

Austerity and Exports

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Abstract

Recent papers have focused attention on the potential for expansionary austerity (i.e. that cutting budget deficits may increase growth in the short run). In this paper we investigate the impact of fiscal consolidation on trade using bilateral trade data. The use of bilateral trade data allows us to demonstrate three novel empirical results. First, while fiscal consolidation is associated with an increase in own-country exports, it is also correlated to an equal extent with a decrease in foreign-country exports (i.e. imports); indeed, simultaneous austerity has no statistically significant impact on bilateral trade. Second, the positive effect of austerity on exports disappears when trading partners share a common currency. Third, the increase in exports as a result of austerity is associated entirely with an increase in the range of goods exported (the extensive margin), at the expense of trade volume among existing trade relationships (the intensive margin).

1. Introduction

The recent worldwide financial crisis, coupled with the plight of European economies such as Greece and Spain, has strengthened interest in the effects of changes in a government's fiscal policy stance. Much attention has focused on the potential for "expansionary austerity": the idea that cutting budget deficits can stimulate the economy in the short run (typically by increasing business confidence and reducing uncertainty about future fiscal actions). Indeed, an extensive literature analyzes the effects of fiscal consolidation on the macroeconomic environment.¹ One of the most influential papers (Alesina and Ardagna, 2010), uses a statistical approach (an increase in the cyclically adjusted budget surplus) to identify episodes of fiscal consolidation for a sample of 21 advanced countries for the years 1970–2007. They find that episodes of fiscal consolidation are often associated with no decrease in growth and sometimes result in subsequent economic expansions (especially when those episodes involve spending cuts). Such work on the potential for "expansionary austerity" has motivated a follow-up literature, including the companion papers by International Monetary Fund (IMF) researchers Guajardo et al. (2014) and Devries et al. (2011).² These papers use a narrative-based approach to identify episodes of fiscal consolidation based on identifying fiscal policy actions that are intended to reduce the budget deficit. Using a dataset of 17 advanced countries for the years 1978–2009, they find, in contrast to Alesina and Ardagna (2010), that episodes of fiscal consolidation typically have a contractionary effect on output in the short term. However, the IMF papers do find one measure by which their episodes of fiscal consolidation are expansionary: net exports. They find that episodes of budget-

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cutting are typically followed by an improvement in the trade balance. It is this link between fiscal consolidation and trade that we investigate in this paper.

However, in contrast to the previous literature that uses aggregate trade data, in this paper we use bilateral trade data, which allows us to demonstrate three novel empirical results. First, we show that, while fiscal consolidation is associated with an increase in own-country exports, it is also correlated to an equal extent with a decrease in foreign-country exports (own-country imports). Using bilateral export data for the Alesina and Ardagna (2010) set of fiscal consolidation events (which covers 21 advanced countries over the years 1970–2007) and a standard gravity specification, we find that a fiscal consolidation episode in the exporting country is associated with a subsequent increase in the volume of exports of approximately 11.3%.³ Next, we augment our gravity specification by allowing bilateral trade flows to depend on fiscal consolidation in both the exporting and importing countries. As before, fiscal consolidation by the exporter increases export volume (by 7.8% over the three years following consolidation); however, there is also evidence of a spillover effect, in that fiscal consolidation by the *importing* country reduces foreign exports by a similar magnitude (a cumulative decrease of 9.2% over the three years following consolidation). Combining these two effects, we find that simultaneous austerity by both the exporting and importing country fails to have a significant impact on export volume. In addition, we show that this pattern is robust, as it also occurs in the IMF sample (with a different time period, different sample of countries, and perhaps most importantly, a different approach to identifying episodes of fiscal consolidation).

Second, we find that the positive effect of austerity on exports disappears when trading partners share a common currency. The IMF studies provide some evidence that episodes of fiscal consolidation (as identified by their narrative method) typically result in currency depreciation, indicating that the exchange rate is an important mechanism through which austerity affects trade.⁴ From this, they argue that fiscal consolidation may have less of an impact on exports when the trading partners share a common currency.⁵ Using bilateral trade data and our gravity specification we verify that this argument is correct: we show that, while fiscal consolidation (as defined by Alesina and Ardagna) has a strong positive impact on own-country exports in trade between countries with independent currencies, it has no significant impact on export volume between countries that share a currency. Again, we show that this pattern is robust to using the IMF sample.

Finally, we show that any increase in exports is associated entirely with an increase in the range of goods exported (the extensive margin), at the expense of trade volume in existing trade relationships (the intensive margin). It is possible that our previous focus on aggregate bilateral trade flows masks an underlying connection between fiscal consolidation and export decisions. If standard justifications for austerity are valid (that they spur business investment by reducing interest rates and increasing confidence), then it would seem such episodes should have a stronger impact on the extensive margin of trade (i.e. the number of trade relationships) relative to the intensive margin (i.e. the amount of trade in existing trade relationships). This differential effect is due to the well-known fact that opening a new export market requires substantial investment.⁶ Looking at the Alesina and Ardagna (2010) sample of consolidation events, we find the predicted differential impact: fiscal consolidation generates a strong positive increase in the extensive margin (i.e. it results in the exporting country increasing the number of products in exports to each trading partner) while decreasing the intensive margin (i.e. export volume in existing trade relations actually decreases). Thus, fiscal consolidation is associated with a significant reallocation in which countries enter new export markets at the expense of existing trade relations. Notably, this differential impact occurs both

in trade between countries with independent currencies and in trade between countries sharing a common currency, which implies that it is not due simply to exchange rate changes. In addition, as before, we find that this differential impact is robust to the IMF's alternative strategy for identifying episodes of austerity.

These results have implications, not just for current arguments over the economic merits of austerity, but also for a long-running literature on the “twin-deficits” hypothesis: whether an increase in the government budget deficit generates an increase in the current account deficit. As discussed previously, the IMF (Guajardo et al., 2014) found that episodes of fiscal consolidation led to an increase in net exports (i.e. twin-deficit convergence). They follow the statistical methodology of Cerra and Saxena (2008), Romer and Romer (2010), and others in utilizing a vector autoregression (VAR) model in which growth rates of real gross domestic product (GDP) (alternatively net exports, interest rates, etc.) are regressed on current and lagged values of the fiscal consolidation measure as well as lags of the the dependent variable. Indeed, the sizable literature on the twin-deficits hypothesis has commonly utilized the VAR technique, often with mixed results. For example, while Beetsma et al. (2008), Monacelli and Perotti (2010) and Boileau and Normandin (2012) employ VAR techniques to find evidence in favor of the twin-deficits hypothesis, Soyoung and Nouriel (2008) and Müller (2008) find more support for “twin divergence”, where an increase in budget deficits *improves* the trade balance by increasing net exports. VAR techniques are traditionally used in this literature, because the focus is on aggregate macroeconomic variables (e.g. real GDP, the government budget deficit and the current account balance), which are endogenous and linearly interdependent (for example, a common problem is that budget deficits tend to be counter-cyclical while the current account deficit is pro-cyclical). In contrast, we utilize a standard log-linear gravity model of *bilateral* trade to examine the impact of fiscal episodes on international exports. The advantage of the bilateral trade flow approach is that it allows us to directly test some predictions such as whether the effect of fiscal consolidation on trade is less in cases of simultaneous austerity or common currency, as well as allowing for disaggregation to focus on the intensive and extensive margins of trade. In addition, we utilize the fiscal consolidation episodes identified by Alesina and Ardagna (2010) and the IMF reports, since those authors argue that these episodes can plausibly be treated as exogenous fiscal shocks.

The paper proceeds as follows. In section 2, we explore the link between fiscal consolidation and exports and test whether the positive effect of consolidation on exports is lessened either by simultaneous consolidation or currency unions. Next, in section 3, we disaggregate the data to see if fiscal consolidation has a stronger effect on the extensive margin of trade. Section 4 concludes.

2. Data, Methodology and Results

We utilize the standard log-linear gravity model of trade to examine the impact of fiscal episodes on international exports:

$$\ln T_{ijt} = \beta_0 + \sum_{k=0}^{k=3} \beta_k EFC_{it-k} + \sum \alpha_1 Imp_a + \sum \alpha_2 Exp_b + \sum \alpha_3 Year_t + \gamma Z_{ijt} + \epsilon_{ijt} \quad (1)$$

where T_{ijt} denotes the real export value of country i (the exporter) to j (the importer) at time t . EFC_{it-k} is a binary variable, which is unity if a fiscal consolidation episode

occurred in i (the exporter) at time $t - k$, and zero otherwise, where $k=0, 1, 2, 3$. Similar to Alesina and Ardagna (2010) and the IMF (Guajardo et al., 2014), we are interested in the effects of fiscal episodes for up to three years following the end of an event. Following Guajardo et al. (2014), this allows for a delayed impact of fiscal consolidation on exports (their results indicate that the impact of fiscal consolidation usually takes around two years from the start of the episode to fully materialize).

As additional control variables, Imp_a and Exp_b are comprehensive sets of exporter and importer fixed effects that take into account any time-invariant country-specific factors.⁷ $Year_t$ is a year-specific fixed effect included to take into account any common trends or effects (e.g. business cycles, oil price shocks). The row vector Z_{ijt} represents a list of common gravity control variables (or proxies) between the bilateral country pair. It includes the natural log of bilateral distance between the countries, combined population, combined annual real GDP per capita and product of the land areas of the countries, in addition to indicator variables for countries sharing a currency, a common language, a common land border, in a regional trade agreement together, or having a colonial relationship. A complete list and summary statistics are provided in Tables 1 and 2, and definitions are included in the Appendix.

Data

The disaggregated product level export data are based on the four-digit Standard International Trade Classification (SITC), Revision 2, from the World Bank's World Integrated Trade Solution (WITS) database. Within WITS, the data are from the United Nations Statistics Division (UNSD) Comtrade database. GDP per capita and population data are retrieved from World Development Indicators (2012). Data for the control variables are taken from Andrew Rose's website.⁸ The Appendix includes further descriptions of the data and summary statistics are provided in Tables 1 and 2.

We draw on two sources for the identification of fiscal consolidation episodes, Alesina and Ardagna (2010) and what we refer to as "the IMF" (Devries et al., 2011). Alesina and Ardagna (2010) identify such episodes using a statistical technique to identify substantial decreases in the cyclically adjusted budget.⁹ The purpose of the cyclical adjustment is to account for variations of the fiscal variables induced by business cycle fluctuations. They implement a method proposed by Blanchard (1990) to correct components of the government budget for year-to-year changes in the unemployment rate. They argue that these definitions of episodes are based on a demanding criterion that rules out small but prolonged consolidation or stimuli. Hence, these are very sharp and large episodes that clearly indicate a change in the fiscal stance. Their sample is of 21 advanced countries over the years 1970–2007 and their list of fiscal consolidation events is listed in Table 3.

In contrast, the IMF studies use a narrative-based methodology to identify fiscal episodes, citing some limitations in the methodology of Alesina and Ardagna (2010). The authors argue that their definition of fiscal consolidation is more accurate because it is based on policy actions, rather than budget outcomes. A narrative approach is used to identify cases of fiscal consolidation, in which the authors consult numerous sources to determine what policy actions countries actually take. Their sample is 17 advanced countries for the period 1978–2009 and their set of fiscal consolidation episodes are listed in Table 4. In keeping with the Alesina and Ardagna (2010) emphasis on large episodes that clearly indicate changes in fiscal stance, as before we focus on episodes in which the primary balance improves by at least 1.5% of GDP.

Table 1. Gravity Results

	AA		IMF	
	Coef.	(SE)	Coef.	(SE)
<i>Exporter Consolidation t</i> (dummy)	0.013	(0.011)	-0.011	(0.020)
<i>Exporter Consolidation t + 1</i> (dummy)	0.047***	(0.012)	0.058**	(0.025)
<i>Exporter Consolidation t + 2</i> (dummy)	0.038***	(0.012)	0.024	(0.018)
<i>Exporter Consolidation t + 3</i> (dummy)	0.010	(0.011)	-0.015	(0.019)
<i>Log Population</i> (exporter)	0.654*	(0.357)	0.694	(0.490)
<i>Log Population</i> (importer)	1.342***	(0.296)	1.450***	(0.360)
<i>Log GDP per capita</i> (exporter)	1.060***	(0.096)	0.913***	(0.099)
<i>Log GDP per capita</i> (importer)	0.679***	(0.070)	0.624***	(0.085)
<i>Log Distance</i>	-1.143***	(0.068)	-1.121***	(0.099)
<i>Log Product Land Areas</i>	0.225	(0.236)	0.219	(0.353)
<i>Shared Land Border</i> (dummy)	-0.106	(0.119)	0.018	(0.138)
<i>Strict Currency Union</i> (dummy)	0.206***	(0.058)	0.188***	(0.056)
<i>Common Language</i> (dummy)	0.148	(0.095)	0.139	(0.101)
<i>Regional Trade Agreement</i> (dummy)	0.313***	(0.052)	0.251***	(0.062)
<i>Colonial Relationship</i> (Dummy)	0.672***	(0.150)	0.482***	(0.131)
<i>Number of Islands</i> (0,1,2)	0.969*	(0.516)	-0.382	(1.216)
Observations	14,066		8,017	
R ²	0.917		0.917	

Notes: Robust standard errors in parentheses. ***, **, * Indicates p -values less than 0.01, less than 0.05 and less than 0.1, respectively. In this and the following tables, AA and IMF refer to Alesina and Ardagna, and International Monetary Fund respectively.

Fiscal Consolidation and Own-country Exports

The results from the standard log-linear gravity model of equation (7) are shown in Table 5. The coefficient estimates on the control variables are mostly all statistically significant and of the correct expected sign (e.g. trade is increasing with country size and country ties, and decreasing with distance). The coefficient estimates of interest are the dummy variables for the fiscal consolidation events. In reporting the results, the row labeled *Exporter Consolidation t* represents the marginal effect of fiscal consolidation in the year(s) of the event, while the columns labeled $t + 1$, $t + 2$ and $t + 3$ represent the subsequent three years (following the end of the event). As can be seen in column 1 (using the Alesina and Ardagna identification of fiscal events) fiscal consolidation by the exporting country tends to have no statistically discernible effect on total exports in the year(s) of the event. However, one year and two years after consolidation, total exports increase by 4.8% and 3.9% respectively. Combining all the estimates, one finds that, three years after the end of a consolidation episode, total export volume increased by 11.3%. Thus, fiscal consolidation appears to have a statistically and economically significant impact on exports. Recall that Alesina and Ardagna (2010) tend to find that their list of fiscal consolidation events were followed by episodes of short-run growth. Our results suggest that a contributing factor to such growth was a significant increase in exports.

Looking at column 2, one sees a similar pattern when the IMF list of fiscal consolidation events are used, with a cumulative increase in export volume of approximately 5.8% three years after the end of the event. Recall that the IMF (Devries et al., 2011)

Table 2. Summary Statistics for AA data

Variable	Obs.	Mean	Std Dev.	Min	Max
<i>Extensive Margin</i>	13,375	354.01	2.06	6.00	1,478.00
<i>Intensive Margin</i>	13,375	15.66	4.37	0.10	1,894.97
<i>Total Exports</i>	13,375	5,545.42	7.63	1.40	1,392,804.64
<i>Exp. Fis. Consolidation_t</i>	13,375	0.14	0.35	0.00	1.00
<i>Exp. Fis. Consolidation_{t+1}</i>	13,375	0.11	0.31	0.00	1.00
<i>Exp. Fis. Consolidation_{t+2}</i>	13,375	0.10	0.30	0.00	1.00
<i>Exp. Fis. Consolidation_{t+3}</i>	13,375	0.10	0.30	0.00	1.00
<i>Imp. Fis. Consolidation_t</i>	13,375	0.14	0.35	0.00	1.00
<i>Imp. Fis. Consolidation_{t+1}</i>	13,375	0.11	0.31	0.00	1.00
<i>Imp. Fis. Consolidation_{t+2}</i>	13,375	0.10	0.30	0.00	1.00
<i>Imp. Fis. Consolidation_{t+3}</i>	13,375	0.10	0.30	0.00	1.00
<i>Distance</i>	13,375	2,098.13	3.11	137.23	12,294.42
<i>Population_h</i>	13,375	18,338,441.00	3.53	2,820,007.00	301,581,243.00
<i>Population_i</i>	13,375	18,292,103.00	3.53	2,820,007.00	301,581,243.00
<i>Real GDP per capita_h</i>	13,375	13,119.15	5,382.39	2,372.72	40,298.76
<i>Real GDP per capita_i</i>	13,375	13,117.19	5,388.27	2,372.72	40,298.76
<i>Strict Currency Union</i>	13,375	0.07	0.26	0.00	1.00
<i>Common Language</i>	13,375	0.14	0.35	0.00	1.00
<i>Regional Trade Agreement</i>	13,375	0.37	0.48	0.00	1.00
<i>Common Border</i>	13,375	0.08	0.27	0.00	1.00
<i>Number of Islands</i>	13,375	0.31	0.50	0.00	2.00
<i>Log Product of Land Area</i>	13,375	25.50	2.23	20.96	32.20
<i>Colony</i>	13,375	0.04	0.20	0.00	1.00

tended to find negative growth after their fiscal consolidation events; however, our results suggest that the export growth subsequent to such consolidation played an important role in cushioning the full effect of austerity on the economy. In addition, we observe export growth in each dataset (which use different countries, time periods and methods of identifying fiscal events), suggesting a degree of robustness to this link between fiscal consolidation and export growth.

Fiscal Consolidation and Foreign-country Exports

In the previous section, we used bilateral trade data and a standard gravity specification to verify the positive link between austerity and own-country exports found in the IMF report, and showed that an equivalent correlation appears in the Alesina and Ardagna (2010) data as well. However, this raises the question of whether there are also spillover effects in bilateral trade relations: does fiscal consolidation increase or decrease *foreign-country* exports? Such a question is relevant as, if fiscal consolidation has negative spillovers on foreign countries, then simultaneous austerity by multiple countries might not generate any positive results. Indeed, simultaneous fiscal consolidation is a relatively common occurrence in our datasets and, in the wake of the Great Recession, budget difficulties brought on by the global recession have led many countries to simultaneously enact austerity measures.

Thus, we introduce a new variable measuring whether the *importing* country (in the bilateral country pair) is experiencing an episode of fiscal consolidation:

Table 3. Summary Statistics for IMF data

Variable	Obs.	Mean	Std Dev.	Min	Max
Extensive Margin	8,017	477.26	1.56	30.00	1,478.00
Intensive Margin	8,017	25.14	4.02	0.20	1,947.83
Total Exports	8,017	11,999.30	5.69	10.02	1,433,600.97
Exp. Consolidation _t	8,017	0.07	0.25	0.00	1.00
Exp. Consolidation _{t+1}	8,017	0.04	0.20	0.00	1.00
Exp. Consolidation _{t+2}	8,017	0.04	0.20	0.00	1.00
Exp. Consolidation _{t+3}	8,017	0.04	0.20	0.00	1.00
Imp. Consolidation _t	8,017	0.07	0.25	0.00	1.00
Imp. Consolidation _{t+1}	8,017	0.04	0.20	0.00	1.00
Imp. Consolidation _{t+2}	8,017	0.04	0.20	0.00	1.00
Imp. Consolidation _{t+3}	8,017	0.04	0.20	0.00	1.00
Distance	8,017	1,801.59	3.00	137.23	10,032.20
Population _h	8,017	23,456,776.79	3.39	3,314,011.68	307,006,660.30
Population _i	8,017	23,416,465.81	3.39	3,314,011.68	307,006,660.30
Real GDP per capita _h	8,017	14,717.26	4,910.80	2,394.78	28,869.54
Real GDP per capita _i	8,017	14,700.88	4,917.87	2,394.78	28,869.54
Strict Currency Union	8,017	0.12	0.33	0.00	1.00
Common Language	8,017	0.15	0.36	0.00	1.00
Regional Trade Agreement	8,017	0.43	0.50	0.00	1.00
Common Border	8,017	0.10	0.29	0.00	1.00
Number of Islands	8,017	0.24	0.45	0.00	2.00
Log Product of Land Area	8,017	25.64	2.39	20.96	32.20
Colony	8,017	0.05	0.22	0.00	1.00

Note: Consolidation statistics are only for those $\geq 1.5\%$ of GDP.

Source: Devries et al. (2011).

$$\ln T_{ijt} = \beta_0 + \sum_{k=0}^{k=3} \beta_k EFC_{it-k} + \sum_{k=0}^{k=3} \beta'_k IFC_{jt-k} + \sum \alpha_1 Imp_a + \sum \alpha_2 Exp_b + \sum \alpha_3 Year_t + \gamma Z_{ijt} + \epsilon_{ijt}. \quad (2)$$

The notation is identical to before. IFC_{jt-k} denotes a binary variable, which is unity if j (the importer) underwent a fiscal consolidation episode at time $t-k$, and zero otherwise. Table 6 displays the results of this regression, concentrating on the coefficient estimates for exporter and importer consolidation (coefficient estimates for the other control variables are relatively unchanged). The findings in each panel, labeled “AA” (Alesina and Ardagna) and “IMF”, are from a single regression—the table is arranged in multiple rows and columns to show the marginal effect of the episodes over time (where, again, the column labeled t represents the marginal effect at the time of the event). The estimates in the last column are the sums across each row and p -values reflect the test that this sum is equal to zero.

In the top panel, the results for the Alesina and Ardagna (AA) data show the familiar pattern that the cumulative effect of fiscal consolidation by the exporter increases export volume, here by 7.8% over the three years following consolidation. However, as can be seen from the second row, there is also evidence of a spillover effect, in that fiscal consolidation by the *importing* country reduces foreign exports by a similar magnitude (a cumulative decrease of 9.2% over the three years following consolidation).

Table 4. List of Countries and Episodes of Fiscal Consolidation—AA Definition

Country	Year
Australia	1987, 1988
Austria	1984, 1996, 1997, 2005
Belgium	1982, 1984, 1987, 2006
Canada	1981, 1986, 1987, 1995, 1996, 1997
Denmark	1983, 1984, 1985, 1986, 2005
Finland	1973, 1976, 1981, 1984, 1988, 1994, 1996, 1998, 2000
France	1979, 1996
Germany	1996, 2000
Greece	1976, 1986, 1991, 1994, 1996, 2005, 2006
Ireland	1976, 1984, 1987, 1988, 1989, 2000
Italy	1976, 1980, 1982, 1990, 1991, 1992, 1997, 2007
Japan	1984, 1999, 2001, 2006
Netherlands	1972, 1973, 1983, 1988, 1991, 1993, 1996
New Zealand	1987, 1989, 1993, 1994, 2000
Norway	1979, 1980, 1983, 1989, 1996, 2000, 2004, 2005
Portugal	1982, 1983, 1986, 1988, 1992, 1995, 2002, 2006
Spain	1986, 1987, 1994, 1996
Sweden	1981, 1983, 1984, 1986, 1987, 1994, 1996, 1997, 2004
Switzerland	0 episodes
UK	1977, 1982, 1988, 1996, 1997, 1998, 2000
USA	0 episodes

Note: Alesina and Ardagna (2010) include Switzerland and the USA in their original study. They find no evidence of large fiscal consolidations in either country.

Source: Alesina and Ardagna (2010).

Combining these two effects, when both the exporting and importing country experience fiscal consolidation simultaneously, such consolidation fails to have a significant impact on export volume. The bottom panel, with IMF data, reveals a similar pattern in which consolidation by importing countries has a negative impact on foreign exports and, thus, simultaneous fiscal consolidation by both countries results in no statistically (or economically) significant change in total exports. Thus, once again we find a consistent pattern in the relationship between fiscal consolidation and exports across the two samples.

Note that this result, that the positive effect of austerity on exports does not appear when trading partners engage in fiscal consolidation simultaneously, has direct policy implications for the debate over the short-run growth aspects of austerity. As discussed by the IMF (Guajardo et al., 2014), the positive effect of fiscal consolidation on exports is an important component in either austerity resulting in short-run growth (as in the Alesina and Ardagna episodes) or in at least reducing the negative effects on production (as in the IMF episodes). Thus, evidence that these positive growth effects do not emerge when trading partners engage in simultaneous consolidation suggests that austerity is likely to be more damaging (or less stimulative) when a large number of countries undertake it.

Fiscal Consolidation and Currency Unions

The IMF report also finds that, in their dataset, fiscal consolidation is often followed by exchange rate depreciation. They find that for each 1% of GDP of fiscal

Table 5. List of Countries and Episodes of Fiscal Consolidation—IMF Definition

Country	Year
Australia	1985, 1986, 1987, 1988, 1994, 1995, 1996, 1997, 1998, 1999
Austria	1980, 1981, 1984, 1996, 1997 , 2001, 2002
Belgium	1982, 1983 , 1984, 1985, 1987 , 1990, 1992 , 1993, 1994, 1996, 1997
Canada	1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997
Denmark	1983, 1984, 1985 , 1995
Finland	1992, 1993, 1994, 1995 , 1996, 1997
France	1979, 1987, 1991, 1995, 1996, 1997
Germany	1982, 1983, 1984, 1991, 1992, 1993, 1994, 1995, 1996, 1997 , 1999, 2000, 2003, 2004, 2006, 2007
Ireland	1982, 1983 , 1984, 1985, 1986, 1987, 1988, 2009
Italy	1991, 1992, 1993 , 1994, 1995 , 1996, 1997 , 1998, 2004, 2005, 2006, 2007
Japan	1979, 1980, 1981, 1982, 1983, 1997, 1998, 2003, 2004, 2005, 2006, 2007
Netherlands	1981, 1982, 1983, 1984 , 1985, 1986 , 1987, 1988, 1991, 1992, 1993, 2004 , 2005
Portugal	1983 , 2000, 2002 , 2005, 2006 , 2007
Spain	1983 , 1984, 1989, 1992, 1993, 1994 , 1995, 1996, 1997
Sweden	1984, 1993 , 1994, 1995, 1996, 1997 , 1998
UK	1979, 1980, 1981 , 1982, 1994, 1995, 1996, 1997, 1998, 1999
USA	1978, 1980, 1981, 1985, 1986, 1988, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998

Note: Bold font indicates a total budgetary impact $\geq 1.5\%$ of GDP.

Source: Devries et al. (2011).

consolidation, the value of the currency falls by, on average, about 1.1%, and the contribution of net exports to GDP rises by about 0.5%. Thus, Guajardo et al. (2014) also hypothesize that the positive effect of fiscal consolidation on exports is less pronounced for countries that are members of a currency union (and thus the corresponding costs to fiscal consolidation may be greater). Intuitively, if the export boost is driven by currency depreciation, then countries that are members of a currency union will experience less export growth since many of their trading relationships involve fixed currencies. As evidence, they demonstrate that the expansionary effect of fiscal consolidation is lessened when a country has a fixed exchange rate regime. Their results are also consistent with Ilzetzki et al. (2013), which finds that estimates of fiscal multipliers depends crucially on whether the country has an independent currency. While intuitively convincing, their approach suffers from the fact that the decision to adopt a fixed exchange rate regime is not exogenous, which raises the possibility that there is some missing variable that is correlated both with the decision to adopt a fixed exchange rate and the lessened aggregate impact of austerity. Thus, as additional evidence we look at a slightly different correlation: whether (controlling for country fixed effects) exports only increase in bilateral trade relationships involving independent currencies.

To test this, we use our bilateral trade data and gravity specification to examine whether fiscal consolidation episodes have the same positive effect on exports between country pairs that share a common currency relative to country pairs that have independent currencies. That is, we now run the following specification:

Table 6. Importer and Exporter Effects

	AA				Total
	<i>t</i>	<i>t</i> +1	<i>t</i> +2	<i>t</i> +3	
Exporter Consolidation (dummy)	0.006 (0.011)	0.039*** (0.012)	0.029** (0.012)	0.001 (0.011)	0.076** (0.038)
Importer Consolidation (dummy)	-0.026** (0.012)	-0.017 (0.013)	-0.018 (0.012)	-0.020* (0.011)	-0.082* (0.043)
Exporter + Importer combined	-0.020 (0.016)	0.022 (0.019)	0.011 (0.018)	-0.019 (0.017)	-0.006 (0.061)
R ²	0.919				
Observations	13,375				

	IMF				Total
	<i>t</i>	<i>t</i> +1	<i>t</i> +2	<i>t</i> +3	
Exporter Consolidation (dummy)	-0.012 (0.020)	0.055** (0.025)	0.021 (0.018)	-0.017 (0.019)	0.047 (0.073)
Importer Consolidation (dummy)	-0.019 (0.021)	-0.040** (0.020)	-0.046** (0.020)	-0.032* (0.019)	-0.137** (0.069)
Exporter + Importer combined	-0.031 (0.029)	0.015 (0.032)	-0.025 (0.028)	-0.049* (0.027)	-0.090 (0.099)
R ²	0.917				
Observations	8,017				

Notes: These are the estimated marginal effects when the indicated fiscal episode occurs in period *t*. The coefficient estimates are from a single regression for each specification (AA, IMF). All control variables from Table 5, including year, exporter and importer fixed effects, are also included in the regression. Robust standard errors are in parentheses. Significance is denoted as follows: ****p* < 0.01; ***p* < 0.05; **p* < 0.1.

$$\ln T_{ijt} = \beta_0 + \sum_{k=0}^{k=3} \beta_k EFC_{it-k} + \sum_{k=0}^{k=3} \delta_{t-k} CU_{ijt-k} * EFC_{it-k} + \sum \alpha_1 Imp_a + \sum \alpha_2 Exp_b + \sum \alpha_3 Year_t + \gamma Z_{ijt} + \epsilon_{ijt}. \quad (3)$$

Here, CU_{ijt-k} denotes a binary variable, which is unity if the exporter (*i*) and importer (*j*) countries share a common currency at time *t* - *k*, and zero otherwise (this currency-union dummy variable is also included linearly as one of the control variables in all the regressions). The coefficient of interest is (δ_{t-k}), which we expect to be negative following Guajardo et al. (2014). Note that our bilateral trade approach allows us to include country fixed effects, which lessens concerns about country-specific missing variable bias. Instead, we measure the interaction between austerity and fixed exchange rates by exploiting the variation between independent and same-currency trading relationships, rather than countries with independent currencies and those in a currency union.

Table 7 displays the results of this regression, again suppressing the control variables. The results for the Alesina and Ardagna data (labeled AA) demonstrate that fiscal consolidation by the exporter increases export volume over the three years

Table 7. Currency Union Effects

	AA				
	t	t+1	t+2	t+3	Total
<i>Exporter Consolidation</i> (dummy)	0.006 (0.011)	0.038*** (0.012)	0.030** (0.012)	0.004 (0.012)	0.077* (0.040)
<i>Currency Union</i> × <i>Exp. Cons.</i>	0.005 (0.050)	0.025 (0.050)	-0.004 (0.057)	-0.042 (0.045)	-0.016 (0.156)
<i>Marginal Effect</i>	0.011	0.063	0.026	-0.038	0.061
<i>Exp. Consol. in CU</i>	(0.048)	(0.048)	(0.055)	(0.042)	(0.147)
<i>R</i> ²	0.919				
Observations	13,375				

	IMF				
	t	t+1	t+2	t+3	Total
<i>Exporter Consolidation</i> (dummy)	-0.012 (0.020)	0.056** (0.025)	0.043** (0.020)	0.011 (0.023)	0.097 (0.078)
<i>Currency Union</i> × <i>Exp. Cons.</i>	-0.020 (0.099)	-0.028 (0.124)	-0.136* (0.072)	-0.174** (0.078)	-0.358 (0.346)
<i>Marginal Effect</i>	-0.032	0.028	-0.093	-0.163**	-0.260
<i>Exp. Consol. in CU</i>	(0.096)	(0.121)	(0.066)	(0.069)	(0.327)
<i>R</i> ²	0.917				
Observations	8,017				

Notes: As per Table 6 footnote except corresponding importer variables are also included in the regression but not presented.

following consolidation. However, as can be seen from the third row, this effect is much less and is no longer statistically significant between trading partners who share a common currency. Repeating the exercise with the IMF data reveals a similar pattern in which consolidation by exporting countries has a statistically significant positive effect on exports overall, but not between countries that share a common currency.

These results are consistent with the hypothesis that a primary mechanism by which austerity increases export volume is through currency depreciation. In addition, this result has direct policy relevance, suggesting that austerity is likely to be less stimulative in countries that are members of a currency union (particularly since they are likely to trade disproportionately with currency-union partners). While our approach is different, this policy implication is consistent with the results of Guajardo et al. (2014) and Ilzetzki et al. (2013).

3. Fiscal Consolidation and the Intensive and Extensive Margin of Trade

In the previous section, we provided evidence that the main transmission mechanism through which fiscal consolidation affected exports was through exchange rate depreciation. However, the focus on aggregate bilateral trade flows between trading partners may mask some underlying impacts of fiscal consolidation on trade. One of

the main arguments for “expansionary austerity” is that it will spur private investment by reducing interest rates, reducing future uncertainty (about policy actions) and spur investor confidence. As mentioned previously, the recent trade literature has documented that the decision to export to a foreign market often involves significant fixed costs. This literature has thus emphasized the distinction between the establishment of new trading relationships (the extensive margin) and an increase in trade volume within an existing relationship (the intensive margin) (e.g. see Helpman et al., 2008; Bernard et al., 2000; Chaney, 2008). Given that the establishing of new export markets (the extensive margin) requires substantial investment, it seems reasonable that fiscal consolidation may have more of an effect on the extensive margin of a country’s exports.

This is not entirely an academic discussion; recent studies have established the importance of the extensive margin of a country’s exports. Export diversification, or a broader export basket, reduces the risks of balance of payments crises and large fluctuations in domestic output after-shocks that can negatively affect the performance of the external sector, such as price fluctuations in international markets or output swings in trading partners (Agosin, 2007; Lederman and Maloney, 2003). Feenstra and Kee (2008) suggest that increases in sectoral export variety boost country productivity if the new mix of exports improves the allocative efficiency of the economy. Hummels and Klenow (2005) find that export growth, based solely on the intensive margin, can have negative terms-of-trade effects, especially for large economies (although this may be reduced if the export base is broadened).¹⁰ Thus, fiscal consolidation might have positive long-run results if it generates an increase in the extensive margin of a country’s exports, even if the overall impact on the volume of trade is small. Thus, in this section we examine the effects of fiscal consolidation on the extensive and intensive margins of exports separately.

Methodology

We use disaggregated data at the four-digit Standard International Trade Classification (SITC) Revision 2 product level to construct a measure of the two margins. The methodology applied in this paper to analyze the two margins is referred to as the count method. Previous studies, such as Nitsch and Pisu (2008), Bernard et al. (2007), Flam and Nordström (2006), and recently by Dutt et al. (2013), have adopted a similar methodology to decompose total trade into the two margins.¹¹ In the traditional log-linear form, the decomposition of total exports can be expressed as follows:

$$\ln(T_{ijt}) = \ln(N_{ijt}) + \ln\left(\frac{T_{ijt}}{N_{ijt}}\right) \quad (4)$$

where T_{ijt} , the real aggregate bilateral exports (sum of total exports for all products for a given year) or total exports between a country pair is decomposed into two different dependent variables (N_{ijt} and T_{ijt}/N_{ijt}). N_{ijt} (the extensive margin) is the number of products exported per year per country pair and T_{ijt}/N_{ijt} (the intensive margin) is the average volume of exports per product per year. Utilizing the log-linear gravity model specification the extensive margin of exports can be expressed by the following specification:

Table 8. Extensive Margin: Importer and Exporter Effects

	AA				
	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>t+3</i>	Total
Exporter Consolidation (dummy)	0.020*** (0.006)	0.058*** (0.005)	0.048*** (0.006)	0.033*** (0.006)	0.159*** (0.018)
Importer Consolidation (dummy)	0.007 (0.005)	0.011 (0.007)	0.005 (0.007)	0.006 (0.007)	0.030 (0.023)
Exporter + Importer combined	0.027*** (0.009)	0.069*** (0.010)	0.053*** (0.010)	0.039*** (0.009)	0.189*** (0.032)
R ²	0.837				
Observations	13,375				
	IMF				
	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>t+3</i>	Total
Exporter Consolidation (dummy)	0.029*** (0.011)	0.088*** (0.016)	0.059*** (0.011)	0.033*** (0.007)	0.209*** (0.042)
Importer Consolidation (dummy)	0.006 (0.010)	-0.000 ^a (0.010)	-0.004 (0.009)	0.004 (0.009)	0.005 (0.033)
Exporter + Importer combined	0.035** (0.016)	0.088*** (0.020)	0.055*** (0.015)	0.037*** (0.012)	0.214*** (0.056)
R ²	0.775				
Observations	8,017				

Notes: ^aThis coefficient is between -0.001 and -0.000. As per Table 6 footnote for other details.

$$\begin{aligned} \ln N_{ijt} = & \beta_0 + \sum_{k=0}^{k=3} \beta_k EFC_{it-k} + \sum_{k=0}^{k=3} \beta_k^I IFC_{jt-k} \\ & + \sum \alpha_1 Imp_a + \sum \alpha_2 Exp_b + \sum \alpha_3 Year_t \\ & + \gamma Z_{ijt} + \epsilon_{ijt} \end{aligned} \quad (5)$$

and the intensive margin as:

$$\begin{aligned} \ln \left(\frac{T_{ijt}}{N_{ijt}} \right) = & \beta_0 + \sum_{k=0}^{k=3} \beta_k EFC_{it-k} + \sum_{k=0}^{k=3} \beta_k^I IFC_{jt+k} \\ & + \sum \alpha_1 Imp_a + \sum \alpha_2 Exp_b + \sum \alpha_3 Year_t \\ & + \gamma Z_{ijt} + \epsilon_{ijt}. \end{aligned} \quad (6)$$

Results

Tables 8 and 9 present the results for the extensive margin of exports. In looking at the results with the Alesina and Ardagna dataset, a strong pattern emerges with fiscal consolidation being associated with a substantial increase in the extensive margin (the cumulative increase in the extensive margin following an exporter consolidation is 17.2%). Since the average number of products exported by a given country to another

Table 9. Extensive Margin: Currency Union Effects

	AA				
	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>t+3</i>	Total
Exporter Consolidation (dummy)	0.005 (0.005)	0.046*** (0.005)	0.045*** (0.006)	0.040*** (0.006)	0.136*** (0.018)
Currency Union×Exp. Cons.	0.226*** (0.029)	0.162*** (0.028)	0.028** (0.034)	-0.082*** (0.026)	0.334*** (0.093)
Marginal Effect Exp. Consol. in CU	0.231*** (0.030)	0.208*** (0.028)	0.073** (0.034)	-0.042* (0.024)	0.470*** (0.092)
R ²	0.838				
Observations	13,375				

	IMF				
	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>t+3</i>	Total
Exporter Consolidation (dummy)	0.029*** (0.010)	0.078*** (0.015)	0.052*** (0.010)	0.037*** (0.008)	0.197*** (0.041)
Currency Union×Exp. Cons.	-0.009 (0.066)	0.111** (0.052)	0.040 (0.034)	-0.021 (0.021)	0.121 (0.153)
Marginal Effect Exp. Consol. in CU	0.020 (0.066)	0.189*** (0.051)	0.093*** (0.034)	0.016 (0.020)	0.318** (0.154)
R ²	0.775				
Observations	8,017				

Notes: As per Table 6 footnote except corresponding importer variables are also included in the regression but not presented.

country in the sample is 360, this means that a fiscal consolidation is associated with approximately 60 new products being exported, cumulatively, three years after the consolidation. Notice also, from Tables 8 and 9, that this positive impact on the extensive margin seems not to be driven entirely by exchange rate changes as it is not lessened either by currency unions or by simultaneous consolidation by the importing country. This is intuitive, since our motivation for looking at the effect of consolidation on the external margin is an interest rate story, rather than an exchange rate story. In general, the results using the IMF data are qualitatively similar.

The intensive margin of exports is affected differently than the extensive margin after a fiscal consolidation, as evidenced by the results in Tables 10 and 11. In the Alesina and Ardagna sample, an episode of fiscal consolidation results in a statistically significant *decrease* in the intensive margin of exports (despite the overall increase in export volume). Indeed, a consolidation in an exporting country results in a decline of the intensive margin by a total of 9.2%, and this negative effect on the intensive margin continues to occur even between currency-union members or countries experiencing simultaneous consolidation. As before, we find a similar pattern with the IMF data, suggesting a degree of robustness to the methodology by which fiscal consolidation episodes were identified.

Thus, the total effect of fiscal consolidation on export volume masked some underlying heterogeneity. Fiscal consolidation resulted in a substantial broadening in the

Table 10. Intensive Margin: Importer and Exporter Effects

	AA				
	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>t+3</i>	Total
Exporter Consolidation (dummy)	-0.014 (0.010)	-0.019* (0.011)	-0.019* (0.011)	-0.032*** (0.010)	-0.083** (0.036)
Importer Consolidation (dummy)	-0.033*** (0.011)	-0.028** (0.012)	-0.023** (0.011)	-0.026** (0.011)	-0.111*** (0.040)
Exporter + Importer combined	-0.047*** (0.015)	-0.047*** (0.017)	-0.042*** (0.016)	-0.058*** (0.016)	-0.194*** (0.056)
R ²	0.881				
Observations	13,375				

	IMF				
	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>t+3</i>	Total
Exporter Consolidation (dummy)	-0.041** (0.019)	-0.033 (0.020)	-0.038** (0.019)	-0.050*** (0.019)	-0.162** (0.070)
Importer Consolidation (dummy)	-0.024 (0.019)	-0.040** (0.019)	-0.042** (0.018)	-0.036** (0.017)	-0.142** (0.063)
Exporter + Importer combined	-0.065** (0.027)	-0.073*** (0.028)	-0.080*** (0.026)	-0.086*** (0.027)	-0.304*** (0.095)
R ²	0.901				
Observations	8,017				

Notes: As per Table 6 footnote.

number of trading relationships at the expense of a reduction in the volume of trade among existing exports.

Robustness Check

Recent studies have indicated that the traditional log-linear gravity model leads to inconsistent estimates in the presence of heteroskedastic residuals. Under heteroskedasticity, the parameters of log-linearized models estimated by ordinary least squares (OLS) lead to biased estimates of the true elasticities (Silva and Tenreyro, 2006; Liu, 2009). Studies have proposed the Poisson regression as an alternative solution to this issue (Flowerdew and Aitkin, 1982; Silva and Tenreyro, 2006). In this section, we implement the Poisson Pseudo-Maximum Likelihood (PPML) estimation proposed by Silva and Tenreyro (2006). They suggest the gravity equation be estimated in the multiplicative form allowing for heteroskedasticity. The commonly used conditional mean specification in the Poisson model is $E(T_{ijt}|Z_{ijt}) = \exp(Z_{ijt}\beta)$, where the coefficients are explained as elasticities if the dependent variable (T_{ijt}) is in level and the covariates (Z_{ijt}) are in logs. Our specification takes the following form:

$$T_{ijt} = \exp\left(\beta_0 + \sum_{k=0}^{k=3} \beta_k EFC_{it-k} + \sum \alpha_1 Imp_a + \sum \alpha_2 Exp_b + \sum \alpha_3 Year_t + \gamma Z_{ijt}\right) + \epsilon_{ijt}. \tag{7}$$

Table 11. Intensive Margin: Currency Union Effects

	AA				
	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>t+3</i>	Total
Exporter Consolidation (dummy)	0.001 (0.010)	-0.008 (0.012)	-0.016 (0.012)	-0.036*** (0.011)	-0.058 (0.039)
Currency Union×Exp. Cons.	-0.221*** (0.055)	-0.137*** (0.052)	-0.032 (0.059)	0.040 (0.045)	-0.350** (0.160)
Marginal Effect Exp. Consol. in CU	-0.220*** (0.054)	-0.145*** (0.049)	-0.048 (0.056)	0.004 (0.042)	-0.409*** (0.150)
R ²	0.881				
Observations	13,375				

	IMF (2011)				
	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>t+3</i>	Total
Exporter Consolidation (dummy)	-0.041** (0.020)	-0.022 (0.020)	-0.009 (0.020)	-0.026 (0.022)	-0.099 (0.075)
Currency Union×Exp. Cons.	-0.011 (0.102)	-0.138 (0.119)	-0.177*** (0.068)	-0.153** (0.072)	-0.479 (0.335)
Marginal Effect Exp. Consol. in CU	-0.052 (0.097)	-0.161 (0.114)	-0.186*** (0.062)	-0.179*** (0.064)	-0.578* (0.313)
R ²	0.901				
Observations	8,017				

Note: As per Table 6 footnote except corresponding importer variables are also included in the regression but not presented.

The decomposition of T_{ijt} (total exports) can now be expressed as follows:

$$(T_{ijt}) = (N_{ijt}) * \left(\frac{T_{ijt}}{N_{ijt}} \right) \quad (8)$$

where total exports (T_{ijt}) is decomposed into the extensive margin (N_{ijt}) and the intensive margin (T_{ijt}/N_{ijt}).

These results are available in Tables 12–15. The results are largely robust to the PPML specification, both qualitatively and quantitatively. However, there are two notable exceptions. First, there is no longer a statistically significant decrease in the intensive margin of exports in the AA dataset. Second, there is a slight change in the marginal effects of a fiscal consolidation for trading partners that are members of a currency union. Specifically, the cumulative impact of a consolidation on total exports becomes statistically significant in the IMF dataset, while the extensive margin loses significance in the IMF dataset, and the intensive margin is no longer statistically significant in either dataset—although the coefficients still have a negative sign.

4. Conclusion

The main contribution of this paper is to investigate the link between episodes of fiscal contraction and trade flows using bilateral trade data. The use of bilateral data allows

Table 12. All Fiscal Consolidations (AA-PPML)

	Aggregate Exports				
	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>t+3</i>	Total
Exporter Consolidation (dummy)	-0.023 (0.020)	0.037** (0.015)	0.045** (0.019)	0.023.0 (0.018)	0.082* (0.048)
Importer Consolidation (dummy)	-0.008 (0.016)	-0.003 (0.017)	-0.025 (0.020)	-0.029* (0.017)	-0.066 (0.060)
Exporter + Importer combined	-0.031 (0.024)	0.033 (0.025)	0.020 (0.029)	-0.006.0 (0.025)	0.016 (0.083)
R ²	0.942				
Observations	13,375				
	Extensive Margin				
	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>t+3</i>	Total
Exporter Consolidation (dummy)	-0.007 (0.007)	0.044*** (0.005)	0.047*** (0.006)	0.029*** (0.006)	0.112*** (0.016)
Importer Consolidation (dummy)	0.004 (0.005)	0.004 (0.006)	-0.001 (0.007)	0.002 (0.007)	0.010 (0.022)
Exporter + Importer combined	-0.003 (0.009)	0.048*** (0.008)	0.047*** (0.009)	0.030*** (0.009)	0.122*** (0.027)
R ²	0.788				
Observations	13,375				
	Intensive Margin				
	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>t+3</i>	Total
Exporter Consolidation (dummy)	0.018 (0.016)	0.021 (0.013)	0.012 (0.015)	-0.006.0 (0.011)	0.045 (0.043)
Importer Consolidation (dummy)	-0.010 (0.013)	0.003 (0.013)	-0.017 (0.014)	-0.025** (0.012)	-0.048 (0.042)
Exporter + Importer combined	0.008 (0.020)	0.023 (0.020)	-0.004 (0.023)	-0.030* (0.018)	-0.003 (0.066)
R ²	0.945				
Observations	13,301				

Notes: These are the estimated marginal effects when the indicated fiscal episode occurs in period *t*. The coefficient estimates are from a single regression for each specification. All control variables from Table 1, including year, exporter, and importer fixed effects, are also included in the regression. Corresponding importer variables are also included in the regression but not presented. Robust standard errors are in parentheses. Significance is denoted as follows: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

us the flexibility to derive some novel empirical results both documenting a negative spillover effect (in that austerity reduces foreign-country exports), and that the positive effect of austerity on own-country exports does not occur for trading partners with a shared currency. It should be noted that these results are consistent with exchange rate changes being a primary mechanism by which fiscal consolidation effects trade. In addition, our results have clear policy implications for the recent

Table 13. All Fiscal Consolidations (IMF-PPML)

	Aggregate Exports				
	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>t+3</i>	Total
Exporter Consolidation (dummy)	0.044 (0.036)	0.133** (0.054)	0.028 (0.030)	0.010 (0.021)	0.215 (0.133)
Importer Consolidation (dummy)	-0.040* (0.022)	-0.054** (0.027)	-0.057** (0.028)	-0.057** (0.028)	-0.209** (0.087)
Exporter + Importer combined	0.004 (0.038)	0.079 (0.055)	-0.029 (0.041)	-0.048 (0.031)	0.006 (0.147)
R ²	0.946				
Observations	8,017				
	Extensive Margin				
	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>t+3</i>	Total
Exporter Consolidation (dummy)	0.038*** (0.011)	0.114*** (0.020)	0.062*** (0.010)	0.033*** (0.007)	0.248*** (0.046)
Importer Consolidation (dummy)	0.003 (0.011)	-0.001 (0.010)	-0.003 (0.009)	-0.000 (0.008)	-0.001 (0.031)
Exporter + Importer combined	0.041** (0.016)	0.113*** (0.023)	0.059*** (0.014)	0.033*** (0.011)	0.246*** (0.057)
R ²	0.737				
Observations	8,017				
	Intensive Margin				
	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>t+3</i>	Total
Exporter Consolidation (dummy)	0.000 (0.021)	-0.015 (0.019)	-0.042** (0.019)	-0.026* (0.015)	-0.082 (0.062)
Importer Consolidation (dummy)	-0.033* (0.017)	0.044** (0.017)	-0.051** (0.020)	-0.053*** (0.019)	-0.181*** (0.061)
Exporter + Importer combined	-0.032 (0.031)	-0.059** (0.027)	-0.093*** (0.028)	-0.079*** (0.024)	-0.263*** (0.091)
R ²	0.947				
Observations	8,017				

Notes: As per Table 12.

experiences of the European Monetary Union countries with austerity measures. Indeed Guajardo et al. (2014) stresses that, while they find that austerity has a negative impact on short-run growth, these negative effects are often counterbalanced by the stimulus provided to exports. However, to the extent that this export stimulus primarily arises from exchange rate adjustments, fiscal consolidation will be more damaging to a country's economy when it is engaged in by several trading partners simultaneously, or by countries that are members of currency unions. We find exactly these types of patterns in the data.

Table 14. All Fiscal Consolidations: Currency Union Effects (AA-PPML)

	Aggregate Exports				
	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>t+3</i>	Total
Exporter Consolidation (dummy)	-0.024 (0.021)	0.034** (0.015)	0.051** (0.021)	0.039** (0.018)	0.099** (0.046)
Currency Union×Exp. Cons.	0.005 (0.046)	0.023 (0.049)	-0.056 (0.054)	-0.096** (0.042)	-0.125 (0.163)
Marginal Effect of Exp. Consol. in CU	-0.019 (0.043)	0.056 (0.049)	-0.006 (0.051)	-0.057 (0.042)	-0.026 (0.162)
R ²	0.942				
Observations	13,375				
	Extensive Margin				
	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>t+3</i>	Total
Exporter Consolidation (dummy)	-0.022*** (0.007)	0.033*** (0.004)	0.044*** (0.006)	0.034*** (0.006)	0.088*** (0.015)
Currency Union×Exp. Cons.	0.182*** (0.022)	0.127*** (0.024)	0.036 (0.026)	-0.048*** (0.017)	0.298*** (0.073)
Marginal Effect of Exp. Consol. in CU	0.161*** (0.022)	0.160*** (0.024)	0.080*** (0.025)	-0.015 (0.016)	0.386*** (0.073)
R ²	0.789				
Observations	13,375				
	Intensive Margin				
	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>t+3</i>	Total
Exporter Consolidation (dummy)	0.029* (0.017)	0.026* (0.015)	0.018 (0.016)	0.007.0 (0.012)	0.081* (0.46)
Currency Union×Exp. Cons.	-0.087** (0.040)	-0.036 (0.043)	-0.050 (0.043)	-0.073** (0.036)	-0.246* (0.133)
Marginal Effect of Exp. Consol. in CU	-0.057 (0.036)	-0.010 (0.039)	-0.032 (0.041)	-0.066* (0.035)	-0.165 (0.128)
R ²	0.945				
Observations	13,301				

Notes: As per Table 12.

However, we also find an underlying pattern in the effect of fiscal consolidation on trade that is masked by the use of aggregate trade data: the consolidation episodes identified by Alesina and Ardagna (2010) and IMF (Devries et al., 2011) both generally lead to an expansion in the extensive margin (i.e. the number of trade relationships) and a contraction in the intensive margin of trade (i.e. depth of existing relationships). Interestingly, this pattern emerges even between countries sharing a common currency, implying that the connection between fiscal policy and trade is not driven entirely by exchange rate changes.

Table 15. All Fiscal Consolidations: Currency Union Effects (IMF-PPML)

	Aggregate Exports				
	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>t+3</i>	Total
Exporter Consolidation (dummy)	0.041 (0.038)	0.142** (0.056)	0.092*** (0.034)	0.059*** (0.022)	0.334** (0.134)
Currency Union×Exp. Cons.	-0.084 (0.0082)	-0.176** (0.085)	-0.219*** (0.054)	-0.183*** (0.051)	-0.663*** (0.191)
Marginal Effect of Exp. Consol. in CU	-0.043 (0.072)	-0.034 (0.073)	-0.127*** (0.045)	-0.125*** (0.043)	-0.329* (0.176)
R ²	0.947				
Observations	8,017				
	Extensive Margin				
	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>t+3</i>	Total
Exporter Consolidation (dummy)	0.040*** (0.011)	0.109*** (0.020)	0.062*** (0.011)	0.043*** (0.008)	0.253*** (0.048)
Currency Union×Exp. Cons.	-0.025 (0.059)	0.041 (0.049)	0.001 (0.030)	-0.055*** (0.016)	-0.037 (0.137)
Marginal Effect of Exp. Consol. in CU	0.015 (0.059)	0.150*** (0.047)	0.063** (0.028)	-0.012 (0.014)	0.216 (0.133)
R ²	0.737				
Observations	8,017				
	Intensive Margin				
	<i>t</i>	<i>t+1</i>	<i>t+2</i>	<i>t+3</i>	Total
Exporter Consolidation (dummy)	-0.019 (0.022)	-0.014 (0.021)	0.012 (0.022)	0.012 (0.018)	-0.009 (0.066)
Currency Union×Exp. Cons.	0.081 (0.113)	-0.064 (0.066)	-0.146*** (0.049)	-0.117*** (0.045)	-0.246 (0.172)
Marginal Effect of Exp. Consol. in CU	0.062 (0.105)	-0.078 (0.058)	-0.134*** (0.039)	-0.105*** (0.037)	-0.255 (0.157)
R ²	0.947				
Observations	8,017				

Notes: As per Table 12.

Data Appendix

The following fiscal episode definition is from Alesina and Ardagna (2010):¹²

Fiscal Consolidation: A period of fiscal consolidation is a year in which the cyclically adjusted primary balance improves by at least 1.5% of GDP.

We construct the timing as follows: if a fiscal consolidation occurs in 1980, then EFC_t takes the value 1 in 1980 and zero in all other years. The variable EFC_{t-1} takes the value 1 in 1981, but zero in all other years, indicating that a consolidation occurred in the prior year. The definition is analogous if the episode lasts multiple

years. For example, if a consolidation takes place in 1982 and 1983 in a given country, then EFC_t equals one in both 1982 and 1983 and EFC_{t-1} equals one in 1984. This allows the marginal effect of the episode lasting an additional year to be calculated, while adding up the coefficient estimates from each time period allows for the total effect to be calculated.

Guajardo et al. (2014) and Devries et al. (2011) also look at fiscal consolidations that result in a deficit reduction of greater than 1.5% of GDP. However, they use a narrative approach, in which they parse through country records to identify policy actions.¹³

Variable definitions are listed below. Trade data are collected from the World Integrated Trade Solutions database (four-digit level SITC rev. 2). Data for the control variables are collected from Andrew Rose's website: <http://faculty.haas.berkeley.edu/arose/>. All variables are in five-year averages.

Total Exports: Log of real FOB exports from exporter i to importer j , measured in millions of US dollars.

Extensive Margin: Log of the number of products exported from i to j .

Intensive Margin: Log of the volume of exports per product from i to j .

Distance: Log of the distance between i and j .

Population: Log of population.

Real GDP per capita: Log of annual real GDP per capita.

Strict Currency Union: Equal to 1 if each country in a bilateral trading relationship share a common currency at time t .

Common Language: Equal to 1 if each country in a bilateral trading relationship have a common language.

Regional Trade Agreement: Equal to 1 if each country in a bilateral trading relationship have a RTA at time t .

Common Border: Equal to 1 if each country in a bilateral trading relationship share a border.

No. of Islands: Equal to the number of islands in a country pair (maximum value of 2).

Log Product of Land Area: Log of the product of the land area of h and i .

Colony: Equal to 1 if each country in a bilateral trading relationship were ever in a colonial relationship.

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Notes

1. The majority of this literature examines the different macroeconomic consequences of consolidation based on reducing government spending vs increases in tax rates. Among many others, see Alesina and Perotti (1997), Alesina et al. (1998), Giavazzi and Pagano (1998), Kumhof and Laxton (2007) and McDermott and Wescott (1996).
2. These papers are related to the IMF's 2010 edition of the *World Economic Outlook*, in which Leigh et al. (2010) consider this issue.
3. We find a smaller positive correlation using the IMF's sample of 17 advanced countries for the years 1978–2009.
4. Alesina et al. (1998) explain that this is a common result of the Mundell–Fleming model.
5. Using aggregate data, Guajardo et al. (2014) show that the expansionary effects of fiscal consolidation is lessened when a country has a fixed exchange rate regime. Here, we use bilateral trade data to show that, while fiscal consolidation has a strong positive effect on own-country exports in trade between countries with independent currencies, it has no significant effect on export volume between countries that share a currency.
6. See Helpman et al. (2008) and Griffoli (2006). Helpman et al. (2008) and Bernard et al. (2000) place substantial emphasis on fixed trade costs and the number of firms that engage in trade. In these models, a firm's decision to enter the market depends on the expected flow of profits (based on the uncertainty of its productivity) against the fixed entry costs.
7. We also repeat all regressions with country-pair fixed effects instead of importer and exporter fixed effects. All results are robust to this change and are available from the authors upon request.
8. For more information, see Andrew Rose's website: <http://faculty.haas.berkeley.edu/arose/>.
9. See Alesina and Ardagna (2010), p. 8.
10. In contrast, Besedeš and Prusa (2011) argue that the survival of trading relationships is important for long-run export growth and that the majority of growth in exports occurs at the intensive margin. Felbermayr and Kohler (2006) postulate that the intensive margin historically explains the majority of export growth, leaving room for the extensive margin to increase in importance for future export growth. Amurgo-Pacheco (2008) also find that export growth is primarily determined along the intensive margin, especially for developed economies.
11. An alternative measure of the margins at the product level is used by Hummels and Klenow (2005). They define the extensive margin as a weighted count of the categories in which a country exports relative to the categories exported by the rest of the world. The intensive margin is defined as the nominal exports from a country relative to the nominal exports from the rest of the world in the categories that the country also exports. Hence, the extensive margin can be viewed as a measure of diversification and the intensive margin as a measure of trade volume. Dutt et al. (2013) mention that the count method and the Hummels and Klenow (2005) method of extensive and intensive margins are comparable with each other. They find the correlation of the extensive margin between the count and the Hummels and Klenow (2005) method to be around 0.86 and the correlation between the intensive margins to be around 0.88.
12. See Alesina and Ardagna (2010), pp. 8–10, for a detailed exposition as to why this specific definition is chosen.
13. For more information, see Guajardo et al. (2014).

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