sample to countries for

Table 4.1. Explaining costs of exports (1n of US$ per container in 2008)

Sample	(1) All	(2) All	(3) All	(4) *Tpr*06>0	(5) All	(6) All	(7) Africa	(8) Africa	(9) All
Aid for trade policy and regulation									
Log(1+*TPR*)$_{2006}$	–0.062	–0.136	–0.089	–0.109	–0.080	–0.085	–0.072	–0.040	
	(1.01)	(2.83)[c]	(2.60)[b]	(2.82)[c]	(1.90)[a]	(1.76)[a]	(2.11)[b]	(0.75)	
Log(1+avg *TPR*)$_{2005–06}$									–0.075
									(2.33)[b]
Log GDP$_{2006}$	–0.053	–0.013	0.017	0.025	0.016	0.018	0.005	0.002	0.015
	(2.53)[b]	(0.63)	(1.52)	(1.75)[a]	(1.38)	(1.34)	(0.25)	(0.12)	(1.32)
Governance$_{2006}$		–0.173	–0.062	–0.070	–0.063	–0.063	0.014	0.004	–0.067
		(2.29)[b]	(1.18)	(1.09)	(1.21)	(1.27)	(0.42)	(0.11)	(1.26)
Log GNI per capita$_{2004}$		–0.040	–0.004	–0.005	–0.002	–0.005	–0.042	–0.033	0.002
		(0.94)	(0.14)	(0.17)	(0.07)	(0.22)	(1.57)	(1.05)	(0.09)
Landlocked		0.489	0.090	0.116	0.090	0.100	0.109	0.112	0.097
		(5.19)[c]	(1.88)[a]	(1.83)[a]	(1.87)[a]	(1.70)	(1.01)	(1.02)	(1.93)[a]
Log (*X* cost)$_{2007}$			0.837	0.816	0.839	0.830	0.878	0.881	0.841
			(13.90)[c]	(11.11)[c]	(13.59)[c]	(11.79)[c]	(8.62)[c]	(8.45)[c]	(14.07)[c]
Egypt					–0.120	–0.110		–0.201	
					(1.04)	(0.81)		(1.30)	
Asia						–0.028			
						(0.71)			
America						0.024			
						(0.40)			
Europe						–0.050			
						(0.50)			
Constant	7.208	7.255	1.143	1.295	1.114	1.202	1.152	1.057	1.072

Table 4.1 (continued)

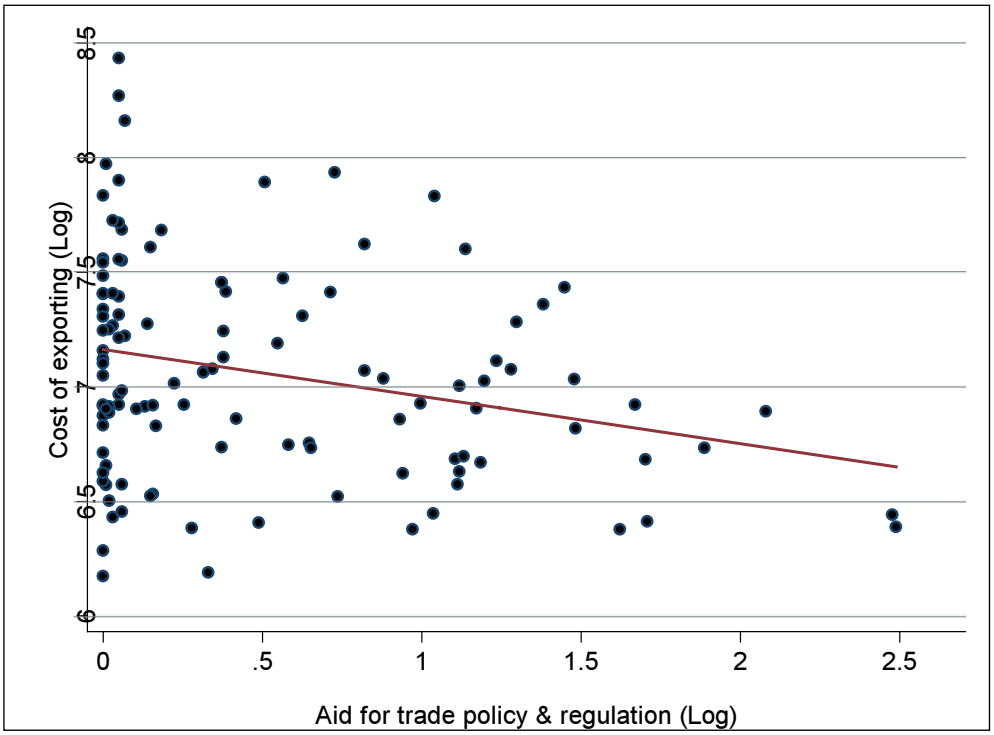
Sample	(1) All	(2) All	(3) All	(4) *Tpr*06>0	(5) All	(6) All	(7) Africa	(8) Africa	(9) All
Observations	129	120	119	97	119	119	49	49	119
R-squared	0.07	0.42	0.86	0.85	0.86	0.86	0.90	0.90	0.86

Robust t-statistics in parentheses; [a]significant at 10 per cent; [b]significant at 5 per cent; [c]significant at 1 per cent; dependent variable is $1n(1+\text{cost of exporting})_{2008}$.

which a positive value of *Atpr* is reported (column 4). This robustness check is important to verify that results are not driven by potential misreporting. That would be the case if, for instance, countries which appear not to have received any *Atpr* are in fact just non-reporting countries. The cost-reducing effect of *Atpr* holds also when a dummy for Egypt (by far the largest *Atpr* recipient in our sample) is included, and dummies for the main continents (columns 5 and 6).[10] The effect of *Atpr* in Africa is slightly lower than for the whole sample (column 7), and it appears to be mainly driven by Egypt (column 8). If Egypt is included as an additional variable, *Atpr* does not have a significant effect. This calls for a closer evaluation of the effects of this type of aid on African countries. Finally, the results are robust to the use of the average value of *Atpr* between 2005 and 2006, to excluding the possibility that cross-country year-to-year fluctuations of aid are not driving the findings (column 9). The high values of R-squared for columns 3–9 suggest that these regressions are well specified, explaining up to 86 per cent of the cross-country variability in the changes of the costs of exporting.

Figure 4.1 suggests that the negative relationship found in the regressions is not due to the presence of outliers or influential observations (Egypt is excluded from the picture).

Figure 4.1. Conditional relation between costs of exporting and *Atpr*



The relationship shown in the graph is conditional on the control variables found in Table 4.1 (column 6)

Costs of importing, and time of exporting and importing

We carried out additional tests to check whether our findings are robust to the use of other dependent variables as well as to other main regressors. Table 4.2 presents the results. The results of Table 4.1 hold when using costs of importing (rather than exporting) as the dependent variable (columns 1 and 2), and the coefficient of *Atpr* is very similar (only slightly smaller) than that of Table 4.1.

Higher *Atpr* is associated with decreases in the time taken to export goods (column 3). The results in column 4, where a control for the number of documents is added, suggest that this result is not driven by a lower number of documents to be processed. These results for time (to export) do not to apply to the same extent to dynamic specifications. Adding the time taken for exporting in 2007 (column 5) makes the coefficient of *Atpr* insignificant and reduces its value substantially (although it is still negative). This suggests that *Atpr* does not significantly affect changes in time to export, which is rather explained by other control variables, such as governance, the size of the economy and being landlocked. This case is confirmed in the case of Africa (column 6).

The negative effect of AfT on the costs of exporting is confirmed by the use of aid for trade facilitation (*Atf* a sub-category) in place of *Atpr*. Unlike the latter, this variable has a non-linear U-shaped relationship with the costs of exporting (as suggested by the difference in the coefficient's significance between column 7 and 8). This implies that *Atf* reduces the cost at a diminishing rate up to a trough, after which it even increases it. This is consistent with the idea of diminishing returns to aid already found by other studies (e.g. Hansen and Tarp, 2001; Clemens et al., 2004). This relationship is robust to restricting the sample to those countries which report positive levels of *Atpr* (column 9), but not when using the time of exports as the dependent variable (column 10). In the latter case the relation appears negative and linear, although not significant.[11]

Table 4.2. The effects of Aid for Trade on other trade cost variables

Dep var.	(1) Log (M cost)$_{2008}$	(2) Log (M cost)$_{2008}$	(3) Log (X time)$_{2008}$	(4) Log (X time)$_{2008}$	(5) Log (X time)$_{2008}$	(6) Log (X time)$_{2008}$	(7) Log (X cost)$_{2008}$	(8) Log (X cost)$_{2008}$	(9) Log (X cost)$_{2008}$	(10) Log (X time)$_{2008}$
Sample	**All**	**All**	**All**	**All**	**All**	**Africa**	**All**	**All**	***Tpr*06>0**	**All**
Aid for trade policy and regulations										
Log (1+*Atpr*)$_{2006}$	–0.074	–0.078	–0.088	–0.082	–0.019	–0.014				
	(2.67)[c]	(2.54)[b]	(2.13)[b]	(2.02)[b]	(0.79)	(0.53)				
Aid for trade facilitation (narrow)										
Log (1 + *Atf*)$_{2006}$							–0.009	–0.047	–0.076	–0.010
							(0.87)	(1.68)[a]	(1.96)[a]	(1.42)
Log (1 + *Atf*)$_{2006}$ sq.								0.004	0.006	
								(1.60)	(1.99)[b]	
Log GDP$_{2006}$	0.011	0.012	0.015	0.011	–0.016	–0.007	0.008	0.010	0.021	–0.013
	(1.10)	(1.12)	(0.93)	(0.71)	(1.87)[a]	(0.63)	(0.74)	(0.92)	(1.35)	(1.73)[a]
Governance$_{2006}$	–0.045	–0.044	–0.160	–0.131	–0.063	–0.045	–0.075	–0.076	–0.084	–0.065
	(1.27)	(1.30)	(2.70)[c]	(2.20)[b]	(2.22)[b]	(1.22)	(1.26)	(1.27)	(1.20)	(2.00)[b]
Log GNI per capita$_{2004}$	–0.003	–0.005	–0.092	–0.089	0.037	0.007	0.009	0.007	0.007	0.032
	(0.20)	(0.36)	(2.53)[b]	(2.46)[b]	(1.90)	(0.63)	(0.36)	(0.26)	(0.22)	(1.53)
Landlocked	0.062	0.070	0.484	0.448	0.108	0.069	0.117	0.126	0.138	0.115
	(2.38)[b]	(2.38)[b]	(6.20)[c]	(5.64)[c]	(2.98)[c]	(1.49)	(1.76)[a]	(1.83)	(1.62)	(3.10)[c]
Log (M Cost)$_{2007}$	0.911	0.904								
	(29.63)[c]	(26.54)[c]								
Log (X time)$_{2007}$					0.851	0.881				0.851
					(14.30)[c]	(13.27)[c]				(13.96)[c]
Log (X Cost)$_{2007}$							0.836	0.833	0.815	
							(11.94)[c]	(11.76)[c]	(9.26)[c]	

Table 4.2 (continued)

Dep var.	**(1) Log (M cost)$_{2008}$**	**(2) Log (M cost)$_{2008}$**	**(3) Log (X time)$_{2008}$**	**(4) Log (X time)$_{2008}$**	**(5) Log (X time)$_{2008}$**	**(6) Log (X time)$_{2008}$**	**(7) Log (X cost)$_{2008}$**	**(8) Log (X cost)$_{2008}$**	**(9) Log (X cost)$_{2008}$**	**(10) Log (X time)$_{2008}$**
Sample	**All**	**All**	**All**	**All**	**All**	**Africa**	**All**	**All**	**Tpr06>0**	**All**
Log (*X* Docs)$_{2007}$				0.271	0.064	0.130				0.061
				((2.14)[b]	(1.19)	(1.52)				(1.13)
Asia		–0.011	0.056	0.048	0.003		–0.019	–0.016	–0.015	0.017
		(0.38)	(0.84)	(0.75)	(0.13)		(0.52)	(0.44)	(0.34)	(0.61)
America		0.012	–0.087	–0.073	–0.023		0.021	0.031	0.012	–0.012
		(0.25)	(0.99)	(0.87)	(0.55)		(0.34)	(0.53)	(0.18)	(0.29)
Europe		–0.041	–0.460	–0.428	–0.089		–0.000	–0.036	0.069	–0.080
		(0.56)	(2.39)[b]	(2.16)[b]	(1.26)		(0.00)	(0.32)	(0.30)	(1.05)
Egypt						–0.292			–0.358	
						(3.05)[c]			(8.18)[c]	
Constant	0.637	0.698	3.791	3.255	0.083	0.053	1.061	1.172	1.356	0.139
Observations	119	119	120	120	119	49	118	118	97	118
R-squared	0.93	0.94	0.61	0.63	0.93	0.96	0.85	0.85	0.85	0.93

Robust t-statistics in parentheses; [a]significant at 10 per cent; [b]significant at 5 per cent; [c]significant at 1 per cent.

Aid for Trade and exports

Macro analysis

We use a standard export demand equation as in equation (2), where the volume of exports depends on relative prices and the demand for exports. We proxy these two variables through the Real Effective Exchange Rate (REER) and world GDP, respectively. We employ two aid measures: aid to economic infrastructure and aid to productive capacities.

Table 4.3 presents the results of the analysis. Aid for productive capacity (*Apc*) has an insignificant effect on real exports (column 1), while world demand is highly and positively related to real exports and REER has the expected negative sign but is not significant (column 1). When we re-run the same regression using year effects, the coefficient on aid for productive capacity becomes more negative and mildly significant, while the coefficient for REER is insignificant (column 2).

This negative result for *Apc* is driven by the restricted sample we are using (44 developing countries), which is constrained by the availability of REER data. Given the insignificance of the REER coefficient (which is also orthogonal to the aid variable), we drop it, and the *Apc* coefficient then becomes insignificant (column 3).

The effect of restricting the sample to countries for which REER data are available is even more distorting when we use aid to economic infrastructure (*Ainf*). With this restricted sample, this variable exerts an insignificant effect on exports (column 4); this positive effect becomes much larger (and the coefficient highly significant) when we use the full sample (column 5).

The impact of *Ainf* on exports appears to be highly non-linear U-shaped (column 6). This type of relationship is confirmed when both aid variables are included (column 7). In this case, *Apc* appears to exert a negative and significant impact on real exports, while *Ainf* has a negative and then a highly positive effect on exports. The latter effect may be explained through the lumpiness of the investment in economic infrastructure. If this investment is insufficient, the infrastructure would not reduce export prices and thus stimulate exports.

It is more difficult to explain the negative coefficient of *Apc*. It is possible that this effect is driven by omitted variable bias due to unobserved time varying heterogeneity across countries (e.g. specific country shocks) or by problems with the identification strategy, i.e. *Apc* has mainly sectoral effects and considering its impact on the whole of exports may be misleading. Of course it could also be the case that this type of aid is not actually spent effectively and actually harms exports via Dutch Disease type effects by subsidising inefficient production within the country.

The positive effects of aid to infrastructure are clearer for non-African countries than for African countries. These results are robust to the exclusion of country-year pairs for which a value of zero for both types of aid is reported (column 8). These effects appear to be magnified when world demand is higher (negative and significant effect for the interaction between *Apc* and world demand and positive and significant effect for the interaction between *Apc* and world demand (column 9)). Finally, the results for Africa

Table 4.3. Real exports and Aid for Trade (1984–2006)

Sample	(1) REER available	(2) REER available	(3) All	(4) REER available	(5) All	(6) All	(7) All	(8) *Ai* and *Apc*>0	(9) All	(10) Africa
Aid for productive capacities										
Log $(1+Apc)_{t-1}$	–0.025	–0.038	–0.007				–0.038	–0.049	0.354	–0.041
	(1.31)	(1.77)[a]	(0.54)				(2.74)[c]	(4.07)[c]	(2.13)[b]	(1.39)
Aid for infrastructure										
Log $(1+Ainfra)_{t-1}$				0.033	0.059	–0.131	–0.120	–0.169	–0.129	–0.121
				(1.35)	(4.00)[c]	(3.75)[c]	(3.34)[c]	(3.99)[c]	(3.96)[c]	(1.21)
Log $(1+Ainfra)_{t-1}$ sq.						0.035	0.035	0.026	–0.026	0.044
						(6.40)[c]	(6.55)[c]	(4.24)[c]	(0.81)	(1.86)[a]
Log REER	–0.017	–0.024		–0.012						
	(0.26)	(0.31)		(0.16)						
Log World GDP	1.242									
	(16.44)[c]									
Log $(1+Apc)_{t-1}$ x world GDP									–0.070	
									(2.29)[b]	
Log $(1+Ainfra)_{t-1}$ x world GDP									0.010	
									(1.87)[a]	
Constant	–2.670	4.922	4.261	4.696	4.144	4.225	4.190	5.247	2.864	3.514
Year effects	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	466	497	1468	497	1468	1468	1468	457	1009	350
Number of countries	44	44	82	44	82	82	82	43	81	26
R-squared	0.48	0.49	0.53	0.49	0.54	0.55	0.55	0.71	0.59	0.47

Robust t-statistics in parentheses; [a]significant at 10 per cent; [b]significant at 5 per cent; [c]significant at 1 per cent

are qualitatively in line with those of the whole sample but less robust (column 10). The most important findings are that different types of aid can have different effects and that these vary across regions.

Sectoral analysis

The surprising impact of *Apc* on exports suggests problems in the type of specification used to estimate the equations in Table 4.3. In order to deal with these issues, we adopt the specifications based on equation (3), analysing the impact of sectoral aid on sectoral exports. We study how the inter-sectoral, as well as intra-sectoral (over time), variation in aid and exports is related, using data from four sectors: food production, manufacturing, mineral extraction and tourism.

The results are clear and show a robust, positive and non-linear effect of *Apc* on exports. In line with the results shown in Table 4.2, as well as with other findings on the impact of aid on growth (e.g. Hansen and Tarp, 2001; Clemens et al., 2004), this relationship has the shape of an inverted U. Aid has a positive impact on exports at a diminishing rate.

These results are robust to a variety of specifications, control variables and sampling strategies. Tables 4.4 and 4.5 show that they are robust to the inclusion of country and sector-year fixed effects (columns 1–3), country-year fixed effects only (column 4) and both country-year and sector-year fixed effects (columns 5–13). They are also robust to using different types of samples: including only observations with positive values of *Apc*; including all observations (columns 7 and 8); and including only years after 1990 (columns 6 and 7). The power of the results also holds when including a lagged change in export variables (which has a highly negative association with the dependent variable). This controls for a potential source of endogeneity in aid allocation, as discussed above. Moreover, *Apc* also has a positive (although only at 10 per cent) impact on the rate of export growth (column 11, where a lagged export variable is included). The effect of *Apc* is around 50 per cent larger when country-year fixed effects are included, instead of only country effects (see columns 1 and 5), confirming that time varying country-specific effects (e.g. policies, shocks and state of the economy) play an important conditioning role in determining the impact of aid on exports.

There are a number of other interesting findings from the regressions reported in Tables 4.4 and 4.5. First, aid to economic infrastructure appears to exert a positive and significant effect on exports (columns 2–3). Such an effect is linear, unlike that found in regression (2) and reported in Table 4.3.[12] Moreover, *Ainf* appears to interact with *Apc* in affecting exports in a non-linear way (columns 10 and 12). *Apc* has a smaller positive impact for higher levels of *Ainf*, although the effect of this interaction changes as *Apc* increases, becoming positive for high levels of *Apc*. This suggests that positive complementarities between these two types of aid tend to emerge for relatively large amounts of *Apc*. Such complementarities appear to be positive in the case of landlocked economies (column 12).

Table 4.4. Sectoral exports and sectoral aid for productive capacity (1985–2006)

Sample	(1) *Apc*>0	(2) *Apc*>0	(3) *Apc*>0	(4) *Apc*>0	(5) *Apc*>0	(6) *Apc*>0 and post-1990	(7) post-1990
Aid for productive capacities							
Log $(1+Apc)_{t-1}$	0.446	0.438	0.423	0.624	0.658	0.710	0.629
	(7.93)[c]	(7.75)[c]	(8.58)[c]	(8.23)[c]	(8.21)[c]	(8.62)[c]	(8.72)[c]
Log $(1+Apc)_{t-1}$ sq.	–0.049	-0.048	-0.050	-0.071	-0.073	-0.078	-0.090
	(4.14)[c]	(4.09)[c]	(4.72)[c]	(4.38)[c]	(4.28)[c]	(4.58)[c]	(5.67)[c]
Aid for infrastructure		0.055	0.035				
Log $(1+Ainf)_{t-1}$		(2.74)[c]	(1.75)[a]				
Manufacturing				0.646			
				(11.11)[c]			
Minerals				–1.120			
				(9.68)[c]			
Tourism				0.561			
				(5.73)[c]			
Δ Export$_{t-1}$			–0.030				
			(6.02)[c]				
Country effects	YES	YES	YES				
Country-year effects	NO	NO	NO	YES	YES	YES	YES
Sector-year effects	YES	YES	YES	NO	YES	YES	YES
Constant	16.701	16.659	17.958	19.129	18.549	18.494	18.721
Observations	3647	3595	3167	3647	3647	3340	6176
R-squared	0.79	0.79	0.81	0.84	0.84	0.83	0.79

Robust t-statistics in parentheses; [a]significant at 10 per cent; [b]significant at 5 per cent; [c]significant at 1 per cent; dependent variable is log of export value (in current US$).

The effects of *Apc* are relatively more important in supporting exports in mining and manufacturing than in tourism and agriculture (column 13). This suggests that the more capital-intensive sectors (such as mining and manufacturing) are also the ones where the lack of domestic resources has been most penalising in developing countries. Aid can thus play a role helping to move the comparative advantage of (certain) developing countries away from non-capital intensive sectors.

Table 4.5. Sectoral exports and aid for productive capacity, developing countries (1985–2006)

Sample	(8) All	(9) *Apc* > 0	(10) *Apc* > 0	(11) *Apc* > 0	(12) *Apc* > 0	(13) *Apc* > 0
Aid for productive capacities						
Log $(1 + Apc)_{t-1}$	0.492	0.622	0.976	0.033	0.614	0.480
	(7.16)[c]	(8.55)[c]	(5.77)[c]	(1.89)[a]	(3.74)[c]	(2.78)[c]
Log $(1 + Apc)_{t-1}$ sq.	–0.068	–0.072	–0.156		–0.167	–0.060
	(4.47)[c]	(4.54)[c]	(3.39)[c]		(3.87)[c]	(1.34)
Δ Export$_{t-1}$		–0.038			–0.038	
		(6.10)[c]			(5.93)[c]	
$(Apc \times Ainf)_{t-1}$			–0.081	–0.006	–0.076	–0.034
			(2.31)[b]	(0.99)	(2.32)[b]	(1.00)
$(Apc$ sq. $\times Ainf)_{t-1}$			0.020	0.000	0.023	–0.004
			(2.31)[b]	(0.53)	(2.88)[c]	(0.51)
Log $(export)_{t-1}$				0.948		
				(62.50)[c]		
Apc x *Ainf* x landlocked					0.069	
					(3.65)[c]	
Apc x America					0.381	
					(4.02)[c]	
Apc x Asia and Oceania					0.201	
					(2.07)[b]	
Apc x Africa					0.280	
					(2.84)[c]	
Apc x Mineral						0.436
						(4.13)[c]
Apc x Manufacturing						0.380
						(8.18)[c]
Apc x Tourism						–0.060
						(0.57)
Country-year effects	YES	YES	YES	YES	YES	YES
Sector-year effects	YES	YES	YES	YES	YES	YES
Constant	18.220	18.807	18.931	1.095	18.820	19.176
Observations	9963	3216	3595	3375	3167	3595
R-squared	0.77	0.85	0.84	0.98	0.85	0.84

Robust t-statistics in parentheses; [a]significant at 10 per cent; [b]significant at 5 per cent; [c]significant at 1 per cent; dependent variable is log of export value (in current US$).